**Original Article**

# Development of long pass test instruments in football

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**Abstract**:
Development research procedures help clarify and refine instruments and designs. The purpose of this research was to produce a product in the form of a measuring instrument or a football long pass test instrument. This research used the research and development method based on the Borg and Gall development model, which aims to produce a product. There are 7 stages in the instrument development including needs analysis, initial product development, small group trials, initial product revisions, large group trials, and final product development. The obtained research results state that the developed instrument is adopted from the Lofted Pass Bobby Charlton instrument. The percentage of expert evaluation results is 88.33% and that of the small group test is 90%, which means that the developed instrument model is included in the usable category. Furthermore, in the large group test stage as validity and reliability testing of the instrument with 100 subjects, the long pass I validity value is 0.78 and long pass II is 0.70, while the long pass I reliability value is 0.802 and long pass II is 0.852. This value is greater than 0.60, which means that the long pass instrument is valid and reliable. The long pass instrument also shows ICC (Intraclass Correlation Coefficient) 0.81 and ES 1.91, meaning that it has good reliability and can distinguish the long pass accuracy of professional and amateur players. Thus, it can be concluded that the developed long pass instrument is a valid and reliable test and is suitable to measure the accuracy of long pass football, allows coaches to evaluate players' long pass techniques, and can be used to detect talented individuals in football.
**Keywords: Instrument development, long passing, football**

## Introduction

Football is a sport in which eleven players use their feet to kick the ball, except for the goalkeeper who is allowed to use his hands in the penalty box. Football is an intermittent team sport characterized by transitional activity patterns ranging from high-intensity movements (such as running, jumping, shooting, accelerating, and decelerating) to low-intensity activities (such as jogging, walking, and standing) (Krolo et al., 2020). Football players must master good basic techniques to make it easier to play. Technical variables are key to high performance in football and contribute to winning matches, such as passing in the attacking zone being one of the determining factors for the success of a professional football team (Kvas-Cabral, et al., 2022). Passing involves giving the ball to teammates so this skill is considered the most important in football where this skill is needed in the realization of defensive and offensive strategies (Keskin, 2015).  The defensive principle relates to actions aimed at delaying the progression of the player in possession to finally win the ball back and can be done by blocking passing lanes, while the offensive principle if closer to the ball can be done through the creation of passing lanes to create space in the opposing defense so that the ball can be brought forward or if it is further from the ball it can be done by providing longer passes in width and depth (Andrade, et al., 2021). Besides being important, passing skills are also often carried out in matches. In this case, Zainuddin et al (2022) show that throughout the match both teams lost and won, the most frequent action was passing, while the lowest was a blocked shot. A successful passing process is one of the main determinants of the attacking performance of a football team because the passing process is positively correlated with a higher chance of winning the match (Clemente et al., 2020).

Therefore, it is necessary to have players who have good basic football skills and able to maintain cohesiveness to allow a team to play the ball in the right position and situation without wasting energy. A player must have good technique, both individually and within a team. The purpose of a football game is for the players to put as many balls into the opponent's goal and to protect their own goal; the ability to use proper technique requires regular practices. The dominant technique used in football games is the kicking technique because in a football game, the kicking technique is a characteristic of the game. A football player with a good ability to kick the ball can be used for passing the ball to teammates near or far, shooting the ball towards the goal, and cleaning or sweeping the ball from the defense area directly to the front, which is usually done by defenders to break opponent's attack and perform all types of kicks. Therefore, football player must be able to master the technique of kicking the ball properly and correctly.

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Kicking in this case involves long passing. Passing is a technique of passing the ball to a teammate. Good pass will make it easier for the teammates to accept it. The passing pattern in football is one of the key characteristics of the team's tactical behavior (Khaustov et al., 2019). Long passing to the right is not easy. Many factors affect accuracy such as an opponent who consistently performs blocking, concentration, feeling, and so forth. In terms of its function, long passing has a major contribution; it allows to achieve long-distance passes on the ground or fly balls and pass them into the opponent's goal (Doewes, 2016). Accurate passes will make it easier for teammates to accept passes or complete them into goals. In addition, a long pass kick has a fairly good effectiveness; if the ball is bouncing upwards, it is very unlikely that the opponent will miss it. The results of research by Lisenchuk et al (2021) show that the long pass is widely used by goalkeepers (29.8% of all technical and tactical actions) and central defenders (17.0%). Long passing has an important role; therefore, it must be trained and systematically developed. The principles of the long pass technique are: support foot, kick leg (right or left), leg swing movement, eye view, part of the ball being kicked, and posture after kicking. To be able to perform a long pass in football with maximum results, in addition to good physical condition, mastering a proper kicking technique is required.

To improve the mastery of long pass techniques, a model and various exercises and test instruments are needed that can be used as training guidelines. Several testing protocols have been developed to evaluate football passing such as the F-MARC test battery, which considers the physical condition of football players (Guskiewicz et al., 2000). However, the existing passing assessment is a battery test, which is not specifically made to assess passing ability. Recently, a study by Padron-Cabo et al. has evaluated the test–retest of the F-MARC test battery. The obtained results show that it is relatively satisfactory and reliable for short pass skills, but the reliability value for long passes is insufficient; thus, it is not recommended for use in research or training (Padrón-Cabo et al., 2019). Padron-Cabo et al. stated that the long pass results were not reliable enough because the coordination and strength of the players were not optimal for an accurate long pass at a distance of 36 m. Thus, they suggested that it was necessary to redesign instruments to address reliability. Redesign can be performed using relevant measurement results such as redesign based on distance (Padrón-Cabo et al., 2019). This research develops a long pass football test instrument with a distance of 35 m for the initial design, which will then be validated by experts and tested on several groups. In addition, the long pass football test instrument uses semicircular targets with 5 different diameters. It aims to determine the accuracy of football long pass at different distances, thus enabling coaches to evaluate players' long pass techniques and can be used to detect talented individuals in football.

**Materials and Methods**

This study used the research and development method. Development research procedures help clarify and improve instrument items and designs (Shroff et al., 2019). In developing the instrument, the authors refers to the Borg & Gall development model, which aims to produce a product (Borg, 2014). There are seven steps that have been adjusted to various aspects, as follows. (1) Needs analysis is performed by discussion. (2) Development of the initial product (the researcher develops an instrument model). (3) Expert judgment. (4) Small groups trial. (5) Revision of initial products based on expert evaluation and small group trials. (6) Large group trial as testing instruments for checking the validity and reliability scale. (7) Revision of the final product based on the results of large group trials, results, and final product reports (Borg, 2014).

The research was conducted at the UNS stadium, Jl. Ki Hajar Dewantoro No.61, Jebres, Kec. Jebres, Surakarta City, Central Java, Indonesia. This research was performed in several stages. The first stage of needs analysis was performed in February 2020. The second stage of an expert review, small group trials, and initial product revisions were performed in March–April 2020, and the trial phase lasted for 30 days due to the provision of trial and revision of products that have been tested. Then a large group trial was performed in May 2020.

In this study, 50 male athletes were used for small group trials, and 100 male athletes were used for large group trials. In the small group trial, a question and answer session was conducted in the form of a questionnaire; in the large group trial, it was performed by assessing the results of the kicks to check the validity and reliability of the developed instrument.

In this study, the questionnaire data were analyzed using comparative descriptive analysis by comparing the results of the questionnaire data with the following assessment standards. The higher is the score, the better is an instrument. If the value reaches 80%, it means that the instrument is valid (Hyrkäs et al., 2003).

**Results**
**Stage 1: Needs Analysis**

At this stage, discussions were held with expert football practitioners. Based on the discussions with experts, the following results were obtained:
1. A previous football long pass test instrument used a square.
2. Furthermore, the previous instrument has been developed with several square size models, i.e., 4, 6, and 8 m$^2$.

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3. The limitation of the previous instruments with the square shape is the mismatch of the distance between the center point and the corner square. Thus, it is necessary to develop an instrument in the form of a circle where the distance between the center point and the end of the circle is the same.

**Stage 2: Initial Product Development**

The speed training development model is adopted from Bobby Charlton's football skills test model. Bobby Charlton's football skills test model for the long pass test is called the Lofted Pass, and the measurement criteria use a score (Kadagadakai & Pradhan, 2018). The Bobby Charlton's long pass test uses a square shape with 3 sizes, i.e., 4, 6, and 8 $m^2$. The score for the 4 $m^2$ square is 50 points; the score for the 6 $m^2$ square is 40 points; the score for the 8 $m^2$ square is 30 points. In this study, we developed a long pass test with a circular shape with 5 sizes, i.e., 1, 2, 3, 4, and 5 m. The score for the circle with 1-m radius is 50 points, 40 points for 2 m, 30 points for 3 m, 20 points for 4 m, and 10 points for 5 m.

**Stage 3: Expert Evaluation**

The rating scale is from 1 to 5. Score 1 is given to the very inappropriate/precise/easy/safe category. Score 2 is for the inappropriate/appropriate/easy/safe category. Score 3 is for the sufficient category. Score 4 is for the appropriate/precise/easy/safe category. Score 5 is for the very suitable/precise/easy/safe category. The percentage results in Table 1 are compared with the standard assessment (Hyrkäs et al., 2003). Thus, it can be concluded that the initial product developed can be used for small group trials.

**Table 1.** Results of expert evaluation

| | Aspect | Score |
|---|---|---|
| 1 | Clarity of implementation of the instructions | 4 |
| 2 | Instrument ability to measure long pass accuracy | 4 |
| 3 | Safe to apply in long pass assessments | 5 |
| 4 | Ease of instrument model for athletes | 3 |
| 5 | Can increase student interest and motivation | 4 |
| 6 | Can encourage physical aspects | 5 |
| 7 | The suitability of the tools and facilities used with the level of growth and development of athletes | 5 |
| 8 | The suitability of the long pass instrument model between the description and the picture | 5 |
| 9 | Can be performed by male athletes | 5 |
| 10 | The accuracy in choosing the long pass instrument model for male athletes | 4 |
| 11 | Long pass instrument is appropriate to achieve the expected goals | 4 |
| 12 | Long pass instruments are easy to understand by male athletes | 5 |
| | Percentage | 88.33% |

**Stage 4: Small Group Trials**

**Table 2.** Validity and reliability test of football long passing in a small group trial

| Long pass trial | Validity | Reliability |
|---|---|---|
| I | 0.78 | 0.804 |
| II | 0.71 | 0.803 |

Table 2 shows the results of the validity and reliability test of the football long pass test instrument using 50 subjects who performed the test 2 times. Based on the table 2, the validity value for long pass I is 0.78 and 0.71 for long pass II, while the reliability value for long pass I is 0.804 and 0.803 for long pass II. These values are more than 0.60, which means the long pass instrument is valid and reliable.

In small group trials, in addition to testing the validity and reliability of the instrument using the kick experiment, a questionnaire was also used to determine the subject's opinion about the developed instrument.

**Table 3.** Response to the passing test instrument in small group trials

| No. | Question | Yes | No |
|---|---|---|---|
| 1 | Is the developed instrument in accordance with the basic football longpass? | 44 (88%) | 6 (12%) |
| 2 | Is the developed instrument in accordance with existing tools and facilities? | 47 (94%) | 3 (6%) |
| 3 | Is the developed instrument in accordance with student growth and development? | 46 (92%) | 4 (8%) |
| 4 | Is the developed instrument able to increase student's interest and motivation for improving long pass skills? | 49 (98%) | 1 (2%) |
| 5 | Does the developed instrument encourage student's physical development? | 46 (92%) | 4 (8%) |
| 6 | Is the developed instrument able to measure the accuracy of football long pass skills? | 44 (88%) | 6 (12%) |
| 7 | Can the developed instrument be used as an alternative to assess the accuracy of football long passing? | 46 (92%) | 4 (8%) |
| 8 | Is the developed instrument safe to apply? | 49 (98%) | 1 (2%) |
| 9 | Is the developed instrument easy to understand? | 45 (90%) | 5 (10%) |
| 10 | Is the developed instrument easy to perform? | 29 (58%) | 21 (42%) |
| 11 | Can male athletes perform the developed instrument? | 47 (94%) | 3 (6%) |
| 12 | Are the implementation instructions of the developed instrument clear? | 48 (96%) | 2 (4%) |
| | Total | 90% | 10% |

Based on the table 3, it can be concluded that on average, 90% of the subjects considered the instrument to be appropriate. The highest average is obtained for aspect (4), i.e., "the developed instrument is able to increase interest and motivation for improving long pass skills" and aspect (8) "the developed instrument is safe to apply". Both aspects have a percentage of 98%. In addition, almost all aspects have a value of ≥88%; there is only one aspect whose score is below 88%, i.e., aspect 11 "the developed instrument is easy to perform". This aspect has a percentage value of 58%. This means that the instrument is suitable in many aspects except in terms of ease of operation.

**Stage 5: Initial Product Revision**

Based on expert evaluation, there are sufficient categories in the aspect of the ease of the instrument model for students to do, this is also in accordance with the results of the answers in the small group trial that 21 subjects stated that it was not easy to do. Thus, it is necessary to revise the initial product.
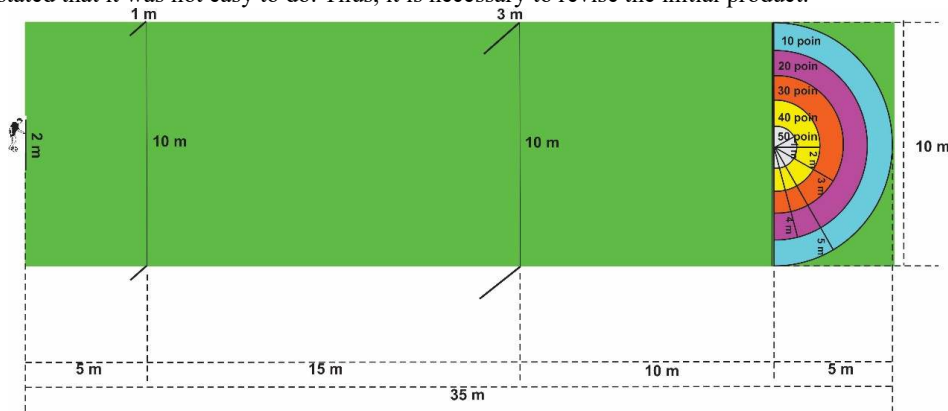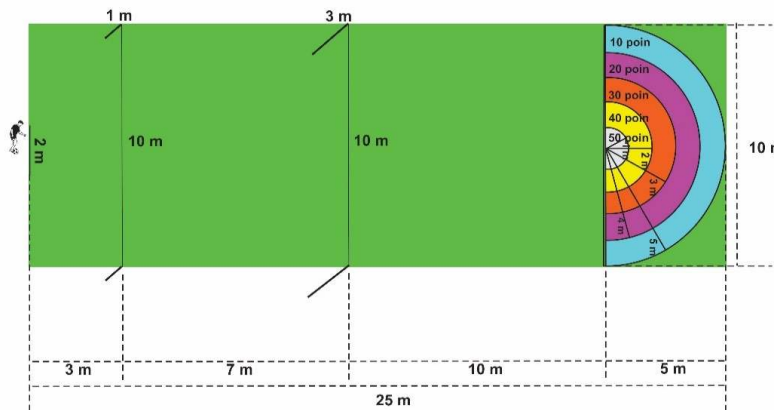
Figure 1. Initial product

Figure 2. Revised product

Figures 1 and 2 show the difference between the initial and revised products, i.e., the difference in the target distance. In the initial product, the target distance was 35 m, while in the revised product the target distance is changed to 25 m. This revision is based on the suggestions from experts and the results of the small group trial. The difficulty for the subject occurred because the distance was too far; thus, the target distance was revised.

**Stage 6: Large Group Trials**

After the product was revised, the product revision implementation was performed in large group trials. Large group trials are used as testing instruments to check the validity and reliability scales. The validity of the instrument assesses the measurement instruments designed for the measurement. Reliability test is one of the requirements in instrument development. Reliability test examines whether instruments are consistent or stable during every test. Long pass practice is declared valid and reliable if it is more than 0.60. Table 4 presents the validity and reliability test.

**Table 4.** The validity and reliability test of football long pass in the large group trial

| Long Pass Practice | Validity | Reliability | ICC |
|---|---|---|---|
| I | 0.78 | 0.802 | 0.81 |
| II | 0.70 | 0.852 | |

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Table 4 shows the results of the validity and reliability test of the football long pass test instrument using 100 subjects who performed the test 2 times. Based on the table, the validity value of long pass I is 0.78 and 0.70 for long pass II, while the value of long pass I reliability is 0.802 and 0.852 for long pass II. The values are more than 0.60, which means that the long pass instrument is valid and reliable. To explain the reliability between the two testing sessions, the researcher also calculated the Interclass Correlation Coefficients (ICC). The obtained results show high correlation with the ICC value of 0.81.

Furthermore, the large group test was also performed by comparing the level of long pass accuracy between professional and amateur players. Professional players have been members of the senior-level national football team for the past two years and have participated in the highest professional football competition in Indonesia (Indonesian League 1) for the past two years. Amateur players are those who are not classified as professional players. Each player performs a long pass football test and then the accuracy of each group is compared using an independent t-test. To determine the magnitude of the difference between the two groups, the effect size was also calculated using Cohen's d, where the effect size of 0.20 means small, 0.50 means medium, and >0.80 means large (Russell et al., 2010).

Table 5. Comparison of long pass soccer test accuracy results

| Variable | p-value | Effect Size (ES) |
|---|---|---|
| Long Pass Soccer Test | 0.00 | 1.91 |

Table 5 shows that there is a significant difference in the accuracy of long pass between professional and amateur football players. The professional group of players achieved significantly better accuracy than the amateur group. This can be seen from the effect size value, which is >0.80.

**Stage 7: Final Product**

This stage is the final stage of product development. After the instrument product was tested in a large group, the obtained results indicated that the instrument was reliable and consistent; thus, the developed instrument can be used to measure football long pass skills. The following is the final product and its implementation instructions:
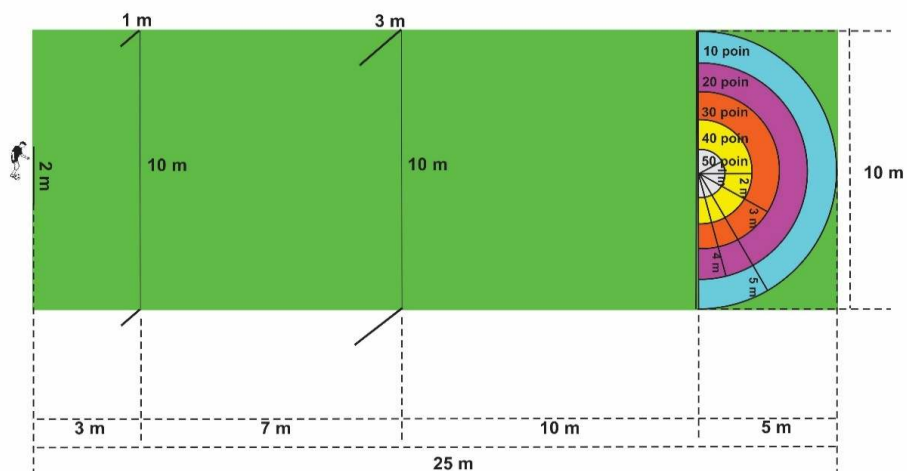


Figure 3. Final product

Purpose: The purpose of the test is to measure the long pass skill to the target.
1) Tools
   a) 5 balls
   b) Chalk (to create a field), target circle, and starting position.
   c) Roll measuring tape
   d) 2 poles 1 m high and 2 poles 3 m high. The first pole is placed 3 m from the starting position. The second pole is placed 10 m from the starting position.
   e) 2 pieces of rope (10 m long)
   f) Field size (25 m × 10 m)
   g) Semicircular targets with a diameter of 1, 2, 3, 4, and 5 m (the starting point of the target is located 20 m from the initial position)
   h) Starting position box measuring 1 m x 2 m
2) Implementing Officer
   a) 1 person who controls the turn also serves as a starter
   b) 1 person serves as target supervisor
   c) 1 person who records the results
3) Implementation
   a) Student stands at the starting position with the ball ready to be kicked in a dynamic state.

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    b) On the signal "yes", student performs a long pass to the provided target.

    c) Long passing is performed 5 times.

4) Assessment

    a) The number of balls that enter the circle target is counted

    b) The target size of 1 m is given 50 points, 40 points for 2 m, 30 points for 3 m, 20 points for 4 m, and 10 points for 5 m.

5) Value Criteria

**Table 6.** Value criteria

| Category | Value Limits |
|----------|--------------|
| Very low | <151 |
| Low | 151–173 |
| Sufficient | 174–196 |
| Good | 197–221 |
| Very good | >221 |

**Discussion**

Football is a team sport that requires performance cooperation with the aim to win by scoring as many goals as possible in the opponent's goal and to maintain the defense to prevent goals from the opponent. Football is a ball game in which one of the teams with the higher score is declared the winner within a predetermined time (Kai et al., 2018). In a football match, an athlete must be able to quickly anticipate and react to rapidly changing situations (i.e., the position of teammates and opponents) (Gantois et al., 2020). The correct understanding and mastery of basic football techniques will help a player to perform good teamwork both in the defense and attack. In football players, coordination is largely dependent on the timing, speed, and trajectory of the ball and then used by players for specific skills such as controlling, dribbling, and passing the ball (Dmitruk et al., 2020). This study is a development research. The developed product is a football long pass test instrument. Previously, a needs analysis was performed, which aims to identify the problems that occur in the field and develop appropriate solutions for these problems. This reinforces the importance of performance analysis on very high accuracy and comprehensive requirements that add to feedback in the training process (Nicholls & Worsfold, 2016). Needs analysis is performed by discussion with football experts, i.e., football coaches. The results of the discussion with football experts indicated that a long pass instrument is needed that can be used as training guidelines to improve the long pass ability; in addition, the development of an instrument is needed because the previous instrument used one target square model and 3 target sizes in a square shape; the use of a square shape is a limitation because the distance between the center and the edge/corner of the square is not equal.

The initially developed product is in the form of a circle model with 5 target sizes. This model is based on Bobby Charlton's lofted pass test. Based on the expert evaluation, the developed instrument model is sufficiently easy for the athletes to use; this also agrees with the results of the answers in the small group trial where 21 subjects stated that it was not easy to use; thus, it was necessary to revise the instrument model by reducing the target distance because it was too far. After the revision was made, the product was tested again in large groups by conducting a long pass test using the revised instrument product. This large group trial is a test of the validity and reliability of the developed instrument using 100 subjects and 2 trials. The results of the validity and reliability tests showed that the long pass I score is 0.78 and 0.70 for long pass II, while the long pass I reliability is 0.802 and 0.852 for long pass II. These values are greater than 0.60, which means that the long pass instrument is valid and reliable. This means that the long pass test instrument is able to perform its measuring function or provide precise and accurate measuring results. The obtained research results support previous research, which observed that the long passing and shooting instruments were valid and reliable (R > 0.6). Thus, this measurement instrument is great for measuring the long passing and shooting skills of Medan City SSB students (Nusri et al., 2018). In addition, the constancy of the long pass football instrument in providing measurement results is also supported by the ICC value, which shows good reliability (ICC = 0.81). In the reliability test, Interclass Correlation Coefficient (ICC) $\geq$ 0.75 indicates good reliability (Sekulic et al., 2019). The accuracy of the long pass football instrument is also confirmed by the ability of the instrument to distinguish the performance level of football players (p-value = 0.00, ES = 1.91).

Previously, passing protocols using footbonauts showed that they were valid and reliable in terms of execution time, but their accuracy was less valid and reliable (Saal et al., 2018). There was an increase in the accuracy but there was no significant difference between the two groups. In this case, the increase in accuracy was caused by the effects of learning or exercise and physiological abilities. High variability in short pass accuracy indicated a low ICC (Saal et al., 2018). In addition, Ali et al. (Ali et al., 2007) has reported that the passing test is valid and reliable but has a lower ICC value for the Loughborough Soccer Passing Test (LSPT) (ICC = 0.37–0.75), and the average performance of professional players in the LSPT is significantly lower than that of amateur players. Research by Russell et al. (Russell et al., 2010) has also shown that the passing performance of professional players is 14% faster, 17% more accurate, and 20% more successful than that of amateur players; however, the ICC result is lower in terms of accuracy and success of passing (ICC = 0.51; ICC = 0.43). Although the previous passing test showed that it was valid and reliable and could distinguish the

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passing performance of players with different standards, the research findings clearly show a higher ICC, which indicates the consistency of this test, as well as a large effect size (ES), which distinguishes the accuracy of football long passes between professional and amateur players.

## Conclusions

From the analysis, it can be concluded that in producing a development product, steps that must be considered are necessary. After passing these steps, this research resulted in a development product in the form of a football long pass test instrument that can measure football long pass skills. These results indicated that skills development in football is a time-consuming process with many variations. The broad range of football practices related to skills can also help to learn specific football skills. In other words, young footballers greatly benefit from technical training, where young football players get some deliberate touches with the ball. To change player's skills that are lacking, the player must spend more time practicing various types of technical skill in his spare time, not only during organized sessions (Gråstén et al., 2018).

The results of this study show that the developed long pass football instrument is a valid and reliable test and is suitable for measuring the accuracy of long pass football. This occurs because the developed long pass football instrument can distinguish long pass accuracy between professional players and amateur players. The accuracy of long pass in football can be influenced by the quality of the muscles possessed by players, e.g., the leg muscles. The power of different leg muscles produces different results in the accuracy of long pass in football. However, this has not been studied by researchers. Thus, future researchers can consider the physical conditions and anthropometry of the players when testing the long pass football instrument.

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