

Somatotype of the Tarung Derajat martial arts athletes in the fighter category

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Received: 22 November 2022; Accepted 13 January 2023; Published 06 February 2023
Ed 2023; 8(1): 14-23

ABSTRACT

Somatotype is a parameter used to determine criteria based on body type. However, not many have taken somatotype measurements when selecting prospective athletes. The purpose of this study is to examine the somatotype of fighters in Tarung Derajat Martial Arts. In this study, tests and measurements of somatotype were carried out using manual anthropometric measurements, including height, weight, skinfold measurements at five points (biceps, triceps, supraillaca, subscapula, and calf), arm circumference, calf circumference, and measurement of the width of the humerus bone and femur. The purposive sampling technique is used in determining the sample. In this study, 15 Tarung Derajat martial arts athletes, consisting of seven men and eight women, were sampled. The results of this study showed that 7 athletes had a mesomorph endomorph somatotype with a percentage of 46%, 1 athlete had an endomorph somatotype with a 7% percentage, 6 central athletes had a percentage of 40%, and 1 athlete had an ectomorph endomorph somatotype with a percentage of 7%. Finally, the dominant body type in Tarung Derajat Fighter athletes is mesomorph endomorph (46%), followed by central (40%). This study's data provide physical characteristics of degree fighters, which can be used to establish a reference for systematic sports medicine research.

Keywords: Somatotype; tarung derajat; anthropometry; self-defense

 [https://doi.org/10.25299/sportarea.2023.vol8\(1\).11015](https://doi.org/10.25299/sportarea.2023.vol8(1).11015)

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How to Cite: Samodra, Y. T. J., Gustian, U., Seli, S., Riyanti, D., Suryadi, D., Fauziah, E., & Mashud. (2023). Somatotype of the Tarung Derajat martial arts athletes in the fighter category, *Journal Sport Area*, 8(1), 14-23. [https://doi.org/10.25299/sportarea.2023.vol8\(1\).11015](https://doi.org/10.25299/sportarea.2023.vol8(1).11015)

Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

Somatotype is a parameter used to measure and determine body composition (Chiu et al., 2021; Das et al., 2021; Ibáñez-Zamacona et al., 2019; Khairil et al., 2021; Khairunnisa Balqis et al., 2020; Subramanian et al., 2019; Sukmawarti et al., 2019). In general, human body types are divided into three, namely mesomorph, endomorph, and ectomorph (Drywien et al., 2016; Kathirgamam et al., 2020). The endomorph type is characterized as tending to be fat, heavy, and usually short (Kathirgamam et al., 2020), while the mesomorph is muscular and the ectomorph is thin (Rahmah et al., 2020) (Khairil et al., 2021). An example

of this is found in the somatotypes of overweight and obese people (Liu et al., 2021): endomorphic mesomorph, mesomorph-endomorph, and mesomorphic endomorph.

According to several studies, the somatotype component is an important assessment of athletes (Penggali et al., 2017). The importance of knowing the athlete's somatotype is reinforced by the statements of Drywie et al., (2021) and Gutnik et al., (2015) that somatotype characteristics help in selecting sports activities because this has benefits and influences the training to be carried out. In line with the statement of Shariat et al. (2017), body composition plays an important role in the achievement of an athlete's sport. Furthermore, Sevdalev et al. (2020) discovered that somatotypes play a role in developing women's training programs to improve health, and Roklicer et al. (2020) discovered that different somatotypes require different training. Based on these reviews, it can be concluded that in sports, the somatotype provides a role based on the sports the athletes are involved in.

Furthermore, somatotype makes it easier for athletes with disabilities to develop body composition components to practice and develop their athletic abilities (Kamionka et al., 2020). Women with a small athletic somatotype are likely to have type 2 diabetes mellitus (Guryeva & Alekseyeva, 2021). Previous research on endomorphs and mesomorphs has found poor autonomic nerves compared to other somatotypes (Subramanian et al., 2019). In terms of strength, Inarli and Kafkas (2019) support the mesomorph-endomorph structure, while the mesomorph and ectomorph components contribute positively to explosive strength and aerobic capacity scores. Research has shown that the diversity of somatotypes may change by implementing exercises that focus on the physical abilities of athletes (Drapsin et al., 2020); nutritional intake also affects somatotype (Khairil & Wan, 2019; Penggali et al., 2017).

Based on the aforementioned review, it can be concluded that there are a lot of benefits that can be obtained by knowing the somatotype possessed by athletes. This should be a serious concern for coaches so that they can adjust their training based on the physical abilities of the athletes. Khasawneh (2015) revealed the constant balance and agility among males who have the endomorph somatotype, while mesomorph and ectomorph females effectively contributed to the dynamic balance and agility. A balanced mesomorph has more agility than other somatotype categories (Qurun, 2016). According to Drywien et al. (2016), mesomorph somatotypes consume more carbohydrates, whereas endomorphs find it difficult to maintain ideal body weight in women.

Based on the research results of Noh et al. (2018), almost all martial arts athletes tend to be mesomorphs. Having a mesomorph body type is more beneficial than other body types. To maximize athlete performance, somatotype identification is needed. Unfortunately, the Tarung Derajat athlete's proclivity toward somatotype was never fully realized. Likewise, research on the impact of somatotype on athlete performance is not yet available. Through this research, it is hoped that anthropometric measurements can be carried out in order to develop training programs and athlete specifications. The measurement of body type in the sport of pencak silat Tarung Derajat was calculated using the Heath-Carter anthropometric method, which included measurements of body weight, height, thickness of body fat, body circumference, and bone width. This research data is very useful for developing training and providing input to coaches so they can develop training programs that suit the body shape of each athlete. By presenting somatotype data, it makes it easier to see weaknesses and strengths from the other side in terms of training technology.

METHOD

This research is descriptive and quantitative, using survey methods, in which tests and measurements of somatotype were carried out using manual anthropometric measurements, including height, weight, skinfold measurements at five points (biceps, triceps, supraillaca, subscapula, and calf), arm circumference, circumference of the calves, and measurements of the width of the humerus and femur bones (Penggali et al., 2016; Rifki et al. 2020). Anthropometric measurements are taken by measuring body parts, which are done by first measuring body weight with a scale, then measuring height with a microtoise staturmeter, then measuring fat thickness with skinfold calliper measuring tools by measuring the triceps, subscapular, supraspinale, humerus and femur width with a sliding caliper, and calf and biceps width with a measuring

tape. This is done based on the figure of "the calculation of the anthropometrica," which is explained by Norton and Eston (2019) as follows:

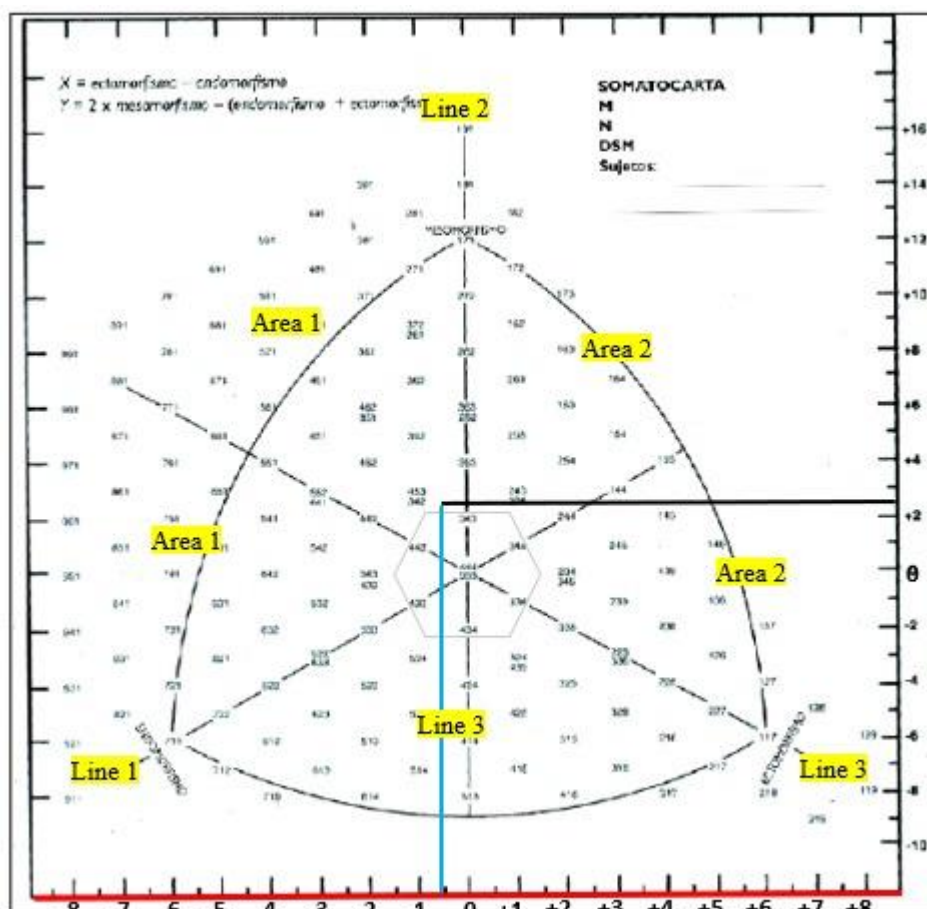


Figure 1. "Calculation of the Anthropometrica"

The population in this study was Tarung Derajat martial arts athletes, totaling 35 athletes. The sampling technique used was purposive sampling with the condition that Tarung Derajat athletes in the Movement Arts category who have participated in championships in all official events, at least Kurata IV (blue belt strip 1), and are still actively practicing Tarung Derajat were included. The sample of the study consisted of 15 Tarung Derajat athletes in the Pontianak City Fighter category, consisting of seven boys and eight girls. The research was carried out at the Mujahidin Satlat, Pontianak City, in June 2021. The data obtained in the field was in the form of test results for the somatotype measurement of Tarung Derajat athletes, which were then analyzed by using descriptive percentages for the analysis.

The anthropometric measurement test instrument determines somatotype by measuring three skinfold thicknesses to determine endomorphs, arm and calf circumference and humerus and femur widths to determine mesomorphs, and height and weight to determine ectomorphs. After finding these three somatypes, the next step was to use the X (endomorph) and Y (ectomorph) formulas to find the somatotype of the existing samples (Norton & Eston, 2019). Calculations in this study were assisted by Microsoft Excel software to determine the body shape of the Tarung Derajat athletes in West Kalimantan.

RESULTS AND DISCUSSION

Mesomorph Endomorph

Mesomorph-endomorphs are mesomorphs and endomorphs that are the same or do not differ by more than half a unit, while ectomorphs are smaller. Seven of the 15 participants in the study had a mesomorphic or endomorphic body type. The results show that where the X axis is, the X axis is in the horizontal line

position. The X axis and Y axis meet in region 1, where the region is the coordinate location for the mesomorph-endomorph body type. Body type can be determined by using a somatochart, which can be seen in Table 1.

Table 1. Mesomorph Endomorph Coordinate

Sample name	Coordinate		Category
LYA	X= -3,5	Y= 1,5	Mesomorph Endomorph
RA	X= -5,5	Y= 1,5	Mesomorph Endomorph
NSJ	X= -3	Y= -1	Mesomorph Endomorph
NY	X= -3	Y= 1	Mesomorph Endomorph
ARS	X= -2,5	Y= 2,5	Mesomorph Endomorph
SNA	X= -2,5	Y= 0,5	Mesomorph Endomorph
BK	X= -5	Y= 1	Mesomorph Endomorph

Endomorph

The endomorph is dominant, while the mesomorph and ectomorph are the same or do not differ by more than 1/3 unit. Of the 15 research samples conducted, there was only one that had an endomorph body type. The results show that the X axes meet at line 1, where the region is the location coordinate for the endomorph body type. Body type can be determined by using a 6* somatochart, which can be seen in Table 2.

Table 2. Endomorph Coordinate

Sample name	Coordinate		Category
SQK	X= -1,5	Y= -0,5	Endomorph

Central

The central idea is that there are no components that distinguish one type of unit from the other two types. Of the 15 research samples conducted, there were six that had a central body type. The results show that the X and Y axes meet on the inside of the hexagon, where the region is the coordinate location for the central body type. Body type can be determined by using a somatochart, which can be seen in Table 3.

Table 3. Central Coordinate

Sample name	Coordinate		Category
IAR	X= -1,5	Y= 0,5	Central
TWN	X= -1,5	Y= -0,5	Central
DSF	X= 1,5	Y= 0,5	Central
RF	X= 1,5	Y= 0,5	Central
AMP	X= 0	X= 2	Central
MRS	X= -0,5	X= 0,5	Central

Ectomorph Endomorph

The ectomorph endomorph is the more dominant endomorph, and the ectomorph is larger than the mesomorph. In the 15 research samples conducted, there was 1 sample that had an ectomorph-endomorph body type. The results show that the location of the X axis meets in region 3, where the region is the location coordinate for the Ectomorph Endomorph body type. Body type can be determined by using a somatochart. This can be seen in Table 4.

Table 4. Coordinate of Ectomorph Endomorph

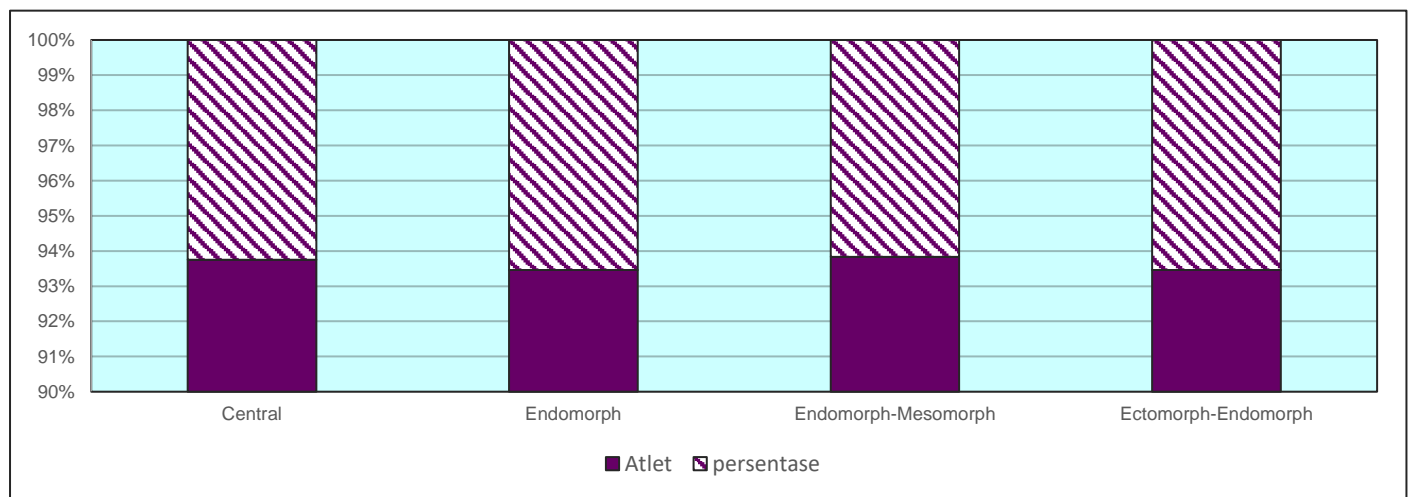
Sample name	Coordinate		Category
SF	X= -5,5	Y= 1,5	Ectomorph Endomorph

Based on the results of the data analysis, it shows that the somatotype of the Tarung Derajat martial arts sport has a body type, as shown in the data in Table 5:

Table 5. Percentage of Fighter Athlete Somatotype Categories

Somatotype	Percentage	Mode
Central	40%	6
Endomorph	7%	1
Endomorph-Mesomorph	46%	7
Mesomorph	0%	0
Mesomorph-Ectomorph	0%	0
Ectomorph	0%	0
Ectomorph-Endomorph	7%	1
Total	100%	15

The results of the research analysis have proven that the Tarung Derajat fighter athletes in Pontianak City have a mesomorph endomorph body type of seven athletes with a percentage of 46%, an endomorph body type of one athlete with a percentage of 7%, a central body type of six athletes with a percentage of 40%, and an ectomorph endomorph body type of one athlete with a percentage of 7%. This can be seen in the bar chart as follows:

**Graph 1. Somatotype Percentage**

Based on the results of the data that has been analyzed, it indicates that overall, the dominant body type possessed by Tarung Derajat fighter athletes tends to have a mesomorph endomorph body type of 46% and a central body type of 40%. Research has shown that the somatotypes of soccer players are different, which the position of the players tends to influence (Gorla et al., 2017; Kaplánová et al., 2020). Other researchers claim that different somatotypes in women have different levels of anxiety, motor activity, and adaptive potential (Kamionka et al., 2020). Furthermore, Roklicer et al. (2020) in their research obtained different results between male and female judoka. Athletes with disabilities also show several characteristics that are different from ordinary athletes (Penggali et al., 2019). Based on this study, somatotype differences tend to be influenced by the type of sport performed, where each sport certainly has its own predominance, so this is one of the factors that influences.

The next research study, which is in the form of an article, stated that the endomorph-mesomorph possessed by male sambo athletes dominates the musculoskeletal system (Trivic et al., 2020), elite pedal players (De La Fuente et al., 2019; Sánchez-Muoz et al., 2020; Stankovi et al., 2020), and Mexican men's volleyball defenders (Pineda et al., 2021), whereas those for offense are ecto-mesomorphic) (P. The mesomorphic endomorphic somatotype in Spanish tennis athletes tends to accumulate fat in the upper and lower limbs (Doménech et al., 2020). The results of research by Kaplánová et al. (2020) indicate that mesomorph-endomorph is dominant in Saudi Arabian football players. These results were reinforced by Shimrah et al. (2020), who claim that mesomorphic endomorph Sunni Muslim women and balanced endomorph men Based on the research review, it can be concluded that the endomorph-mesomorph body

type is more common in sports that require defense. With this, the somatotype should be one of the measurement tests in the selection of prospective athletes, so this gives an illustration that the somatotype can be a consideration in determining sports according to their body criteria.

In futsal and basketball athletes, there is a significant relationship with the mesomorph somatotype (Maulana, 2019). Another opinion states that adult males in Purulia, West Bengal, India, have the dominant body type found to be mesomorph-ectomorph (Das et al., 2021). The results of the balanced mesomorphic somatotype study are characteristic of international stand-up rowers, namely low skin folds and high arm muscle mass, which can represent key factors for performance in this sport because of their relationship with acceleration and striking force (Castaeda-Babarro et al., 2020); Slovak football players are the same (Pineda et al., 2021). According to Roklicer et al. (2020), the light category with a body weight of 48 kg is for female mesomorphic ectomorphs and male ectomorphic mesomorphs. Rahmah et al. (2020) said that a balanced mesomorph body shape must be owned by soccer athletes and an ectomorphic mesomorph for takraw.

Next, in the judo martial arts category, mesomorphic endomorphic represents the 52 kg class, mesomorphic ectomorphic (60 kg, 73 kg, 80 kg), and mesomorphic endomorphic (90 kg, 100 kg, >100 kg) class (Drapsin et al., 2020). For example, a study of 146 male volleyball, soccer, and rugby athletes with an age range of 26.2 4.4 years obtained results showing that 46 athletes had an endomorphic mesomorphic somatotype, balanced mesomorphy at age 26, and 55 ectomorphic mesomorphic mesomorph athletes consisting of mesomorph ectomorphs in 10 athletes, 13 with a mesomorphic ectomorph, and 14 balanced ectomorphy athletes (Campa et al., 2020). Research on Pencak Silat athletes in PAB Yogyakarta tends to dominate the ectomorphic endomorph semototype (Agustin et al., 2018). The quote above explains that somatotypes in sports have different types. Therefore, knowing the somatotype will make it easier for coaches to provide training. Thus, special training programs will be given to athletes (Roklicer et al., 2020; Seyhan, 2019). Based on these reviews, it can be concluded that knowing the somatotype will make it easier for coaches to determine the sport of prospective athletes to be coached. The results of the analysis of the research conducted have proven that the Tarung Derajat fighter athletes in Pontianak City have a mesomorph endomorph body type of seven, an endomorph body type of one, a central body type of six, and an ectomorph endomorph body type.

The results of this study are expected to influence training for training camps, with more emphasis on somatotype. The characteristics of fighters tend to have an ectomorph-mesomorph body type because the movements they make tend to be unstable so that after carrying out an attack, they can change positions and directions so they can avoid counterattacks by their opponents and can launch counterattacks again. Mesomorphy is a somatotype that dominates martial artists (Poliszczuk et al., 2015). Representatives of martial arts are muscles, height, and thinness (Raschka & Heppenheimer, 2016).

CONCLUSION

Based on the results of the data analysis and discussion about the somatotype of Tarung Derajat fighters in Pontianak City, it can be concluded that the body type of fighters with a sample of 15 people is mesomorph endomorph with a percentage of 46%, central with 40%, endomorph with 7%, and ectomorph endomorph with 7%. The body type possessed by fighter athletes does not meet the criteria that require fast movement in each movement. The results showed that the somatotype of Tarung Derajat fighters in Pontianak City is more mesomorph than endomorph.

Through this research, trainers must provide more appropriate training so that athletes can have the proper somatotype posture and thus maximize athlete performance. The coach must take measurements first to find out the athlete's body type. This is done to find out whether prospective athletes have a body type that matches their category, because with the appropriate body type, athletes can develop well and produce good achievements. The limitations of this study are that it only takes one martial art and the research subjects are still small. Furthermore, this study only describes the athlete's somatotype and has not provided an assessment of the suitability of the athlete's somatotype for pugilists. Recommendations for future research

are to involve a larger sample size and include other sports. Furthermore, exploring the effects of training programs and athlete performance with somatotype conditions.

ACKNOWLEDGEMENTS

We thank all those who have participated in this research. Tarung Drajat Coach, Atletes, National Sport Committee, West Kalimantan Province, in particular.

CONFLICT OF INTEREST

All authors declare that there is no conflict of interest whatsoever in this study.

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