

# Development of test forms of down passing techniques in sensor-based volleyball games

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## ABSTRACT

The purpose of this study is to develop a form of passing down technique skill test in a sensor-based volleyball game. This research is a research and development (R&D) research. The research steps are: Potential and Problems, Data Collection, Product Design, Design Validation, Design Revision, Product Trial, Product Revision, and User Trial. This development research is first validated by material experts and media experts. The product trial is carried out on volleyball extracurricular students at SMA Nusantara in the open field of PBVSI Deli Serdang, as many as 14 students. Small group test of 7 students, and large group test of 14 students. Type of data collection is with the instrument in the form of a questionnaire. The results obtained from the validation results (a) material experts amounted to 98.3% categorized as very feasible; (b) 98.3% of media experts are categorized as very eligible; (c) small group trial of 86.9% of students in the very appropriate category, (d) large group trial of 91% of students in the very eligible category. The product produced in this development is a sensor and wall target application which is equipped with a user manual. This sensor tool has been declared "very feasible" to be used as a medium or means to help automatically calculate points in the volleyball underpass test. This study also finds some limitations that can be taken into consideration for further research, namely the number of samples studied is still relatively small and supporting facilities are inadequate so that there is a slight delay in taking the exam. Based on the limitations contained in this study, it is hoped that in the future partner researchers can use this research as a reference material for contributions in their research, so that perfection in technological developments in the world of volleyball is achieved.

**Keywords:** Skill test; sensor-based; volleyball; sensor and wall target



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## INTRODUCTION

The rapid progress of Science and Technology (IPTEK) is undeniable, and diverse research findings are increasing rapidly (Laksana et al., 2017; Pahlevi & Muhammad, 2019). Advances in science and technology, or science and technology, have helped various human activities, especially in the field of sports, where they

have helped in training and competition (Hidayat et al., 2019b). Advances in science and technology also affect the use of science and technology in sports from year to year in various developed countries or professional athletes have undergone significant changes and improvements, for example, today if we want to increase speed we don't have to train it by running continuously, conceptually is the ability to cover the shortest distance (Szelag et al., 2019; Widianingsih & Listyaningrum, 2019).

Similar to the game of volleyball, in essence the game of volleyball aims for recreational purposes in filling spare time. However, in line with the times, volleyball has become a sport that can maintain and improve physical fitness and health. Along with the development of volleyball, the goal of playing volleyball turned into an increase in performance which requires the players to be serious in coordinating. To improve the technical skills of the volleyball game, it must be trained and evaluated so that the coach knows the weaknesses and shortcomings of the technique. Today's modern volleyball is a game of very fast, explosive, and multi-complex movement, action development, and situational problem solving (Pujiyanto et al., 2021). All of these things are marked by the intensity of high-level activities that require high-level skills from players, both in terms of basic abilities and special abilities possessed by Czerwinsky (Urahman & Hidayat, 2019). According to García-de-Alcaraz et al. (2020), and Movahed et al. (2019) the importance of effective and up-to-date educational programs in all professional sectors, including sports coaching, is highlighted by the rapid development of information and technology, and up-to-date in all professional areas, including sports coaching.

Volleyball players can be said to be skilled if they can master and perform various elements of movement in volleyball games well by applicable rules (Kurowski et al., 2018; Nita & Wiranto, 2020). However, based on the results of observations made on sports students at the State University of Medan (UNIMED), it was found that when doing the underpass ability test, many students were less able and understanding in doing the underpass technique. Then since the number of unimed sports students is quite large, the lecturers are quite weak in carrying out the assessment process.

Research related to measuring test equipment in the passing test has been carried out by Suriadi and Dewi (2020) and Zhou (2021), who developed a test tool in the form of a test with a diameter of 1.5 meters and a height according to the needs of the test to be carried out. Hidayat et al. (2018) and Tian (2021) has also carried out his research related to test equipment in passing techniques, namely computer-based tools by making target matches with adjusted sizes. Apart from research, there is a lot about the development of the ball regarding the development of learning models such as the Primary research, CMW 2020 on the development of a volleyball game passing learning model. The developed a downward passing learning model for elementary school children (Biese et al., 2020; Rudi & Arhesa, 2020), the development of low-level learning in junior high schools using the drill method (Destriana et al., 2018), and the development of the drill underpassing method for Budi Utomo students (Mu'arifuddin, 2018). Looking at the research that has been done by previous researchers, this is developing a ball passing test instrument by modifying it by adding a test form as a measuring tool used in the assessment, so this research is different from previous research.

This study aims to develop a measuring instrument in the underhand passing technique in the form of a measuring instrument test form which is expected to facilitate lecturers or coaches in the process of assessing students or athletes in the underhand passing technique of volleyball games. What distinguishes this test from the previous test is that the previous downward passing test did not use a target, while this test uses a target, namely by using a sensor board and also a target wall application. Current technological advances, one of the shortcomings experienced in conducting a passing test for volleyball games is that the calculations are still manual. Using instruments that are still manual, of course the data produced is not objective. This situation can occur because the data obtained is manipulated because it is still manual. Therefore, there is a need for innovation by developing a volleyball bottom passing test tool that is still manual in calculating tests to be developed into a sensor-based bottom passing test tool for volleyball games.

## METHOD

Researchers will develop products in the form of sensor media development and target wall applications. This research was conducted in October 2021. The method used was Research and Development (R&D) which

was carried out with 7 stages of development (Wa'asil et al., 2018), namely: (1) determining potential and problems; (2) ingest data; (3) product design; (4) product design validation; (5) product design revision; (6) product trial; and (7) implementation. The subjects in this study were 50 students. Experiments were carried out in large and small groups. Small group test was conducted on 10 students. The large group trial was carried out by 50 students who were members of the volleyball club. The data analysis technique in this research is descriptive analysis.

## RESULTS AND DISCUSSION

This research first conducts observations regarding the material/science of volleyball plus supporting references through print media or online media. Researchers also observe and analyze potential or problems that occur in the field. The products to be developed in this study are sensor media/target boards where this product is new and wall target applications where this product is a new product in volleyball games. The Sensor Board is developed as a volleyball bottom passing test target and a wall target application is added with the aim of making it easier to calculate test points automatically. The wall target application in this development research is an application that is placed on an android phone with the aim of automatically calculating points in the volleyball game's bottom passing test. The bluetooth sensor in this development research is a device that is placed on a solid wall as a target for the volleyball bottom passing test. The sensor is active by pressing the power button on the sensor board, while the target wall application is active when the cellphone bluetooth is turned on. The following are the results of the Material Expert stages I and II, which have been summarized in the form of tables and diagrams:

Table 1. Data Results of Stage I and Stage II Material Experts

No	Aspect Rated	Score Retrieved	Score Maximum	Percentage (%)	Category
Stage I					
1	Physical	20	20	100%	Very Worthy
2	Design/Display	15	20	75%	Worthy
3	Use	19	20	100%	Very Worthy
Total Score		57	60	95%	Very Worthy
Stage II					
1	Physical	20	20	100%	Very Worthy
2	Design/Display	19	20	95%	Very Worthy
3	Use	20	20	100%	Very Worthy
Total Score		59	60	98,3%	Very Worthy

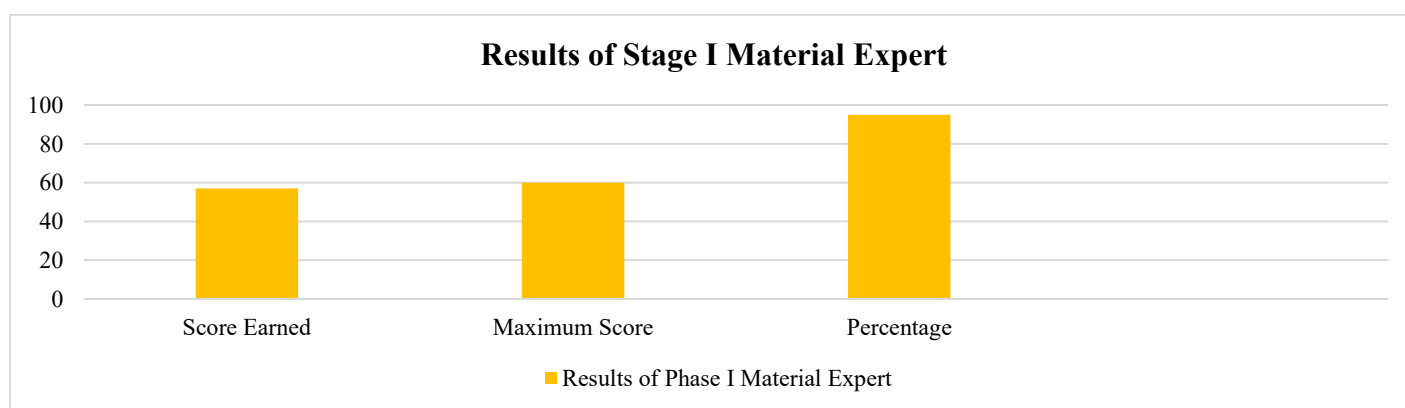


Figure 1. Data Diagram of Stage I Media Experts

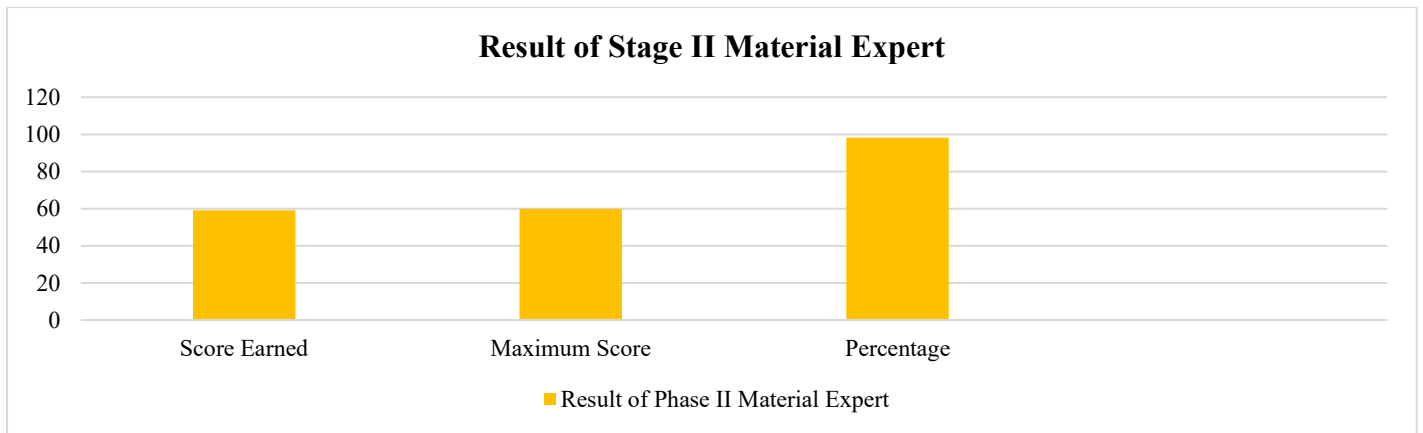


Figure 2. Data Diagram of Stage II Media Experts

The following are the Media Expert stage I and stage II results, which are presented in the form of tables and diagrams:

Table 2 of Data Results of Stage I and Stage II Media Experts

No	Aspect Rated	Score Retrieved	Score Maximum	Percentage (%)	Category
Stage I					
1	Physical	19	20	95%	Very Worthy
2	Design/Display	17	20	85%	Very Worthy
3	Use	20	20	100%	Very Worthy
Total Score		56	60	93,3%	Very Worthy
Stage II					
1	Physical	20	20	100%	Very Worthy
2	Design/Display	19	20	95%	Very Worthy
3	Use	20	20	100%	Very Worthy
Total Score		59	60	98,3%	Very Worthy

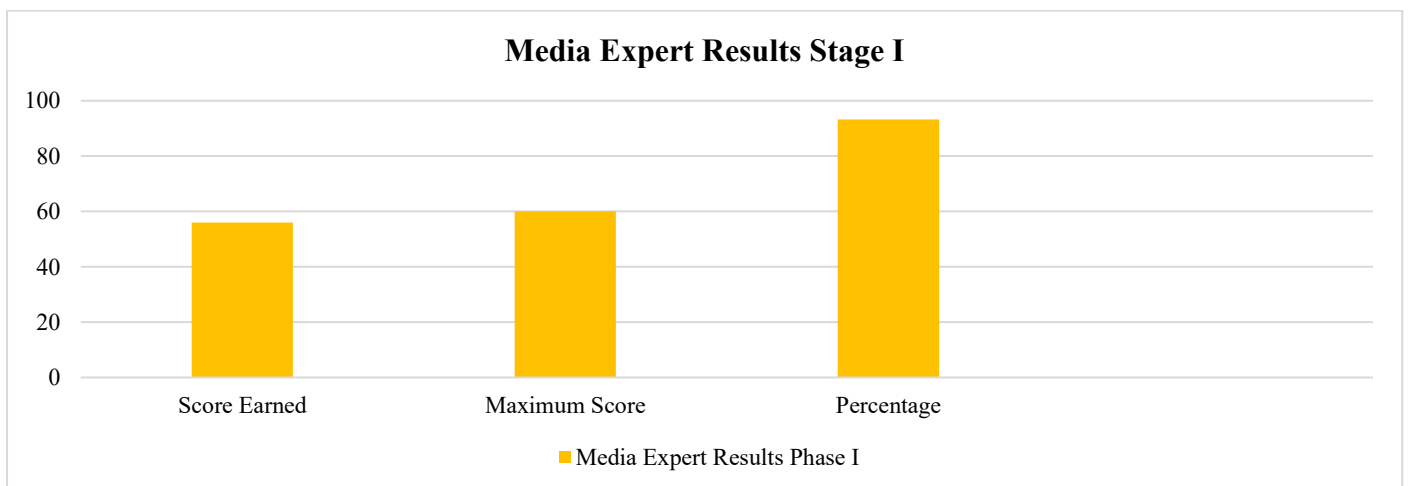


Figure 3. Data Diagram of Stage I Media Expert Results

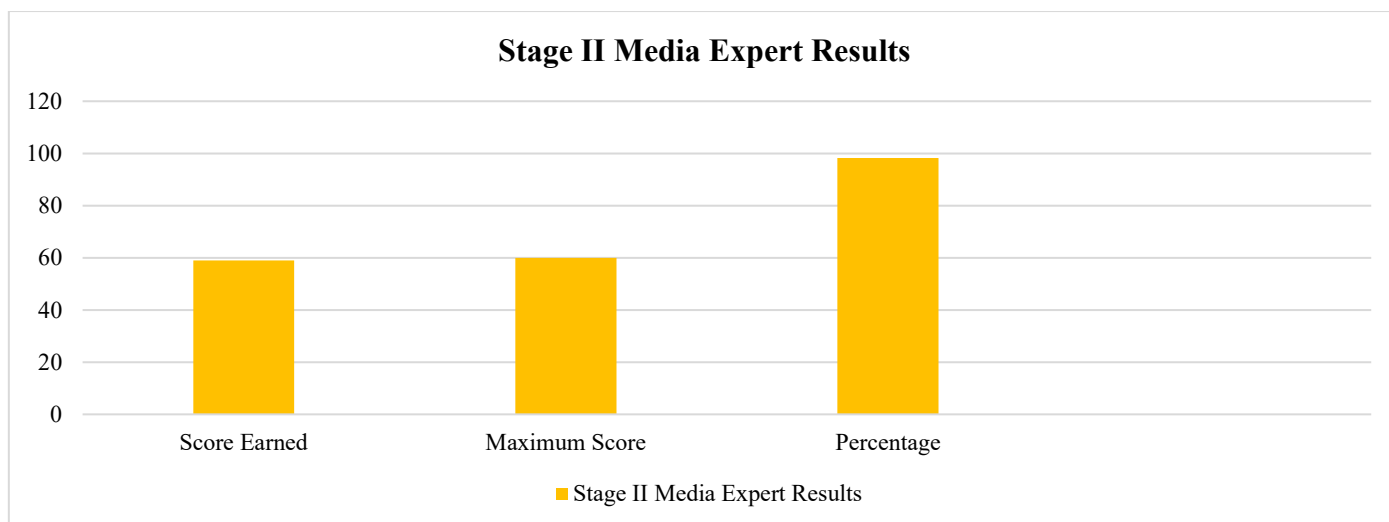


Figure 4. Data Diagram of Stage II Media Experts

The following are the results of the small group trial, presented in the form of tables and diagrams:

Table 3. Student Questionnaire Results for Small Group Trials

No	Aspect Rated	Score Retrieved	Score Maximum	Percentage (%)	Category
1	Physical	125	140	89,2%	Very Worthy
2	Design/Display	118	140	84,2%	Very Worthy
3	Use	124	140	88,5%	Very Worthy
	Total Score	365	420	86,9%	Very Worthy

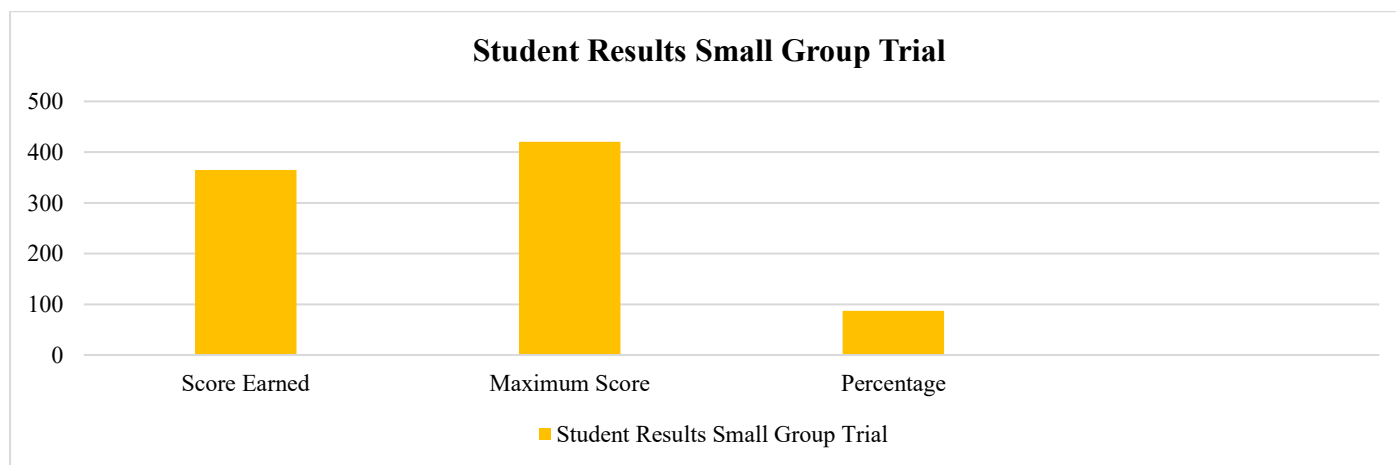


Figure 5. Data Diagram of Small Group Trial Student Results

The following is the data from the large group trial which is concluded in the form of tables and diagrams as follows:

Table 4. Results of Large Group Trial Student Questionnaire

No	Aspect Rated	Score Retrieved	Score Maximum	Percentage (%)	Category
1	Physical	254	280	90,71%	Very Worthy
2	Design/Display	252	280	90%	Very Worthy
3	Use	264	280	94,28%	Very Worthy
	Total Score	770	840	91%	Very Worthy

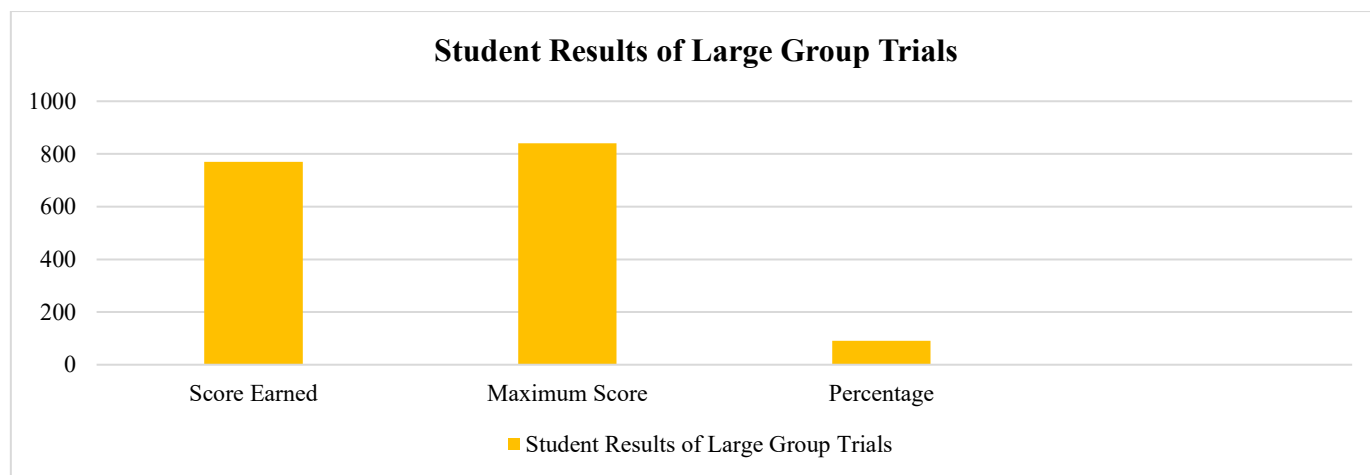


Figure 6. Data Diagram of Large Group Trial Student Results

This study aims to develop a sensor-based form of a volleyball passing skill test. Based on the research that has been done, the score on the “physical” assessment aspect of the test instrument is 100%. These results mean that the shape of the test instrument is very well structured/concise to be used as an assessment material in the volleyball game’s bottom passing test. This result is also strengthened by research [Hidayat et al. \(2018\)](#), [Hides et al. \(2022\)](#), and [Pahliwandari et al. \(2018\)](#) which state that the preparation of a good instrument can be seen based on the arrangement of designed questions. Likewise, with the statement [Faozi et al. \(2019\)](#), [Nugroho et al. \(2022\)](#), and [Zhang and Zhong \(2021\)](#) which state that in the process of preparing test instruments, it can be said to be good if the shape of the instrument arrangement is good or looks good. As it is known, that in the process of assessing volleyball lectures, there are many indicators that need to be assessed, both in terms of theory and game techniques, so to achieve an effective and targeted assessment process, a test instrument is needed that is in accordance with the assessment process ([Heriyadi & Hadiana, 2018](#); [Nishino et al., 2022](#)).

In the results of this study, it is also known that the average score on the aspect of appearance/design is 85% (very good). This shows that the form of the test instrument used has a very attractive appearance/design that makes the assessors interested in using it. In the assessment process there are several things that need to be emphasized, including an attractive appearance. The appearance/design that is not monotonous will make the assessors, both of lecturers and other educators, more enthusiastic in assessing every aspect, so that it will not cause them to “give a value at will”. The results of this research are also relevant to the research that has been done by [Julianto \(2016\)](#), [Limroongreungrat et al. \(2022\)](#), and [Prayoga \(2016\)](#) which state that the form of a test instrument is good if the appearance/design is also attractive and appropriate to the assessment process. A testing instrument must be able to adapt to the times. Not only with a full paper, but it is necessary to make an innovation related to the content and style of the appearance of the assessment process ([Achmad, 2018](#); [Pasaribu, 2016](#); [Sheikh Ali et al., 2021](#)). This statement is also reinforced by [Alviana \(2016\)](#), [Duan \(2021\)](#), and [Sahabuddin et al. \(2020\)](#) who reveal that if the form of the test instrument is interesting, the lecturer or assessor is also more active in the assessment process. This study aims to develop a sensor-based volleyball passing skill test form. Based on the research that has been done, the average value is 95% for all criteria at each stage. This shows that there are no difficulties for students when using the measuring instrument developed, then the design or display on the test form presented to the test subjects is easy to reach, and easy to reach.

The average result on the assessment of the “usage” aspect shows a result of 96%. These results mean that the instrument form developed is very easy to use when assessing volleyball underpasses. In every volleyball game, there are techniques for doing volleyball well, one of which is the down passing technique. Of course, in carrying out this technique, a continuous training process is needed so that the downward passing technique can be carried out perfectly so that players can receive the ball from the opponent perfectly ([Kawatani & Hori, 2022](#)). This statement is supported by [Miura et al. \(2020\)](#), and [Samsuddin and Rahman \(2016\)](#) who state that

in order to receive attacks from opponents, a good/perfect passing technique is needed. The same thing was also expressed Juniarta et al. (2017), and Umek and Kos (2020) which revealed that by doing good passing techniques, players will be able to more easily receive “attacks” from opponents.

Based on the average number of the three aspects of the assessment obtained by 95%. This shows that there are no difficulties for students when using the measuring tool developed, then the design or display on the test form presented to the test subject is easy to reach, and easy to reach. The research conducted by Destriana et al. (2022), and Gupta et al. (2021) needs analysis of every aspect studied. The results obtained are that the soccer field requires a tool that is able to measure up and down passing tests. In line with Destriana's research, research conducted by Carvalho et al. (2021), and Hidayat (2019a) shows the results that to measure upper passing in ball games, test, and measurement tools are needed. Kurniawan et al. (2021), and Xu and Liu (2021) have also analyzed the passing technique in volleyball in the high category. From the three relevant studies and based on the research results that have been obtained, it means that to carry out the passing technique in the ball game, tools and measuring tools are needed that are easy to use so that the technique is carried out can be implemented properly.

## CONCLUSION

Development of sensor-based down passing skills test for volleyball game “very appropriate” is used to support the volleyball underpass test. This is based on expert validation data which shows that: (1) Material experts scored 98.33 percent in the “very eligible” category. (2) Media experts scored 98.33% in the “very eligible” category. When using the sensor tool and the wall target app to help automatically calculate points earned during a volleyball underpass test, students offer positive answers. This is based on the results of user questionnaires on small-scale student trials, where the resulting percentage is 86.9%, and large-scale student trials, where the resulting percentage is 91 percent. This study also finds several limitations that could be taken into consideration for further research, namely the number of samples studied is still categorized as small and the supporting facilities are inadequate so that there was a slight delay in taking the exam. Based on the limitations found in this study, it is expected that in the future allied researchers can use this research as a reference contribution material in their research, so that perfection in technological developments in the world of volleyball is achieved.

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## CONFLICT OF INTEREST

In this study, all authors have no conflict of interest in it.

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