



The Effect of Imagery Training on Performance Improvement in Basic Football Techniques: A Meta-Analysis Study

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Abstract. Studies examining imagery training and improving the performance of basic football techniques have been widely conducted in the sports field. These kinds of studies explain that imagery training has a very positive effect on the performance improvement of athletes in several sports, particularly football. However, the different reporting trends have led to the need for inclusive data analysis to correctly determine the effect of imagery training on improving the performance of basic football techniques. This study aimed to determine the effect of imagery training on improving the performance of basic football techniques through a meta-analysis study method. The basic techniques of playing football in this study included shooting, passing, dribbling, throwing and heading. The data searching in this study was carried out by collecting data from research results indexed by Google Scholar published in the 2010–2021 period. The searching process was by entering keywords of effect, imagery, and football. The data analysis was performed through the stages of identifying variables, identifying the value of t-count/f-count, transforming the value of t-count/f-count to the r-value, and transforming the r-value into a z distribution, which was the effect size of each analyzed study, calculating the variance, calculating the Standard error of z, and calculating the summary effect. The summary effect calculation used Jeffreys's Amazing Statistics Program (JASP) software version 0.16.0.0. The results of this study indicated that there was a significant positive effect between imagery training on the performance improvement of basic football techniques. With the value of Random Effect (r_{RE}) was 0.862, this indicated that the effect of imagery training on improving the performance of basic football techniques was in the high category.

Keywords: Imagery · Football · Meta-Analysis · Sport Performance

1 Introduction

Football is a world popular sport, especially in Indonesia. It can be observed from the enthusiasm of every football club in various regions participating in inter-district, city, provincial and national tournaments. Moreover, football is also a sports entertainment in every part of society, both children and adults. Football is played by two teams with

a limit time of 2×45 min. Each team consists of 11 players, and one of whom is the goalkeeper.

To become a professional player, an athlete must have three aspects (physical, technical and psychological) that have to be maximized through a systematic program [1]. Basic technique is an indispensable component to play football [2]. The basic techniques of football consist of passing, shooting, dribbling, throwing, and heading [3]. Additionally, the psychological aspect also needs to be considered, for the psychological aspect is also one of the factors supporting the achievement of football athletes. To improve the football performance, the training process does not only involve the motoric training, but the non-motoric training is also required [4].

One form of the training used is the imagery training method. Imagery training is an exercise using imagination to figure certain situations [5]. The function of imagery training is to improve cognitive abilities and concentration to think [6]. In addition, imagery is also useful for improving the mentality of football athletes.

Studies that examine the effect of imagery exercise and the performance of basic football techniques have been widely conducted in the sports field. Various studies explain that imagery training has a very positive effect on the performance improvement of basic techniques of football athletes. According to previous research, the effect of kicking exercises using imagery on the accuracy of kicks on goal obtained significant positive results [7]. Meanwhile, according to research conducted by [8], the effect of imagery training on football shooting skills at the Java Putra Yudha Football School showed a significant increase. Imagery training has an effect on shooting accuracy at Berlian Muda FC Solok Football School [9]. According to the research conducted at Batam Muda Batu Ampar Club, the implementation of imagery training in football shooting exercises has a high effect on the shooting test results.

Due to the different results of each study, it was necessary to carry out an inclusive data analysis to provide comprehensive and accurate information about how important and how much effect the imagery training has on the performance improvement of basic football techniques. It was to conclude the results of previous research so that the results could be used as a reference for coaches to determine the right training that is suitable with the aspects of football performance.

Based on the explanation above, the research would be conducted on the effect of imagery training on improving the performance of basic football techniques through a meta-analysis study, by analyzing various studies that have been carried out and have not been advancedly tested.

2 Method

2.1 Design

The form of research used in this article was meta-analysis. Meta-analysis began to develop in 1970 and became to be known as a part of statistical analysis techniques that summarize various research results, so that the results obtained was aiming to integrate the latest findings [10]. Meta-analysis is a quantitative-based research method by accumulating data from previous studies with certain criteria to conduct the data to be more integrative and systematic. Meta-analysis is urgently needed in research to assess

various studies with the same theme carried out by previous researchers that the truth has not cleared from the data obtained [11]. This study aimed to examine the effect size of imagery training on improving the performance of basic football techniques through the meta-analysis study. Effect size can be defined as the significance measurement of the research results, in the form of the value of correlation, difference, and effect from one variable to another [12]. Meta-analysis is very useful, particularly for education circles, such as sports teachers and coaches who want to improve the athlete's football performance.

2.2 Criteria of Documents Inclusion and Exclusion

The data inclusion and exclusion criteria used in this study were:

Inclusion Criteria.

- Research using imagery and football training methods
- Articles published in national scientific journals that have been fully published and are not repository articles or proceeding articles
- The article taken is a full text article that can be accessed
- Articles taken is using a quantitative research structure, especially those to use the t-test and f-test in researching the data
- Articles published in 2010 to 2021, for research on imagery training on basic football techniques began to be widely conducted starting in 2010.
- Article was sourced from Google Scholar.
- The research uses a quasi-experimental method
- The research was conducted in Indonesia
- The subjects used in the study were football athletes, because the studies on the implementation of imagery training on basic football techniques is rarely done in Indonesia, so the subjects used according to research that meet other inclusion and exclusion criteria were limited.

Exclusion Criteria.

- Research with different operational definitions.
- Research that is not available in full text.

2.3 Registration Procedure for Studies and Data Analysis

In this study, the meta-analysis study began with searching the data using the Google Scholar database using the keywords effect, imagery, and football. From this study, 204 population data were obtained. The research sample was taken using purposive random sampling, it means to take samples using certain criteria. The data sampling here used inclusion and exclusion criteria. Inclusion is a criterion used to select a population group into a sample that theoretically suitable into the criteria related to the topic and research conditions, while exclusion is a criterion used to exclude a sample group from the inclusion criteria, or in other words, the criteria for population members that cannot be determined as sample [13].

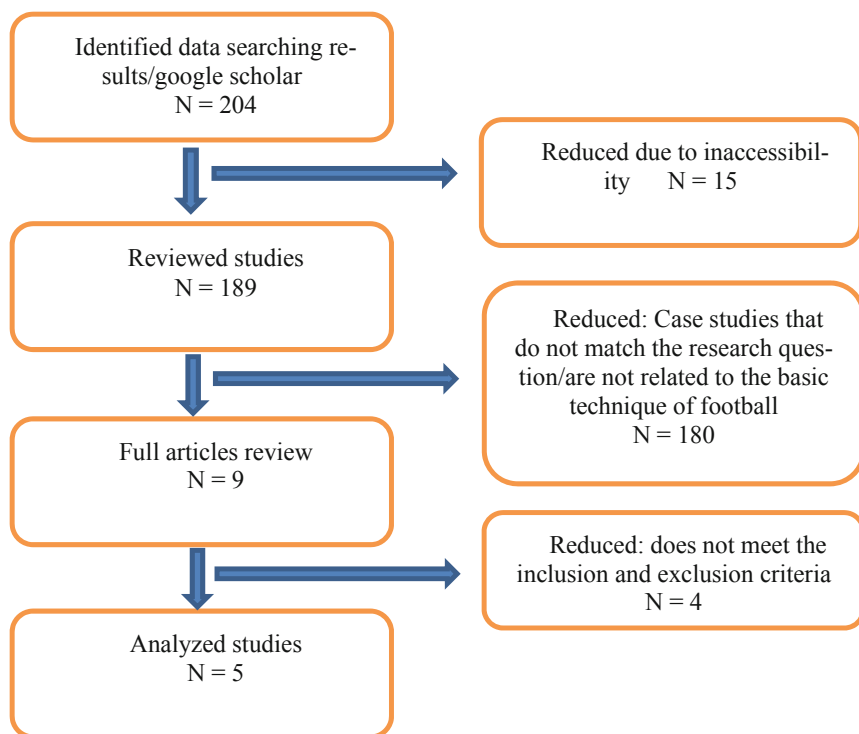


Fig. 1. Flowchart in identifying the case study data that qualify for meta-analysis in the research.

From the results of inclusion and exclusion of the data obtained from five samples that meet the requirements for the analysis, the data selection stage can be seen in Fig. 1.

The next stage is analyzing the data by (1) identifying research variables, the data was grouped into tables according to the variable column, (2) identification of the r value in each analyzed article. If the results of the research being analyzed only contained F or t values, then they were transformed into r values, using the equation:

$$F = t^2$$

$$t = \sqrt{F}$$

$$r = \frac{t}{\sqrt{t^2 + N - 2}}$$

(3) transforming the value of r into z distribution, which is the effect size of each study, then calculating the variance, (4) calculating the standard error of z , and (5) calculating the summary effect of the entire study [14]. The summary effect calculation was performed using meta-analysis with the help of Jeffrey's Amazing Statistics Program (JASP) software version 0.16.0.0.

3 Result and Discussion

3.1 Result

The next stage was the meta-analysis study stage using research data that had passed the selection stage. A total of 204 total data were obtained, and 199 data did not meet the inclusion or exclusion criteria for analysis. 5 research data were obtained that were ready to be continued for analysis obtained from the source of the data base used, namely Google Scholar. The studies to be analyzed are presented in Table 1.

3.1.1 Heterogeneity Test Results

To determine the calculation model in JASP version 0.16.0.0 determined from the studies analyzed showed heterogeneous results or p-value was less than a significant value of

Table 1. Data study to be conducted the meta-analysis.

Autho/year	Sample Characteristics	N	Measuring Variable	r	ES	SE
Alpen, J. [4]	Athletes of the Pantai Raja Football Club of Kampar Regency	15	imagery on passing and stopping skills	0,951	1,845	0,289
Candra, A. [7]	Athlete of SMA Negeri 01 Kampar Kiri Club, Kampar Regency	14	imagery on the accuracy of kicks on goal	0,934	1,686	0,302
Nurfalah, R. T., Ugelta, S., & Imanudin, I. [8]	Athlete of Java Putra Yudha Football School	20	imagery training on shooting skills	-0,831	-1,191	0,243
Surya, B., Purnomo, E., & Gustian, U. (2021)	Athlete of Batam Muda Batu Ampar Club	10	instructional imagery on shooting practice	0,881	1,381	0,378
Alestio, R. (2018)	Berlian Muda FC Solok football athlete	20	Imagery On Penalty Kick Accuracy	0,571	0,649	0,243

Table 2. Fixed and random effects.

	Q	df	p
Omnibus test of Model Coefficients	2.357	1	0.125
Test of Residual Heterogeneity	90.001	4	< .001

Note. *p* -values are approximate

Table 3. Coefficients.

	Estimate	Standard Error	z	P	95% Confidence Interval	
					Lower	Upper
intercept	0.0862	0.562	1.5	0.1	-	1.9

Note. Wald test

0.05, with the appropriate calculation model used the Random Effect model. If the p-value was more than a significant value of 0.05, then the correct calculation model is the Fixed Effect (Table 2).

Interpretation: From the calculation results above, the five effect size studies were analyzed and showed heterogeneous results ($Q = 90.001, p < 0.001$) because the p-value was less than the significant value. Thus, the Random Effect model was more suitable to be used to estimate the effect size of the five analyzed studies.

3.1.2 Summary Effect Result

Interpretation: The results above show an estimated value of 0.862 and do not show negative results. This means that imagery training had a positive and significant effect on the performance of basic football techniques. Observing from the value ($z = 1.535, p 0.125, 95\%CI, (-0.239; 1.963)$) to determine the effect of imagery training into high, medium, and low categories, used the provisions of high norms (0.5), moderate (0.3), low (0.1) [15]. In conclusion, imagery training significantly improves the performance of basic football techniques, which are included in the high category (Table 3, Fig. 2).

This forest plot was used to determine the effect size of all analyzed studies. Based on the Forest Plot above, it can be seen that the RE Model value was 0.86 and the effect size of the analyzed studies varies between -1.19 and 1.84 . Which means that imagery training affected 86% of the performance of basic football techniques and the remaining 14% was influenced by other factors.

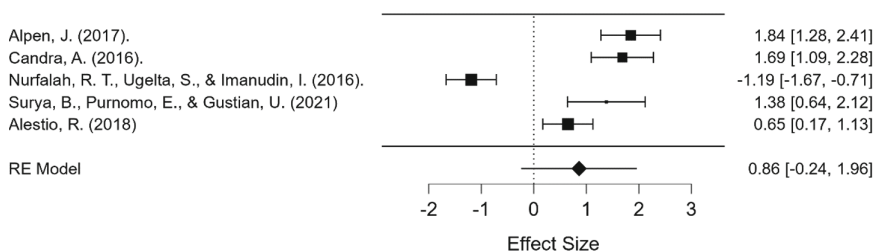


Fig. 2. Forest plot

3.1.3 Publication Bias Test

A publication bias analysis was conducted to determine whether or not there was bias in each of the analyzed studies. The purpose of the publication bias test was to determine whether the data used in this study was valid or manipulated (Fig. 3).

Egger’s test was conducted to determine whether the funnel plot was symmetrical or not (Tables 4 and 5).

This egger test was used when the funnel plot did not depict a symmetrical pattern. To determine whether the funnel plot was symmetrical or not, it could be seen from the p value (greater or less) than the significant value 5% (0.05). If the p value was greater than the significant value, it could be concluded that the funnel plot formed a symmetrical pattern or there was no publication bias problem.

Interpretation: Regarding the rank correlation, Kendall’s value of 0.316 could be interpreted as a large correlation coefficient between effect size and variance. Then the

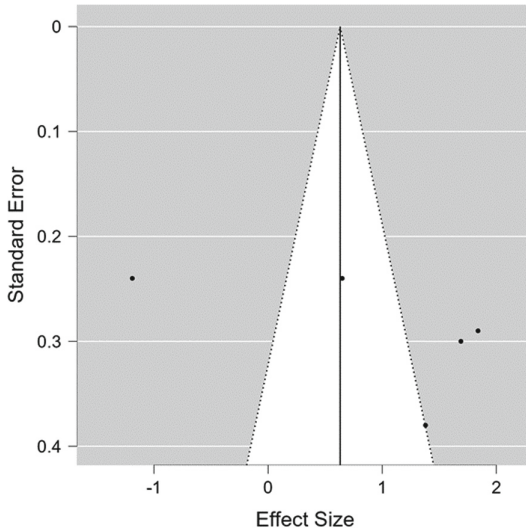


Fig. 3. Funnel plot.

Table 4. Rank correlation test for funnel plot asymmetry.

	Kendall’s τ	P
Rank test	0.316	0.448

Table 5. Regression test for funnel plot asymmetry (“egger’s test”).

	Z	P
sei	1.255	0.209

Table 6. File drawer analysis.

	Fail-safe N	Target Significance	Observed Significance
Rosenthal	62.000	0.050	<.001

p-value of 0.448 was greater than the value of 0.05, so it could be concluded that there was no indication of publication bias.

It could be seen that the z value, which was the magnitude of the regression coefficient, was 1.255, while the p-value of 0.203 was greater than the significant value of 5% (0.05). It could be concluded that there was no indication of publication bias, and the funnel plot was above symmetrical (Table 6).

Interpretation: File-drawer analysis is an estimate of the number of articles whose results are insignificant and unpublished (Rosenthal, 1979). The results of the file-drawer analysis showed that $K = 5$, so $5K + 10 = 5(5) + 10 = 35$. K is the number of studies analyzed. The fail safe-N value obtained was 62,000, with a significant target of 0.050 and $p < 0.001$, for the fail-safe N value $> 5K + 10 = 62,000 > 35$, if the fail safe-N value is greater than the results obtained from the formula (Azzahrah et al., 2021). It can be concluded that there was no publication bias problem in the meta-analysis study.

3.2 Discussion

The findings of this study report that the basic technical performance of playing football can be improved through an imagery training program. This indicates that the mental aspect only determines achievement.

In the current development of the sports field, the training methods used are greatly varied, especially in training that aims to improve basic skills (generally or specifically in certain sports), and one of which is football. One form of training used to improve basic football skills is imagery training. Imagery training is an exercise process by mentally imagining certain aspects of the skills being studied without engaging in actual action [16]. Imagery mental training refers to a way to re-manipulate experiences in mind and recreate an experience in brain. The experience mentioned is a movement that is conducted and then remembered by imagining and then practicing the movement repeatedly to make it efficient, so that it becomes an automatic movement. Therefore, the purpose of imagery training is to familiarize an athlete to encounter certain situations, so that a football player can get used to perform basic technical movements properly and correctly during training and matches.

This is in line with research conducted at the Batam Muda Batu Ampar Club, that Instructional imagery could affect the decision-making in a game, so that it was able to train players physically, mentally and technically to be calmer when controlling the ball, so the accuracy of shooting football was increasing. According to the research conducted at the Student Football Club of SMA Negeri 01 Kampar Kiri, Kampar Regency, there was a significant increase in the accuracy of kicks on goal because the exercises carried out were not only focused on kicking motion exercises, but the real exercises ought to be equipped with imagery exercises with training pressure on understanding the movement

before the real exercise was applied [7]. Moreover, according to the research conducted at SSB (Football School) Berlian Muda FC Solok, imagery training had a significant effect on the accuracy of penalty kicks. Without a good imagery training, it would affect the results of penalty kicks, because imagery was one thing that was needed as it could improve the players mentality to do penalty kicks [9].

From the explanation above and the results of this study, the results of the Random Effect (rRE) value are 0.862, which means that imagery training has a positive and significant effect on improving the performance of basic football techniques, and the effect is included in the high category.

Although the results of the publication bias analysis in the funnel plot diagram could not show clear and specific results, the egger's test and fail-safe N analysis showed that there was no publication bias. It showed that the meta-analysis of the data carried out in this study could be accepted as unambiguous data and suitable to the current conditions.

The weakness of this research is that the searching process of the sample and subject criteria was only obtained from research using imagery training methods, without involving research using other terms from imagery training. In the searching process for the criteria, the subjects only used research whose samples used the term athlete without classifying them into the suitable levels of the athletes. Because the most subjects in the sample search in this study were football athletes, so the criteria for the subjects used were also following the football athletes. This is because the research of imagery training on the performance improvement of basic football techniques is rarely done in Indonesia.

The explanation above can be used as a reference source for future researchers, so that they will be able to create the latest, creative and innovative research, about imagery training to improve the performance of basic football techniques.

4 Conclusion

Based on the results of the summary effect and bias tests that we have done on articles with the keywords effect, imagery, and football and from the data that has been presented, it can be concluded that imagery training has a positive and significant effect on improving the performance of basic football techniques.

5 Suggestion

As a coach, it is a duty to be able to know the purpose of training to improve physical, technical or psychological abilities. The aspects above are a factor in improving football performance. From the results of this study, imagery training has a high effect on the performance improvement of basic football techniques so that it can be used as a training method as an effort to improve basic football techniques.

Because the research of imagery training on improving the performance of basic football techniques is rarely done in Indonesia, this study can be used as a reference for future researchers to conduct the latest, innovative and creative research about imagery training to improve the performance of basic football techniques.

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