Validity and reliability of futsal player skill measurement tests

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Abstract

This study tested the validity and reliability of the Futsal Skill Test (FST) for student actors. Twenty-four futsal players from the university's futsal team comprised men's (n=12) and women's (n=12) teams. The Futsal Skill Test (FST) is carried out on the futsal field and checks skills such as passing, controlling, dribbling, and shooting the ball as quickly as possible by making the minimum possible mistakes. The validity of the content is assessed using experienced futsal trainers and instructors. Data analysis in validity measurements was determined using known group differences between male and female university futsal players, then reliability was determined using Pearson's correlation coefficient (r), intraclass correlation coefficient (ICC), and variation coefficient (CV) between experimental repeats. The results showed that the variance equivalence test on Performance Time (Time Taken and Penalty Time) showed that F had been 0.048 (0.013 and 0.375) with a significance of 0.829 (0.910 and 0.547). Performance Time for men is different from that of female university players. T-test results for the quality of the means for Performance Time (Time Required and Penalty Time) t=-5.506 p=0.000 (t=-5.5277 p=0.000 and t=-2.060 p=0.051). The CV Time Taken, Penalty Time and Performance Time scores for male students were 6.97%, 28.46%, and 6.88%, for female students, were 6.81%, 19.63%, and 6.38%, both for male and female students were 6.89%, 24.04%, and 6.63%. The FST assessment is an apt score to describe the performance time, that the player with the faster time achieved from the futsal skill Test is more skilled. The Performance Time score consists of Time Taken and Penalty Time.

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INTRODUCTION

The game of futsal displays very fast movements on a field that is limited in size. Spectators generally watch futsal matches on the

movement of the ball. Futsal has characteristics that are different from other sports, especially football. This can be seen from some of the characteristics of rapid and spontaneous position changes with high intensity in each match (Beato et al., 2017), besides that this futsal sport prioritizes every technical ability to support success in playing Futsal (Reis et al., 2019). The transition from our ball to the opponent's ball means that the opponent has taken over the possession of the ball (transition attack to defense). The opponent's ball refers to the ball in the opponent's possession (defense). Last but not least, transitioning from the opponent's ball to our ball means that the possession of the ball has been taken over by us (transition defense to attack). These four moments depart from the ball possession by the players on the court.

Ball possession becomes a priority for the competing teams. Every player should have a concept of a futsal game with the philosophy of 100% ball possession (Ali, 2011). According to Maughan (2017), in soccer, a team usually starts with ball possession to score a goal (Goral, 2015). The three most fundamental techniques in a game are control of the ball, driving the ball, and shooting (Polidoro et al., 2013). Attacking in futsal includes three principles: marking the ball's possession, moving toward the opponent's goal, and trying to score a goal (Soares Leite, 2012). The efforts of scoring goals that the Portuguese futsal team displayed started from the organization of ball possession (56.00%), counterattack (17.36%), and stopped ball (25.75%). The indicators of a sequence of attacking include the duration of ball possession, the involved players, the number of ball touches by the players, the number of passing, and the number of shooting (Veiga et al., 2012). Futsal skills depart from ball possession to scoring a goal, which might be performed by all players in a team (ball possession) or some players in a team (counterattack), which might be performed through stopped-ball situations when an opponent blocks a player.

The basic skills possessed by every futsal player have a very important role in achieving game goals and achievements (Khurrohman et

al., 2021). Playing skills can be evaluated based on the execution of skills and decision-making activities (Guitiérrez & García-López, 2012). Techniques in the sport of futsal are the initial foundation for the most basic or the lowest-level training menu. Technical training aims to develop basic skills for futsal players. This training starts early, an effort to produce quality and professional players in the future (Hutomo et al., 2019). Every technical material taught to futsal players must be followed by a continuous training program with the aim that the technique can be mastered by each player in order to have good skills. The skill in question is the ability to use game techniques that can be used in any conditions or conditions when competing on the field (Travassos et al., 2018). Playing skills are a combination of playing technique and playing tactic execution. Players will have futsal playing skills if they can execute their playing techniques based on the playing tactics that have been demanded by the available yet limited time and space.

Therefore, in the futsal game, the dominant techniques used by players during the game (Zhukova et al., 2018), including passing, dribbling, ball control, and kicking, so that players can master and practice good skills in the match, the supporting factor is the tactics of the game in the match (Morgan et al., 2013). However, these techniques should not be executed separately; instead, these skills should be executed in a sequence to depict ball possession within a futsal game. Ball possession always involves receiving and passing, dribbling, and shooting to the opponent's goal at the end of this sequence. Players will be considered skillful in playing futsal if they are able to execute receiving, passing, dribbling, and shooting within the limited time and space due to the presence of the opponents. Futsal playing skills, therefore, are a matter of selecting and displaying the variation of passing, receiving, and dribbling in an effort to possess the ball in order to approach the opponents' balls so that the players can shoot the ball in order to score a goal.

In a futsal competition in a professional competition, the dominant basic techniques include the frequency of using passing techniques 2181

times, control 1853 times, dribbling 422 times, shooting 238 times, feinting 92 times, heading 25 times, shielding 56 times, turning 17 times, and chipping 37 times. While the percentage of using passing techniques is 44%, control is 37%, dribbling is 9%, shooting is 5%, feinting is 2%, heading is 1%, shielding is 1%, turning is 0%, and chipping is 1% (Wijaya Kusuma, 2021). In futsal games, basic techniques need to be developed by players with the aim of mastering the game.

In the process of coaching players in futsal, mastery of technical skills becomes a key factor in observing player skills. The player's skills can be observed using skill testing (Oppici et al., 2018). Skills that can measure through test administration should be developed in sport skill measurement. Sports skills measurement is one of the fundamental aspects of human performance measurement through sport skill tests (Hood et al., 2012). Differences in characteristics between soccer and futsal must be differences between soccer and futsal skill tests. We need to use soccer skill tests to measure futsal skills. The Futsal Skill Test (FST) might be developed as a tool for estimating the level of futsal skills.

The FST is a valid method of assessing futsal skill performance using content validity methods, and the test score was a total time that had been added Time Taken and Penalty Time as Performance Time (Marhaendro, 2014), needed further research using other methods of estimation validity, especially with a quantitative approach to establish the value validity. The player's ability can be measured by conducting a test that can represent the player's performance on the field, This test is carried out so that the player can know his basic abilities (Koltai et al., 2016). Ability tests assess an athlete's ability if the test is valid and can be done easily, representing ability (Etxaleku et al., 2020; McIntosh et al., 2019). The test's validity and reliability become the criteria that should be met so that the sports skills test can be categorized as "Good" and can be administered. This study aims to prove the validity and reliability of futsal skill tests so that the test can be categorized as a good test.

METHOD

Participants

The participants of this study were futsal players who were futsal players at the level of university players in this study after receiving approval from the university's ethics committee. Selection of research subjects using purposive sampling techniques by applying several inclusion and exclusion criteria in the selection of subjects. The inclusion criteria in this study were to gather these players as part of the men's futsal team and the university women's futsal team. The exclusion criterion is that the subject must be registered in the men's and women's futsal teams and prepared to participate in the National Sports University Match (POMNAS) so that the subjects recruited in this research consisted of 12 male and 12 female student players. The players were informed of the potential risks of the research and gave written consent.

Futsal Skill Test Procedure

Figure 1 illustrates the FST site. The test area took an 8 x 12 meter-wide court. In this court, the researcher put two deflection boards which size was 1 meter-width and 40 cm-height as the passing targets, two goals which size was 3 meter-width and 2 meter-height as the shooting targets, three passing areas which size were 1 x 1 meter, and two shooting areas size was 1 x 1 meter, six ball placement points which size was 1 meter x 60 cm, two dribbling reversal points which size was 1 meter x 20 cm, and 13 cones with 20 cm diameter. Before being placed, the deflection boards were equipped with five colors as the passing targets and the sequence of the color was white, red, yellow, red, and white; the size of each color was 20 cm-width. The goals then were equipped with shooting obstacle targets whose size was 1-meter width and 2-meter height; these obstacles were hung in the middle of each goal.

The subjects stood in front of the yellow passing area with the ball that had been put inside the area. In the first part of FST, the subjects passed all of the six balls onto the target board, and the first tester started taking the time using a stopwatch, and the time was counted from the first

time the subjects hit the ball. In the second part of FST, the subjects dribbled the balls straight to the reversal box and returned to the yellow passing area. In the third part of FST, the subjects performed a sequence of passing about six times involving two targets in turn. In the fourth part of the futsal skill test, the subjects dribbled the ball in a zigzag way, following the obstacles to the reversal box, and returned to the green passing area. In the fifth part of FST, the subjects passed six times from two green passing areas to one target in turn. In the sixth part of FST, the subjects performed shooting three times, two times with the dominant leg and one time with the other leg, from two blue shooting areas, and the test would be finished. However, if the players did not score a goal after three shooting times, they should perform other shooting activities using the available seven balls until they could score three goals. The test would have been finished if the seven balls had been used and the players still could not score any goal. The first ball was the ball that would be used for performing the sequence of futsal skills, while the second to seventh balls were put on the grey area. The tester stopped the time when the ball entered the goal for the third time, or the last ball passed the goal line for the last time by turning off the stopwatch.

Figure 1. Futsal skill test site

The first tester started turning on the stopwatch when the subjects hit the first ball and turned off the stopwatch when the subjects had finished performing shooting. The second tester noted the subjects' errors during the test administration and converted the note into the Penalty Time (Table 1). In this study, researcher gathered the data using a Handycam (not using the second tester) and transferred data to observation sheet.

Table 1. Penalty time in futsal skill test

Type of Errors	Penalty Time
Passing and receiving	
Ball hits the red target	.5 sec.
Ball hits the white target.	1.0 sec.
Receiving the ball outside the ball	1.0 sec.
Passing the ball outside the box	1.0 sec.
Dribbling	
Touching the ball less than 5 times	1.0 sec.
The ball was touching the cone.	1.0 sec.
Shoes touching the cone	1.0 sec.
The ball is not in the reversal box.	1.0 sec.
Shooting	
Shooting outside the box for 5 times	1.0 sec.
The ball hit the goal obstacle.	0.5 sec.
Ball hits the bar	1.0 sec.
Ball outside the goal target	2.0 sec.
General	
Touching the ball with hands	3.0 sec.

The score of Performance Time was in the form of the Time Taken and the Penalty Time in performing the sequence of the Futsal Skill Test. The errors were defined as a penalty by adding the time according to the errors that had been committed. As a result, the test score was the total time that had been attained from the summation of Time Taken and Penalty Time. The test score would be the best score from the two trials. The second trial was conducted after all players finished performing the first trial.

Statistic Analysis

The validity was determined using the known group difference method (Maughan, 2017) by comparing the male and the female players. The statistical test for the two groups used an independent sample t-test with significance at $p > 0.05$. The reliability was determined by using Pearson's correlation coefficient (r) (Ali, 2011), intraclass correlation coefficient (ICC) (Stevens & Dascombe, 2015), and coefficient of variation (CV) (Russell et al., 2011). The meaningfulness of r and ICC reliability was measured by considering the significance value ($p < 0.05$). The value of CV that had been lower than 20.00% showed the indicators of reliability acceptance (Kutlu et al., 2014).

RESULT

In outlining the result, one should only describe research results of data acquired in the research or field observation and data analysis interpretation. This section is outlined without providing discussion and should be written in logical sentences. The result is applicable in the form of a table, text, or figure.

Table 2. Mean (±sd) of BAPOMI players' futsal skill

Var.	Trial (Second)					
	1		2		Best	
Male University Students (n = 12)						
Time Taken	57.89	(10.43)	56.59	(11.08)	54.93	(10.34)
Penalty Time	12.25	(5.33)	11.46	(3.99)	10.67	(3.14)
Performance Time	70.14	(14.81)	68.05	(11.27)	65.60	(11.04)
Female University Students (n = 12)						
Time Taken	83.63	(13.59)	78.34	(11.81)	77.30	(10.43)
Penalty Time	13.42	(5.16)	15.29	(2.14)	13.50	(3.59)
Performance Time	97.05	(17.34)	93.64	(11.78)	90.80	(11.38)
Total University Students (n = 24)						
Time Taken	70.76	(17.70)	67.47	(15.77)	66.12	(15.29)
Penalty Time	12.83	(5.17)	13.38	(3.69)	12.08	(3.00)
Performance Time	83.59	(20.92)	80.84	(17.26)	78.20	(16.91)

Table 2 shows the mean and the standard deviation of male and female players' Performance Time (Time Taken and Penalty Time) from the first trial, second trial, and best performance. The first and the second trials for male players have improved in the time, penalty, and performance time, but for female and both players on time taken and performance time. Figure 2 shows the differences in the mean of male and female players' futsal skill (Time Taken and Penalty Time). The male university students' futsal skill was better than the female university students' futsal skill.

Table 3. Means equality of BAPOMI futsal players

Variable	F (sig.)		t (sig.)	
Time Taken	0.013	(0.910)	-5.277	(0.000)
Penalty Time	0.375	(0.547)	-2.060	(0.051)
Performance Time	0.048	(0.829)	-5.506	(0.000)

F= Levene's Test; t=independent sample t-test; sig=significant

Table 3 showed the test for equality of variance on the Performance Time (the Time Taken and the Penalty Time) displayed that the F had been 0,048 (0,013 and 0,375) with significance 0,829 (0,910 and 0,547) so that equal variances were assumed. The mean compare test was intended to show that male performance time differed from female university players. The results of the t-test for quality of means for Performance Time (Time Taken and Penalty Time) t=-5.506 p=0.000 (t=-5.5277 p=0.000 and t=-2.060 p=0.051) show a significant difference for Performance Time and Time Taken but not significant for Penalty Time. This study proves that Performance Time and Time Taken for male university students had been better than for female students but not for Penalty Time. So that FST had the evidence of construct validity on Performance Time and Time Taken

through the known group difference method implemented between the male and the female university futsal players.
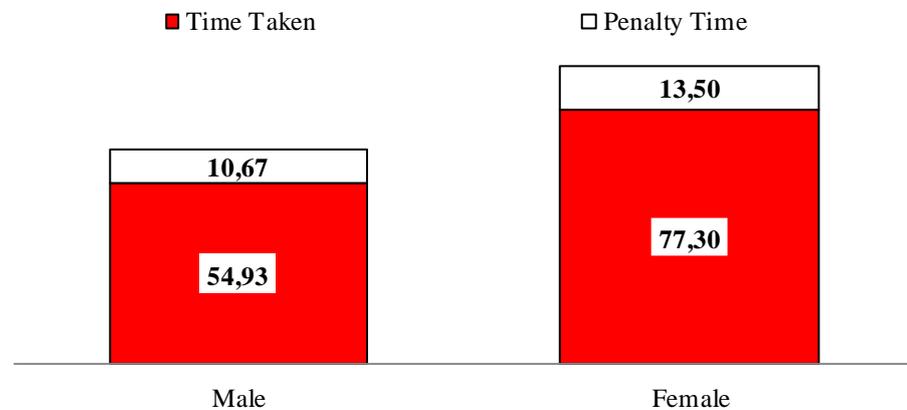

Figure 2. Differences in the BAPOMI futsal players

The r values (sig.) of Time Taken, Penalty Time, and Performance Time for the male university players were 0.789 (0.002), 0.040 (0.902), and 0.794 (0.002), for the female university players were 0.753 (0.005), 0.692 (0.013), and 0.740 (0.006), for both the male and the female university players ware 0.887 (0.000), 0.274 (0.013), and 0.873 (0.000). The ICC values (sig.) of Time Taken, Penalty Time, and Performance Time for the male university players were 0.887 (0.001), 0.079 (0.450), and 0.871 (0.001), for the female university players were 0.825 (0.002), 0.627 (0.045), and 0.815 (0.005). For both the male and the female university players were 0.930 (0.000), 0.420 (0.105), and 0.921 (0.000). The r and ICC significance of Time Taken and Performance Time for males, females, and both had been less than 0.05 (< 0.05). The r and ICC significant on Penalty Time had been accepted only for female university players (0.013 and 0.045) and not significant for males, and both (male and female) had been more than 0.05 (0.450 and 0.105). The CV values of Time Taken, Penalty Time, and Performance Time for the male university students were 6.97%, 28.46%, and 6.88%, for the female university students, were 6.81%, 19.63%, and 6.38%, for both the male and the female university students, were 6,89%, 24.04%, and 6.63%. The CV values of Time Taken and Performance Time were lower than 20.00%

(< 20.00%). The CV value for the Penalty Time had been accepted only for the female university players (19.63%) and not accepted for male and both (male and female) university players had more than 20.00% (28.46% and 24.04%). The acceptance of the reliability for university futsal players (male. female, and both) of Time Taken and Performance Time might be confirmed through r, ICC, and CV.

Table 4. The reliability of BAPOMI players

Varibel	r (sig.)	ICC (sig.)	CV
Male (n = 12)			
Time Taken	0.789 (0.002)	0,887 (0.001)	6.97 %
Penalty Time	0.040 (0.902)	0,079 (0.450)	28.46 %
Performance Time	0.794 (0.002)	0,871 (0.001)	6.88 %
Female (n = 12)			
Time Taken	0.753 (0.005)	0,824 (0.002)	6.81 %
Penalty Time	0.692 (0.013)	0,627 (0.045)	19.63 %
Performance Time	0.740 (0.006)	0,815 (0.005)	6.38 %
Total (n = 24)			
Time Taken	0.887 (0.000)	0,930 (0.000)	6,89 %
Penalty Time	0.274 (0.195)	0,420 (0.105)	24,04 %
Performance Time	0.873 (0.000)	0,921 (0.000)	6,63 %

r=coefficient correlation of Pearson; ICC= intraclass correlation coefficient; CV=coefficient of variation; sig.+significant.

Reliability refers to the consistency between the assessment results and the measurement results. The consistency of measurement results has been attained by administering the Futsal Skill Test. On the other hand, the reliability of the Futsal Skill test was the degree of consistency of the measurement results. Then, the reliability for the male and the female university students has been attained for the time taken and performance time from r, ICC, and CV value (< 20.00%) but not from the penalty time. Therefore, the presence of Penalty Time will be inconsistent if it stands alone, but it will be consistent if Penalty Time is included in Time Taken become Performance Time. The evidence of reliability does not only apply to the penalty time but also to the time taken and the performance time.

DISCUSSION

Research results showed that the variance equivalence test on Performance Time (Time Taken and Penalty Time) showed that F had been 0.048 (0.013 and 0.375) with a significance of 0.829 (0.910 and 0.547). Performance Time for men is different from that of female universty players. T-test results for the quality of the means for Performance Time (Time Required and Penalty Time) t=-5.506 p=0.000

(t=-5.5277 p=0.000 and t=-2.060 p=0.051). The CV Time Taken, Penalty Time and Performance Time scores for male students were 6.97%, 28.46%, and 6.88%, for female students, were 6.81%, 19.63%, and 6.38%, both for male and female students were 6.89%, 24.04%, and 6.63%. The Futsal Skill Test has also been a tool that might be administered for measuring the performance time of university futsal players, that score of FST is in time with two decimal seconds. This statement is in accordance with Sadiq's (2016) opinion that futsal is a very dynamic and fast game. Time is the appropriate score for describing the performance time, the player with a faster time attained from the Futsal Skill Test was more skillful.

Performance Time score consists of two parts Time Taken and Penalty Time. Time Taken is when a player needs to perform a test sequence as a speed variable, while Penalty Time is when a player makes an error during the test as an accuracy variable. The performance time score is the combination of speed and accuracy in performing the test sequence. Futsal is a fast, dynamic game played on a small pitch (Moch Fath Khurrohman et al., 2021). On a relatively small pitch, futsal players are demanded to play fast; as a result, the players make errors relatively. Therefore, speed and accuracy become important to display in the performance time. The performance time in speed and accuracy displays futsal techniques in a relatively small (narrow) space.

This test noted two important variables: speed and accuracy in the futsal skill. The two variables have contradictory aspects; therefore, futsal players should be able to perform futsal techniques quickly and accurately. The choice will be either performing the techniques quickly but resulting in many errors or accurately but slowly. In performance, skills refer to the execution of movement in an activity or a game. When the players display the skills, they should be focused on the objectives instead of the process of displaying the related movement. When the skills have been performed, the players' mind is replaced by automation. The players with better

performance time can display the futsal techniques more automatically to adapt to the situation faster and more accurately.

Figure 2 shows that male university students have been more skillful than female university students. A sport skill test (sports) with good construct validity should easily distinguish between players of different levels (Ali, 2011). The test scores from both groups from different skill levels, namely the male and the female university student players, were applied to provide evidence of construct validity (differential) and the criteria validity. Thereby, the futsal skill test was a valid tool for measuring Performance Time. The acceptance of validity for male and female university student players of Time Taken and Performance Time was not applied to Penalty Time. The acceptance of validity was only accepted on the Penalty Time that had been given to the female university student players. Thereby, the score of Performance Time was in line with the element of Time Taken and total time. However, the Penalty Time did not stand alone on the higher futsal skill level (male in comparison to female); as a result, a player should not be viewed from the errors that he or she had committed but also from the speed in displaying the Performance Time. Instead, speed should be the priority for consideration. This test could be administered as an estimation tool for measuring the Performance Time level so that it serves as an instrument within this study. However, there should be the further study that makes use of other validity estimation methods so that the test validity might be enriched.

The Futsal Skill Test has already had evidence as a reliable tool for measuring performance time. This test might be administered as an estimation tool for the performance time level; as a result, this test might be an instrument in a study. The test reliability value was attained from the test-retest method through r, ICC, and CV. Reliability analysis used statistics through Pearson's correlation coefficient (r), intraclass correlation coefficient (ICC), coefficient of variation (CV), and limits of agreement (LOA) (Milanović et al., 2011). However, further studies should use other

reliability estimation methods and other subjects so that the evidence of the test reliability might be enriched.

The movements in the Futsal Skill Test are the items put into a skill test. If sport skill is being measured, the item should be similar to the game situation (Lopes et al., 2019). The movements of passing and receiving, dribbling, and shooting are the ones that have been dominantly performed in a futsal game. All players (except the goalkeeper) always perform these movements. However, two techniques have yet to be included in these movements: heading and goalkeeping. The consideration is that the dominant movements will always be displayed in futsal games. The more dominant the skills are, the more items that a test will have. The movements of passing and receiving have three items, those of dribbling have two items, and those of shooting has one item. The reason is that the movements of passing and receiving are the ones that have been dominant in comparison to the other movements in a futsal game.

The Futsal Skill Test has already had evidence as a good and reliable measurement tool for measuring performance time. This test could be administered as a tool for estimating the performance time so that this test can serve as an instrument in a study. The test reliability value has been attained using the test-retest method through r, ICC, and CV. From the results of this study, the least of research subjects recruited in this study influenced the results. However, further studies should use other reliability estimation methods so that the evidence on the reliability of this test might be enriched.

CONCLUSION

The reliability of the Futsal Skill test is the degree of consistency of measurement results. Then, reliability for male and female students has been achieved for the required time and performance time of r, ICC, and CV grades (< 20.00%) but not penalty time. Therefore, the presence of Penalty Time will be inconsistent if it stands alone but consistent if Penalty Time is included in Time Taken into Performance Time. The Futsal Skill Test can be administered to measure or estimate futsal performance. The

results of this research can be a development of ability in futsal athletes, especially in the scope of universities. So that by conducting tests in ability tests in futsal sports, you can find out the ability of athletes to find out the ability of athletes.

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