

Analytical Study of Skill Performance and Exercise Intensity in Small-Sided Game (4 vs. 4) with the Application of the Ball Touch Rule in Football Players Under 13 Years Old

دراسة تحليلية للأداء المهاري وشدة التمرين في اللعبة المصغرة (4 ضد 4) بتطبيق قاعدة عدد لمسات الكرة لدى لاعبي كرة القدم أقل من 13 سنة.

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Received: 2024-08-15

Accepted: 2025-01-23

Published: 2025-02-22

Abstract:

The study aimed to conduct a quantitative analysis of skill performance across three variables- passing, shooting, and scoring- and examine exercise intensity in small-sided games (4 vs 4) by applying various ball touch rules to explore the relationships among these factors. For this purpose, the researcher selected a purposive sample comprising 32 players under 13 years of age from the Ain El-Sabt Youth Club in Setif Province, divided into four groups of eight players each. The research methodology employed was descriptive-analytical, utilizing quantitative video analysis of the scheduled training sessions, in addition to analyzing heart rate averages and Rate of Perceived Exertion (RPE) scores.

The analysis of the results indicates a significant correlational relationship between the ball touch rule and both the skill performance across its three variables and the exercise intensity.

Keywords: Skill Performance; Exercise Intensity; Small-Sided Game (4 vs. 4); Football; Under 13 Category.

1.Introduction and Research Problem:

Modern football necessitates a holistic and interconnected development of physical and skill attributes. Contemporary training methodologies eschew the traditional separation of physical preparation from skill development. Instead, they aim to simultaneously enhance both the skill and physical capabilities of players. Hassan El-Sayed Abu Abdo articulates this integration: "It is impossible to separate general and specific physical preparation from skill training because a player who possesses basic components and a high level of fundamental skills without being on the same level physically is consequently not skilled. Thus, the positive relationship between the physical and technical preparation of players during the training stages and during matches becomes evident". **(Abu Abdo, 2008)**

Eric Bottym (1981) emphasizes that small-sided game, which typically occur in constrained spaces, represent one of the most effective contemporary training methods, reflecting a diverse array of forms tailored to the characteristics of specific goals. This approach is favored by a majority of coaches who prepare their players within small designated areas. Additionally, Dellal (2008) supports this method stating " small-sided game allow the development of all performance attributes in football throughout the season and are suitable for all ages."

The reliance on a combination of technical, physical, and tactical skills in football performance underscores the widespread adoption of small-sided games in training regimes. These games are designed to concurrently enhance technical skills, tactical awareness, and physical fitness. **(Ngo and al, 2012)**

Their simple, enjoyable, and accessible nature makes small-sided games suitable for all ages and both genders. These games harness the body's basic kinetic energy, establishing them as an effective and significant method in the developmental process of children. **(Alali, 2021, p 429)**

For several years, small-sided games have offered a valuable alternative to traditional ball-less training. When designing small-sided game sessions, adjustments are typically made to the playing area, number of players, and game rules, such as the number of allowed touches, to meet specific technical, tactical, and physical objectives. This method, akin to interval training, has been validated by numerous studies and research. The inclusion of the ball in these games not only enhances player motivation but also optimizes training time, making the training more specific and effective. **(Castellano J and al, 2013)**

Furthermore, research has demonstrated the efficacy of using small-sided games to develop physical fitness among football players. The flexible nature of these games allows for modifications in exercise intensity through adjustments in several variables, such as the number of players, the size of the pitch relative to the number of players and employing motivational techniques by coaches. **(Casamichana and al, 2013)**

Building on existing research, Halouani and al (2017) underscore the efficacy of small-sided games as a training method specifically tailored for enhancing aerobic endurance in football. These games ingeniously integrate ball use and active play scenarios that encompass explosive actions typical of the sport, simultaneously facilitating the development of technical and tactical skills while sustaining player motivation. The research further highlights the necessity of customizing the competitive format to align with the unique characteristics of youth or adolescent participants. Modifications to the rules are frequently made to accommodate the physical maturation of children and adolescents, thereby enriching their gaming experience by making participation more accessible and engaging. Additionally, it is noted that coaches or physical trainers often adjust these rules to manipulate play intensity to achieve desired training outcomes, recognizing that such changes can significantly influence physiological responses and consequently enhance performance. **(Halouani and al, 2017)**

From this analysis, it is evident that small-sided games occupy a pivotal role in modern sports training for football. This sentiment is echoed by Jones and All (2007), who state, "Small-sided games are vital in sports training because they immerse players in various situational contexts that may arise during matches, fostering the acquisition of technical skills, play intelligence, physical abilities, and a cooperative spirit, all of which are essential for enhancing the quality of play and achieving superior performance and an engaging spectacle".

Drawing upon both scholarly insights and practical experiences, including the student's background as a former player and current coach of youth football categories, it is observed that coaches, particularly in amateur settings, tend to rely on traditional methods for teaching and reinforcing basic skills, often isolating them from physical training sessions. This approach does not adequately develop and enhance physical and skill attributes in a comprehensive and integrated manner. There is also a noticeable disregard for applying scientific principles during training sessions that incorporate small-sided games, which are sometimes viewed merely as informal matches to alleviate routine, break monotony, and provide entertainment at the end of training sessions. Such practices lead to subpar performance among amateur players in actual matches, where a player might excel at passing during practice but falter and become disoriented when executing the same skill in a competitive setting. Moreover, these games are frequently programmed without careful consideration of specific game aspects such as the area of play, the number of players, or variations in rules, particularly those concerning the number of ball touches. For instance, coaches may limit players to only one or two touches on the ball to discourage selfish play, not realizing how such restrictions impact the technical load of performance and the intensity of the exercise. This issue forms a central theme of this research. Although numerous studies have explored the technical demands of small-sided games, the research conducted thus far lacks systematic analysis. Future studies should undertake detailed investigations to better understand the technical skill requirements of various small-sided game formats, enabling coaches to more effectively gauge the relationship between technical load and exercise intensity in small-sided game training.

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Small-sided games in football training vary widely in format, ranging from larger setups like 8 vs 8 to more individualized encounters such as 1 vs 1. Each format is designed with specific objectives in mind, targeting physical, technical, or tactical improvements. For the purposes of this study, the small-sided game format of 4 vs 4 was selected due to its demonstrated high efficiency in enhancing key skills -passing, shooting, and scoring- as compared to other formats. This choice is supported by empirical evidence from a study by Dr. Rick Fenoglio in 2003, involving the Manchester United football team. Fenoglio's research compared the 8 vs 8 and 4 vs 4 small-sided game formats and found that the 4 vs 4 format significantly increased player engagement in key activities, with a 135% increase in passing, a 260% increase in shooting, and an astounding 500% increase in goals scored.

One of the most critical skills enhanced during small-sided game sessions is the passing technique. This skill, fundamental to football, is frequently executed under competitive pressure, making it essential for maintaining possession percentages during matches. Similarly, the ability to shoot at the goal, and particularly to score, is vitally important as it directly contributes to winning matches and securing trophies. This study aims to perform a detailed quantitative analysis of these skills along with exercise intensity, measuring parameters such as heart rate and RPE (Rate of Perceived Exertion) effort degrees, within the context of the 4 vs 4 small-sided game format, applying specific rules regarding the number of ball touches.

In light of the aforementioned findings, the following questions were posed:

- General Question:

- Is there a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the skill performance and exercise intensity among football players under 13 years old?

- Sub-Questions:

- Is there a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the passing rate among football players under 13 years old?

- Is there a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the shooting rate among football players under 13 years old?

- Is there a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the scoring rate among football players under 13 years old?

- Is there a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the exercise intensity among football players under 13 years old?

- Hypotheses:

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- General Hypothesis:

- There is a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the skill performance and exercise intensity among football players under 13 years old.

- Sub-Hypotheses:

- There is a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the passing rate among football players under 13 years old.

- There is a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the shooting rate among football players under 13 years old.

- There is a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the scoring rate among football players under 13 years old.

- There is a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the exercise intensity among football players under 13 years old.

- Research objectives:

- To examine the relationship between the number of ball touches applied in the small-sided game (4 vs 4) and skill performance in its three variables (passing, shooting, and scoring) among football players under 13 years old.

- To explore the relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the intensity of the exercise among football players under 13 years old.

- To conduct a precise quantitative analysis of the skill performance characteristics (passing, shooting, and scoring) and the intensity of the exercise (FC, RPE) in the small-sided game (4 vs 4) by applying the rule of the number of ball touches.

2. Definition of Concepts and Terms:

2.1. Skill Performance:

Defined as the player's capability to manipulate the ball and solve problems within the game's rules to contribute to both defensive and offensive strategies. Hazem & Abu Youssef describe it as "the ability to select the most suitable movements that fit the nature of the changing situation, which enables the primary goal in football, which is to score against the opponent's goal."

2.2.Exercise Intensity:

In sports training, intensity refers to the effort required to perform an exercise, a pivotal element in training program design. Intensity can be quantified in various ways depending on the sport and participant level, including heart rate, the amount of weights used, speed, or the personal feeling of exertion. **(Bompa and Haff, 2009)**

2.3.Small-Sided Game (4 vs 4):

A small-sided game is a training drill involving a small-sided game between two teams, each consisting of four players, with or without goalkeepers, under diverse rules and conditions tailored to the objectives. The game is played in a designated area starting from 20x20 meters, lasting no more than 3 to 4 minutes per repetition, as articulated by Alexandre Dellal.

2.4.Rule of Number of Ball Touches:

This rule encompasses constraints and tasks that can be altered by coaches and researchers to predict significant workloads, regarded as variables that influence the type of training and the physical and physiological responses, thereby facilitating precise training session planning. **(Jara et al., 2018)**. The rule stipulates a specific number of touches a player is allowed during small-sided games, with any excess considered a fault resulting in a turnover.

2.5.Football:

Football is a team sport played by two teams, each consisting of eleven players, using a globally standardized, round, inflated ball on a rectangular field with goalposts at each end. The objective is to score by getting the ball into the opponent's goal. **(Ben Hassan, 1998)**

2.6.Age Category Under 13 Years:

Abdul Rahman Aissaoui defines this age group as "the adolescent stage where there is a gradual transition towards physical, sexual, intellectual, and psychological maturity". **(Aissaoui, 1980)**

3.Previous and Similar Studies:

- ❖ A study by Hill Haas and al (2010) titled: "The effect of player numbers and rule changes on the movement characteristics and physiological responses to small-sided games in elite youth players" explored the physiological and movement dynamics associated with various small-sided game formats (3 vs 4, 3 vs 3 + floater, 5 vs 6, 5 vs 5 + floater) and different rule modifications among elite young football players. Employing an experimental methodology complemented by field testing, the study revealed that even minor rule adjustments in small-sided games could significantly

impact the physiological responses and movement characteristics of young players. Additionally, rules that influenced team scoring opportunities were found to motivate players, thereby enhancing training session intensity.

- ❖ In another relevant study, Castellano and al (2013) investigated "The effect of game format and number of players on heart rate responses and physical demands in small-sided football games." This research aimed to determine how alterations in game format (possession vs. target goals, goalkeepers vs. small goals) and variations in player numbers (3 vs 3, 5 vs 5, 7 vs 7) influenced the physiological and physical demands on semi-professional football players. Utilizing an experimental framework and a combination of physical and physiological tests, including GPS systems and heart rate monitors, with 14 semi-professional players, the findings indicated that both game format and player number
- ❖ Research conducted by Halouani and al (2014) titled: "Physiological Responses According to Rule Changes During 3 vs. 3 Small-Sided Games in Young Football Players: Stop-Ball versus Small-Goal Rules", aimed to assess the physiological impacts of employing stop-ball rules as opposed to small-goal rules in 3 vs 3 small-sided games involving young football players. Through an experimental approach and physiological testing of 12 amateur young players, it was observed that the stop-ball rule notably increased heart rate, although there were no significant differences in RPE outcomes compared to the small-goal rule. This suggests that the stop-ball rule might intensify the effort level in small-sided games.
- ❖ A 2022 study by Hadjab and al, "Application of Various Small-Sided Game Formats in a Training Program to Develop Physical Abilities and Basic Skills in Football Players Under 17 Years," aimed to evaluate the efficacy of a small-sided game-based training program on enhancing the physical abilities and basic skills of football players under 17. Utilizing an experimental design and physical and skill tests for data collection among 20 amateur players, the results demonstrated that small-sided game-centered training significantly fosters the development of physical attributes and fundamental skills in young football players.
- ❖ Lastly, research by Swilah and al (2023) titled: "The Role of Using Modified Rules During Small-Sided Game Training in Improving Physical Performance of Amateur Football Players from Coaches' Perspective" explored the impact of various rule modifications during small-sided game training on enhancing the physical performance of players. Employing a descriptive methodology and questionnaires with 16 football coaches from regional division teams, the study concluded that different constraints and rule changes during small-sided game training notably enhance play intensity and elevate players' physical efforts, contributing to improved physical performance.

4.Methods:

4.1.Research Method Used:

The study utilized a descriptive-analytical approach, focusing on video recordings of the exercises conducted with the sample, followed by a detailed analysis. This methodology aligns closely with the objectives of the study, facilitating an in-depth examination of skill performance and exercise intensity among football players under 13 years old.

4.2.Research Population and Sample:

- **Research Population:** The study encompassed football players under 13 years affiliated with the Setif Provincial League.
- **Research Sample:** A purposive sampling strategy was employed to select 32 players from the amateur sports club RC Ain Sebt, where the researcher also serves as coach and supervisor. The sample was divided into four equal groups of 8 players each.

4.3.Research Variables:

- ✓ **Independent Variable:** The application of the small-sided game (4 vs 4) with the specific rule concerning the number of ball touches.
- ✓ **Dependent Variables:** Skill performance (encompassing passing, shooting, and scoring) and exercise intensity.

4.4.Research Domains:

A- Human Domain: The players, all under 13 years from RC Ain Sebt, comprised the purposively selected sample of 32 participants.

B- Spatial Domain: The proposed exercises were conducted at the Ain Sebt Municipal Stadium, which serves as the training ground for the selected club and sample.

C- Temporal Domain: The study commenced on January 27, 2024, and concluded on February 24, 2024. Training sessions were scheduled as follows:

Table 1: Temporal Domain for Practical Implementation

Training Session	01	02	03	04
Date	27/01/2024	03/02/2024	10/02/2024	24/02/2024

All sessions were held in the morning during the team's regular training time, specifically on Saturdays to ensure field availability and optimal exercise application.

4.5.Preliminary Study:

The researcher's dual role as coach and supervisor provided a unique insight into the training dynamics and field characteristics of the sample. The preliminary phase of the study involved a thorough review of various scholarly and practical sources related to the topic, as well as analogous studies.

This review helped in selecting the most suitable small-sided game format and in detailing the procedural aspects of its application, including area size, playing time, number of repetitions, and the nature of rest periods.

4.6.Research Tools:

The study utilized a combination of tools to collect and analyze data:

- Arabic and foreign scholarly sources and references.
- Video recordings and subsequent analytical review.

4.7.Proposed Exercise (Small-Sided Game 4 vs 4):

- **Objective of the Exercise:** To quantitatively analyze skill performance across three variables -passing, shooting, scoring-and measure exercise intensity through average heart rate and RPE, enforcing a specific rule on the number of ball touches.
- **Resources Used:** Video camera, footballs, whistle, stopwatch, cones for marking the exercise area, bibs for team identification, and goals (measuring 3 x 2 meters).
- **Procedural Characteristics Implemented in the Exercise:**

Table 2: The characteristics of the proposed small-sided game

Game Format	Area	Exercise Duration	Number of Repetitions	Rest Period	Nature of Rest
4 vs 4 + Goalkeeper	20 x 20 m	04 minutes	03 repetitions	01 minute	Passive (inactive)

All exercises were conducted with goalkeepers and under the coach's encouragement and motivation. The four sample groups were rotated through the four ball touch rules as follows:

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Table 3: The rotation of groups through different ball touch rules during training sessions

Training Session	Group 1	Group 2	Group 3	Group 4
01	Free play	03 touches	02 touches	01 touch
02	03 touches	02 touches	01 touch	Free play
03	02 touches	01 touch	Free play	03 touches
04	01 touch	Free play	03 touches	02 touches

The strategy of rotating the groups through the four different ball touch rules during each training session serves a crucial purpose. By implementing all exercise rules on the same day, it guarantees uniform conditions for the training environment and controls for climatic factors that could potentially influence the outcomes of the exercise. This approach ensures that each group experiences the same external conditions, which is essential for maintaining the reliability and accuracy of the results.

4.8.Statistical Methods:

The research utilized several statistical methods to analyze the collected data accurately: Mean, Standard deviation, Pearson correlation coefficient.

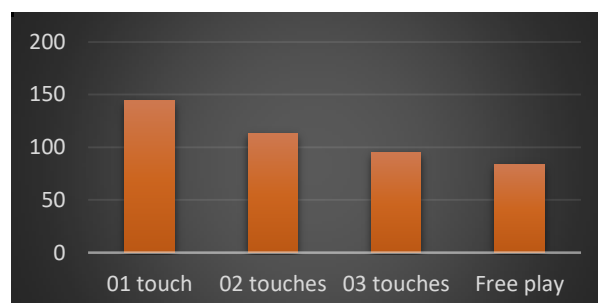
5.Presentation and Analysis of Results:

5.1. Presentation and Analysis of Passing Statistics According to the Number of Ball Touches Rule:

Table 4: The passing statistics according to the number of ball touches rule

Rules	Group 1	Group 2	Group 3	Group 4	Average Number of Passes	General Average	Standard Deviation	Pearson Correlation Coefficient
01 touch	151	142	148	135	144	109	22.7	-0.97
02 touches	119	110	116	107	113			
03 touches	100	92	98	90	95			
Free play	85	83	89	77	84			

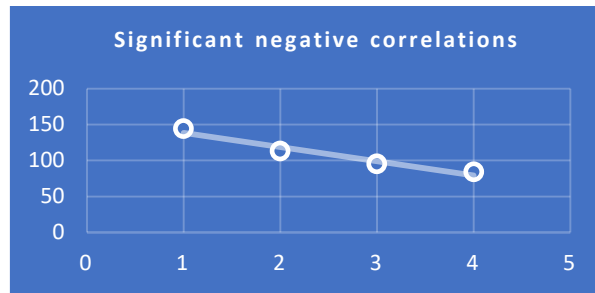
Figure 1: Average passes according to the number of ball touches rule



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Figure 2: The direction and degree of correlation between the number of ball touches and the passing rates



The data derived from Table (04) and illustrated in Figure (01) demonstrates a notable trend in the passing performance metrics under varying ball touch conditions. It is evident that the average number of completed passes significantly increases as the allowed number of touches decreases. Specifically, the lowest average was recorded at 84 passes during free play sessions, increasing to 95 passes with three allowed touches, 113 passes with two touches, and peaking at 144 passes under the one-touch rule. This pattern suggests that the one-touch rule, by compelling players to pass swiftly, effectively enhances the rate of pass completion in contrast to scenarios that permit more handling freedom. This is quantitatively supported by a general average of 109 passes and a standard deviation of 22.7, alongside a pronounced negative Pearson correlation coefficient of -0.97, illustrating a strong inverse relationship between the number of ball touches and passing rates.

5.2. Presentation and Analysis of Shooting Statistics According to the Number of Ball Touches Rule:

Table 5: Shooting statistics based on the number of ball touches rule

Rules	Group 1	Group 2	Group 3	Group 4	Average Number of Shots	General Average	Standard Deviation	Pearson Correlation Coefficient
01 touch	23	14	15	18	17.5	23.8	5.2	0.99
02 touches	29	16	18	20	20.75			
03 touches	34	22	26	21	25.75			
Free play	36	20	31	38	31.25			

Figure 3: The shooting rates according to the number of ball touches rule

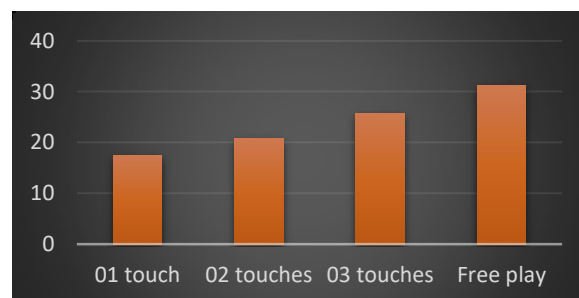
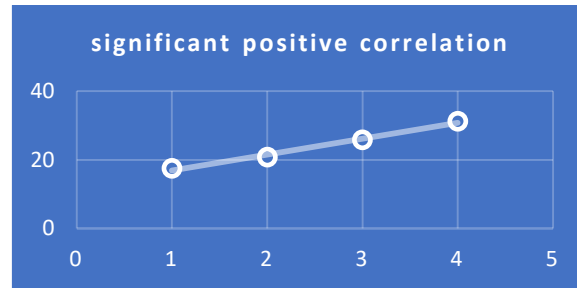


Figure 4: The direction and degree of correlation between the number of ball touches and the shooting rates



As detailed from Table (05) and Figure (03), the average number of shots taken by players escalates with an increase in the number of allowed ball touches. The data shows a minimal average of 17.5 shots for one touch, which rises to 20.75 shots for two touches, 25.75 shots for three touches, and culminates at 31.25 shots during free play. This increase aligns with the enhanced freedom players experience to manipulate the ball, which directly facilitates their ability to execute shooting skills. The inclination to shoot rather than pass becomes more pronounced under less restrictive conditions, as players aim to maximize goal-scoring opportunities. The reduction in the number of allowed touches poses challenges in shooting execution, particularly noticeable in the one-touch condition, where shooting opportunities are markedly diminished. The recorded general average of 23.8 shots, a standard deviation of 5.2, and a very strong positive Pearson correlation coefficient of 0.99 further corroborate the direct relationship between the number of ball touches and shooting rates.

5.3. Presentation and Analysis of Scoring Statistics According to the Number of Ball Touches Rule:

Table 6: Scoring statistics based on the number of ball touches rule

Rules	Group 1	Group 2	Group 3	Group 4	Average Number of Goals	General Average	Standard Deviation	Pearson Correlation Coefficient
01 touch	5	2	3	2	3	5.62	2.18	0.97
02 touches	6	4	3	3	4			
03 touches	12	7	5	5	7.25			
Free play	8	8	10	7	8.25			

Figure 5: Scoring rates according to the number of ball touches rule

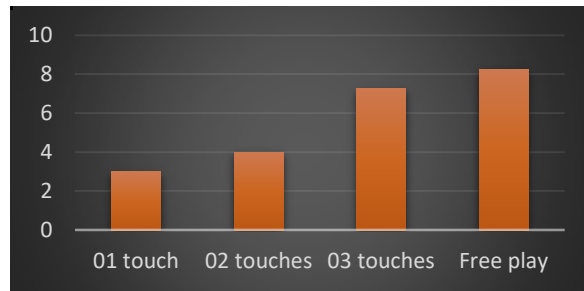
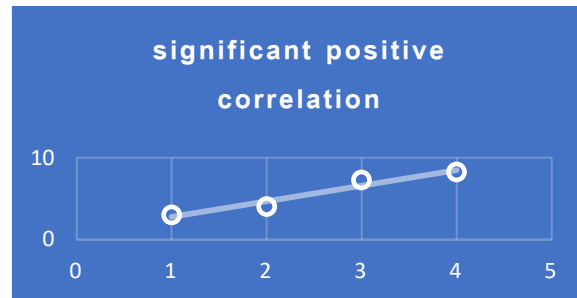


Figure 6: The direction and degree of correlation between the number of ball touches and scoring rates



From the data illustrated in Table 6 and Figure 5, a clear trend emerges showing that the average number of goals scored increases as the number of touches allowed in the game increases. The results are as follows: with one touch, the average was the lowest at 3 goals; with two touches, it increased slightly to 4 goals; with three touches, it rose significantly to 7.25 goals; and with the most lenient rule, free play, it peaked at 8.25 goals. This pattern underscores the direct relationship between the number of shots taken—a factor we've previously noted, and the goals scored. Allowing players more freedom to handle the ball facilitates more focused and precise execution of shooting skills. In contrast, restricting the number of touches complicates shooting efforts and diminishes players' concentration, leading to fewer goals. The study recorded a general average of 5.62 goals with a standard deviation of 2.18. The Pearson correlation coefficient of 0.97 reveals a strong positive correlation between the number of ball touches allowed in the game and the goals scored by the players, further illustrated in Figure 6.

5.4. Presentation and Analysis of Heart Rate Statistics (± 10) According to the Number of Ball Touches Rule:

Table 7: Heart rate statistics according to the number of ball touches rule

Rules	Group 1	Group 2	Group 3	Group 4	Average Heart Rate	General Average	Standard Deviation	Pearson Correlation Coefficient
01 touch	180	170	170	180	175	154	16.7	-0.97
02 touches	160	160	170	170	165			
03 touches	150	140	130	140	140			
Free play	140	130	130	140	135			

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Figure 7: Heart rate averages according to the number of ball touches rule

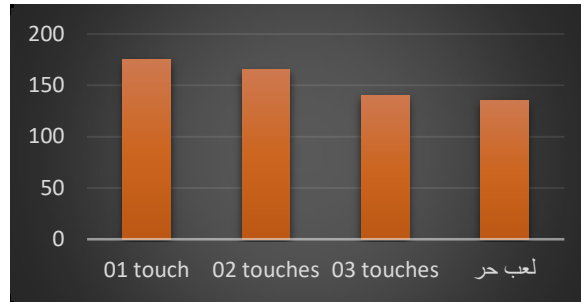
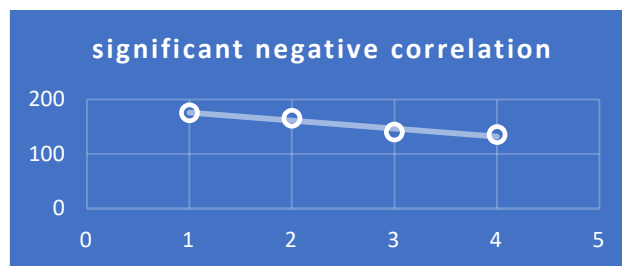


Figure 8: The direction and degree of correlation between the number of ball touches and heart rate averages



From the insights derived from Table 7 and visualized in Figure 7, we observe a distinct pattern where the average heart rate increases as the number of ball touches decreases. Specifically, the lowest average heart rate was recorded at 135 bpm during free play scenarios, which increased to 140 bpm with three touches, escalated further to 165 bpm with two touches, and peaked at 175 bpm with one touch. This trend can be attributed to the increased difficulty and intensity of play in scenarios with fewer ball touches. Such settings require players to continuously move to create and utilize passing lanes effectively, thereby raising the overall performance intensity. Conversely, allowing more touches results in a less demanding performance, characterized by a lower rhythm of play and consequently, a decreased heart rate. Overall, a general average heart rate of 154 bpm was recorded, with a standard deviation of 16.7, a Pearson correlation coefficient of -0.97 indicates a strong negative relationship between the number of ball touches and the players' heart rate, as depicted in Figure 8.

5.5. Presentation and Analysis of RPE Scores According to the Number of Ball Touches Rule:

Table 8: RPE scores according to the number of ball touches rule

Rules	Group 1	Group 2	Group 3	Group 4	Average RPE	General Average	Standard Deviation	Pearson Correlation Coefficient
01 touch	8	8	8	8	8	7.5	0.5	-0.07
02 touches	8	8	8	8	8			
03 touches	7	7	7	7	7			
Free play	7	7	7	7	7			

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Figure 09: RPE scores according to the number of ball touches rule

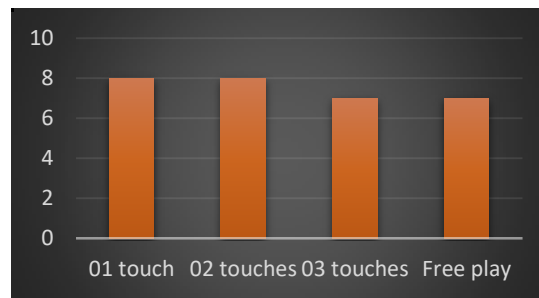


Figure 10: The lack of correlation between the number of ball touches and RPE scores



As illustrated in Figure 10, there is an apparent absence of correlation between the number of ball touches and the RPE (Rate of Perceived Exertion) scores. Data extracted from Table 8 and Figure 9 further corroborate this observation, indicating consistent RPE scores, an average of 7 for scenarios involving three touches and free play, contrasted with an average of 8 in situations of one touch and two touches. These findings highlight the lack of a correlational relationship between the frequency of ball touches during gameplay and the resultant average RPE scores. Such evaluations, while indicative of certain trends, remain inherently subjective and largely dependent on individual players' perceptions. Although these differences are slight, they subtly endorse the notion that performance intensity tends to escalate inversely with the frequency of ball touches.

6. Discuss the results in the light of research hypotheses:

6.1. Discussion of the first hypothesis:

- There is a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the passing rate among football players under 13 years old.

An analysis and statistical evaluation of the sample results across four distinct groups revealed discernible variances in passing rates, which notably increased as the number of ball touches in the game diminished. Specifically, a negative correlation is evident between the frequency of ball touches and the passing rate, as documented in Table 4 .

This phenomenon can be attributed to the constraints imposed by limiting players to a specific number of ball touches, compelling them to pass the ball more frequently, thereby reducing opportunities for ball retention and individualistic play. This is particularly pronounced in scenarios restricted to one or two touches, where players face increased difficulty in ball handling, thus resorting to passing as the most feasible strategy. This continuous engagement in passing not only reinforces the skill but also accelerates decision-making processes. In contrast, scenarios allowing free play tend to encourage players to retain possession, dribble, and explore shooting opportunities, which can inversely affect the passing rate. To enhance and solidify passing skills effectively, it is advisable to implement the one-touch or two-touch rule. Such settings not only yield higher passing rates during practice sessions but also necessitate swift performance and rapid decision-making by the players. As noted by Herman (2004), "Training on small-sided fields enhances the mastery of skills through collective efforts, facilitated by the demands of rapid and continuous transitions. This approach not only improves agility, reaction speed, and accuracy but also mirrors the dynamics of actual match play, thereby boosting skill efficiency and consistency during varied match conditions". These observations substantiate the validity of the first hypothesis.

6.2. Discussion of the second hypothesis:

- There is a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the shooting rate among football players under 13 years old.

In the assessment of the second hypothesis, statistical analysis of sample results across four distinct groups has identified clear differences in shooting rates, which progressively increase with the number of touches allowed in the game. This trend demonstrates a positive correlation between the number of ball touches and the shooting rate, as detailed in Table 5.

The underpinning rationale for this correlation relates to the complexities of shooting, which demands effective control of the ball, optimal positioning towards the goal, and the execution of the shot. Such intricacies become particularly challenging under conditions that restrict players to one or two touches, especially when under the duress of opponent pressure and surveillance, which markedly diminishes shooting opportunities. Conversely, scenarios that permit three touches or unrestricted play markedly enhance shooting rates. This is attributed to the increased freedom players receive in ball handling, which allows them to control the ball, optimally position it, and occasionally dribble past opponents, thereby generating more shooting opportunities. In contexts where enhancing shooting accuracy and mastery is a priority, essential for scoring goals and securing victories, the implementation of either free play or a three-touch rule in small-sided games is advantageous. Such settings not only facilitate skill development but also closely mimic actual match conditions, providing players the liberty to make strategic decisions. Echoing this sentiment, Dellal (2008) emphasizes that "Integrated training should be directed towards quality and specialization using small-sided games." Furthermore, Mofti (1987) supports the alignment of training with competitive conditions, stating, "The closer the training conditions are to competition conditions, the more beneficial the training. Training on skills or performance generally at the

same speed as competitions and matches is very important, and coaches should plan to achieve this gradually". Thus, the findings robustly affirm the validity of the second hypothesis.

6.3. Discussion of the third hypothesis:

- There is a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the scoring rate among football players under 13 years old.

The examination of the third hypothesis revealed notable variances in scoring rates across four groups of football players under 13 years old, with these rates increasing in tandem with the number of ball touches permitted during the small-sided games. This pattern suggests a positive correlation between the number of ball touches and the scoring rate, as documented in Table 6.

This correlation can primarily be attributed to the direct relationship between the number of goals scored and the volume of shooting opportunities created during gameplay. Naturally, a higher frequency of opportunities and attempts to score generally translates to an increased probability of actual goal scoring. This is particularly evident in scenarios allowing free play or three touches, where players benefit from the liberty to fully engage with the ball, thereby enhancing their ability to maneuver past opponents and generate optimal scoring chances. In contrast, settings that restrict players to fewer touches, such as one-touch scenarios, typically see a reduction in scoring rates. The constraints imposed by limited touches complicate ball handling under defensive pressure and curtail the frequency of viable scoring opportunities. Under such conditions, players are compelled to execute shots with heightened focus, precision, and often considerable power, all of which are more feasibly executed in less restrictive playing conditions that allow for more touches. Effective goal scoring in these contexts demands not only physical prowess but also refined skill, strategic intellect, and cohesive teamwork, all elements that are cultivated through small-sided game formats. Supporting this concept, Disvalo and al. (2007) highlight the multifaceted benefits of small-sided games, stating, "The importance of small-sided games lies in developing players' physical, physiological, and psychological capabilities and fostering team spirit, known as comprehensive and integrated sports training ". Furthermore, Eric (1996) emphasizes the holistic approach of comprehensive sports training: "Comprehensive sports training encompasses all performance elements in a single training session, proving its immense importance in achieving the set goals". Thus, the empirical evidence robustly supports the third hypothesis.

6.4. Discussion of the fourth hypothesis:

- There is a correlational relationship between the number of ball touches applied in the small-sided game (4 vs 4) and the exercise intensity among football players under 13 years old.

The analysis of the fourth hypothesis involved examining heart rate data and exercise intensity across four groups of young football players engaged in a 4 vs 4 small-sided game

format. The results indicated that the average heart rate increases inversely with the number of ball touches permitted during gameplay, establishing a negative correlation between the number of ball touches and heart rate average as outlined in Table 7. This trend confirms that exercise intensity escalates as the number of ball touches decreases. This correlation is supported further by minor, yet consistent differences in the Rate of Perceived Exertion (RPE) scores, which, although slight, align with the trend indicating a negative correlation between the number of ball touches and overall exercise intensity .

The research suggests that the heightened exercise intensity observed in scenarios with fewer ball touches stems from the increased physical and mental demands placed on players. Specifically, in a one-touch setting, players are compelled to maintain constant movement to assist teammates and create viable passing lanes, all while navigating the dual pressures of opposing players and restrictive gameplay rules. This scenario requires players to exert considerable mental effort to focus on accuracy and rapid decision-making, both with and without ball possession. Conversely, when the number of ball touches increases, players experience less immediate pressure, allowing for more leisurely movement and consequently lower exercise intensity. This dynamic is supported by the findings of Swilah and al. (2023), who noted that "Applying various constraints or rule changes, such as a specific number of ball touches during small-sided game training, increases play intensity and player effort." Similarly, Hill-Haas and al. (2010) have documented that "Minor changes in game rules during small-sided game training increase training load intensity," further substantiating the observed trends. Based on this comprehensive analysis, the validity of the fourth hypothesis is robustly confirmed.

7. Conclusions and Suggestions:

7.1. Conclusions:

This study reached several important conclusions, the findings are summarized as follows:

- There is a negative correlation between the number of ball touches applied in the small-sided game (4 vs 4) and the passing rate among football players under 13 years old.
- There is a positive correlation between the number of ball touches applied in the small-sided game (4 vs 4) and the shooting rate among football players under 13 years old.
- There is a positive correlation between the number of ball touches applied in the small-sided game (4 vs 4) and the scoring rate among football players under 13 years old.
- There is a negative correlation between the number of ball touches applied in the small-sided game (4 vs 4) and the exercise intensity among football players under 13 years old.
- Changing the number of ball touches rule during small-sided games affects the technical load of performance.
- Changing the number of ball touches rule during small-sided games affects the exercise intensity and physical load in general.

7.2. Suggestions:

- There is a critical need for the continual updating of information and the enhancement of coaches' knowledge through participation in scientific symposiums, training courses, and study days, both nationally and internationally. These should be conducted under the supervision of experts and specialists in sports training to ensure integration of contemporary training methodologies.
- Emphasis should be placed on foundational development by ensuring that regulatory bodies provide diverse material resources, including fully-equipped sports facilities and modern technical equipment. This will significantly ease the operational challenges faced by sports teams and particularly enhance the effectiveness of coaches.
- Future research should incorporate advanced technical tools to attain more precise outcomes, especially concerning the physical dimensions of training.
- Coaches must have a thorough understanding of the various ball touch rules and the specific training objectives associated with each during small-sided game training.
- The implementation of these rules during small-sided game training is imperative as they provide multiple training benefits and innovative solutions for developing diverse aspects such as physical, skill-based, tactical, and mental capabilities.

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