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Development of a Heading Training Model for Football Athletes Aged 14-16 Years

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Abstract. This study aimed to develop and evaluate the effectiveness of a heading training model designed to improve heading accuracy among football athletes aged 14–16 years. The research employed a Research and Development (R&D) approach using the ADDIE framework, consisting of five stages: Analysis, Design, Development, Implementation, and Evaluation. The study was conducted at a football school in Tegal Regency, Central Java, Indonesia, involving youth football athletes aged 14–16 years. Data were collected through interviews, questionnaires, documentation, and assessments of heading performance before and after the implementation of the training model. Qualitative data were analyzed descriptively to inform the development and refinement of the training model, while quantitative data were used to evaluate changes in heading performance. The findings indicated a statistically significant improvement in heading performance following the implementation of the developed training model compared with baseline measurements. These results suggest that the training model has the potential to improve heading accuracy among youth football athletes. In conclusion, the developed heading training model demonstrated effectiveness in improving heading performance and may serve as a structured training reference for youth football coaches.

Keywords: Football; Heading Accuracy; Training Model; Research and Development; Youth Athletes.

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INTRODUCTION

Football is one of the most widely practiced and competitive team sports worldwide, requiring players to demonstrate a combination of technical proficiency, tactical awareness, physical fitness, and decision-making abilities. The continuous development of football has been influenced by advancements in sports science, technology, and training methodologies, which contribute to improvements in player development and performance (Ardi Nusri, 2016). As a dynamic team sport, football requires players to master various fundamental techniques, including passing, dribbling, shooting, ball control, and heading. These technical skills are essential for maintaining possession, creating scoring opportunities, and responding effectively to different match situations (Agus Salim, 2008). Among these fundamental techniques, heading plays an important role in both offensive and defensive situations. Heading refers to the controlled use of the head to direct an airborne ball toward a specific target. It is commonly performed to pass the ball to teammates, attempt to score goals, intercept aerial passes, or clear the ball from dangerous areas (Sucipto et al., 2000).

Effective heading requires appropriate body positioning, coordination, timing, visual tracking, and accurate contact with the ball. Therefore, heading performance depends not only on technical execution but also on the integration of perceptual, motor, and physical abilities. The successful execution of heading techniques requires coordinated movements involving the trunk, neck, and lower extremities. Proper heading technique generally emphasizes controlled contact with the forehead, appropriate positioning relative to the ball, and coordinated body movement to maintain balance and directional accuracy (Pardosi, 2008). Different heading situations, including standing, jumping, and diving headers, also require specific movement patterns and coordination abilities. Consequently, heading training should incorporate progressive learning activities that develop technical proficiency, movement coordination, and accuracy while considering the physical characteristics and safety of young athletes. Despite its importance in football, heading remains a challenging technical skill for developing players.

Previous research by Rifki (2019) reported a heading performance score of 46.55 among football school players, which was classified within a low-performance category based on the assessment criteria applied in that study. Although this finding cannot be

generalized to all young football athletes, it highlights the importance of examining heading proficiency and identifying appropriate training strategies. Inadequate technical preparation, limited training variations, and difficulties in coordinating body movements may contribute to inconsistent heading performance during training and competitive situations.

Developing fundamental football skills during adolescence requires training approaches that are systematic, progressive, and appropriate to athletes' developmental characteristics. Football techniques can generally be categorized into body movement skills and ball-related skills, both of which contribute to effective performance during matches (Lubis et al., 2020). From a motor learning perspective, skill acquisition involves developing movement patterns that enable individuals to achieve intended outcomes with consistency, efficiency, and appropriate control (Dlis et al., 2021). Accordingly, heading training should extend beyond repetitive technical drills by incorporating structured activities that facilitate movement coordination, target accuracy, and the application of skills in relevant football situations. For football athletes aged 14–16 years, the development of heading skills requires particular attention to individual physical maturity, technical readiness, and training safety. At this developmental stage, athletes may demonstrate differences in strength, coordination, movement control, and learning ability.

Therefore, a structured training model should provide appropriate exercise progressions, clear instructional guidance, and opportunities for athletes to develop technical understanding before participating in more complex heading activities. Such an approach may help coaches implement training more consistently while reducing unnecessary exposure to repetitive head impacts. Although previous studies have examined fundamental football skills and heading performance, the development of a systematically organized heading training model specifically designed for athletes aged 14–16 years remains an important area for further investigation. In particular, a training model that integrates technical execution, movement coordination, progressive exercise variations, and accuracy-oriented activities may provide a more comprehensive approach to heading skill development. However, its practical applicability and effectiveness must be evaluated through a structured research and development process. To address this need, the present study employed the Analysis, Design, Development, Implementation,

and Evaluation (ADDIE) framework to develop a heading training model for football athletes aged 14–16 years.

The ADDIE framework was selected because it provides a systematic process for identifying training needs, designing appropriate activities, developing training materials, implementing the model, and evaluating its effectiveness. The primary objective of this study was to develop and evaluate a structured heading training model aimed at improving heading accuracy among football athletes aged 14–16 years. The developed model is expected to provide football coaches with an age-appropriate training reference that supports systematic technical development and evidence-based coaching practices

METHOD

This study employed a Research and Development (R&D) approach using the ADDIE framework, which consists of five interconnected stages: Analysis, Design, Development, Implementation, and Evaluation (Branch, 2010). This framework was adopted to guide the systematic development of a football heading training model specifically designed for athletes aged 14–16 years. The research focused on developing a structured training model and examining changes in athletes' heading performance following its implementation. Participants and Research Setting The study involved 20 football athletes aged 14–16 years recruited from football schools in Tegal Regency, Central Java, Indonesia.

The participants represented the target population for the development and implementation of the heading training model. The research was conducted within a football training environment to ensure that the developed activities were relevant to the technical demands and developmental characteristics of young football athletes. The development process followed the five stages of the ADDIE framework. Analysis: This stage focused on identifying the training needs, technical difficulties, and performance requirements associated with heading skills among young football athletes. The training model was designed by establishing learning objectives, selecting appropriate heading activities, and organizing training variations according to the athletes' technical abilities and developmental characteristics. The proposed training activities were organized into a structured heading training model emphasizing technical execution, movement coordination, and heading accuracy. The developed training model was implemented

with the participating football athletes. Heading performance was assessed before and after the implementation to examine changes associated with the training program.

The evaluation stage focused on examining the outcomes of the training model and determining its effectiveness in improving heading performance. Data were collected using interviews, questionnaires, documentation, and heading performance assessments. Qualitative data were analyzed descriptively to support the development and evaluation of the training model. Quantitative data obtained from pretest and posttest measurements were analyzed using a paired-samples t-test to determine whether statistically significant differences existed in heading performance before and after the intervention (Sugiyono, 2017). The statistical analysis was intended to evaluate within-participant changes following the implementation of the developed heading training model.

RESULT AND DISCUSSION

Result

The results of the development of the Heading Training Model for Football Athletes Aged 14-16 Years have been integrated into a guidebook. This study developed the model using the Research and Development (R&D) method based on the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. After all stages of the ADDIE model were completed, an effectiveness test was conducted to determine the model's effectiveness. This method ensures that the developed training is not only effective in improving athletes' reaction speed but also appropriate to the practical needs and training context on the field.The results of the data analysis are shown in the descriptive data table below.

Table 1.

Data Normality Test Results

Pair 1	df	Statistic	Sig.
Pretest	20	.149	.200*
Posttest	20	.178	.099*

Based on the results of the normality test displayed in the Normality Test table, it is known that the significance value (Sig.) is greater than 0.05, both for the pre-test 0.200 and post-test 0.099 using the Kolmogorov-Smirnov test, both are greater than 0.05. This indicates that the pre-test and post-test data are normally distributed, so it can be concluded that the normality assumption is met. With these requirements met, further statistical analysis (such as a paired t-test) is suitable to test the differences in the

effectiveness of training models in improving heading accuracy in football athletes aged 14-16 years. Next, compare the results of the average value (the pre-test average) and the post-test average after treatment.

Table 2.
Average Value Results

Pair 1	N	Mean	Std. Deviation
Pretest	20	3.95	1.986
Posttest	20	7.90	1.447

Based on the table above, there was an increase in the average score during the pre-test and post-test. The average score during the pre-test was 3.95, then increased to 7.90 in the post-test. These results indicate a difference in the average scores between the pre-test and post-test. Therefore, it can be concluded that the developed football heading training model is effective and can improve heading accuracy in football athletes aged 14-16 years. The next step is usually followed by a paired t-test to test the statistical significance of this difference.

Furthermore, based on the results of the Paired Sample T-Test, it is known that the mean value = -3.950 shows the difference between the pre-test and post-test, with the t-count value = -11.006, and p-value = 0.000 < 0.05 which means there is a significant difference between before and after being given the football heading training model treatment. Thus, it can be seen that the football heading accuracy training model is effective for football athletes aged 14-16 years.

Discussion

After conducting expert validation and testing the model's effectiveness, the results indicate that the football heading training model developed in this study is effective for use in football training and meets the requirements for application in training activities to improve heading accuracy for 14-16 year in football schools. Based on the test results obtained before and after the football heading training model was administered to 14-16 year, a paired t-test yielded a mean value of -3.950, indicating a difference between the pre-test and post-test. The t-count value was -11.006, and the p-value was 0.000 < 0.05, indicating a significant difference between the pre-test and post-test treatment of the football heading training model for 14-16 year.

Based on the results of this study, it can be concluded that the football heading training model developed for 14-16 year has a significant level of effectiveness. The results of the product that has been made by researchers are a football heading training model for football athletes aged 14-16 years, from the shortcomings and advantages of the resulting product there are several inputs given as an effort to improve the resulting product. Therefore, it is necessary to improve several variations of the model can be done by allowing players to make movements to reach the ball, so that the football heading training model is more effective. then, during the training process, it is hoped that coaches can invite football athletes to be more active and participate more enthusiastically and be challenged in the football training process, especially football heading.

This football heading training model for athletes aged 14-16 was created to serve as a reference for coaches in their football training. If this football heading training model is implemented effectively by coaches, it can assist coaches on the field in helping athletes achieve maximum heading accuracy. What distinguishes this training model is that it is systematically structured and offers a wider variety of training options tailored to field needs. The output of this training model is a book that is easily accessible and engaging for users. This product has been evaluated for weaknesses and has been revised to improve the final product. This product provides a variety of football heading training models in book or e-book format. These models are systematically structured based on the athlete's level of mastery, from easy to difficult. Access to related materials in the e-book format is easy.

CONCLUSION

Based on the research results, it can be concluded that the football heading training model, developed using the ADDIE approach, in football training for 14-16 year-old football athletes, has been proven to be applicable and effective. This model improves football heading accuracy for 14-16 year-old athletes at football schools. This study recommends that coaches and schools implement this model in their routine training programs, as well as as a form of coaching for football athletes, of course, by considering various related factors.

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