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Effectiveness of Volleyball Skills Instrument

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ABSTRACT

This study aimed to determine the effectiveness of volleyball skills instrument. The study was conducted on a team from Serambi Mekkah University in Acheh. A total 40 male students aged between 18 -25 years old were involved in this study and has been categorized into two group of expert (n=20) and novice (n=20) athlete. Statistical analysis independent sample T-test was used for data analysis to compared movement and outcome score between expert and novice athlete on serve, dig, set, block, and spike skill. Result of the study found that, expert athlete were significantly ($p<0.05$) perform higher score than novice athlete in the validity of movement construct for serve (t = 14.091; p = .000), dig (t = 5.044; p = .000), set (t = 12.632; p= .000), block (t = 13.816; p = .000), and spike (t = 16.716; p= .000). The same result also showed in the validity of outcome construct for serve (t = 4.181; p = .000), dig (t = 7.285; p = .000), set (t = 8.219; p= .000), block (t = 10.922; p= .000), and spike (t = 7.922; p= .000). Furthermore, the validity value of instrument's battery for volleyball skills movement score was (t = 16.490; p = .000) and the validity value of instrument's battery for volleyball skills outcome score was (t = 10.792; p= .000). It is concluded that this volleyball skills instrument is effective as a good measuring instruments for the skills of volleyball players between ages of 18 until 25 years old.

Keywords: Effectiveness, Volleyball Skills Instrument

INTRODUCTION

Volleyball game was designed by Professor William G. Morgan (1870 – 1942) on 9th February, 1895 at Young Men's Christian Association (YMCA) Holyoke, Massachusetts, United States. This game was designed based on tennis (net game) and basketball (ball game), and he named this new game as "Mintonette". In 1896, the name was changed into "Volley Ball" as suggested by Professor Alfred T. Halstead and accepted by Morgan in conference. In 1952, the United States Volleyball Association Administrative Committee (USVBA) decided to make the spelling of this game as one word "*Volleyball*". Volleyball is a game that has been played worldwide and designed by William G. Morgan, Amerika Syarikat, (Kumar, 2014). It is a team game in which two teams of six players are separated by a net. Each team will attempt a game score by hitting the ball into the opponent's side under orderly rules (Gogoi & Pant, 2017).

Volleyball has its own standard characteristics, it is a sports activity that requires lots of players' different movements (Karalic at el., 2016). The effectiveness of five volleyball skills such as, serve, dig, set, block and spike (Kyprianou, 2015). The volleyball skills can be divided into attacking skills and defence skills. The attacking skills are serve and spike, while defence skills are dig, set and block (Kumar, 2014).

The measurement procedure is essential as through it, coaches can conclude either their teaching and training were good or should they change one or more aspects of their procedure. The issues for the coaches are how to measure their players' ability in each situation in a game and in selecting a good volleyball player. Coaches need referral from this demand to guide and plan the athelete's development and training. (Serrano et al., 2016). According to Ahmad Hashim (2015) when data gained from invalid measurement instrument, it leads to void data to be used in measuring.

The focus of this study was to test the effectiveness of the volleyball skills instrument in measuring the ability and skills of volleyball players and eventually, it can be used by coaches, lecturers and physical education teachers in measuring and selecting volleyball players. Besides, the instrument is aimed to assist coaches, lecturers and physical education teachers evaluate the correct movement and the ability of volleyball skills. Volleyball skills instrument is good as it minimized tools and human resource usage and the the implementation indicators of this instrument are also more in line with the characteristics of volleyball skills: (i) serve, (ii) dig, (iii) set, (iv) block, and (v) spike.

The aim of this study are to i) determine construct validity of skills movement score assessment instrument development for serve, dig, set, block and spike in a volleyball game among male players aged 18 until 25 years old, ii) determine construct validity of assessment score instrument development for the outcome of serve, dig, set, block and spike skills in volleyball games among male players aged 18 until 25 years old, iii) determine construct validity of instrument's battery development for assessment score of skills in volleyball game among male players aged 18 until 25 years old, and iv) determine construct validity of instrument's battery development for assessment score of the outcome of the skills in volleyball game among male players aged 18 until 25 years old.

METHODOLOGY

Research Design

This study fully adapted the quantitative research design. Quantitative research has a variety of designs which each has its own significant rules in selecting sample, statistical data, test administration, findings statistical analysis, and different study reports (Ghazali & Sufean, 2016; Othman Talib, 2013). This study used Pre-Experimental Design - One Case Study (Campbell & Stanley, 1963).

Table 1. Research Design

R	X	O
R	-	Sample
O	-	Behavioural and Outcome Score
X	-	Volleyball Skills Instrument

Research Sample

The sample of this study were involved 20 volleyball expert athletes and 20 novice athlete who followed volleyball lessons aged 18 until 25 years old at Serambi Mekkah University in Acheh, Indonesia.

Volleyball Skills Instrument

Skills Assessment Instrument for Volleyball Serve Skills

Purpose : Measuring volleyball player's serve skills with good and correct techniques.

Age Level : Male subject aged 18-25 years old.

Serve Technique Procedure

1. The position of the left foot (for the lefty, with right foot) is slightly in front, both feet slightly bent.
2. Firstly, both hands hold the ball, then the ball is tossed upwards with left hand (vice versa for the lefty) approximately 1 metre high, at the same time the right hand is pulled backward and up to hit the ball forward using the palm.
3. The touch of the hand with the ball on the time of making the serve can be done with the palm and hand grip facing forward. The moment the ball is touched with the hand, the hand is slightly tensed to achieve a good bounce.
4. The ball is floating towards the field.

Table 2. Serve Movement Score Counts

Scale	Statements	
0	Fail	Not able to do the skills based on any of the set criteria
1	Weak	Able to do the skills based on one correct criteria from any stated criteria with correct technique.
2	Sufficient	Able to do the skills based on two correct criteria from any stated criteria with correct technique.
3	Good	Able to do the skills based on three correct criteria from any stated criteria with correct technique.
4	Excellent	Able to do the skills based on all correct criteria from any stated criteria with correct technique.

Serve outcome Assessment Procedure

1. Before the test, the subject is allowed to practice the serve once.
2. Subject will do the serve test 3 times.
3. The position for the serve is along the allowed serve area.

Score Count for Serve Outcome

1. Score assessment for the outcome is based on the fall of the ball on the targeted area.
2. The ball hits the net and goes out from the field, the score given is 0.
3. The value achieved is the highest score from 3 serves performed.

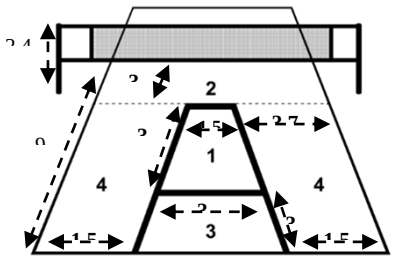

Figure 1. Serve Technique Test Field

Volleyball Dig Skills Assessment Instrument

Purpose : Measuring volleyball players' dig skills with good and correct technique.
Age level : Male subject aged 18 – 25 years old.

Dig Technique Procedure

1. Stand straight with the legs open as wide as shoulder length, or slightly wider, the knees are bent a bit.
2. Both arms are brought together in front of the body, with both arms stretched straight down, elbows should not be bent so that when the contact happens, the ball does not come off, one hand is placed on top of the other palm with both thumbs aligned and held tight.
3. The contact of the ball with the hand should be on the upper arm of the wrist and below the elbow. Take position facing the ball. Once the ball is at the right distance, swing both straightened arms from the bottom to front.
4. The direction of the ball passes 4 metre height with the ball not rotating.

Table 3. Dig Movement Scoring

Scale	**Statement**	
0	Fail	Not able to perform any skills based on the stated criteria
1	Weak	Able to perform skills based on one correct criteria from any stated criteria with correct technique.
2	Sufficient	Able to perform the skills based on two correct criteria from any stated criteria with correct technique.
3	Good	Able to perform the skills based on three correct criteria based on any stated criteria with correct technique.
4	Excellent	Able to perform the skills based on all correct criteria from any stated criteria with correct technique.

Assessment procedure for the Dig Outcome

1. Before the test, the player is allowed to practice dig for once.
2. Subjects do the test three times.
3. The position for digging is done in the lined box.
4. Subjects perform the dig three times continuously and the direction of theball shall pass 4 metres and minimum of 1 metre height.

Scoring Count for Dig Outcome

1. The scoring of outcome is aligned to the contact of the ball.
2. First dig ball shall pass 4 metre height, is not counted as score.
3. Balls that have not passed 1 metre heights are given 0.
4. Subjects that go out from the lined box are given 0.
5. When the ball passes 4 metre height, value of 4 is given. The height of 3 metre will be given 3, 2 metres with value of 2 and height of 1 metre will be given value of 1.
6. Achieved value is the highest score from 3 performed digs.

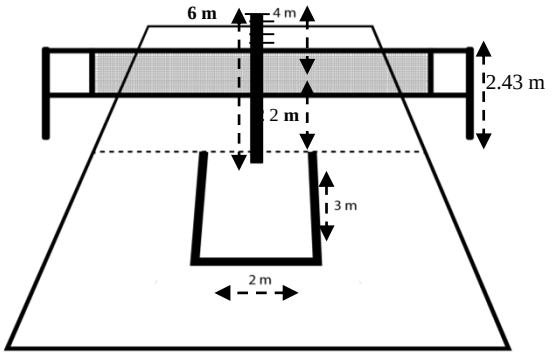

Figure 2. Dig Test Field

Volleyball Set Skills Assessment Instrument

Purpose : Measuring the set skills of male volleyball players with good and correct technique.

Age level : Male subject aged 18 - 25 years old.

Set Technique Procedure

1. Subject stands focusly with both legs as wide as shoulder width, and one foot slightly in front. Knees are bent, body slightly leaning forward with both hands in front of chest.
2. When about to do the set, the body is positioned below the ball, hands are brought together in front of the forehead. Fingers are positioned in a semi circle.
3. During the set, the ball contacted with the tips of the fingers at the first and second finger joints of the thumbs, all fingers are slightly stretched, and in the same time, followed by the movement of the wrist towards top front, after the ball has been setted, the arms move straight as advanced movement, followed by body and feet movements so that the movement coordination are well executed.
4. The direction of the ball shall pass 4 metres of height with the ball not rotating.

Table 4. Set Movement Scoring

Scale	**Statement**	
0	Fail	Not able to perform any skills based on the stated criteria
1	Weak	Able to perform skills based on one correct criteria from any stated criteria with correct technique.
2	Sufficient	Able to perform the skills based on two correct criteria from any stated criteria with correct technique.
3	Good	Able to perform the skills based on three correct criteria based on any stated criteria with correct technique.
4	Excellent	Able to perform the skills based on all correct criteria from any stated criteria with correct technique.

Assessment Procedure for Set Outcome

1. Before the test, players are allowed to practice the set for once.
2. Subject performs set for 3 times..
3. The position to do the set is inside the lined box.
4. Subject performs the set 3 times continuously and the direction of the ball shall beyond 4 metres height and minimum of 1 metre.
5.

Scoring of Set Outcome

1. Score assessment of the outcome aligned with the ball contact.
2. The first ball setted shall be at 4 metres of height, and is not counted as score.
3. Ball below 1 metre of height is given 0.
4. When the ball passes 4 metres of height, the score is 4, 3 metres is given 3 score, 2 metres is given 2 score and 1 metre is given value 1.
5. The value achieved is the highest score from 3 sets performed.

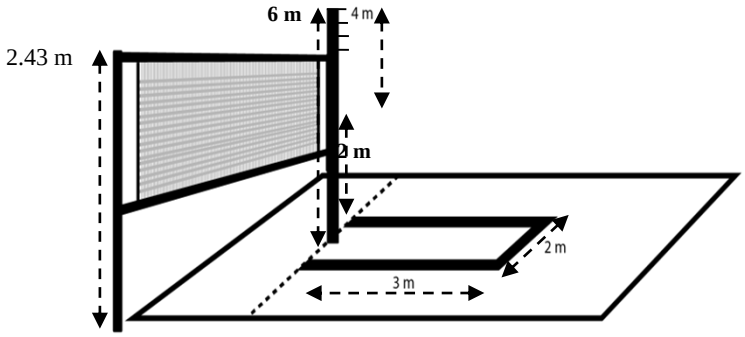

Figure 3. Set Technique Test Field

Volleyball Block Skills Assessment Instrument

Purpose : Measuring volleyball players' block skills with good and correct technique.
Age Level : Male subject aged 18 – 25 years old.

Block Technique Procedure

1. Subjects stand near to the net focusly with both legs shoulder width, and one foot slightly in front. Knees are bent.
2. When the block is about to be performed, the body is lowered slightly leaning forward with hands holding the ball in front of the chest.
3. Jump by pushing both legs while stretching both hands that hold the ball upwards, both palms drop the ball fast. Then, landing with both legs bent.
4. The direction of the ball dropped fastly on the field.

Table 5. Block Movement Scoring

Scale	**Statement**	
0	Fail	Not able to perform any skills based on the stated criteria
1	Weak	Able to perform skills based on one correct criteria from any stated criteria with correct technique.
2	Sufficient	Able to perform the skills based on two correct criteria from any stated criteria with correct technique.
3	Good	Able to perform the skills based on three correct criteria based on any stated criteria with correct technique.
4	Excellent	Able to perform the skills based on all correct criteria from any stated criteria with correct technique.

Assessment Procedure for Block Outcome

1. Before the test, players are allowed to practice the block for once.
2. Subjects perform the block three times.
3. The position of blocking is in the middle of the net.

Scoring of Block Outcome

1. Score assessment of the outcome is aligned with the fall of the ball on the target area.
2. Ball hits the net and goes out of the field is given 0.
3. The achieved value is the highest score from 3 blocks performed.
4.

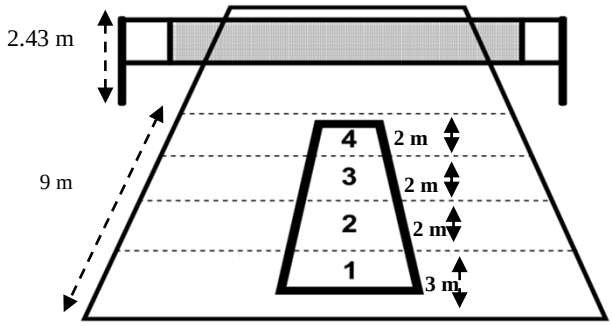

Figure 4. Block Technique Test Field

Volleyball Spike Skills Assessment Instrument

Purpose : Measuring the spike skills of volleyball players with good and correct technique.
Age Level : Male subject aged 18 – 25 years old.

Spike Technique Procedure

1. Subject starts the step with either the right or left foot. The knees are slightly bent, two final steps are right step and short left step or jumping step. Swing both arms backward at waist level, focusly on heels, shift body weight, swings both arms forward and upwards.
2. Hit the ball with a fully straightened arm, hit the ball directly in front of the hitter's shoulder, hit the ball using the palm at the back bottom of it, curl the fingers beyond the upper ball, and bend the wrist when the fingers curl.
3. Land back on the floor with bent knees to absorb impact, drop arms at hip's level.
4. The direction of the ball drops to the field.

Table 6. Spike Movement Scoring

Scale	**Statement**	
0	Fail	Not able to perform any skills based on the stated criteria
1	Weak	Able to perform skills based on one correct criteria from any stated criteria with correct technique.
2	Sufficient	Able to perform the skills based on two correct criteria from any stated criteria with correct technique.
3	Good	Able to perform the skills based on three correct criteria based on any stated criteria with correct technique.
4	Excellent	Able to perform the skills based on all correct criteria from any stated criteria with correct technique.

Assessment Procedure for Spike Outcome

1. Before the test, players are allowed to practice the spike skills once.
2. Subjects perform the spike three times.
3. Subjects perform the spike by hitting the ball placed on the centre position.

Spike Skills Scoring

1. Assessment score is aligned with the fall of the ball at the targeted area.
2. Ball that hits the net and goes out of the field is given 0 value.
3. Value achieved is the score from 3 spikes performed.

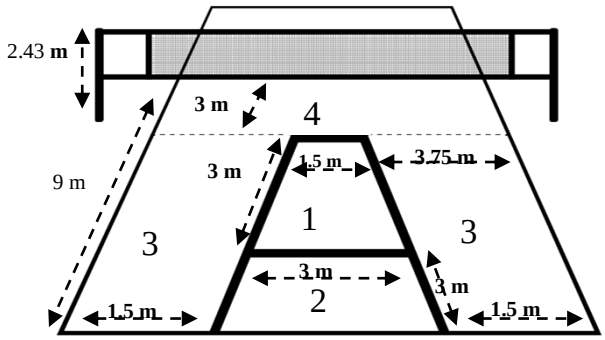

Figure 5. Spike Technique Test Field

Data Analysis

Statistical Package for Social Science (SPSS) version 21.0 was used to analyse the effectiveness data of volleyball skills instruments. The data analysis for the effectiveness of volleyball skills instruments which are serve, dig, set, block and spike skills, used independent sample t-test.

RESULT

Followings are the findings report on the construct validity of assessment score instrument's development for serve, dig, set, block and spike skills in volleyball games among male players aged 18 - 25 years old. The research findings used the independent t-Test to compare movement and the outcome of serve, dig, set, block and spike skills of expert and novice athlete groups.

Table 7. Construct Validity of Assessment Movement Score Test for Serve, Dig, Set, Block and Spike Skills in Volleyball *(N=40)*

Movement Score Instrument	N	M	SD	t	*p*
Serve	Expert	3.85	.366	14.091	.000
	Novice	2.00	.459		
Dig	Expert	3.55	.510	5.044	.000
	Novice	2.40	.883		
Set	Expert	3.80	.410	12.632	.000
	Novice	1.95	.510		
Block	Expert	3.90	.308	16.716	.000
	Novice	1.25	.639		
Spike	Expert	3.75	.444	13.816	.000
	Novice	1.30	.657		

*Significant value was set at the level of $p<0.05$

Based on Table 7, the independent sample t-test analysis was used to compare volleyball skills instruments which are, movement score test for serve, dig, set, block and spike among the expert and novice athlete aged 18-25 years old at Serambi Makkah University. Result showed, movement score of expert athlete was significantly (*p<0.05*) higher than novice athlete for all skill. Movement score test for serve skill among expert was (M= 3.85, SD = .366) and novice (M= 2.00, SD = .459). While, movement score test for dig skill among expert was (M= 3.55, SD = .510) and novice (M= 2.40, SD = .883). Other than that, movement score test for set skill among expert was (M= 3.80, SD = .410) and novice (M= 1.95, SD = .510). Next, movement score test for block skill among expert was (M= 3.90, SD = .308) and novice group (M= 1.25, SD = .639). Lastly, Movement score test for spike skill among expert was (M= 3.75, SD = .444) and novice (M= 1.30, SD = .657).

Table 8. Construct Validity of Assessment Outcome Score Test for Serve, Dig, Set, Block and Spike Skills in Volleyball *(N=40)*

Outcome Score Instrument	N	M	SD	t	*p*
Serve	Expert	3.85	.366	4.181	.000
	Novice	2.75	1.118		
Dig	Expert	3.90	.308	7.285	.000
	Novice	3.00	.409		
Set	Expert	3.90	.308	8.219	.000
	Novice	3.10	.308		
Block	Expert	2.95	.224	7.922	.000
	Novice	2.35	.875		
Spike	Expert	3.85	.366	10.922	.000
	Novice	1.95	.686		

*Significant value was set at the level of *p<0.05*

Based on Table 8, the independent sample t-test analysis was used to compare volleyball skills instruments which are, outcome score test for serve, dig, set, block and spike among the expert and novice athlete aged 18-25 years old at Serambi Makkah University. Result showed, outcome score of expert athlete was significantly (p<0.05) higher than novice athlete for all skill. Movement score test for serve skill among expert was (M= 3.85, SD = .366) and novice (M= 2.75, SD = 1.118). While, outcome score test for dig skill among expert was group (M= 3.90, SD = .308) and novice (M= 3.00, SD = .409). Other than that, outcome score test for set skill among expert was (M= 3.90, SD=.308) and novice (M= 3.10, SD =.308). Next, outcome score test for block skill among expert was (M= 2.95, SD = .224) and novice (M= 2.35, SD = .875). Lastly, outcome score test for spike skill among expert was (M= 3.85, SD = .366) and novice (M= 1.95, SD = .686).

Table 9. Construct validity of battery development for overall score assessment instrument of movement skills in volleyball games

	Group	N	Mean	Std. Deviation	Std. Error Mean
Overall Movement	expert	20	18.85	1.309	.293
	novice	20	8.90	2.360	.528

Table 10. Independent Samples T test for overall score assessment instrument of movement skills in volleyball games

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Movement Battery	Equal variances assumed	1.736	.195	16.490	38	.000	9.950	.603	8.729	11.171
	Equal variances not assumed			16.490	29.680	.000	9.950	.603	8.717	11.183

*Significant value was set at the level of $p<0.05$

Based on Table 10, a independent t-test was used to compare the overall score of movement skills between the expert and novice male athlete group aged 18 until 25 years old. The test indicated value (t = 16.490; p = .100) was significant. The test results showed mean score of expert athlete (M= 18.85, SD=1.301) was higher than novice athlete (M= 8.90, SD =2.600). This showed the validity of the movement skills score assessment instrument's battery procedure is valid.

Table 11. Validity construct of the battery development for movement skills in volleyball games outcome score assessment instrument

	Group	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Overall Outcome	Expert	20	19.45	1.050	.235
	Novice	20	13.15	2.390	.534

Table 12. Independent Samples T test for overall score assessment instrument of outcome skills in volleyball games

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	3.656	.063	10.792	38	.000	6.300	.584	5.118	7.482

Outcome Battery	Equal variances not assumed	10.792	26.071	.000	6.300	.584	5.100	7.500

*Significant value was set at the level of $p<0.05$

Based on Table 12, a independent t-test sample was used to compare the overall score of the skills outcome between the expert and novice male athlete aged 18 until 25 years old. The test indicated value (t = 10.792; p = .000) was significant. The test results showed mean score of expert athlete (M= 19.45, SD=1.050) was higher than novice athlete (M= 13.15, SD =2.390). This showed that the procedure of the instrument's battery of the skills outcome score assessment instrument is valid.

DISCUSSION

Result of this study showed expert athlete have a significant better performance in all movement and outcome skill (Serve, Dig, Set, Block, Spike) that have been measured compared to the novice athlete. The findings of this study was in line with the findings of studies by Vansteenkiste, Vaeyens, Zeuwts, Philippaerts and Lenoir (2014) that have been compared the visual ability to perform spike skills between novice and elite athletes among volleyball player, it found that time reaction and accuracy of elite athlete was significantly higher than novice athlete because the differences of visual strategy due to the level of experience, elite athlete tend to analyses space between the ball and the setter's hands before spike, while novice player tend to analyses hand movement of setter only.

In other study by Lopes, Magalhães, Diniz, Moreira and Albuquerque (2016) was compared high, intermediate and low technical level of volleyball player on service and setting skill, it was found that player with high technical level showed better performance in service and setting skill due to the high ability in decision making compared to player that have intermediate and low technical skill level. Players with low levels of technical skills will have trouble to making good and accurate decisions while performing skills because it is disrupted by working memory processes that focus on hand movements causing players to be unable to focus on other information in the game such as opponent position and space to perform attacking (serve) or defense (set) the ball.

Performance differences between among novice and elite athletes that have been shown by using skill instrument in this study was proved the effectiveness of the instrument. According to Gabbett and Georgieff (2006) the using of instruments that can show performance differences based on the player's level of experience is likely to be a valid instrument. As stated by Gabbett and Georgieff (2006), level of basic volleyball skills such as spiking, service and passing will increase in line with the level of experience of the players, which is elite players will usually show better performance than novice athletes due to many factor such as level of skill acquisition and level of learning stage as shown in study Vansteenkiste et al., (2014) and Lopes et al., (2016). Therefore, the correct instruments to measured the skill are very important to ensure that a player's skill level is measured accurately.

CONCLUSION

The findings of this study showed there was a significant difference of the construct validity of the instrument development for skills movement score assessment of serve, dig, set, spike and block in volleyball games among male players aged 18 until 25 years old were (t = 14.091; p = .000), (t = 5.044; p = .000), (t = 12.632; p= .000), (t = 13.816; p = .000), (t = 16.716; p= .000). There was a significant difference of validity construct value of the instrument development for movement skills outcome score assessment of serve, dig, set, block and spike in volleyball games among male players aged 18 until 25 years old were (t = 4.181; p = .000), (t = 7.285; p = .000), (t = 8.219; p= .000), (t = 7.922; p= .000), (t = 10.922; p= .000). There was a significant validity construct value of the instrument's battery development of movement skills score assessment in volleyball games among male players aged 18

until 25 years old (t = 16.490; p = .000). There was a significant difference of construct validity value of the instrument's for skills outcome score assessment in volleyball games among male players aged 18 - 25 years old (t = 10.792; p= .000). The usage of the volleyball skills instrument is valid and can be used to measure the volleyball skills such as serve, dig, set, block and spike, and to assist lecturers, coaches and physical education teachers in identifying ability and students' achievement in volleyball subjects.

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