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Relationship Between Body Composition to Physical Fitness Performance among Sarawak Futsal Players

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Abstract

The physical fitness component is an important component in producing competitive futsal players. The purpose of this study was to examine the relationship between body composition on the performance of physical fitness levels among Sarawak futsal players at the initial selection stage. The study population and sample consisted of Sarawak futsal players selected at the initial stage of selection. The design of this study is a cross-sectional survey study that uses motor behavior tests under physical fitness based on motor behavior. Among the fitness tests used were 20-meter Sprint Test, Illinois Agility Test, Beep Test, Agility T-Test, and BMI. The findings show that the mean age of Sarawak futsal players is $\mu = 21$ years. The level of physical fitness based on the 20-meter sprint test showed that the mean time was $\mu = 3.30$ seconds with 100% being the excellent category. For the Illinois Agility Test, the mean time was $\mu = 17.05$ seconds with the highest category being moderate (65.0%). For the Beep Test, the mean time was $\mu = 6.93$ seconds and the highest category was moderate (36.3%). For the Agility T-Test, the mean time was $\mu = 9.92$ seconds and the highest classification was good (52.5%). The results of Pearson Correlation analysis found that BMI had a moderately significant relationship on the 20-meter Sprint Test and Illinois Agility Test namely $R = 0.532$, $p < 0.05$ and $R = 0.582$, $p < 0.05$. There was a significant negative relationship between BMI on the Beep Test which was $R = -0.568$, $p < 0.05$. Illinois Agility's physical fitness is a component that has a high correlation from other tests in improving player performance. Therefore, physical fitness plays an important role in forming a competitive team.

Keywords: Physical Fitness, Futsal, BMI, Team

Introduction

Body composition plays an important role in influencing the level of physical fitness as well as creating a competitive team. BMI is an indirect measure of body composition because it is closely related to the fat found in an individual's weight and height.

According to Davis (1991), physical fitness refers to an individual's ability to meet physical and physiological needs in performing activities without feeling lethargic. Wildor Hollmann (1991), he defines fitness as a physical and mental state, in which a person has the ability to perform a task similar to that performed by another individual. Meanwhile, Clarke (1976) defined fitness as the ability of a person to perform daily activities efficiently and perfectly without feeling tired and able to perform more challenging activities.

Next, futsal is a sport that requires ideal body composition and high physical fitness especially motor behaviors such as agility and speed. Futsal is a team sport played alternately on an indoor court measuring 40 x 20 m over two time periods with 20 minutes each half time (Amani-Shalamzari, Farhani, et al., 2019).

Fatigue is defined as an exercise-based phenomenon, in which a muscle's ability to produce strength or force is reduced, regardless of whether the current task can be maintained or not (Enoka, 2008, 317). Usually fatigue begins as soon as the task begins, although the task is still feasible (Barry & Enoka, 2007). To maintain a desired level of strength or power, perceived effort increases, before it begins to decline (Enoka & Stuart, 1992). During the 4-day futsal tournament, perceived effort increased but game intensity did not vary from game to game (Charlot et al., 2016). Fatigue can increase from the muscles or from the nerve level, and thus encompass the entire motor system (Enoka & Stuart, 1992). Fatigue damages nerve and muscle mechanics, and is divided into central (nerve) and peripheral (muscle) fatigue (Barry & Enoka, 2007). Hence, the term neuromuscular fatigue is used.

In futsal, there are unlimited substitutions throughout the game. A team can have 5 players on the court (goalkeeper and 4 players on the field), and 9 players on the bench (FIFA 2015). With unlimited replacements, there is an opportunity to give players more time to recover if necessary. The mechanism that may cause fatigue during futsal can be heat stress, dehydration or a reduction in glycogen storage (Bueno et al., 2014). One easy way to avoid fatigue and decreased physical performance is by replacing more players during the game (Bueno et al., 2014). Still, the tendency is that 6-8 key players play all the time, and this suggests the number of substitutes is limited by the coach to maximize success in the game. The same is noted in the game of elite women's handball, where in international tournaments the main players will play for a long period of time thus causing the physical load to become heavier and tiring. (Ronglan et al., 2006).

BMI and physical fitness play an important role in creating a fast-paced team and shaping a fast-paced game. Therefore, this study aims to identify the relationship between body composition on physical fitness performance among Sarawak futsal players.

Research Methodology

This study uses a survey study design that is cross-sectional study. Survey studies are used to obtain information from a large sample (Marican, 2005). The selected sample has the characteristics of the population to be studied so that the information obtained becomes a true picture of the study population. Cross-sectional studies were conducted through questionnaire forms and were appropriately used to test individuals' attitudes, beliefs, opinions, and behaviors (Clark et al., 2008; Creswell, 2012).

The study population consists of futsal players in Sarawak who will represent Sarawak to the national level competition. There were 80 futsal players selected at all stages of the competition in the early stage. The research instrument used in this study is a physical fitness test based on motor behavior. Among the components studied were agility and speed. This is because the sport of futsal requires agility and high speed compared to other sports. Among the tests used to test agility and speed are the 20-meter Sprint Test, Illinois Agility Test, Beep Test, and Agility T-Test. In addition, this study also measures body composition i.e. body mass index.

Findings

The findings of the study showed that 80 people of the selected study sample were male. The mean age of futsal players in Sarawak is 21 years old with the highest category being 20 to 24 years old which is 47.5%. Table 1 shows the descriptive analysis of Sarawak futsal players.

Table 1: Descriptive Analysis of Sarawak Futsal Players.

	Category	Frequency (N)	Percentage (%)	Mean
Gender		80	100.0	
Age	< 20 years old	32	40.0	21 years old
	20 – 24 years old	38	47.5	
	25 – 29 years old	9	11.3	
	≥ 30 years old	1	1.3	

Based on Table 2, the findings show the distribution of body mass index (BMI) of Sarawak futsal players in the early stage of selection. Findings show that most players are in the ideal BMI category of 61.3% with a mean BMI of 23.32 kgm⁻². Table 2 shows the BMI distribution of Sarawak futsal players in the early stages of selection.

Table 2: BMI Distribution of Sarawak Futsal Players in the Early Stage of Selection.

		Frequency (N)	Percentage (%)	Mean
BMI	Obesity	7	8.8	23.32 kgm ⁻²
	Overweight	15	18.8	
	Underweight	9	11.3	
	Ideal	49	61.3	

Based on Table 3, the findings show the distribution of physical fitness levels of Sarawak futsal players in the early stage of selection. The results of the 20-meter Sprint Test showed that the players were in the excellent category of 100% with a mean time of 3.30 seconds. For the Illinois Agility Test, it showed the players were in the moderate category of 65.0% with a mean time of 17.05 seconds. For the Beep Test, the findings showed that the players were in the moderate category of 36.3% with a mean time of 6.93 seconds. For the Agility T-Test, the findings showed the players were in the good category of 52.5% with a mean time of 9.92 seconds. Table 3 shows the distribution of physical fitness levels of Sarawak futsal players in the early stages of selection.

Table 3: Distribution of Physical Fitness Level of Sarawak Futsal Players at the Initial Stage of Selection.

Test Type	Classification	Frequency (N)	Percentage (%)	Mean
20 Meter Sprint Test	Moderate	-	-	3.30 Seconds
	Excellent	80	100.0	
Illinois Agility Test	Very weak	10	12.5	17.05 Seconds
	Weak	3	3.8	
	Moderate	52	65.0	
	Good	15	18.8	
	Excellent	-	-	
Beep Test	Very weak	10	12.5	6.93 Seconds
	Weak	27	33.8	
	Moderate	29	36.3	
	Good	13	16.3	
	Very good	1	1.3	
	Excellent	-	-	
Agility T-Test	Weak	-	-	9.92 Seconds
	Moderate	9	11.3	
	Good	42	52.5	
	Excellent	29	36.3	

Based on Table 4, the findings show that BMI has a moderate significant relationship to the 20-meter Sprint Test for which $R = 0.532$; $p < 0.01 = 0.0001$. The findings of the study also found that BMI had a moderate significant relationship with the Illinois Agility Test that is $R = 0.582$; $p < 0.01 = 0.0001$. The findings showed that BMI had a moderate significant negative relationship to the Beep Test i.e. $R = -0.568$; $p < 0.01 = 0.0001$. However, BMI did not have a significant relationship with the Agility T-Test. Table 4 shows a one-way Pearson Correlation test analysis to identify the relationship between BMI on physical fitness level.

Table 4: Analysis of one-way Pearson Correlation Test to Identify the Relationship Between BMI on Physical Fitness Level.

Types of Physical Fitness Tests	N = 80	BMI
20 Meter Sprint	Pearson Correlation	0.532**
	Sig. (2-tailed)	.0001
Illinois Agility	Pearson Correlation	.582**
	Sig. (2-tailed)	.0001
Beep	Pearson Correlation	-.568**
	Sig. (2-tailed)	.0001
Agility T	Pearson Correlation	.195
	Sig. (2-tailed)	.083

** Correlation was significant at the 0.01 (2-tailed) level

Conclusion

Optimal physical performance depends on several factors such as genetic character, health, diet, environment, exercise schedule, mood and body composition (Vila Suárez et al.,

2008). Body composition plays an important role in the physical team in home sports performance where excess fat mass acts as dead body mass in activities where the body must be lifted repeatedly during movements and jumps, decreased performance and increased energy demand. However, skeletal muscles are an indicator of athletic performance (Vila Suárez et al., 2008), as they contribute to energy production during high-intensity activity and provide absolute strength for athletes (Vila Suárez et al. 2008). Body composition and physical performance in team indoor sports has a direct relationship with that intersperse them combining frequent vigorous effort with low -intensity activity duration variables (Vila Suárez et al., 2008; Wallace & Cardinale, 1997). Previously, research focused on body composition attempting to analyze the physical and anthropometric characteristics of basketball (Popovic et al., 2013; Sallet et al., 2005), handball (Chaouachi et al., 2009) and soccer players (Avelar et al., 2013); Ferreira et al., 2009). In basketball and handball, a player's body mass is a limiting factor that determines their game position (Drinkwater et al., 2007; Hoare, 2000).

In addition, the game of futsal requires good body shape as well as having high speed and agility. There have been several studies related to the game of futsal with its objectives mostly based on player response physiology (Castagna et al., 2007; Barbero-Alvarez et al., 2008) or aerobic fitness (Barbero-Alvarez et al., 2008), so far there is no study comparing futsal and men's soccer players with performance agility. While agility is one of the still unexplored motor skills in futsal, agility represents a very important component to the amount of high-intensity movement during a match. Body composition plays an important role in shaping a competitive futsal player and shaping an agile and fast player during the game.

Among the fitness tests used were 20-meter Sprint, Illinois Agility Test, Beep Test, Agility T-Test, and BMI. The level of physical fitness based on the 20-meter sprint test showed that the mean time was $\mu = 3.30$ seconds with 100% being the excellent category. For the Illinois Agility Test, the mean time was $\mu = 17.05$ seconds with the highest category being moderate (65.0%). For the beep test, the mean time was $\mu = 6.93$ seconds and the highest category was moderate (36.3%). For the Agility T-Test, the mean time was $\mu = 9.92$ seconds and the highest classification was good (52.5%). The results of Pearson Correlation analysis found that BMI had a moderately significant relationship on the 20-meter Sprint Test and Illinois Agility Test namely $R = 0.532$, $p < 0.05$ and $R = 0.582$, $p < 0.05$. There was a significant negative relationship between BMI on the Beep Test which was $R = -0.568$, $p < 0.05$. Body composition and physical fitness play an important role in shaping a competitive, agile, and fast futsal player during the game.

Futsal players often experience fatigue as the game progresses due to the high -intensity nature of the game, and the ability to repeat the sprint to the maximum and withstand fatigue is paramount to a player's overall game performance. Therefore, to play at a high level, futsal players need to possess or develop constant endurance, repetitive sprint ability, leg strength, and ability. The pattern of futsal activity indicates that both aerobic anaerobic energy systems are used. Therefore, systematic planning and meeting the needs of players in a particular type of sport must be researched and refined so that everything planned, targeted will be achieved effectively such as increasing the fitness level of players, improving technical skills, tactics and strengthen the physical and psychological players. The impact of team production or the success of an athlete also depends on the preparation of a planned training periodization plan and program.

Finally, the researcher recommends to further researchers to use more modern and up-to-date equipment, for high reliability, and the subject must be a professional player. This will

provide good validation and reliability, and provide a specific training program (periodization) that is geared towards individuals to improve player performance.

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