

Determinants of body fitness in youth Wushu Athlete Saburai Lampung

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Abstract

In addition to having good technique, a wushu athlete who wants to achieve optimal performance must also have a high level of body fitness. One component that can be used to measure fitness is endurance (Endurance). VO2Max is a measure that can be used to assess endurance, which is the body's ability to be able to breathe oxygen optimally during strenuous physical activity. Research results (Zawawi, 2021) in wushu athletes in Kediri city showed that 42.86% of wushu athletes turned out to have (VO2Max) with less category. This study aims to determine the most dominant factors related to the body fitness of Saburai Lampung wushu adolescent athletes. The research design used was cross sectional with a total sample of the population, which was 20 people. Data collection was conducted by means of interviews to determine age, sex, smoking habits, and supplement use, while measurements were used to determine nutritional status, body type, and VO2Max. Bivariate analysis using correlation test Rank Spearman and multivariate analysis using multiple logistic regression tests. The results of this study showed that there were 6 people (30%) wushu athletes who had body fitness with less categories. Then there is a very strong relationship between age and VO2Max ($p = 0.007$; correlation coefficient = 0.728), there is a strong relationship between nutritional status and VO2Max ($p = 0.004$; correlation coefficient = 0.655), there is a very strong relationship between smoking and VO2Max ($p = 0.009$; correlation coefficient = -0.800), and there is a sufficient relationship between body type (somatotype) and VO2Max ($p = 0.016$; correlation coefficient = 0.480). Sex was not associated with VO2Max ($p = 0.160$), and supplement use was not associated with VO2Max ($p = 0.124$). Nutritional status is known to be the most dominant factor associated with VO2Max ($p = 0.001$; OR = 7.025). To increase VO2Max, Saburai Lampung wushu athletes need to maintain good nutritional status through the consumption of nutritious, diverse, and balanced foods every day.

Keywords: Determinant Factor; VO2Max; Wushu Athlete; Saburai Lampung

1. Introduction

In improving the performance of an athlete, in addition to mastery of high technique, another factor is also needed, namely good physical condition. Good physical condition is a requirement that must be met in an effort to improve athlete performance, it can even be said to be a basic need that cannot be delayed or bargained anymore (Ridwan, 2020). Good physical condition can be described through physical fitness.

According to WHO, physical fitness is "the ability to perform physical activities". Meanwhile, according to the Indonesian Ministry of Health, physical fitness is the ability of a person's body to carry out daily activities effectively and efficiently in a relatively long period of time without causing excessive fatigue. Bawiling, Adiputra, & Tirtayasa (2014) stated that physical fitness is a person's ability and physical ability to carry out activities for a long time without experiencing significant fatigue. A person who has a good degree of physical fitness, will have a good ability to carry out tasks related to the physique given to him. In addition, he will experience insignificant fatigue after he performs his duties. He can still perform other tasks. Fit people will have the ability to recover in a relatively short time when compared to people who are not fit.

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The size of each person's physical fitness is different depending on the type of activity he does. The measure of physical freshness is largely determined by the components in it. According to the Ministry of Health (2013), the physical fitness component consists of 2 groups, namely health-related physical fitness components consisting of heart and lung endurance, muscle endurance, muscle strength, flexibility, and body composition. This component is very dominantly needed in community sports / non-competition sports. Then the physical fitness component related to skills (*skill related physical fitness*), consisting of components of movement speed, agility, balance, reaction time, coordination, and muscle explosive power. This component, plus health-related components, is needed in performance sports / competition sports. The cardiopulmonary endurance component is the basic and main component of physical fitness, so the cardiopulmonary endurance test is the minimum test that must be done in conducting a physical fitness test.

Based on the results of several studies that have been conducted in Indonesia, it can be seen that the level of physical fitness of athletes / sports in Indonesia is still low. The results of Aswin Priambodo's (2013) research on 12 Central Java PPLP basketball athletes showed that 25% had less fitness levels. Then the results of research by Elok Dwi Anggitasari, et al (2018) on 42 Semarang City Porprov team football athletes and Semarang EPFC soccer athletes turned out that 26.2% had a physical fitness level of less to moderate. Meanwhile, the results of research by Isnanda Putri Nur Istiqomah, et al (2021) on 30 athletes at the Mahameru Sukoharjo taekwondo club showed that 26.6% had a level of physical fitness that was less to moderate. The results of Vincentius Arsenio Vitolan Harianja's (2021) research on 15 badminton athletes in Bantul Regency also showed that 53.3% had a moderate level of physical fitness. Further research results (Zawawi, 2021) wushu athletes in Kediri City reported that of a number of athletes measured, 42.86% of them had endurance (VO_{2Max}) with less categories. Although each of the studies above is known to use different tests, in general it can be known that the level of physical fitness of athletes is still not good.

There are several factors that can affect a person's physical fitness level. According to Roji (2006), a person's physical fitness level is influenced by health problems (such as health conditions, infectious and chronic diseases), nutritional problems (such as lack of protein, calories, low nutrition and inadequate nutrition, physical exercise problems (such as age of starting exercise, frequency of weekly exercise, exercise intensity, and exercise volume), and hereditary problems (such as anthropometry and congenital abnormalities). Meanwhile, according to Asep Kurnia Nenggala (2016) physical fitness is influenced by diet, rest, exercise, and age. In his book entitled Sports Health Guide, Karim (2002) states that physical fitness is influenced by age, gender, genetics, food, and cigarette factors. According to Wiarto (2015), physical fitness is influenced by gender, age, food intake, somatotype, physical activity and smoking. The use of supplements that are not excessive is also believed to increase muscle size, so that muscle strength will be able to increase and fat will decrease. Supplements that are often used are vitamins and minerals because these two nutrients cannot be produced by the body.

Endurance is a basic component of physical fitness needed so that a person is able to move without feeling excessively tired. This component is a person's ability to use the heart, lungs, and circulatory systems. These organs must function optimally in carrying out daily activities, for a long time and without experiencing significant fatigue. The endurance of the heart and lungs plays a role in taking oxygen and distributing it to all parts of the body. Therefore, endurance is one of the main indicators of physical fitness.

Measurement of endurance (*Endurance*) can be done by measuring maximum oxygen consumption (VO_{2Max}). VO_{2Max} can be used as a parameter for athlete evaluation for training achievement (Fauzan et al., 2016). By measuring VO_{2Max} , it can be known how much the athlete's ability to absorb oxygen to perform activities until the athlete is at his highest fatigue point. The higher the athlete's VO_{2Max} achievement, the better the athlete's performance. (Aqmarin, 2022).

Wushu is a sport that belongs to a branch of martial arts originating from China and began to develop in Indonesia in the 1980s. As with other sports, to achieve high achievements, a wushu athlete must master skills and also have high physical fitness. Wushu is a sport that requires skills related to physical freshness, namely muscle stability and strength (especially, legs, hands, back, and abdomen), flexibility or flexibility of the body, body balance, and body coordination.

Sasana Wushu Saburai Lampung is one of the training places for wushu athletes in Lampung province which was established in April 2012, occupying Hall B PKOR Wayhalim (Jalan Sultan Agung, Wayhalim) and is under the guidance of KONI Bandar Lampung. Until now, no measurement has been made about physical fitness in Saburai Lampung wushu athletes and the factors that influence it.

Based on the description above, this study aims to determine the most dominant factors that affect VO_{2Max} of Saburai Lampung wushu athletes based on age, sex, nutritional status, smoking habits, supplement use, and body type (somatotype).

2. Methods

This research is a quantitative research with a *cross sectional approach*. This research was conducted on all wushu athletes at Saburai Wushu Gym, Lampung, totaling 20 people. The independent variables in this study were age, sex, nutritional status, smoking habits, supplement use, and body type (somatotype), while as the dependent variable was VO₂Max.

Data collection was carried out by means of interviews using questionnaires to determine age, sex, smoking habits, and supplement use. While nutritional status is measured using BMI index, body type is measured through body size, and VO₂Max is measured directly using *the bleep test audio method*. Data analysis was carried out bivariate and multivariate. For bivariate analysis, a correlation test is used because the data used is ordinal scale, while for multivariate analysis, multiple logistic regression tests are used at a 95% meaning level because the dependent variable is non-metric data.

3. Results

3.1. Univariate Analysis

The body fitness of 20 teenage wushu athletes was measured through the endurance component, namely by looking at VO₂Max using the bleep test *method*. The results of VO₂Max measurements of athletes can be seen in the following table:

Table 1 VO₂Max Level of Wushu Saburai Lampung Athletes in 2023

VO ₂ Max level	n	%
Good	4	20
Keep	10	50
Less	6	30
Total	20	100

Source : Primary Research Data Processing

In Table 1 it can be seen that of the 20 athletes measured it turns out that 10 people (50%) of them have VO₂Max levels with medium categories, while athletes who have VO₂Max levels with less categories are 6 people (30%), the rest have good VO₂Max levels.

For an overview of the characteristics of Saburai Lampung wushu athletes can be seen in the following table.

From the table below, it can be seen that most respondents (75%) are men, less than 18 years old (65%). Based on the results of BMI measurements, 20% have nutritional status with the fat category and the rest have nutritional status with normal categories. As many as 35% of respondents admitted to smoking ranging from mild to moderate categories. Then 30% of respondents also admitted to using supplements ranging from levels every day to certain times only. Judging from body type, 50% have a fat and short body type (*endomorph*), and 50% have a normal body type (*mesomorph*).

Table 2 Frequency Distribution of Characteristics of Wushu Athletes Saburai Lampung Year 2023

No	Characteristic	n	%
1	Age		
	≤18 Years	13	65
	>18 Years	7	35
2	Gender:		
	Man	15	75
	Woman	5	25
3	Nutritional Status (BMI)		
	Thin	0	0
	Usual	16	80
	Fat	4	20
4	Smoking Habits		
	No Smoking	13	65
	Smoke	7	35
5	Supplement Usage		
	Not Consuming	14	70
	Consume	6	30
6	Body type (Somatotype)		
	Endomorph (short plump)	10	50
	Mesomorph (ideal)	10	50
	Ectomorph (tall skinny)	0	0

3.2. Bivariate Analysis

After knowing the magnitude of each variable, the analysis continued with bivariate analysis. In this study, to determine the correlation or relationship between two variables, the *Spearman Rank test* was used because both variables are data with ordinal scales.

3.2.1. The relationship between sex and VO2Max of Wushu athletes

Table 3 Correlation of sex with VO2Max levels In 2023 Lampung Saburai Wushu Athletes

			Gender	VO2Max
Spearman's rho	Gender	Correlation Coefficient	1.000	0.450
		Sig. (2-tailed)		0.160
		N	20	20
	VO2Max	Correlation Coefficient	0.450	1.000
		Sig. (2-tailed)	0.000	
		N	20	20

Source : Primary Data of Processed Products

Based on the Spearman Rank test using the SPSS device, it was found that there was no significant correlation or relationship between the sex of Saburai Lampung wushu athletes and their VO2Max levels (sig.2-tailed = 0.160).

3.2.2. *The Relationship Between Age and VO2Max of Wushu Athletes*

Table 4 Correlation of age with VO2Max levels In 2023 Lampung Saburai Wushu Athletes

			Age	VO2Max
Spearman's rho	Age	Correlation Coefficient	1.000	0.728**
		Sig. (2-tailed)		0.007
		N	20	20
	VO2Max	Correlation Coefficient	0.728**	1.000
		Sig. (2-tailed)	0.007	
		N	20	20

Source : Primary Data of Processed Products

In the table above, it can be seen that there is a significant correlation between the age of Saburai Lampung wushu athletes and their VO2Max levels (sig.2-tailed = 0.007). with the strength of correlation in the category is very strong (correlation coefficient = 0.728). Because the value of the correlation coefficient is marked positive, the younger the age of wushu athletes, the higher the VO2Max they have.

3.2.3. *Relationship between nutritional status and VO2Max of Wushu athletes*

Table 5 Correlation of nutritional status with VO2Max levels In 2023 Lampung Saburai Wushu Athletes

			Nutritional Status	VO2Max
Spearman's rho	Nutritional Status	Correlation Coefficient	1.000	0.655
		Sig. (2-tailed)	-	0.004
		N		20
	VO2Max	Correlation Coefficient	0.655	1.000
		Sig. (2-tailed)	0.004	-
		N	20	20

Source : Primary Data of Processed Products

In table 5 it can be seen that there is a significant correlation or relationship between the nutritional status of Saburai Lampung wushu athletes and their VO2Max levels (sig.2-tailed = 0.004). with the strength of correlation in the strong category (correlation coefficient = 0.655). Because the value of the correlation coefficient is marked positive, the better the nutritional status of wushu athletes, the higher the VO2Max they have.

3.2.4. *The relationship between smoking habits and VO2Max of Wushu athletes*

Table 6 Correlation of smoking habits with VO2Max levels In 2023 Lampung Saburai Wushu Athletes

			Smoking Habits	VO2Max
Spearman's rho	Smoking Habits	Correlation Coefficient	1.000	-0.800
		Sig. (2-tailed)	.	0.009
		N	20	20
	VO2Max	Correlation Coefficient	-0.800	1.000
		Sig. (2-tailed)	0.009	.
		N	20	20

Source : Primary Data of Processed Products

Table 6 shows that there is a significant correlation between the smoking habits of Saburai Lampung wushu adolescent athletes and their 2Max VO because the value of sig.2-tailed is smaller than 0.05 ($p = 0.009$). The strength of the correlation between the two variables included in the category is very strong (correlation coefficient = 0.800). Because the value of the correlation coefficient is marked negative, it can be understood that if athletes do not smoke, their VO2Max levels will increase.

3.2.5. Relationship Between Supplement Use With VO2Max Wushu Athletes

Table 7 Correlation of supplement use with VO2Max levels In 2023 Lampung Saburai Wushu Athletes

			Supplements	VO2Max
Spearman's rho	Supplements	Correlation Coefficient	1.000	0.210
		Sig. (2-tailed)		0.124
		N	20	20
	VO2Max	Correlation Coefficient	0.210	1.000
		Sig. (2-tailed)	0.124	
		N	20	20

Source : Primary Data of Processed Products

The results of the Spearman Rank test on supplement use showed that there was no significant correlation between supplement use by Saburai Lampung wushu athletes and their VO2Max levels (sig.2-tailed = 0.124).

3.2.6. The Relationship Between Body Type and VO2Max of Wushu Athletes

Table 8 Correlation of body type (*somatotype*) with VO2Max levels In 2023 Lampung Saburai Wushu Athletes

			Body Type	VO2Max
Spearman's rho	Body Type	Correlation Coefficient	1.000	0.480**
		Sig. (2-tailed)		0.016
		N	20	20
	VO2Max	Correlation Coefficient	0.480**	1.000
		Sig. (2-tailed)	0.016	
		N	20	20

Source : Primary Data of Processed Products

In table 8 it can be seen that there is a significant correlation between the body type of Saburai Lampung wushu athletes and the VO₂Max they have because the value of sig.2-tailed is smaller than 0.05 ($p = 0.016$). The strength of the correlation between the two variables is included in the sufficient category (correlation coefficient = 0.480). Because the value of the correlation coefficient is positively signed, it can be understood that the more ideal the athlete's body shape, the VO2Max level will increase.

3.3. Multivariate Analysis

In multivariate analysis, the variables included in the analysis are variables that have been analyzed bivariately and have a *p-value* of < 0.25. The results of bivariate analysis can be seen in the table below:

Based on the table below, the variables that are included as candidates to be included in the multivariate analysis are age, nutritional status, smoking habits, and body type (*somatotype*) because it has a *p value of* < 0.25. The supplement use variable was not a candidate and was excluded, while the gender variable although not included as a candidate but because it was substantially considered important it was still included as a candidate in the multivariate analysis.

Table 9 The results of the correlation analysis between respondents' characteristics and VO_{2Max} in wushu athletes Saburai Lampung in 2023

No.	Variable	p-value	Information
1.	Age	0.007	Candidate
2.	Gender	0.160	Not a Candidate
3.	Nutritional Status	0.004	Candidate
4.	Smoking Habits	0.009	Candidate
5.	Supplement Usage	0.124	Not a Candidate
6.	Body Type (Somatotype)	0.016	Candidate

All variables that passed the *bivariate logistics* selection were then included in the multivariate modeling test phase I. The results can be seen in the table below.

Table 10 Multivariate Modeling Test Results Phase I

Variable	PR	P value	95.0% C.I	
			Lower	Upper
Age	1.383	0.529	0.504	3.792
Gender	1.829	0.236	0.673	4.972
Nutritional Status	7.025	0.001	2.173	22.708
Smoking Habits	4.464	0.004	1.613	12.351
Body Type	5.246	0.013	1.409	19.526
Constant	0.002	0.000		

Of the 5 variables mentioned above, there are two variables that have a p value of > 0.05 , namely *age and gender*, but because the p value of the age variable is the largest, in stage II modeling the age variable is excluded from the model.

Table 11 Multivariate Modeling Test Results Phase II

Variable	PR	P value	95.0% C.I	
			Lower	Upper
Gender	1.861	0.222	0.687	5.044
Nutritional Status	7.028	0.001	2.184	22.610
Smoking Habits	4.571	0.003	1.663	12.561
Body Type	5.836	0.007	1.631	20.888
Constant	0.002	0.000		

After the age variable is removed, it is known that there is a change in the prevalence risk (PR) value for the variables Gender, Nutritional Status, Smoking Habits, and Body Type as follows:

Table 12 PR Changes after Age Variables Are Excluded

Variable	PR Age Exists	PR Age does not exist	Change OR (%)
Age	1.383	-	
Gender	1.829	1.861	1.7
Nutritional Status	7.025	7.028	0.0
Smoking Habits	4.464	4.571	2.3
Body Type	5.246	5.836	10.1

It turns out that after age is released, there is a variable that changes PR > 10%, namely body type. In the Phase III multivariate modeling test, age variables were again included in the modeling and sex variables were excluded.

Table 13 Multivariate Modeling Test Results Phase III

Variable	PR	P value	95.0% C.I	
			Lower	Upper
Age	1.432	0.484	0.524	3.909
Nutritional Status	5.960	0.002	1.944	18.270
Smoking Habits	4.747	0.003	1.724	13.076
Body Type	5.368	0.012	1.445	19.936
Constant	0.003	0.000		

After the sex variable was excluded, there was a change in PR values for the variables of age, nutritional status, smoking habits, and body type as follows:

Table 14 PR Changes after the Gender Variable is excluded

Variable	PR Gender Exists	PR Gender is missing	Change OR (%)
Age	1.383	1.432	3.4
Gender	1.829	-	-
Nutritional Status	7.025	5.960	17.9
Smoking Habits	4.464	4.747	6
Body Type	5.246	5.368	2.3

After the sex variable was excluded, it turned out that the variable that experienced a change in PR > 10% was nutritional status.

In this study, no interaction test was carried out because it was substantially understood that there was no interaction between the variables used so that the final results of multivariate analysis were as follows:

Table 15 Final Stage Multivariate Modeling Test Results

Variable	B	PR	P value	95.0% C.I	
				Lower	Upper
Age	0.324	1.383	0.529	0.504	3.792
Gender	0.604	1.829	0.236	0.673	4.972
Nutritional Status	1.950	7.025	0.001	2.173	22.708
Smoking Habits	1.496	4.464	0.004	1.613	12.351
Body Type	1.657	5.246	0.013	1.409	19.526
Constant	-6.327	0.002	0.000		

From the table above, it can be seen that nutritional status is the most dominant factor related to VO₂Max levels because it has the highest PR value, which is 7.025.

4. Discussion

4.1. Physical Fitness

From the measurement results on 20 Saburai Lampung wushu athletes, it can be seen that there are 6 people (30%) who have VO₂Max with less category and 4 people (20%) who have VO₂Max with good category. The rest have VO₂Max with a medium category. The results of this study are no different from the results of Isnanda Putri Nur Istiqomah's research. et al (2021) on 30 Taekwondo athletes in Surakarta who found 26.6% of athletes turned out to have VO₂Max with less to less categories. The results of another study conducted by Sarah Ulfah Mahaciliawati and Sintha Fransiske (2020) on 50 teenage soccer athletes in South Tangerang found that 22% of teenage soccer athletes in South Tangerang had a lack of physical fitness. Then the results of research by Muhamad Yusup and Siti Rochmani (2020) on 96 vocational school students in Tangerang found that 45.8% of students had a lack of physical fitness. The results of research by Angga Hardiansyah, et al (2022) on 87 MAN students in Semarang also showed that 50.6% of students measured turned out to have a less physical fitness level. The high level of physical fitness mentioned in the last 2 research results is likely due to the respondents measured are high school students who do not necessarily have sports habits compared to athletes.

There are still Saburai Lampung wushu athletes who have less VO₂ Max can occur due to several things, for example due to lack of rest / sleep factors, lack of exercise intensity, and unbalanced food consumption factors. Rest is needed by the body to restore energy when fatigue occurs. With enough sleep, the body will come back refreshed and ready to move again the next day. Sleep time needed in a day is approximately 7-10 hours at night. Consumption of adequate and balanced food, in addition to being used as a source of energy is also very necessary as a means of growth and development of body organs. Food consumed must be healthy and nutritious so that the body can grow and develop optimally.

While good exercise or exercise must be in accordance with the frequency, duration, and intensity. To maintain fitness, exercise should be done 3 times a week with a duration of about 45 minutes and intensity according to body strength. Exercise habits are very influential on physical fitness, especially the intensity, frequency, and duration of exercise. By getting used to exercising, it will greatly help improve fitness (Ilyas, 2020). Exercisethat is done regularly will cause the lungs to have the ability to hold 1.5 more air than people who never exercise. Low VO₂Max will have an impact on the body's performance, namely the body cannot work optimally (Bryantara, 2016). According to Pawaria, et al (2017), physical fitness is something important in order to be able to carry out various activities, a person's physical fitness is reflected in respiratory and cardiovascular fitness which is the overall capacity of the respiratory and cardiovascular systems, as well as the ability to carry out prolonged activities.

Physical fitness consists of several components, namely endurance, muscle strength, speed, agility, flexibility, power, balance, coordination, accuracy, reaction. The endurance component is the main component in one's physical fitness, because with good endurance, a person can carry out his activities without having to feel excessive fatigue. To measure the level of endurance, VO₂Max can be used, which is how much oxygen is inhaled maximally during activity. The more

oxygen you breathe, the more energy your body can use for activities. Therefore, if a person has a high level of VO₂Max usually also has good physical fitness. If the VO₂ Max level is low, the body's ability to produce energy also becomes low as a result of reduced oxygen which functions to bind Adenosine Tri Phosphate (ATP) to produce energy. A person who has a low VO₂ Max is not fast enough to be able to perform intensive activities because the energy needed must be taken from burning fat.

4.2. The Relationship Between Age and VO₂ Max

From the results of this study it can be seen that there is a significant and very strong relationship between age and VO₂ Max in Saburai Lampung wushu athletes ($p = 0.007$; correlation coefficient = 0.728). This is in line with the results of research by Seni Oktriani, et al (2020) which reported that there is a relationship between age and physical fitness in the elderly ($p = 0.012$). Then the results of Yusri's research (2019) also found that there was a meaningful relationship between age variables and the physical fitness status of prospective pilgrims in Palembang City ($p = \text{value} = 0.000$; PR = 3.601). Research by Arisandi, et al (2018) on employees of the Probolinggo Port Health Office (KKP) also concluded that there is a relationship between age and physical fitness ($p\text{-value} = 0.030$). Although the results of the study above used different respondents, it can be seen that there is a relationship between age factors and the level of physical fitness.

Increasing age will limit joint space, so that in older people flexibility or flexibility of motion will decrease because the joints become more rigid. Flexibility or flexibility is the ability of the joint to perform movements in the joint space to the maximum. People who have good flexibility can achieve better fitness levels. Increasing age will also cause a decrease in muscle ability and organ function, such as a decrease in contraction and heart muscle mass, a decrease in total lung capacity and a decrease in skeletal muscle ability. The increase in muscle strength will peak until the age of 25 years, then will decrease with age. At the age of 65 years muscle strength is estimated to be only about 65 – 75%.

Age can affect almost all components in physical fitness. Each age level has a variety of physical fitness levels. Physical fitness in children can increase until the age of 25-30 years. Then there will be a decrease in the functional capacity of all organs of the body around 0.81-1% per year along with age, especially for people who lack activity (Afrwardi, 2011). The form of physical decline that occurs as a person ages, can be seen from muscle strength, heart endurance, to the speed of movement.

In this study, most (65%) of the athletes measured were less or equal to 18 years old, so it is understandable that only 30% had a lack of physical fitness.

4.3. The Relationship Between Sex and VO₂ Max

The results of this study showed that there was no relationship between sex factors and VO₂ Max in Saburai Lampung wushu athletes ($p = 0.160$). This result is in line with the results of research by Fadhilati Sabrina (2020) who reported that there was no relationship between sex and physical fitness of elementary school children in Padang ($p = 0.283$). But different results are shown by the results of research by Seni Oktriani (2020) and Arga Firdaus (2021) which report that there is a relationship between sex and physical fitness.

The occurrence of differences in the results of this study with the two results of the last mentioned study is likely to occur in addition to the respondents measured differently also because the physical fitness tests used are different. In this study, the physical fitness test only measured 1 (one) component, namely endurance, while the Art research measured 6 components, namely muscle strength, body mass index, endurance, flexibility / flexibility, agility, and balance. While Arga measures 4 components, namely speed, muscle strength, muscle explosive power, and heart and lung endurance. By measuring more components, there is a greater likelihood of differences in results obtained between men and women. Compared to women, men have more muscles, so muscle strength and muscle explosive power will be better. In addition, the difference between men and women is also caused by differences in maximum muscular power related to body surface area, body composition, muscle strength, hemoglobin count, lung capacity, and so on.

4.4. The relationship between nutritional status and VO₂ max

The results of this study showed that there was a significant correlation between the nutritional status of Saburai Lampung wushu adolescent athletes and their 2Max VO ($p = 0.044$). The strength of the correlation between the two variables is included in the medium category (correlation coefficient = 0.455). The results of this study are in line with the results of research by Ni Made Ida Damma Anggraeni (2022) which states that there is a relationship between nutritional status and physical fitness of elementary school students in East Lampung Regency ($p = 0.000$). Similarly, the results of Isnanda Putri's research. et al (2021) who reported that there was a relationship between nutritional

status and physical fitness ($p = 0.028$) with the strength of the relationship in the medium category ($R = 0.401$). The results of research by Sarah Ulfah Mahaciliawati and Sintha Fransiske (2020) also stated that there was a significant relationship between the nutritional status of ASTAM South Tangerang Football School students and their fitness level ($p = 0.040$).

An optimal level of physical freshness is not only obtained by doing regular exercise, adequate rest and maintaining health, but also must be balanced with the fulfillment of nutrients contained in the food consumed.

Someone with normal nutritional status will be able to produce a fresh body condition and will appear more confident appearing in public, especially in everyday life. Other than that someone who has good freshness will be able to work or move for a long time without feeling tired prematurely. This is because they have large energy reserves. They will be quick in recovering energy that is used up during activities. So that this is clearly effective for one's performance both during work and activities.

Eating nutritious foods will make a person have a good level of nutritional status that will increase the level of physical freshness of a person. However, if excessive food consumption will cause obesity. If the consumption of more nutrients (fat) will be followed by a decrease in physical freshness. Eating nutritious foods will make a person have a good level of nutritional status that will increase the level of physical freshness of a person. However, if excessive food consumption will cause obesity. If the consumption of more nutrients (fat) will be followed by a decrease in physical freshness. The availability of sufficient energy can be obtained if a person's nutritional status is in good condition, therefore the better a person's nutritional status, the better the level of physical fitness, so that the need for food that has sufficient and balanced nutritional components is needed to obtain sufficient and balanced energy for the body (Widiastuti, 2015)

4.5. The relationship between smoking habits and physical fitness

The results of this study showed that there was a correlation between the smoking habits of Saburai Lampung wushu adolescent athletes and their VO_{2Max} ($p = 0.049$). The strength of the correlation between the two belongs to the low category ($R = 0.300$). The low strength of the correlation between smoking habits and VO_{2Max} of Saburai Lampung wushu athletes can occur because most athletes have non-smoking habits (65%), and those who have smoking habits are still in the mild category (35%). In addition, it is possible that the smoking habit has not been done for a long time.

The results of this study are no different from the results of research by Muhamad Yusup and Siti Rochmani (2020) which stated that there is a meaningful relationship between the smoking habits of vocational school students in Tangerang and their level of physical fitness ($p = 0.000$). Similarly, the results of the study Su et al. (2020) reported that smoking correlated with a decrease in physical fitness in aerobic (3000 m run) and anaerobic (sit-ups and push-ups) capacity tests.

Smoking habits can not only have a negative impact on general health, but can also have a negative impact on a person's physical fitness level because smoking is one of the predictors of decreased cardiopulmonary fitness (Nikolakaros, 2017). Smoking habits can cause an increase in carbon monoxide levels so that it will reduce the amount of oxygen that can be carried by hemoglobin. This disruption of oxygen delivery can reduce the formation of adenosine triphosphate, resulting in a lack of energy to help muscle contraction (Degens, et al, 2015). In addition, decreased fitness as a negative effect of smoking is on the circulatory system. Smoking can damage the endothelium of blood vessels and affect the blood supply of respiratory muscles. Smokers have 7.2% less cardiorespiratory endurance than nonsmokers. Smokers have a higher resting pulse rate and a lower maximum pulse rate. The higher the resting pulse rate means the smoker's cardiovascular system is working harder to pump blood so fatigue comes on faster.

Based on the results of research by Marta and Indika (2020) that there is a difference in VO_{2Max} levels between smoker and non-smoker athletes, where VO_{2Max} of non-smoker athletes is better than smoker players. Smoking habits can cause an increase in blood cholesterol. Each cigarette can increase heart racing and blood pressure, there is a lack of oxygen in blood circulation throughout the body, a gradual decrease in aerobic capacity.

Some studies have also reported that smoking also negatively affects another component of fitness: speed. Smoking habits can increase proteolysis and inhibit protein synthesis, resulting in loss of muscle mass. The results of the study Moslemi-Haghighi et al. (2011) showed that the running speed of smokers was significantly slower compared to those who had never smoked.

4.6. The Relationship Between Supplement Consumption and VO2 Max

In this study, there was no relationship between supplement consumption and VO2 Max in Saburai Lampung wushu athletes ($p = 0.124$). The results of this study are no different from the results of research by Fajar Afrindo and Merryana Adriani (2019) which stated that there was no relationship between taking supplements and physical fitness in members of the Tivoli fitness center in Sidoarjo ($p = 0.716$). Similarly, the results of research by Sarah Ulfah Mahaciliawati and Sintha Fransiske (2019) stated that there was no relationship between taking supplements and physical fitness in ASTAM football school students in South Tangerang ($p = 0.107$).

It is known that more than 50% of respondents take vitamin and mineral supplements, this is because respondents believe that consumption of vitamin and mineral supplements can improve their performance. The results of research by Yosefin Hanna, et al (2009) on 99 aquatic athletes reported that 74.7% of athletes took vitamin and mineral supplements.

There are several types of supplements, including supplements that contain natural oils, supplements that contain enzymes and also supplements that contain vitamins and minerals. Some sources state that vitamin and mineral supplements are supplements that are widely consumed by the community. This is because vitamin and mineral supplements are essential organic ingredients for the body but are not formed by the body. But the effects of using supplements have actually not been regulated so there is no guarantee if taking supplements can provide positive results, even if consumed in excess can endanger health.

Burke and Deakin (2006) mentioned that respondents who take supplements will not be able to improve physical fitness. This is reinforced by the opinion of Mann & Truswell (2007) which states that taking supplements regularly will not be able to show improvement in physical fitness, except in cases of dehydration. While Erdman (2006) states that consumption of vitamin and mineral supplements can increase energy, maintain health, and prevent deficiency.

4.7. Relationship Between Body Type (Somatotype) and VO2 Max

In this study, there was a relationship between supplement consumption and VO2 Max in Saburai Lampung wushu athletes ($p = 0.016$). What was obtained in this study turned out to be in line with the results of Elok Dwi Anggitasari, et al's (2019) research that there is a relationship between somatotype and physical fitness. Meanwhile, the results of research by Zulfah Rahmah, et al (2019) reported that there was no relationship between somatotype and physical fitness of sports athletes in West Sumatra PPLP ($p = 1,000$). The difference in the results of this study with the results of the last mentioned study can occur because the number of samples used by Zulfah Rahmah is only 37 people, besides that the somatotype variable is categorized into 2, which is appropriate and not in accordance with the sports occupied by respondents.

Somatotype is the suitability of a person's body condition with the sport he undergoes and somatotype is very decisive in physical activity. Athletes with somatotypes that are in accordance with sports are very influential on athlete performance, as well as futsal athletes who can shape the level of fitness owned by athletes. In performing physical activity, the somatotype can increase the level of fitness obtained from intensity and frequency.

Broadly speaking, the human body type consists of: endomorph type which has the characteristics of a round body with a lot of fat, a large and round head, short bones, a short neck, fat concentration on the abdomen and chest, narrow shoulders, fatty chest, short hands, large buttocks, wide legs and waist. The mesomorph type has the characteristics of a square body, strong and hard muscles, large bones and covered with thick muscles, legs, togok, arms are generally massive (solid or heavy) with strong muscles, large and relatively have a slim waist, broad shoulders, while the ectomorph type is generally slim, small body, small bones with thin muscles, arms and legs relatively long with short rubbing, This does not mean that the person is always tall, the abdomen and spine are evenly distributed, the chest is relatively sharp and raised, the shoulders are narrow, and the muscle paths are not visible.

In this study, it was known that there were 10 people (50%) wushu athletes who had a mesomorph body type, which is the ideal body type for wushu, while 10 other people had an endomorph body type, which is a short fat body type. With an ideal body, speed, muscle strength, balance, and coordination are needed in wushu.

4.8. The most dominant factor affecting VO2 Max

From the results of multiple logistic regression tests conducted on 4 (four) variables that are candidates, namely age, nutritional status, smoking habits, and body type (somatotype), it can be seen that nutritional status is the most

dominant factor affecting the VO₂Max of wushu athletes ($p = 0.001$; $PR = 7.025$), followed by the somatotype factor ($p = 0.013$; $OR = 5.246$), and smoking factors ($p = 0.004$; $OR = 4.464$).

More dominant nutritional status factors against VO₂Max can occur because 80% of wushu athletes measured have normal nutritional status. Measurement of nutritional status of athletes using Body Mass Index (BMI) shows that the nutritional status depicted today is a reflection of past conditions (chronic). That is, the nutritional status of athletes today is the result of a long process, as well as heart and lung health conditions that do not appear instantly in a short period of time.

For an athlete, good nutritional status can enhance cardiovascular endurance. Nutritional status has an important role in improving the cardiovascular endurance of wushu athletes, in addition to regular and regular exercise. Wushu athletes need good nutrition to perform strenuous physical activities, such as training and matches.

5. Conclusion and Advice

From the results of VO₂Max measurements conducted on 20 teenage wushu athletes in Saburai Lampung, it can be seen that 30% of them have less VO₂Max levels. Low levels of VO₂Max can reflect a low level of physical fitness because VO₂Max is an indicator of endurance. The study also reported that there was a correlation between age ($p = 0.007$), nutritional status ($p = 0.004$), smoking habits ($p = 0.009$), and body type ($p = 0.016$) with VO₂Max of Saburai Lampung wushu athletes, then there was no relationship between sex ($p = 0.160$) and supplement use ($p = 0.124$) with VO₂Max of Saburai Lampung wushu athletes.

Based on the results of this study, to improve the physical fitness of wushu saburai Lampung adolescent athletes, it is recommended that wushu athletes consume a balanced diet every day to maintain good nutritional status and always abstain from smoking, both electronic and conventional cigarettes.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

All respondents in this study made informed consent.

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