

INVESTIGATING THE RELATIONSHIP BETWEEN MALAYSIAN RUGBY SEVENS MATCH OFFICIALS PHYSICAL FITNESS AND PERFORMANCE

M. N. Nazarudin^{1,*}, M. R. Abdullah², V. Parnabas³, N. M. Abdullah³ and A. B. H. M. Maliki²

¹Faculty of Psychology and Educational Studies, Universiti Malaysia Sabah, 88400 Sabah, Malaysia

²East Coast Environmental Research Institute, University of Sultan Zainal Abidin, Gong Badak Campus, 21300 Terengganu, Malaysia

³Faculty of Sport Science and Recreation Faculty, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

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ABSTRACT

The objective of this study is to investigate the relationship between rugby match officials physical fitness to their performance. 132 rugby side match official seven were selected as the respondent of the study. ANOVA indicated no significant differences [$F = (3, 128) = 0.322, p = 0.809$] in physical fitness across age level but there is a significant differences [$F = (3, 128) = 60.903, p < 0.05$] across experience level. Highly experienced match officials scored significantly higher in physical fitness compared to less experienced match officials. There is a positive and significant relationship between physical fitness ($r = 0.64, p < 0.05$) to match official performance. Finally, physical fitness are important for rugby sevens match officials and it must considered as criteria in determining match official grades.

Keywords: physical fitness; performance; match official; rugby.

Author Correspondence, e-mail: drnizam.ums@gmail.com

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1. INTRODUCTION

As team sports descend deeper into the professional era, players are becoming fitter, faster, more powerful and cynical with regard to the laws of the game [1-2]. Thus, the pressure on sports officials to produce flawless performance is increasing and with media pundits attempting to create controversy, the spotlight is often cast upon the match officials. Clearly, these match officials have a crucial influence on the game [3], yet while sport science research literature holds many investigations into the enhancement of elite athletes [4], there is a dearth of literature investigating the performance of match officials.

Match officials are responsible for maintaining flow and control [3, 5] and ensuring fair play both in accordance with the laws and the spirit of the game [6]. Their performance is critical and not only is match officials responsible for maintaining a safe environment, but they are also expected to ensure that the game's result is just. The fact that the match official cannot be replaced when exhausted during a match contributes to his increased stress level. Following this, a match official's assignments and mistakes can lead to loss of confidence, high anxiety levels and further increased levels of stress on the match official [7-10]. Not surprisingly, this leads to a further swell in the frequency of match official retirement [11-12].

International rugby union or now known as World Rugby match officials are responsible for consistency, control and maintaining the flow in matches [6]. Since rugby union turned professional in 1995, there has been an increased demand on the standard of match officiating [13]. Match officials need to be physically fit to keep up with the intensity of play and also be able to apply the laws of the game accurately [14-15]. Inaccurate decision-making by rugby union match officials can change the course of a game [3], and may even lead to significant financial implications for the clubs, players and coaches [13]. During a match, match officials need to be in a position on the field which allows them to make the correct interpretation or decision, thus placing demands on their fitness [16].

World Rugby has put an international test battery in place and it is required that all match officials need to successfully complete this test battery throughout the year to show the necessary fitness levels to match official the games [17]. The test battery consists of anaerobic (in the absence of oxygen) and aerobic (in the presence of oxygen) fitness tests [18]. If match

officials do not perform well during matches, their poor performance (assessed by an appointed performance reviewer) has significant implications for them (e.g. Lose position on panels or can be withdrawn from future games).

1.1. Rugby Sevens and Match Officials Physical Demand

According to the statistics of the match, the World Rugby Sevens Series Championships 2014/15 issued by the World Rugby as in Table 1 show the rate of try done is every 73 seconds while a total of 87% of the match won by the team that does a lot of try. A total of 42% try is from their half and 57% are from three or less passing. Only 3.2 scrums and 2.6 lineouts average per games. These statistics show that each team in seven a side match will try make a try without doing a lot of stoppages. The players certainly have a wider space to make a run and need speed to defeat the opponent.

Based on the description of statistical activities rugby seven match above, high performance match official should be able to control the match. Rugby match official also like other sports, should give a level of control over the game. Match official must also be in the best position to observe the game [19]. According to previous study, match officials rugby sevens covered an average distance of 1665.2 ± 203.5 m per game (15.1 ± 0.5 minutes) [20]. Over this distance, 22.3% (371.8 ± 48.9 m) was spent standing and walking, 25.9% (431.2 ± 92.6 m) jogging, 12.4% (206.5 ± 53.2 m) cruising, 23.8% (395.6 ± 94.3 m) striding, 8% (133.3 ± 61.6 m) high-intensity running and 7.6% (126.7 ± 87.3 m) sprinting. The average maximal distance of sprints, the number of sprints and the mean sprint distance over the game were 31.3 ± 13.4 m, 5.76 ± 3.6 sprints and 19.9 ± 7.8 m respectively. The match official's work-to-rest ratio was 3.5:1.

Table 1. World Rugby Sevens Series Championships 2014/15 statistic by World Rugby

	2014-15
Matches Scoring	405
Points (Average Per Game)	36.4
Scoring Tries (Average Per Game)	5.8
Try Scoring Rate (Rate): 1 Every _ Second	73
Match Won By Scoring Most Tries (%)	87
Origin Of Tries-Own Half (%)	42
Try Build Up-3 Or Fewer Passes (%)	57
Scrum (Average Per Game)	3.2
Lineouts (Average Per Game)	2.6

Minimum qualifying level fitness test 20 Meter Multistage Shuttle Run for match official Rugby seven was raised from level to level 10.0 to 12.5 because of changes in the pattern of rugby seven nowadays [15]. This shows that physical fitness factors need to be taken into account. There are no studies that examine the relationship between fitness and performance. Therefore the extent to which physical fitness factors impact on the performance of match officials often questioned, especially when after the match officials performance evaluation results obtained. Consequently, this study has threefold of research question to scrutinize namely, 1) what is the level of physical fitness and performance of rugby sevens match officials?; 2) Are there any differences in the level of physical fitness and performance based on age and years of rugby sevens match officials experience?; and 3) Is there a relationship between physical fitness with the rugby sevens match officials performance? Thus, the objective of this study is to investigate the relationship between rugby match officials physical fitness to their performance.

2. MATERIALS AND METHODS

2.1. Participants

Malaysian Rugby Union match officials (mean age 33.4 + 1.5 years; 132 males) have volunteered to take part as participants. To determine the sample size of 200 people in match

official sevens population, the researcher refers to the determination of sample size tables [40]. A total of 132 participants were selected at random from ten rugby seven tournaments held in Malaysia. Power analysis has confirmed that the samples were in accordance with the Alpha = 0.0276, Power = 0.9724, Critical F (4,127) = 2.9040, Lambda = 25.33. A total of 33 people (25.0%) under the age of 30 years, 35 people (26.5%) aged 30 to 35 years, 34 people (25.8%) aged 36 to 40 years and 30 people (22.7%) aged over 40 years. A total of 33 people (25.0%) had match officiating experience between 1 to 5 years, 34 (25.8%) had between 6 to 10 years, another 34 (25.8%) had between 11 to 15 years and while 31 people (23.5%) had match officiating experience for more than 15 years as shown on Table 2.

Table 2. Distribution participant's age and match officiating experience

Age	< 30 years	30-35 years	36-40 years	> 40 years
	33 (25.0%)	35 (26.5%)	34 (25.8%)	30 (22.7%)
Match Officiating Experience	1-5 years	6-10 years	11-15 years	> 15 years
	33 (25.0%)	34 (25.8%)	34(25.8%)	31(23.5%)

2.2. Data Collection Procedure

This study took for two days in each tournament where data collection will be held a day before the game with physical fitness test and on the first day of the tournament using Rugby Sevens Match official Performance Evaluation to measure performance in the field. Permission from the Malaysia Rugby Union have been obtained before commencing the research.

2.3. Data Analysis

Statistical tests used in this study is Mean, Standard Deviation, Percentage, One Way ANOVA and Pearson Correlation (refer Table 3) [41-51].

Table 3. Instrument and statistical tests

No	Research Question	Instrument	Statistical Tests
1	What is the level of physical fitness and performance of rugby sevens match officials?	20 Meter Multistage Shuttle Run Fitness Test 40 meters Sprint Test Performance Evaluation form	Mean, Standard Deviation and Percentage
2	Are there any differences in the level of physical fitness and performance, based on age and years of rugby sevens match official's experience?	20 Meter Multistage Shuttle Run Fitness Test 40 meters Sprint Test Performance Evaluation form	One Way ANOVA
3	Is there a relationship between physical fitness with the rugby sevens match officials performance?	20 Meter Multistage Shuttle Run Fitness Test 40 meters Sprint Test Performance Evaluation form	Pearson Correlation

3. RESULTS

Physical fitness variable contains two dimensions namely cardiovascular endurance and speed. Based on Table 4, cardiovascular endurance dimensions identified to be at a moderate level with a mean of 3.39 and the majority of the respondents (68.9%) are at this stage. Speed dimensions are also at a moderate level with a mean of 3.40 and 68.9% respondents are at this stage. However, the overall physical fitness identified is at high level with a mean of 6.80 but 68.9% respondents is at intermediate stage.

Table 5 showed Positioning ($\bar{x} = 13.52$) is at high level, but the 54.5% of respondents were at intermediate level. Control ($\bar{x} = 13.42$) is at high level, but 55.3% of respondents were at intermediate level. Communication ($\bar{x} = 13.52$) is at high level, but 56.1% of respondents were at intermediate level. Application of Law ($\bar{x} = 96.05$) with 55.3% respondents was at intermediate level. Overall, the Performance ($\bar{x} = 136.45$) with 69.7% respondents was also at intermediate level. Based on Table 6, ANOVA test results show that levels of all physical fitness subscales between the four age groups were not significantly different [Cardiovascular

Endurance [$F = (3, 128) = 0.322, p = 0.809$] and Speed [$F = (3, 128) = 0.322, p = 0.809$]. Levels of physical fitness among the four age groups was also not significantly different [$F = (3, 128) = 0.322, p = 0.809$]. That means that there were no differences overall in the level of physical fitness based on the age of the match officials.

Table 4. Level of physical fitness subscales (n = 132)

Subscales	%	\bar{x}	SD	Level
Cardiovascular endurance dimension		3.39	0.77	Intermediate
Low (1.00-2.33)	1.5			
Intermediate (2.34-3.66)	68.9			
High (3.67-5.00)	29.5			
Speed dimension		3.40	0.75	Intermediate
Low (1.00-2.33)	1.5			
Intermediate (2.34-3.66)	68.9			
High (3.67-5.00)	29.5			
Overall		6.80	1.49	High
Low (1.00-3.33)	1.5			
Intermediate (3.34-6.67)	68.9			
High (6.68-10)	29.5			

Based on Table 7, ANOVA test results show that levels of all physical fitness subscales between the four experience groups were significantly different [Cardiovascular Endurance [$F = (3, 128) = 60.903, p < 0.05$] and Speed [$F = (3, 128) = 60.903, p < 0.05$]. Levels of physical fitness among the four age groups was also significantly different [$F = (3, 128) = 60.903, p < 0.05$]. That means that there were differences overall in the level of physical fitness based on the experience of the match officials.

Table 5. Level of performance subscales (n = 132)

Subscales	%	\bar{x}	SD	Level
Control		13.42	3.17	High
Low (0.00-6.67)	0.0			
Intermediate (6.68-13.33)	55.3			
High (13.34-20.00)	44.7			
Communication		13.45	3.25	High
Low (0.00-6.67)	0.0			
Intermediate (6.68-13.33)	56.1			
High (13.34-20.00)	43.9			
Positioning		13.52	3.26	High
Low (0.00-6.67)	0.0			
Intermediate (6.68-13.33)	54.5			
High (13.34-20.00)	45.5			
Law Application		96.05	4.40	Intermediate
Low (0.00-50.99)	0.0			
Intermediate (51.00-100.99)	55.3			
High (101.00-150.00)	44.7			
Overall Performance		136.45	4.47	Intermediate
Low (0.00-70.99)	0.0			
Intermediate (71.00-140.99)	69.7			
High (141.00-210.00)	30.3			

Table 6. Comparison of physical fitness level between ages using One-Way ANOVA test

Subscales	Age	SS	df	MS	F	P
Cardiovascular	Between group	0.230	3	0.077	0.322	0.809
Endurance	Within group	30.399	128	0.237		
	Total	30.629	131			
Speed	Between group	0.230	3	0.077	0.322	0.809
	Within group	30.399	128	0.237		
	Total	30.629	131			
Overall	Between group	0.230	3	0.077	0.322	0.809
	Within group	30.399	128	0.237		
	Total	30.629	131			

*Note: n = 132; significant: p < 0.05

Table 7. Comparison of physical fitness level between years of experience using One-Way ANOVA test

Subscales	Age	SS	df	MS	F	P
Cardiovascular	Between group	18.011	3	6.004	60.903	0.000
Endurance	Between group	12.618	128	0.099		
	Within group	30.629	131			
Speed	Total	18.011	3	6.004	60.903	0.000
	Between group	12.618	128	0.099		
	Within group	30.629	131			
Overall	Total	18.011	3	6.004	60.903	0.000
	Between group	12.618	128	0.099		
	Within group	30.629	131			

*Note: n = 132; significant: p < 0.05

There are differences in the cardiovascular endurance with years of experience as a match official. Highly experience match officials scored significantly higher in physical fitness constructs compare to less experience match officials.

Based on Table 8, the results of the analysis of inter-correlation shows a high correlation and

had a strong connection between the dimensions of the cardiovascular endurance and performance ($r = 0.64, p < 0.05$). The correlation between the dimensions of speed with performance ($r = 0.64, p < 0.05$) is also high and have a strong connection. As a whole also shows a high correlation and had a strong connection between the physical fitness and performance ($r = 0.64, p < 0.05$). All of the correlation is positive and significant at $p < 0.05$. Summarize for relationship between variables and dimensions with performance showed as below.

Table 8. Relationship between physical fitness and performance

Variable	Correlation	Relationship Level
Physical Fitness		
Cardiovascular endurance	$r = 0.64, p < 0.05$	Strong
Speed	$r = 0.64, p < 0.05$	Strong
Overall	$r = 0.64, p < 0.05$	Strong

4. DISCUSSION

4.1. Level of physical Fitness and Performance of Rugby Sevens Match Officials

Cardiovascular endurance and speed of Malaysia Rugby Match Official identified to be at a moderate level but overall physical fitness identified is at high level. Match official must increase the level of cardiovascular endurance and speed to rival players game rhythm who mainly over 10 to 15 years younger than the match official [21]. The findings supported by research match activities profile and match officials physiological needs almost the same [22-24] as well as related to the player [25]. This means that the movement of the players either running, jogging or running fast in the games require the match officials to prepare themselves in terms of cardiovascular and speed.

The match official should also be trained to increase physical fitness just as players for preparation for a match. Though the findings show the match officials' overall physical fitness level is high, the match officials should also maintain a level of physical fitness and not just during match's season. This finding is also supported by the implementation of the assessment system by the Malaysia Rugby that takes into account fitness test results in a decrease and an

increase of match official grade.

Accordingly, the match officials will receive pressure if poor performance and media try to make controversy with a focus often thrown to match official. Match official often blamed the media on the decisions and is said to influence the results of matches and competitions. In line with the development of rugby at present, match official rugby sevens also need to prepare themselves so that rival game pattern changes. The umpire is complementary to a match and also carry out special assignments as well as specific.

Positioning Control and Communication of Malaysia Rugby match officials is at high level but Application of Law was at intermediate level. Overall, the Performance of the match officials was at intermediate. With rugby players, coaches and fans all moving toward a faster and more technical game, rugby referees are being asked to make quick decisions in this new, expansive game. Referees have been focusing on fitness as a key component of their training to ensure they are in the right place to make the right call and best serve the game.

Proper training and a rigorous process for the selection of refereeing teams are vital for achieving the desired results. Traditionally, the training and selection process used to be composed of physical and technical preparation [2, 26]. A good referee must be well acquainted with the Laws of the Game, interpret and apply them correctly, be in good physical condition, be well positioned on the field of play at all times and have a good understanding with the other members of the refereeing team [3, 26].

4.2. Differences in the Level of Physical Fitness and Performance Based on Age and Years of Malaysia Rugby Sevens Match Official's Experience

There were no differences overall in the level of physical fitness based on the age of the match officials. This finding is inconcordance with previous study indicated that age is not one of the factors that influence physical performance, as they must prepare their physical in advance to rival the speed of the players [21-22]. However, an increasing of age will reduce more on anaerobic performance capacity compared to aerobic performance [22, 27].

Although there are no scientific studies that determine the match officials retirement age limit, but there may be a documents regarding physical fitness decrease with age [28-30]. This may cause some sports organizations set the retirement age of match officials, and certainly they

also set the match official physical fitness level [31-32].

There are differences in the cardiovascular endurance with years of experience as a match official. Highly experience match officials scored significantly higher in physical fitness constructs compare to less experience match officials. Study shows that an experienced match officials said to have increased because of the physical fitness stage has undergone a modern practice and some of them make the match officiating as full time and professional [24, 33].

Although no studies regarding match officials physical fitness based on the stages of experience in sevens, but the data retrieved that international match officials who match officiating Asian Rugby Sevens Under 20 years shows that their years of experience minimum active as an umpire was 11.43 years. This means that they are already experienced and went through the feasibility test of physical fitness [34]. The match officials might have experience officiating matches while not fit and also has done fitness session before officiating matches, so they will ensure that they are always ready in terms of physical fitness.

4.3. Relationship Between Physical Fitness With the Rugby Sevens Match Official's Performance

This study shows a high correlation and had a strong connection between the dimensions of the cardiovascular endurance, speed and physical fitness towards performance. Based on the revision of documents found that match officials must be at least level 12.5 in 20 meters Multistage Shuttle Run Fitness Test to officiating international matches for compete with rugby players cardiovascular endurance in the sevens match. Though it is a good test for general anaerobic fitness and can serve as a baseline for referees, the beep test does not directly correlate to the actions a referee will take on the field.

Reacting to the new needs in a fitter and faster game, Malaysia Rugby is switching its fitness testing protocols from the beep test to the Yo-Yo Intermittent Recovery Test. This new test mirrors a referee's activities on the field, will puts Malaysia Rugby in line with World Rugby's testing protocols and gives referees a new opportunity to show their hard work through fitness testing. Although it consists of the same 20-meter shuttle structure as the beep test, the Yo-Yo gives the participants a 10-second recovery after each shuttle, better simulating the start-and-stop nature of a rugby game.

The research finding also acquired the same as suggested by theories in the field of physiology proper outline the stages of physical fitness an important component that determines the achievements in the game. This is supported by plundering the acquired which states that the relationship of physical fitness with achievement has been demonstrated by in football match official [35]. Most of the world sports bodies have stressed the importance of the match official physical fitness in the regulations and their documentation [36].

Speed and accuracy of the doing general skills and perform the skills in game situation depending on the fitness element [37-38]. However, when the level of physical fitness is interrupted or low then resulted in the match official fails to make good control in field. Match officials need to be in the best position to observe the game [19]. The failure to be in the best position can result in failure to detect infringement. This statement is supported by previous study specified that match officials must be at the right place at the right time so that law application can be managed [13].

Theories in physiology exercise stated that match officials trained in aerobic training or have high cardiovascular endurance, then they will not get tired and affect performance. The increase in the rate of fatigue due to the level of physical fitness that uninterrupted or low also resulted in the failure of the match officials to use whistles effectively. The match officials also failed to communicate and apply the law correctly in the match due to fatigue. According to the physical condition that fatigue will affect the blood in the brain, resulting in difficulty in remembering [39]. Physical fitness factors also has a direct impact on the knowledge and decision-making [2-3, 26].

5. CONCLUSION

The results of this study indicated the physical fitness are important for match official in rugby sevens match. Match official are now training more like players throughout the week, mixing in strength training, running, referee skills and other items to help them prepare for matches. Having the endurance to be present and ready to make the tight call in those big matches has become imperative. Being fit is a controllable responsibility belonging solely to the referee.

This new focus on fitness is another reason players are making the jump to match officiating, as they find some of the same challenges they faced as a player. They can stay fit, stay on the field and contribute to the success of a rugby match after they have finished their playing careers. Being fit and focused to make clear calls will ultimately lead to good performances, which in turn builds one's self-esteem and confidence levels. There are amazing opportunities for a fit, confident match official that has fun and helps to make the game fair and safe for the players.

6. ACKNOWLEDGMENT

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