

Technology-Based Football Shooting Skills Test Instrument

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ABSTRACT

This study aimed to develop a digital-based football shooting skills test instrument that produced student shooting results in football courses. The resulting product was a shooting test instrument using technology to record shooting results. This research procedure used was simplified Borg and Gall research and development measures by converting them into five main steps, namely (1) information gathering, (2) product design development, (3) expert validation and revision, (4) small-scale field trials and revisions, and (5) small-scale field trials and final product revisions. Data analysis techniques were used in this research in two ways, such as quantitative and qualitative. The study results from a small-scale trial of ten students showed an average of 80% with a feasible category, and the results of a large group trial showed an average of 90% with a very feasible category. The research data collected through research shows that this instrument for testing football shooting skills is worth using to measure shooting skills tests.

Keywords: Instruments, Shooting Tests, Technology-Based.

INTRODUCTION

Football is a team sport played by two teams consisting of eleven players (Mesnan, Supriadi, & Siregar, 2019). The football game is a collective sport. The football game requires some basic skills and techniques closely related to each other. The basic techniques are passing, dribbling, controlling, and shooting. In line with this, the basic techniques in football games include: kicking, stopping the ball, heading, dribbling, throwing in, and the technique of the goalkeeper (Girsang & Supriadi, 2020). The basic technique is certainly supported by the training process carried out regularly. In football, the winning principle is to score as many goals as possible in the opponent's

goal. Mielke (2007) explains that shooting requires technical quality (kicking the ball well and accurately), physical quality (explosiveness, coordination, balance), and mental quality (determination, courage, confidence). Of course, entering the ball against the opponent requires good basic techniques. The basic technique needed to score points is the basic shooting technique. Supriadi, Mesnan, Azandi, & Kasih (2021) have explained that shooting is a basic technique that needs attention from other techniques—in general, shooting aims to put the ball into the opponent's goal (Mielke & Human Kinetics (Organization), 2003). Shooting is a movement to kick the ball towards scoring the goal (Mielke & Human Kinetics (Organization), 2003). Shooting the ball is a kick towards the goal to put the ball into the opponent's goal (Girsang & Supriadi, 2020). Shooting is significant when the player and the ball are in the opponent's penalty area. Unless a player is blocked or closely guarded by the opposing defender, the right action in the penalty area is to shoot (Mielke, 2007). When shooting, there is no point in kicking the ball hard if it is not on target (Mielke & Human Kinetics (Organization), 2003). Thus, accuracy is also one of the significant indicators in making shots. It is in line with the theory stated by Astuti (2019a) that if a player is not on target, then it cannot produce a goal. The best shooting distance is near the front line of the penalty box goal (Nusri, 2018). Based on the football skill of shooting, athletes usually do a shooting skills test. Several numbers in the media shooting skills test range from the lowest to the highest number. Test instruments are one way to estimate the level of a person's ability indirectly, namely through a person's response to a stimulus or question. Nowadays, the shooting skills can still be manual because testers must make and draw the direction of the target for the test shape on the wall. Currently, many shooting test instruments measure the shot's target direction (Eriko & Febriyanti, 2014).

It is not effective considering that the making of the test media must take a long time because the tester must draw it along the width of the wicket. Then, when each athlete shoots three times, the tester will write down the numbers hit by the ball when the athlete shoots. The creation of its test media must be technology-based with digital technology. Technology itself is now evolving as a practical science of technical matters and has developed into one of the foundations of scientific knowledge in general. Many fields of science demonstrate it based on technology. It also results in various definitions and opinions from experts about the understanding and definition of technology. Technology is classified as media because it is a set of integrated processes involving humans, procedures, ideas, tools, and organizations and managing the ways of solving problems are faced (Bangun, Supriadi, & Tarmizi, 2020). In this case, researchers saw something so futile that after all the shooting targets were made, they could be lost or erased, e.g., due to rain. Researchers assume that shooting is one of the most important elements in football because, without good shooting possession, it is difficult for a goal to be created. During this era, advances in science and technology in sports proved capable of sustaining a nation's sporting achievements. In countries where science and technology thrive, sporting achievement also thrives. The

development and engineering of sports' equipment and tools are necessary to balance the training technology and implementation of a sports activity. The lack of sports equipment and technology-based exercise facilities will greatly affect sports achievement. Of course, the invention of science and technology has been widely developed, as in football, it is the goal line that helps the referee if it may not be visible, but the tool, such as a goal-line or VAR (Video Assistant Referee). It has been able to help in determining the creation of goals or not. In this case, researchers are concerned about developing football shooting test instruments using technology media to utilize science and technology in sports.

Based on the explanation above, researchers did not see the effectiveness and efficiency in conducting tests of football shooting skills. It could be where the ball hits the dividing line between the numbers 2 and 3, e.g., the assessor will write a number that may not be the actual number and also the data that cannot be accounted for. Researchers were inspired to develop a tool for football shooting skills test that used technological media. Implementing this shooting skills test is effective in its treatment, and the data obtained can be accounted for. Precisely in this digital era, there needs to be the use of technology to facilitate conducting tests and measurements, especially for football skill tests. It is supported by research that has been conducted by Bangun & Tarmizi (n.d.) with the title of Analysis of the Use of Media Technology on Soccer Shooting Skills Test Instruments, which explains that the research concept developed is to develop a tool for football shooting skills test using media technology, which can be used as a tool for football shooting skills test. In the concept of media implementation, data technology will go directly to the computer when the ball shoots, hitting the target number that has been set on the wall with the sensor vibrating the technology as a means of data transmission. In this study, researchers developed a football shooting skills test. When conducting a test, the ball resulted from a football player's shot on the test's target number. The data went directly to the laptop and was recorded on it. The vibration sensor attached behind each test target number became a tool used to receive ball vibrations, and the results were sent to the device on the laptop. The application of the shooting skills test tool using the media on the laptop showed the target number hit by the ball. To get vibrations when the ball hits the test target number, researchers used a tarp as the base of the target number, taped to the wall as a buffer. This study focused on producing a product testing shooting skills in football using technological media. This medium was expected to provide ease and accuracy in seeing the results of the shooting ability of football athletes. In implementing the technology media, the data was directly sent to the computer device when the ball of shooting results regarding the target numbers was set on the wall with vibrating sensor technology as a data sending tool. This development research aimed to produce a football shooting skills test using an effective and efficient technological medium as a football shooting skills test development.

Methods

The research was designed using a type of quantitative research design in which quantitative research respondents or research subjects were called informants (Prof. dr. Sugiyono, 2010). The research subjects were students from the Faculty of Sports Science (FIK). The preparation of trial samples in this study was the phase I and II tests. The phase I trial involved 10 students from the PJKR FIK study program, and the phase II trial involved 20 students from the PKO FIK study program. The techniques used for data collection were questionnaires, interviews, documentation, and observations. Questionnaires were used to find out respondents' opinions about the shooting skills test tool that used technological media. The data analysis technique used was a quantitative descriptive technique with percentages. The data processing formula of the questionnaire for each trial subject is as follows:

$$P = \frac{X}{X_1} \times 100\%$$

The collected data was analyzed with quantitative descriptive analysis techniques expressed in the distribution of scores and percentages against predetermined categories of scoring scales. After the presentation in percentage form, the next step was to describe and conclude the indicator, respectively. Regarding the conformity aspects in the media development of the tool, it can use the following table:

Table 1. Eligibility Category

Percentage of Achievement	Interpretation
< 21%	Very Unfeasible
21% - 40%	Less Feasible
41% - 60%	Fairly Feasible
61% - 80%	Feasible
81% - 100%	Very Feasible

The table above mentions the achievement percentage, value scale, and interpretation. To find out the feasibility of using the tool medium, the table can be a reference for assessing data generated from expert validation through research instruments. A research instrument was used to measure natural and social events (research variables) observed. The instrument was developed using a Likert scale with five scales. The lowest score is numbered 1, and the highest is 5 (Mustafa & Dwiyoogo, 2020). The instrument used in this study was a questionnaire given to football coaches who were talented in football and got national recognition (certificate) for their talent and technology experts who had IT certificates or IT lecturers. The research method used was R & D (Research and Development). It was a method used to produce a particular product and test its effectiveness. This development research follows these steps cyclically. These research steps, or development processes, are as follows:

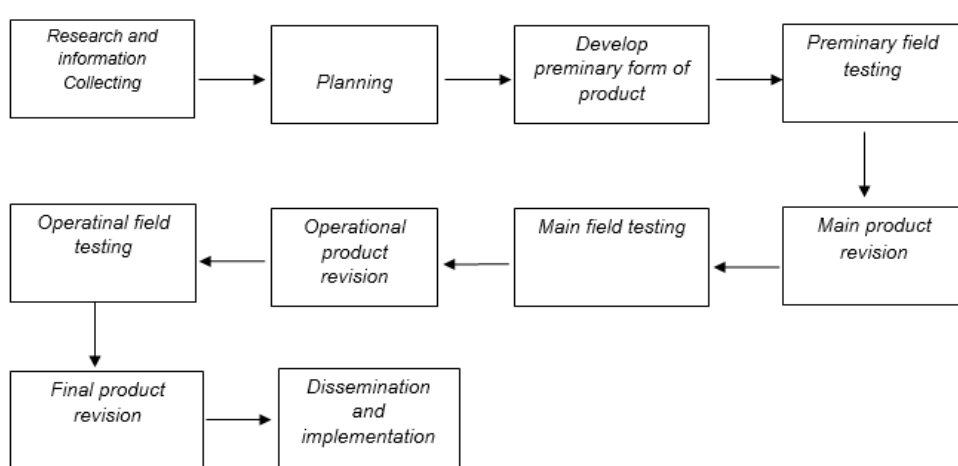


Figure 1. R & D Steps Scheme

In this study, the researchers only did the steps of research up to the eighth stage, i.e., the trial phase of use, because many factors made researchers unable to continue to the last stage, i.e., the stage of mass product making. One of the factors is the limited cost of researchers in this study.

Results

In this study, researchers created a football shooting skills test using technology, which was previously done manually. The wall for the test target numbers was decorated using paint or chalk. Then, in implementing the test, when each football player shot three times, researchers or coaches would write down the numbers on the wall exposed to the ball when the football player shot. Based on these, researchers can proceed to design a tool for football shooting skills test using technological media.

Design of Development Tool Tests Football Shooting Skills Using Technological Media

The tool's design for football shooting skills tests using technological media can be seen in the figure below, along with details of the parts of the tool used to develop tools for football shooting skills tests using technological media.



Figure 2. Design of the Football Shooting Skills Instrument Tests

Figure 2 is a product of a tool for football shooting skills test designed and has gone through the stage of design revision by experts. Furthermore, the researcher entered the phase I trial stage, namely a small-scale trial.

Phase I Trial

The results of the phase I trial were conducted on 10 students of the PJKR FIK study program as a sample of the trial. This phase I product trial aimed to provide scores and input on shooting skills test instruments developed by researchers. The results of the phase I trial had a score of 80% in the feasible category.

Phase II Trial

The results of the phase II trial were conducted on 20 students of the PKO FIK study program as a sample of the trial. This phase II product trial aimed to provide scores and input on the results of shooting skills test instruments developed by researchers. The results of the phase II trial had a score of 90% with the category of “Very Feasible”. Based on the results of Phase I and II trials that researchers have conducted, researchers saw an increase of 10% from the results of the phase I and phase II trials. Thus, it can be concluded that the shooting skills test instrument developed was in the feasible and very feasible category. The results of phase I and II trials can be seen in the table below:

Table 2. Results of Phase I & Phase II Trials

No	Respondent	Percentage %	Category
1	X10	80	Feasible
2	X20	90	Very Feasible

From Table 2, it can be seen that the respondents (sample) of phase I trials amounted to 10 students, and the phase II trial amounted to 20 people, so the total sample amounted to 30 people. Compared to the results of phase I and II trials in Table 2, it showed a 10% increase in the trial results. The results of this increase can be seen in Figure 3 (Histogram) as follows:

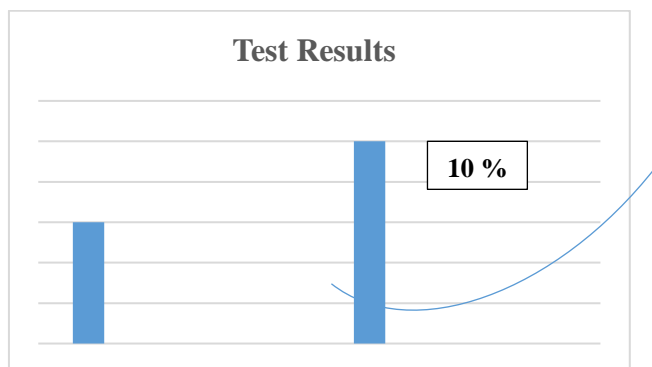


Figure 3. Histogram Increases Phase I & II Trials

Based on phase I and II product trial results, football coaches and IT media experts assess and re-evaluate the development of football shooting skills tests that researchers developed. Thus, it will provide a feasible conclusion on whether or not a football shooting skills test tool that developed. The following assessments and evaluations are given by experts in Table 3:

Table 3. Expert Assessment Results

No	Expert	Total Score	Maximum Score	Percentage %
1	Football Coach	252	300	84%
2	IT-Media Expert	227	240	95%
Total		479	540	88 %

Table 3 results explain that the questionnaires on media and football coach experts are in the category “**Very Feasible**”, with a mean score for football coach experts of 252 and a maximum score of 300, and a presentation of 84%. While for IT-media experts, a total score was 227 and a maximum score was 240 with a presentation of 95%. The total score of the football coach and IT-media experts was 479, and the maximum score was 540 with a presentation of 88%. The range between the total scores, the maximum score, and the percentage can be seen in figure 4 of the diagram as follows:

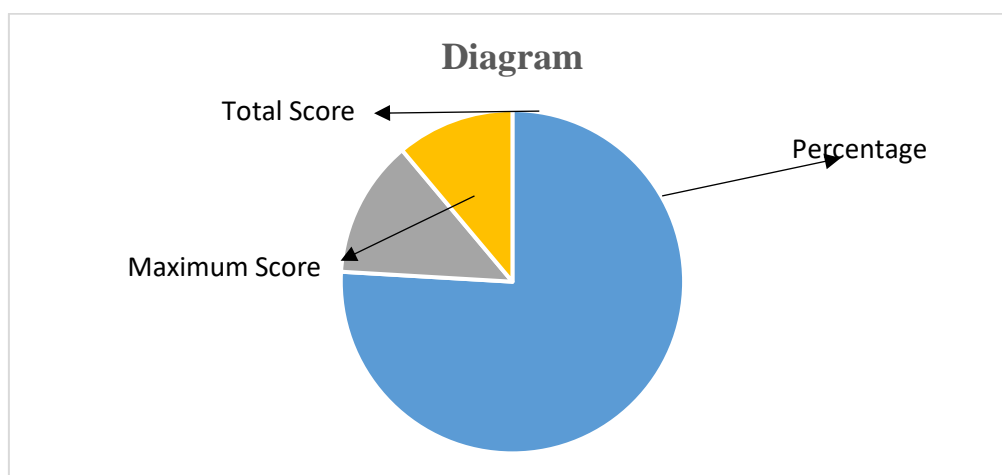


Figure 4. Expert Assessment Diagram of football shooting performance test instruments

Discussion

In general, research, figures out the characteristics of sports from an overall point of view and analyzes every contextual variable, addresses the development of shooting tools using technological media that determines the competitive performance of shooting results, is still limited in number. The general purpose of this study is to develop football shooting test instruments using technology and test the effectiveness and efficiency of test tools developed to measure football shooting skills based on the utilization of technology in sports. Effectiveness in shooting on goal is analyzed based on the variables that determine the shot (Gamonales Puerto, Muñoz Jiménez, León Guzmán, & Ibáñez Godoy, 2018). Astuti (2019) explains that shooting on goal is a problem immediately addressed in football. Since 60% of goals are scored by shooting, it is necessary to have a shooting test instrument to measure and improve the shooting ability of football players. It is reinforced by research developed by Ilahi, Raibowo, Sugihartono, & Hiasa (2021) that training using applications can improve basic techniques, one of which is the basic technique of football. Bangun & Tarmizi (n.d.), explain that shooting practice using technology media can improve the ability of basic shooting techniques in football games. Furthermore, the technology itself is useful in obtaining more valid and measurable test results to abort the ability to shoot football for football players. In the concept of media implementation, data technology was directly connected to the computer when the ball shoots, hitting the target number set on the wall with the sensor vibrating the technology as a means of data transmission. In this study, researchers developed a football shooting skills test. When conducting a test, if the ball results from a football player's shot on the test's target number, the data will go directly to the laptop and be recorded on it. The vibration sensor attached behind each test target number became a tool used to receive ball vibrations, and the results were sent to the device on the laptop. The application of the shooting skills test tool using the media on the laptop would show the target number hit by the ball. To get vibrations when the ball hits the test target number, the researcher used a tarp as the base of the target number, taped to the wall as a buffer.

The football shooting skills test instruments and tools researchers developed use vibrating sensors with a vibrating frequency sensitivity of 2 Hertz. With a vibrating frequency sensitivity of 2 Hertz, vibrating sensors have been protected by iron plates measuring 3x4 cm with a thickness of 0.3 cm. This iron plate has the durability to receive the impact of walls and balls, and its durability is unlimited. That is evident from the experiments conducted by throwing the ball hard to one vibrating sensor target protected by iron 300 times. Vibrating sensors did not experience any problems. Data was being sent to the laptop application, running smoothly even though the battery power had been drastically reduced. The nature of this vibrating sensor itself would send data to the overlaid application when the vibrating sensor received which vibration was strongest when the ball hit the dividing boundary between each test target number. This development research was to create football shooting skills instruments and test tools that are expected to work effectively and efficiently to be an attraction for coaches in activities to obtain the results of shooting and future researchers.

Conclusion

Based on the research results, researchers concluded that the instruments and tools used in football shooting skills tests are feasible in conducting football shooting skills tests. With the development of football shooting skill test instruments developed, coaches can more easily see their athletes' football shooting skills, and students who research football shooting skills can be easier in their implementation. This development research produces football shooting skills instruments and test tools, which are expected to work effectively and efficiently so that they can be an attraction for athletes and coaches in activities to obtain the results of shooting and future researchers. These instruments and test tools are expected to provide convenience in preparing the shooting test media and accuracy in seeing the results of the shooting ability of football athletes. With the implementation of the technology media, the data will go directly to the computer device when the ball of shooting results in the target numbers set on the wall with vibrating sensor technology as a data sending tool. This product of football shooting skills test instruments and tools can be an input for football coaches and students researching football shooting skills to see how much ability they have on the football shooting skills test. For the process of spreading the instrument of this football shooting skill test tool to a wider target, researchers provide advice that before sharing it, it is necessary to re-examine the display packaging and the durability of the tools developed so that it can be better in marketing.

Conflict of Interests

The authors declare to have no conflicts of interest with the manuscript.

References

Astuti, Y. (2019a). Relations with Foot-Eye Coordination of Shooting Football School Students, III(Viii), 229–232.

- Astuti, Y. (2019b). The Effect of Circuit Training Methods, Circuit Series and Learning Motivation on Students' Volleyball Basic Skill. *Journal of Education Research and Evaluation*, 2(3), 120. <https://doi.org/10.23887/jere.v2i3.14467>
- Bangun, S. Y., Supriadi, A., & Tarmizi, A. (2020). Development of Shoot the Ball After Dribble Practice Towards Soccer School Student-Athletes. *Journal Physical Education, Health and Recreation*, 4(2), 79. <https://doi.org/10.24114/pjkr.v4i2.14721>
- Bangun, S. Y., & Tarmizi, A. (n.d.). Analysis of the Use of Media Technology on Soccer Shooting Skills Test Instruments. *Proceedings of The 4th Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL)*, 2548–46, 27–28.
- Eriko, N., & Febriyanti, I. (2014). Perbandingan Tingkat Kebugaran Jasmani Antara Mahasiswa Pendidikan Olahraga Dengan Mahasiswa Pendidikan Kepelatihan Olahraga. *Jurnal Pendidikan Olahraga Dan Kesehatan*.
- Gamonales Puerto, J. M., Muñoz Jiménez, J., León Guzmán, K., & Ibáñez Godoy, S. J. (2018). Efficacy of shots on goal in football for the visually impaired. *International Journal of Performance Analysis in Sport*, 18(3), 393–409. <https://doi.org/10.1080/24748668.2018.1475194>
- Girsang, F. H., & Supriadi, A. (2020). Pengaruh Variasi Latihan Shooting After Dribbling dan Shooting After Passing Terhadap Akurasi Shooting Pada Atlet Usia 11-13 Tahun SSB Soccer Pratama Tahun 2021. *Journal Physical Health Recreation*, 1(3), 51–58.
- Ilahi, B. R., Raibowo, S., Sugihartono, T., & Hiasa, F. (2021). Kinestetik : Jurnal Ilmiah Pendidikan Jasmani NIKE TRAINING CLUB APPLICATIONS TO IMPROVE FOOTBALL LEARNING IN THE INDEPENDENT ERA OF, 5(100), 827–835.
- Mesnan, M., Supriadi, A., & Siregar, I. (2019). Pengembangan Log Book Pembelajaran Sepak Bola Dengan Pendekatan Taktis. *Jurnal Prestasi*, 3(6), 68. <https://doi.org/10.24114/jp.v3i6.15895>
- Mielke, D. (2007). Coaching Experience, Playing Experience, and Coaching Tenure: A Response to Commentaries. *International Journal of Sports Science & Coaching*. <https://doi.org/10.1260/174795407781394301>
- Mielke, D., & Human Kinetics (Organization). (2003). *Soccer fundamentals*. Sports fundamentals series.
- Mustafa, P. S., & Dwiyoogo, W. D. (2020). Kurikulum Pendidikan Jasmani, Olahraga, dan Kesehatan di Indonesia Abad 21. *JARTIKA Jurnal Riset Teknologi Dan Inovasi Pendidikan*, 3(2), 422–438. <https://doi.org/10.36765/jartika.v3i2.268>
- Nusri, A. (2018). Developing a Long Passing Skill Measuring Instrument For Soccer School Student, 12(Isphe), 233–238. <https://doi.org/10.2991/isphe-18.2018.54>
- prof. dr. sugiyono. (2010). *prof. dr. sugiyono, metode penelitian kuantitatif kualitatif dan r&d. intro* (PDFDrive).pdf. Bandung Alf.
- Supriadi, A., Mesnan, M., Azandi, F., & Kasih, I. (2021). The Development of Electronic Football Teaching Materials (E-Book). *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, 4(2), 3242–3249. <https://doi.org/10.33258/birci.v4i2.2073>