The Effect of Modified Training Equipment on Reaction Time for Goalkeepers at Bajo Soccer School

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Abstract

The goalkeeper is a position in soccer where the player is allowed to use their hands to catch or deflect the ball, as long as it is within the penalty area. The goalkeeper's role is crucial to the team, as they are responsible for preventing the ball from entering the goal, which is the main objective of the game. This research was conducted with the aim of improving the goalkeeper's reaction time in handling match situations that often require quick and accurate decision-making. The method used in this study is a quantitative experimental approach with a one-group pre-test and post-test design. The research revealed that there was a significant improvement in the goalkeeper's reaction time after modifying the training equipment used. At the pre-test stage, the goalkeeper recorded an average score of 29.50, while at the post-test stage, the average score increased to 54.33. This increase indicates that the modification of the training equipment has a significant effect on improving the goalkeeper's reaction. This improvement in reaction ability is very important because it can improve goalkeepers' performance in real matches, helping them make faster and more precise decisions in decisive situations, so the effectiveness of the training tool modification used in this study can be recognized as one of the important factors in goalkeeper skill development.

How to Cite

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INTRODUCTION

Sports are physical activities that are intentionally and systematically carried out, involving direction, purpose, time, and location. In a social context, sports are a human phenomenon and expression. These activities can be performed individually or in groups. Sports injuries are damage to the structure and function of the body due to physical or chemical stress and can occur at any time, anywhere, and to anyone (Siregar and Nugroho 2022). Sports have evolved in various forms and methods, with different objectives, including: (1) Recreational sports focusing on physical and mental health, (2) Competitive sports emphasizing results and achievements, (3) Educational sports highlighting the educational aspect with sports as a subject to support government educational goals, and (4) Physical training aimed at improving physical fitness to support daily activities (pascasarjana 2021). Physical education and sports are long-term investments in improving the quality of human resources, requiring patience and sincerity (Alit 2019). However, a lack of sports facilities can increase the risk of death in the city of Medan, as residents do not have access to healthy living practices without adequate sports facilities (Salahudin and Rusdin 2020). In education, physical education, along with other subjects, supports the achievement of national educational goals, which include enlightening the nation's life and developing a comprehensive human being—a person who is faithful and devout, has good character, knowledge and skills, physical and mental health, a good personality, independence, and social and national responsibility (nurwahidin hakim 2008).

Football is one of the most popular sports worldwide today. It is a team sport involving two teams, each consisting of 11 players, including a goalkeeper (Kahar et al. 2022). This sport is widely known and played by people of all ages, from children to adults and the elderly (Julianto, A. R., Rusmiati, P., & Suryadi 2019). Football uses a ball, usually made of leather, and is played by two teams, each with 11 members (Mubarok, Narlan, and Millah 2019). In physical education, football is taught with basic techniques such as passing, dribbling, shooting, and heading (Mubarok et al. 2019). As a team sport, a strong and resilient team consists of players who can collaborate effectively, with solid teamwork and adequate technical support (Ghazian 2021). Football requires variations in body composition or anthropometric measurements according to the characteristics of different positions on the field,

such as goalkeeper, defender, midfielder, and forward (Olahraga et al. 2019). This sport also requires a lot of energy, and players are expected to use their full energy from the start to the end of the match (Khaerddin 2019).

Modification in physical education is essential for teachers at all educational levels, from elementary to high school. Physical education teachers are expected to explain the concept and definition of modification, identify the elements modified and the methods of modification, and explain various aspects of modification analysis so that the learning process can be more active and effective (Budi 2021). Generally, modification means changing or adjusting something. Modification is a way to alter the form of an object to make it more attractive without losing its original function and to enhance its appearance compared to the original form (Azmi 2020). Modifying basic sports equipment is an innovation in learning that meets the learning standards for elementary school students. The existing body composition can still be used to train skills and identify talent in sports (Usman 2019). Research on the modification of the Agility Ladder Drill with 3 repetitions and 5 sets aims to determine the impact of such training modifications on students agility (I Gst Ngr Agung Cahya Prananta and I Gusti Putu Ngurah Adi Santika 2022). To increase students' motivation, an engaging learning design is needed, one of which is modifying existing games. Enhancing students' motivation in learning activities is considered an important first step in achieving learning goals, as motivation is a highly influential internal factor (Dinarta 2021).

Exercise, derived from the word "exercise," is a key element in daily training routines to improve the quality of the human body's organ system functions, facilitating athletes in perfecting their movements (Wati, Sugihartono, and Sugiyanto 2018). In football, training serves to hone basic technical skills, enhance physical abilities, and build strong mental discipline. Lack of training can be a major obstacle for players aiming to improve their abilities. Training involves a series of body movements and psychological aspects performed regularly and systematically. Increasing the training load each week according to the athlete's condition aims to improve the system and functions of the body and mind, enabling optimal performance in sports activities (Febi and Rifki 2020).

The goalkeeper is a crucial position in football, being the only player allowed to use their hands to handle the ball, provided they are within their own penalty area (Malau, Haetami, and

Triansyah 2022). Goalkeepers must master special skills that set them apart from other players, requiring specialized training (Syahni, Azandi, and Nur 2021). As the last line of defense and the starting point of an attack, the goalkeeper plays a critical role in the team (Andrianto and Widodo 2021). Goalkeepers must have good skills and be able to make various saves (Hidayat, Permadi, and Hermawan 2022). To become a reliable goalkeeper, one must master various factors such as courage, determination, sharp vision, proper positioning, reflexes, catching ability, and long kicks (Belli, Friansyah, and Remora 2021). In Indonesia, football is a very popular sport, and its achievements need to be enhanced, not only among adults but also among children. This is related to the existence of the world football association (FIFA) and the fact that football is a relatively affordable sport in terms of cost and playing space, as it can be played on an open rectangular field covered with grass. The development of competitive sports should be conducted scientifically to support the nurturing and development of athletes, both at the national and regional levels, and to organize competitions in a tiered and sustainable manner (Naldi and Irawan 2020).

Bajo Soccer School is a football school located in Bajo subdistrict, Luwu district. This football school was established in 2020 by its founder, Akmal Annas. Membership in Luwu includes children aged 9-17 years in Bajo subdistrict and outside Bajo. The structure of this football school includes Akmal Annas as the chairman and coach, and Hussein as the vice-chairman and coach.

Over time, this football school has gained many participants and frequently participates in tournaments, both within and outside the district. It is not uncommon for this football school to win championships, and some participants have also achieved notable success. To this day, this football school remains active, with some of its students having played in the national Liga 3. Many children want to join Bajo Soccer School, which continues to grow rapidly. The generation of football players in Bajo subdistrict is increasing, especially in the goalkeeper position at Bajo Soccer School. However, most players have varying levels of speed and agility. The lack of regular training and effective use of time to improve speed and agility has impacted the outcomes of the matches they participate in, particularly in terms of agility and speed, which often becomes a weakness and leads to significant fatigue. This research was conducted with the aim of improving the goalkeeper's reaction time in handling match situations that often require quick and accurate decision-making.

METHODS

This study uses a one-group pre-test and post-test design. It is a pre-experimental study (Sugiono 2018). The research design utilizes pretest data as a baseline to assess the kicking speed of athletes or research samples before the treatment is applied. This design allows for an accurate assessment of the treatment effects by comparing the results with the pre-treatment conditions. The treatment in this study involves modifying training equipment for goalkeepers.

The population in this study consists of 12 individuals, corresponding to the number of goalkeepers at Bajo Soccer School. The sampling technique used in this research is the saturated sampling technique. According to (Sugiyono 2017) the saturated sampling technique is one where the entire population is used as the sample.

The research instrument is a tool or facility used by the researcher to collect data more efficiently, producing more accurate, precise, and systematic results, thereby facilitating the processing of data on reaction speed among goalkeepers at Bajo Soccer School.

Reaction speed is related to the time required from the onset of a stimulus to the initiation of a reaction. Reaction speed can be measured through a test designed to assess the athlete's reaction speed. This test requires a 1-meter wooden ruler and an assistant.
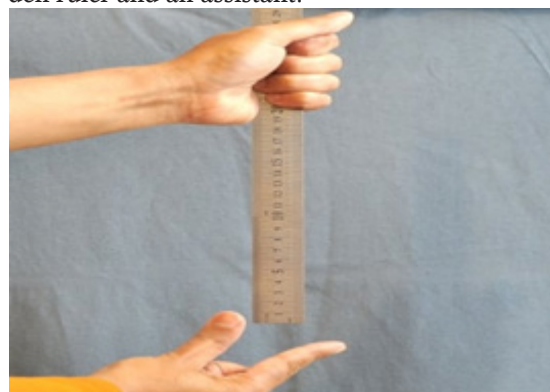

Figure 1. Reaction speed test tool

Here are the objectives and procedures for conductiong the test:
a. Objetive : To measure the reaction speed of goalkeepers.
b. Equipment used : 1 meter wooden ruler.
c. Instructions   :
  1. The assistant holds the wooden ruler directly above the athlete's index finger and thumb.
  2. The zero mark on the ruler should be aligned with the athlete's thumb level.
  3. When the assistant gives the signal "rea-

dy," the ruler is released or dropped, and the athlete must catch it as quickly as possible.

4. The assistant records the distance from the 0 mark to the point where the ruler is caught by the athlete at the top of their thumb.

This research involves designing a product or tool that has been carefully crafted to enhance reaction speed in goalkeepers at Bajo Soccer School. The design of the reaction speed training tool is as follows **Figure 2.**

Figure 2. Reaction speed training tool design.

The observations conducted before the experiment and after the post-test are part of the experimental process. The pre-test provides a baseline for comparing the performance of the same subjects before and after the treatment is administered. In this way, the researcher can compare the results of the treatment with the observations from the initial and final test scores.

The treatment given to the subjects or objects of the research is one of the main aspects of experimental research (Sari et al. 2021). The approach used in this study is quantitative. This research is quantitative in nature, as it aims to answer the research questions with statistical evidence (Rusnandar, Saputra, and Lengkana 2023)

The data collection technique in this study involves an initial test conducted before the research sample receives the treatment. The initial test consists of five shooting attempts at the goal, each using a ball. The assessment is based on the number of balls successfully saved and the goalkeeper's reaction, which is scored as 1 (one). The test results are recorded based on the best goalkeeping performance from two tests conducted by the participants. After the treatment, which involves reaction training for the goalkeepers, the final test is conducted in the same manner, with five attempts using a ball and modified training tools. The final test results are recorded based on the number of successful saves during the reaction test conducted by the participants.

The data analysis technique in this study uses the following formula. To describe the data, the formula applied includes the calculation of the mean or arithmetic average, which is obtained by dividing the total sum of values by the number of individuals. The mean is used to determine the average test results. This study employs parametric statistical tests, which require the fulfillment of certain conditions.

The condition tests in this study include:

a. Normality Test: This test checks the normality of the data before further analysis. The test is adjusted according to the variables to be processed and is conducted using the Kolmogorov-Smirnov test with the help of SPSS 26.

b. Hypothesis Test: Hypothesis testing is performed using the t-test in SPSS 26, comparing the mean values. If the calculated t-value is smaller than the table t-value, the alternative hypothesis is rejected; conversely, if the calculated t-value is greater than the table t-value, the alternative hypothesis (Ha) is accepted. Hypothesis testing is also conducted using SPSS 26.

c. Homogeneity Test: The homogeneity test is conducted using SPSS 26, following homogeneity test criteria. If the significance value is below 0.05, the data being tested is considered not homogeneous.

RESULTS AND DISCUSSION

In this study, the results of the research conducted will be presented. Each athlete first underwent initial data collection and reference (pretest). After the pretest, the researcher administered a treatment consisting of 16 sessions using modified equipment for goalkeepers. Following this, the researcher conducted a final test (posttest) after the training with the modified equipment. Below are the results of the pretest and posttest scores. Based on the research data, most of the goalkeepers at Bajo Soccer School showed improvement.

Table 1. Descriptive test results

Variabel	N	Min	Max	Mean	Std. Deviation
Pre test	12	25	32	25.50	2.023
Post test	12	52	57	54.33	2.498

In the **Table 1** above, the results of the descriptive statistics test before and after the treatment are shown. The pretest values are as follows: minimum value = 25, maximum value = 32, mean = 29.50, and standard deviation = 2.023. For the posttest, the values are: minimum value = 52, maximum value = 57, mean = 54.33, and standard deviation = 2.498. The difference with the average shows an improvement in the goalkeeper tool modification.

It can be seen that the data distribution for the dependent variable is normally distributed, the pretest Kolmogorov Smirnov (K.S) value is 0.209 and the significance value is 0.200 > 0.05. Posttest Kolmogorov Smirnov (K.S) value is 0, 241 and the significance value is 0.200 > 0.05. While the pretest value of Shapiro-Wilk (S.W). 0, 907 with a significance of 0, 415 > 0.05. Posttest value Shapiro-Wilk (S.W) 0, 902 with a significance of 0, 421 > 0.05. From these results, it can be concluded that the data is normally distributed.

The results of the modified goalkeeper training equipment have a statistical value of 2.584 and a significance value of 1.64, which is greater than 0.05. Therefore, it can be concluded that training with the modified equipment demonstrates uniform or homogeneous variation.

The T-test analysis results for the modified goalkeeper training equipment show that the significance probability is 0.000 < 0.05. This indicates that the use of modified equipment for goalkeepers has a significant impact. Based on previous research results, the average accuracy for the pretest was 29.50, while the average for the posttest was 54.33.

The equipment in **Figure 2** is a reaction speed testing tool designed to improve the reaction speed of a goalkeeper in sports like soccer or futsal. This training helps the goalkeeper enhance their reflexes and ability to respond to the rapid and unpredictable movements of the ball. The ball's quick movements will change direction when it hits the training equipment. The materials used in making this tool include PVC pipes for constructing the frame, foam or rubber for the padding, and nylon ropes that are strong enough to hold the padding in place.

As for the usage, the equipment is placed in front of the goalkeeper at a distance suitable for the training needs. The coach then kicks the ball toward the equipment, which allows for variations in the direction and speed of the ball. The goalkeeper must quickly decide whether to catch, deflect, or let the ball go if it is headed out of the goal. The goalkeeper's task is to stay focused on the ball and strive to move quickly and accurately toward it.

The author conducted the research at Bajo field with a total of 12 participants. This study is an experimental research aimed at determining whether the modification of training equipment for goalkeepers can improve soccer goalkeeping skills. The researcher aimed to enhance the reaction time of goalkeepers at Bajo Soccer School. From this idea, the researcher explored ways to improve the reaction time of soccer goalkeepers through the use of modified training equipment. Based on the results obtained from the tests, the researcher plans to compare the training provided by the coach before and after the training.

Modified training equipment involves sports elements and describes a series of movements from one place to another. This activity can be played by various groups within the community (Kustiawan, Prayoga, and Wahyudi 2019).

The goal is to achieve optimal success for students or athletes. In addition to focusing on technical aspects, training should also include tactics, physical conditioning, and mental health, so that each player can master all necessary components in soccer (Putra et al. 2023).

Based on the analysis, the average improvement from the modified training for goalkeepers at Bajo Soccer School is 54.33 with a standard deviation of 2.498. This indicates a significant improvement in the goalkeeper training test before and after the application of the modified equipment. This improvement is attributed to the structured and repetitive activity conducted over 16 sessions, demonstrating that the modified training equipment can yield positive results for soccer goalkeepers.

Research by M Hapifx Saputra titled "The Effect of Reaction Training Variation on the Reaction Speed of Futsal Goalkeepers at Senior High School 6 Jambi" discusses reaction speed or reflexes that are still considered insufficient in catching or avoiding the ball. The initial and final test results showed a significant difference in futsal goalkeeper reaction speed. Data analysis using a t-test showed that the average reaction speed in the initial test was 0.5124 seconds, while in the final test it was 0.4642 seconds. The t-value of 5.12534 was greater than the table value of 2.13185, indicating a clear improvement between the initial and final tests. From the results and discussion, it can be concluded that reaction training variation significantly impacts the reaction speed of futsal goalkeepers at Senior High School 6 Jambi (Saputra 2017).

Research conducted by Raja Syahni in-

volved the development of assistive equipment in the form of weight blocks with dimensions of 8x4x4 cm, totaling 4 pieces, each weighing 300 grams. These weight blocks are placed in a bag used by the athletes. The use of weights on the arms proved to enhance the effectiveness of goalkeeper training, as it allows for simultaneous physical and technical training. This equipment helps improve the goalkeeper's arm strength to prevent the ball from entering the goal. Additionally, this equipment is practical and easy to use, making it suitable for a training program that can be adjusted to each athlete's needs (Syahni et al. 2021).

Research by Ryan Ahmad Hidayat showed that reaction training significantly impacts goalkeeper performance at Putra Bungbulang Soccer School. Data analysis revealed a significance value (2-tailed) of 0.00, which is less than 0.05, indicating a significant improvement. Furthermore, the calculation of the N-gain score showed an average N-gain score for goalkeeper performance of 70.95% or 71%, which falls into the effective category. This means that reaction training can affect goalkeeper performance by up to 50%. Thus, it can be concluded that reaction training methods are highly effective in enhancing goalkeeper performance during matches (Hidayat et al. 2022)

The current research titled "The Effect of Modified Training Equipment on Reaction Time for Goalkeepers at Bajo Soccer School" focuses on a more innovative approach by modifying training tools. This study examines the effectiveness of modified training equipment in improving reaction time and reflexes for goalkeepers. The results of this research are expected to provide new insights and compare the effectiveness of training methods with more modern and innovative approaches.

CONCLUSION

Based on the research activities conducted, it can be stated that modifying training equipment for goalkeepers can improve the reaction time of soccer goalkeepers at Bajo Soccer School. The study titled "The Effect of Modified Training Equipment on Reaction Time for Goalkeepers at Bajo Soccer School" demonstrates that modifications to training equipment positively impact goalkeeper reaction times. This research can serve as a reference or guide for soccer coaches in Luwu and surrounding areas when developing training programs or materials specifically aimed at enhancing goalkeeper reaction times, as the effectiveness of the modified training equipment has been proven.

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