



FUTSAL TECHNOLOGY: VALIDITY AND REALIBILITY PASSING INSTRUMENT TEST

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Abstract. This study aims to create an automatic instrument passing tool to obtain more valid passing data and to overcome the limited availability of instrument instruments in sports, so they still use manual test instruments. This research uses the research and development method from Borg and Gall in 10 stages. This research was conducted with a total sample of 35 people, including two trials of use and products. The results of the study resulted in a tool with name four bright boxes with the results of the passing test instruments carried out at U 17-19 at the Futsal Club U.N.J. with a sample of 15 people obtained a validity value of 0.517 large categories and a reliability value of 0.682 in the moderate category. The test results for the second tool of the Daksina Futsal Academy club with a total sample of 20 people showed a validity value of 0.649 in large categories and a reliability value of 0.787 in the moderate category. These data indicate that the instrument test tool is declared valid and reliable. This tool is still a prototype but can measure passing skills at 17 years and over.

Keywords: Instruments, Passing, Futsal Technology

1. INTRODUCTION

Futsal in Indonesia is growing very fast because it is easy to play by anyone, anywhere. Along with its development, sport science and technology is needed so that it can be used as a medium as well as a means that can facilitate skill measurement or technical training media. One technology that can be used is the manufacture of automatic tools for basic futsal technical instruments. A tool that can automatically determine the accuracy, effectiveness, and speed of an athlete when performing basic techniques. This instrument can be used as a measure of the success of an athlete and a coach when the athlete is passing accurately. The availability of this automatic tool is very

important so that researchers see a huge opportunity to make tools in accordance with current developments in science and technology.

Futsal is a mini football game that is played indoors because the size of the field is smaller than a football field and has game rules, several players, and different ways of playing with a football [1]. A futsal game is a game that has one goal, namely scoring goals and trying to prevent opponents from scoring in a way that is by the rules of the game[2]. The goal in this futsal game is to score as many numbers as possible (goals) by entering the ball into the opponent's goal and preventing the opponent from putting the ball into our goal. The coach must first build the player's physical condition and properly practice basic futsal techniques such as short passing, lob pass, controlling, dribbling, and shooting [3].

Futsal is the same as football. Kicking is a technique with the ball that is most dominant in futsal. Kicking technique is also the basis for playing futsal. The types of passing according to the section of the subject can be classified, namely, "Sole of the shoes, forefoot, outside of the foot, inside of the foot, lob or chip pass [4]. A Good futsal team is a team where all the players master good kicking techniques, quickly, carefully, and on target. Good players need good mastery of basic techniques (passing).

In futsal, passing is thought to be extremely important for the game's continuity, as it initiates the attack, sets the pace, and starts the game. In futsal games, timing, weight, and precision are crucial for delivering successful and high-quality passing [5]. Almost throughout the futsal game, players use passing to be able to dismantle the opponent's defense. Mastery of motion is required to master passing skills so that the desired target is achieved. Passing success is determined by the quality of hard, accurate, and level passes. Please note that the impact of the foot can affect the accuracy of passing. Passing in futsal based on distance is divided into 3 types [2];

1. Short pass, between 0 meters to 4 meters or 10 to 12 feet.
2. Medium pass, between 4 meters to 10 meters or 10 to 30 feet.
3. Long pass, above 10 meters, or more than 30 feet [2].

Tests are tools used to measure some performance and to collect data [6]. An instrument is a measuring device used to objectively gather quantitative and qualitative data regarding the variance in the properties of study variables. A tool that satisfies academic criteria and may be used to collect information about a variable or measure a measuring

item is called an instrument [7]. When judging a study's and assessment's quality, instruments are crucial. An instrument's job is to convert facts into information. Data is used to support a hypothesis and describes the variables being studied. The quality of the data-gathering tool determines whether or not the data is accurate [7]. The criteria for the coefficient of validity and reliability that can be used to select test instruments according to are as shown in the following table 1. [8]

Table 1. Clasification Validity and Realibility [8]

Classification	Excellent	High	Moderate	Low
Validity	0.80-1.00	0.70-0.79	0.50-0.69	0.00-0.49
Realibility	0.90-1.00	0.80-0.89	0.60-0.79	0.00-0.59

Instrument development is a development activity towards theoretical conceptual that are arranged by the construct to produce a standard instrument that refers to the techniques that have been determined by experts in stages and proportionally. The development of this instrument requires a strong theory to underlie a construct for the phenomenon to be measure, for the birth of a good and relevant instrument. This media was created by researchers to make it easier for someone, especially coach can see the results of athletes 'passing in terms of accuracy, speed, and also the effectiveness of an athlete in passing, that can also be a medium for evaluating athletes' passing techniques, and can also be used as an authentic proof of the athlete's passing ability cannot be manipulated or rigged.

2. METHOD

Research and development is conducted using the research technique. Beginning with (1) research & information gathering, (2) planning, (3) product development, (4) preliminary field testin, (5) product revision, (6) main field testing, (7) operational product revision, (8) operational field testing, (9) final product revision, and dissemination and implementation, the 10 stages of borg and gall have been completed[9]. The sample of the trial was 35 people, namely 15 samples from the UNJ Futsal Club and Daksina Academy Futsal with a total sample of 20 people. The validity test in this study used the bivariate correlation statistical analysis of Pearson Product Moment or PPM, and the reliability test in this study used the spearmen brown formula. Calculations were performed using Microsoft Excel 2010.

3. RESULTS AND DISCUSSION

3.1 Result

1. Research & Information Collecting

The limited and small number of sports science tools in sports makes researchers want to further develop and create tools that can make it easier for coaches to measure player skills, especially one of the basic futsal techniques, namely passing. The data related to the instrument that will be developed in the process of making this tool aims to facilitate the creation and measurement of skills according to the passing distance that is often done in futsal games.

2. Planning

The plan for making this instrument passing tool is made automatically with the concept of using lights on the top of the target. The light will be connected to a reflection sensor that will move automatically if the ball hits the target.

3. Develop Preliminary of Product

It takes 6 months for the product design to be created until the initial product or tool is formed. The tool consists of a 220 v / ac power supply, a score sensor and a timer display, the Zelio Smart relay program and the Arduino program,

The specifications of the instrument fitting that will be made include;

- a. The power supply or input power of electrical equipment that can supply electrical energy for other electrical or electronic devices is the 220V A.C. Power Supply (image 1. a), also known as the Power Supply in Indonesia. This power supply needs an electrical energy source and transforms it into the electrical energy that other electronic devices demand. As a result, the Electric Power Converter is another name for the Power Supply. A.C. to D.C. Power Source is a D.C. Power Supply that converts the A.C. power supply voltage into the D.C. voltage required by electronic equipment. A.C. to D.C. Power Supply generally has a transformer that lowers the voltage, a diode as a rectifier, and a capacitor as a filter.
- b. Score and Timmer (picture 1.b) display Score and timmer display are tools used to calculate the score and time digitally and automatically which is usually used in a match.
- c. Smart relay Zelio Program (picture 1. c), P.L.C. (Programmable Logic Control) Zelio SR2 B201 BD is a smart relay with several

inputs and outputs. An intelligent relay is a tool that can be programmed using a specific language commonly used in the automation process. Smart relays are small in size and relatively light. Zelio logic smart relays are designed to automate systems commonly used in industrial and commercial applications. For industrial purposes, it is usually used for small finishing applications, packaging, and production. It is also used for small- to large-scale machines and is sometimes used in the home industry. For the commercial or building sector, it is usually used for rolling equipment, entrances, electrical installations, compressors, and others that use automation systems.

- d. **Arduino Program** Arduino is an open-source single-board microcontroller derived from the Wiring platform designed to facilitate the use of electronics in various fields. The hardware has an AtmelAVR processor, and the software has its programming language. Arduino is also an open hardware list aimed at anyone who wants to prototype interactive electronic equipment based on flexible and easy-to-use hardware and software. The microcontroller is programmed using the Arduino programming language, which has a similar Syntax to the C programming language. Because of its open nature, anyone can download and build the Arduino hardware scheme. Arduino uses the ATmega microcontroller family released by Atmel as a base. However, some individuals/companies make Arduino clones using other microcontrollers and remain compatible with Arduino at the hardware level. For flexibility, programs are entered via the bootloader, although there is an option to bypass the bootloader and use the downloader to program the microcontroller directly via the I.S.P. port.



(a)

(b)

(c)

Picture 1. a. Power supply, b. Digital timer, and c. Zelio Logic Smart Relay Design.

4. Preliminary Field Testing

Initial trials before field tests are carried out involving experts to assess the function, attractiveness, and construction of this automatic tool design. 3 (three) experts in the field of sports, namely futsal experts, sports construction and test experts, and sports biomechanics experts.

Table 2. Expert Judgment

No	Product	Tools	Expert 1		Expert 2		Expert 3		Expert Advice
			Yes	No	Yes	No	Yes	No	
1	Function	- On/Off button	v		v		v		On the timer device, it would be better if the time set on the display can be changed as needed. The passing kick taken by the participant should follow the metronome tempo.
		- Start Button	v		v		v		
		- Reset Button	v		v		v		
		- Sensor Target	v		v		v		
		- Timer	v			v	v		
		- Score	v		v		v		
2	Design	- Interesting			v				
		- Good					v		
		- Practical	v		v				
3	Construction	- Difficult							
		- Medium	v		v				
		- Easy					v		

5. Main Product Revision

Product revision is the application and explanation of the input given by experts or experts. The results of input from experts, among others

- a. Sensors are made more sensitive
- b. The timer sometimes doesn't work very well
- c. The timer can be adjusted as needed for practice or testing

6. Main Field Testing

At the time of field trials, using a sample of 17-19 years old at the Jakarta State University futsal club as many as 15 samples. The problem that is faced is that the sensor located in the box is often interrupted so that the time or the tool does not function properly. The solution given is to lock or hold the reflecting device manually so that the vibration generated by the testee during passing does not have a significant impact on the sensor. The test results of this use resulted in a validity value of 0.517 in the medium category and a reliability value of 0.682 in the moderate category.

7. Operational Product Revision

The test results for the first use of getting input as revision material are the fast removal of the sensor on the back so that a stronger adhesive or glue is needed so that it doesn't come off often. The second input is regarding the digital timer, which must be placed separately from the 3 target boxes to prevent damage to the automatic light and digital timer.

8. Operational Field Testing

The second field product trial was conducted at the Daksina Academi school as many as 20 samples. The results of the validity and reliability of this product trial are the validity values obtained are 0.649 in the medium category, and the reliability value is 0.787 in the moderate category.

9. Final Product Revision

By the revised design, the product was repaired to get maximum results in the form of gluing on the back of the sensor and replacing the reflective board so that the reflection that occurs is better or stronger, making it easier for test participants to pass in the next direction in the direction specified. The resulting product is called 4 smart boxes.

Procedures for Using Tools

- a. Arrange the 3 wickets next to each other with a distance of 45 cm each.
- b. Install the first box on the first pole, set the timer board and score on the 2nd pole, and glue the lights to the 3 posts.
- c. Connect the 3 existing cables to the 3 boxes, the cables that have been marked with black duct tape must be connected to the holes that have been marked with black, and the cables that have no mark connect to the holes that have no mark.
- d. Connect the cable in the timer box to electricity.
- e. Turn on the appliance by raising the switch.

- f. Press the yellow button to activate the tool.
- g. Do a pass towards the lights that are on, the score will increase and the lights will automatically turn off and move randomly to another box for 60 seconds / 1 minute, with a distance of 7 meters.
- h. When the time is up, restart by pressing the red button below the yellow button to restart the score and time.



Picture 2. Final Product

10. Product Dissemination and Implementation

Product implementation has not been carried out because further testing with a larger sample scale is needed to obtain a high level of validity. Mass production has also not been carried out because of the relatively high cost of making this tool cannot be mass-produced. The dissemination of product results has been carried out at the Jakarta State University.

3.2 Discussion

This study aims to create an automatic test instrument to measure the basic technical skills of passing and to make it easier for coaches to determine the skills of players in passing. A coach is a professional whose job is to help athletes or teams to achieve high performance [10]. To achieve high achievement, a measuring instrument is needed that can increase the motivation of athletes to practice developing skills. According to Morrow, sports skills tests are classified based on accuracy, repetition, body movement, distance, time, and power [11]. This is important because these 6 aspects can determine the quality of the measurement results. The purpose of the

skill test is to obtain accurate accuracy, stable performance, efficient time and proper use of the power required [12].

Some of the principles of test development include: (1) the test must be able to clearly measure the results of the exercise, (2) the test items are a representative sample of the population of the exercise material, (3) the test items are varied so that they really fit the purpose, (3) 4) the test is designed according to its use to obtain the desired results, (5) the test has reliable reliability, (6) can be used as a tool to improve the way of practicing [13]. This instrument requires players to quickly move targets according to the lights that are on. Players must be right on target so that the resulting reflection makes it easier to make the next pass.

The development of an instrument requires the following 15 work steps to be completed: selecting a scaling technique, (1) creating an operational definition, (2) creating a conceptual definition, (3) reviewing the item justification about a predetermined scaling technique, (4) selecting a response format or sample size, (6) creating response instructions, (7) creating draft instruments, (8) creating final instruments, (9) gathering trial data in advance, and (10) evaluating test results through reliability, item analysis, and factor analysis approaches, Instruments were revised, final trials were carried out, instruments were created, further validity and reliability analyses were carried out, and test manuals were prepared [14]. This development uses 10 stages of borg and gall by producing a prototype. The difference between the two stages of the theory lies at the end of the research stage. The stages according to Gamble produce manual tests, while Borg and Gall must publish to the public regarding the results of the products that have been made.

The results of the trial using 4 smart boxes resulted in a degree of validity and reliability in the medium category. This process must be the main study in the instrument-making process to ensure instrument reliability and prepare valid instruments from before the next stage where the Validation process is a long process [15]. The distance and the resulting reflection from the 4 smart boxes can also determine the quality of the passing. Human error may contribute to a test's poor reliability if the sample fails to comprehend and become proficient in the lowball passing skill test's execution methodologies. To determine a test's reliability, the sample must complete the first and second days' tests under the same conditions but at different times [16].

At the performance stage, skills are executed in a match or activity. When executing skills, players should focus on the objectives of the activity and not the process. When a skill is performed, the conscious mind is replaced by automation [17]. When using the automatic tool 4 smart boxes, players must focus on the target they want to achieve, namely improving their performance and basic techniques. The target 4 smart boxes which are slightly smaller with a long enough passing distance make this test a little difficult when it is used at a younger age or for early age futsal players, so these 4 smart boxes still need further research so that all categories age can use as a tool for training or measuring skills.

A less skilled player will trade one aspect of the move to satisfy another. Therefore, it appears that non-elite players sacrifice movement speed and technique on the ball to maintain accurate shots on goal, so it can be said that they exhibit a lower level of skill [18]. Elite players perform better than their non-elite counterparts, thus supporting the validity of the test. Moreover, although there was good reliability among all players, this was evident among elite players [19]. The players used in this sample are random, only seeing their age without their abilities. The researcher hopes that these 4 smart boxes can be used by all ages, all athletes (elite or amateur), or all genders (male or female).

4. CONCLUSION

The results of the study resulted in a product in the form of a futsal sport passing instrument called 4 smart boxes, which were used to measure and train the accuracy of passing the degree of validity in the last test of 0.649 in the moderate category and the reliability value of 0.787 in the moderate category. The researcher hopes that this instrument can be used for all age categories, and further research will be carried out to obtain more data to be used as a futsal passing norm.

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