JUARA: Jurnal Olahraga
E-ISSN 2655-1896 ISSN 2443-1117
https://doi.org/10.33222/juara.v7i1.1484

The Somatotype of Martial Athletes in the Fighter Category Against Achievement

Didi Suryadi [1], Uray Gustian [2], Ella Fauziah[3]
[1,2,3] Faculty of Teacher Training and Education, Universitas Tanjungpura, Jl. Prof. Dr. H. Hadari Nawawi, Bansir Laut, Pontianak City, West Kalimantan 78124, Indonesia
e-mail: didisurya1902@gmail.com[1], uray.gustian@fkip.untan.ac.id[2], ellafauziah9@gmail.com[3]

Info Artikel

Article History:
Received 25 October 2021
Approved 15 December 2021
Published 17 December 2021

Keywords:
Somatotype, Martial sport, Tarung Derajat

Abstract

This study aims to determine the effect of the somatotype of the Tarung Derajat martial arts athlete in the Fighter category on achievement. Quantitative descriptive research using survey method. Anthropometric manual tests and measurements to determine the athlete's body type. The research sample consisted of 8 male athletes and seven female Tarung Derajat Fighters in the West Kalimantan category, held at the Salat Mujahidin, Pontianak City. The data obtained in the field is the results of the somatotype measurement test and the achievement of Tarung Derajat athletes, then analyzed using descriptive percentages. The study results were 46% with endomorph mesomorph body type, 40% central, 7% endomorph, and 7% ectomorph mesomorph with local, national, and international achievements. The conclusion is that there is no influence between the somatotypes of the Tarung Derajat martial arts athletes in the Fighter category on achievement.

✉ Alamat korespondensi: Jl. Prof. Dr. H. Hadari Nawawi, Bansir Laut, Pontianak City
E-mail : didisurya1902@gmail.com

INTRODUCTION

Sport is a physical activity done by all ages, including children and the elderly. Various sports activities are carried out to have an ideal body (Balqis et al., 2020). Several studies have proven that sports activities affect fitness (Bile & Suharharjana, 2019; Chrisly et al., 2015; Dharma & Boy, 2020; Endrianto & Ma'mun, 2019; Fikri, 2017; Hadi, 2019; Hayudi & Pratama, 2019; Julianto, 2016; Majid, 2020; Prativi, 2013; Prayoga, 2020; Suryadi et al., 2021), and appropriate food intake (Kuswari et al., 2019). The results of research on hiking activities in women affect physical fitness (Firmana, 2018). Yoga, stationary bicycles, gymnastics, muscle exercises, and stretching at home are safe sports during the COVID-19 pandemic (Yuliana, 2020). Many sports can be done, one of which is a combat martial arts branch.

Tarung Derajat is a type of martial arts native to Indonesia (Putrawan et al., 2018). Came from Bandung on July 18, 1972 by one of the nation's sons, namely Achmad Drajat (Azhari et al., 2018). Aggressive and dynamic martial arts are in the form of punches, kicks, slams, blocks, locks, and dodges (Noviatmoko, 2016). The combat sport is an achievement that has just held the 2nd Southeast Asian championship in Malaysia and the XX September 2016 PON in the West Java championship, and the IFTD World Championship (Alnedral et al., 2018). The statement describes fighting sports as a branch of martial arts that has entered the championships. A lot of athlete coaching is carried out, including selecting somatotype athletes to become one of the coach's targets.

Research has shown that somatotype (Şenol et al., 2018) and good nutrition (Aini & Kemala, 2020) affect sports performance. Body composition and somatotype are considered as one of the elements of sports success (Dwiyanti et al., 2020) (Çinarli & Kafkas, 2019; Drywień et al., 2021; Gutnik et al., 2015; Roklicer et al., 2020), physical performance (Quintero et al., 2019), and anthropometric characteristics are of great importance in many sports (Blerim et al., 2018; Espinoza-Navarro et al., 2019; Perroni et al., 2015; Petković et al., 2019). Research conducted by (Sukmawarti et al., 2019) indicates a significant relationship between somatotype and the passing accuracy of futsal players. The results of these studies reveal the importance of somatotypes in sports; somatotypes are needed to determine the athlete's body shape to know what is required by the sport.

The somatotype of the human body is influenced by many factors, namely genetics, and there are also environmental factors and cultural differences (Kaplánová et al., 2020). According to (Shazmin & Manan, 2019), the most crucial aspect that affects somatotype and body composition is nutritional intake, and this statement is supported by (Penggalih et al., 2017) macronutrient intake has a significant relationship with changes in body weight, height, mesomorphic components of the somatotype. Recent research has found a connection between the nutritional status of athletes, somatotype, and food intake on sports performance (Penggalih et al., 2019). Consuming milk, yogurt, kefir, buttermilk, soft cottage cheese, and cream with more than 20% fat can affect body type (Drywień et al., 2017). In addition, body composition can be improved by performing suspension training (Asmara et al., 2020)

This research is that many athletes still do not know the body type needed in their sport. The coach should first take measurements to determine the body type of the candidate for the Tarung Derajat martial arts athlete in the Fighter category. Based on the results of research (Badaruddin & Rusli, 2019), physical and body structure contributed 89.20% to the achievement of female rowing athletes, so the results of this study provide an overview of the need for tests and measurements because this can help the

process of running a good training and achieve achievement. This study aims to determine the contribution of the somatotype of the Tarung Derajat martial arts athlete in the Fighter category to achievement.

METHODS

Quantitative descriptive research using survey method. Somatotype tests and measurements were carried out using manual anthropometric measurements (Chiu et al., 2021). In this study, the selection of the sample used was purposive sampling with specific considerations, so that 15 Tarung Derajat athletes consisting of 7 men and 8 women in the category of fighters in West Kalimantan Province were used as samples. Implementation of research in the Satlat Mujahiddin Pontianak City. The data obtained in the field is the results of the somatotype measurement test and the achievement of Tarung Derajat athletes, then analyzed using descriptive percentages to analyze. Microsoft Excel software-assisted calculations in determining body type calculations for Tarung Derajat athletes in West Kalimantan.

FINDINGS AND DISCUSSION

Findings

The research carried out a somatotype measurement test for Tarung Derajat athletes in June 2021. Anthropometric tests and measurements were carried out in several body parts, including using a scale to measure body weight. A microtome staturmeter to measure height and fat thickness by measuring the triceps, subscapular, and supraspinal used a skinfold caliper. A sliding caliper was used to measure the humerus and femur width, and the tape measure measured the calf and biceps width. The percentage of anthropometric tests and measurements for Tarung Derajat martial arts athletes in the Fighter category shows that the body type that Fighter athletes mainly own is the endomorph-mesomorph body type, with a total of 7 athletes from the total. Fighter athletes with a significant body type are four sons and two women with a percentage of 40%, an endomorph body type is one female with a percentage of 7%, and an ectomorph-endomorph body type is 1 female with a percentage of 7%. The somatotype of the Tarung Derajat, martial arts athlete, can be seen in table 1.

Table 1. Body Type of Fighter Athletes

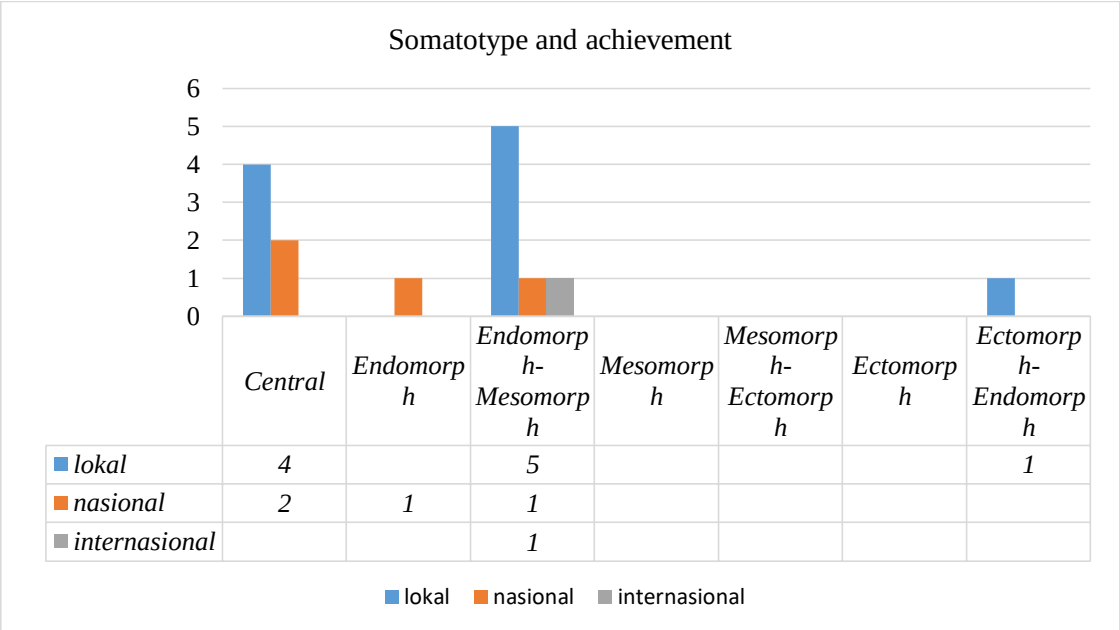
Somatotype	Athletes		Persentase	Modus
	Male	Female		
Central	4	2	40%	6
Endomorph	-	1	7%	1
Endomorph-Mesomorph	3	4	46%	7
Mesomorph	-	-	-	-
Mesomorph-Ectomorph	-	-	-	-

Ectomorph	-	-	-	-
Ectomorph-Endomorph	-	1	7%	1
Total	7	8	100%	

Based on table 2, somatotypes and achievements of the Tarung Derajat martial arts athletes in the Fighter category with an endomorph-mesomorph body type, five athletes have local achievements, 1 national and 1 international. Fighter athletes with a central body type, 4 local achievements, and 2 national achievements, with an endomorph body type, there is 1 national achievement athlete. Furthermore, 1 athlete with local achievements has an ectomorph-endomorph body type.

Table 2. Somatotype and achievement

somatotype	Athletes Fighter	Local	National	International
Central	6	4	2	-
Endomorph	1	-	1	-
Endomorph-Mesomorph	7	5	1	1
Mesomorph		-	-	
Mesomorph-Ectomorph	-	-	-	-
Ectomorph		-	-	
Ectomorph-Endomorph	1	1	-	-
Total	15	6	8	1



Graph 1. Somatotypes and achievements

Discussion

Anthropometry is used as a measuring tool for predicting the type of human body associated with sports (Balqis et al., 2020; Rifki et al., 2020). Previous research on anthropometry has become a key instrument for finding body changes (Gajardo-Burgos et al., 2018). The results of anthropometric measurements of 57 elite wrestlers showed no significant difference between the style and weight of the freestyle wrestlers and the Greco-Roman elite characterized by endomorphic mesomorphy (Kaplan & Yıldıran, 2018). The explanation above provides an overview of all sports that require anthropometric tests and measurements to determine the athlete's body shape to determine what is needed.

Sports that emphasize balance are suggested to have an endomorphic body (Top et al., 2018). The mesomorph body type tends to be owned by all combat sports athletes except for taekwondo athletes (Noh et al., 2018). A study of 20 Serbian male judokas had an average endo-mesomorphic somatotype (Milošević et al., 2016). The categories of mesomorphic endomorphic (-90 kg, -100 kg, >100 kg), mesomorphic ectomorphic (-60 kg, -73 kg, -81 kg), and judo athletes weighing -66 kg were ectomorphic mesomorphic and all-female athletes were endomorphic mesomorphs, except for category 52 (Drapsin et al., 2020). Meanwhile, according to (Kouamé et al., 2017), ecto-mesomorph in girls and boys gives the best performance on the quality of endurance. The somatotype of male rowing athletes is mesomorphic-endomorphic, whereas female players are more endo-mesomorphic (De La Fuente et al., 2019). Another opinion states that the characteristics of international stand-up rowers show that their low body fat percentage and high muscle mass thus have a balanced mesomorphic somatotype (Castañeda-Babarro et al., 2020). Swimming athletes with disabilities have an ectomorphic mesomorph somatotype (Penggalih et al., 2019). The somatotype of elite padel players can be defined as endo mesomorphic (Sánchez-Muñoz et al., 2020; Stanković et al., 2020).

In sports, the game reveals that the goalkeeper exhibits a profile of endomorph-mesomorph (Gorla et al., 2017), outfield center back, balanced ectomorph at center-back, balanced mesomorph midfielder, and forward meso-ectomorph (Caballero-Ruíz et al., 2019; Cárdenas-Fernández et al., 2019), the results of a study (Kaplánová et al., 2020) that Slovakian mesomorphic football players are balanced and Saudi Arabian have mesomorph-endomorph somatotypes. Ultramarathon runners have an endo-mesomorph somatotype (Belli et al., 2016), triathlon mesomorph cyclists and corridor swimmers are ectomorphs (Rivas et al., 2015). Basketball is ectomorphic mesomorph (Rivera-Sosa, 2016), different results basketball is mostly endomorphic, and soccer is most often ectomorphic (Gutnik et al., 2015). Based on this explanation, somatotypes in sports have different types due to the needs in the sport. Tarung Derajat is an open skill

sport that requires speed to move and carry out attacks. In general, the ectomorph body type tends to support this martial art because a tall and thin body shape will reduce the movement made. Mesomorph is also needed. This statement aligns with the information (Noh et al., 2018) that combat athletes tend to be mesomorphs. The results of research conducted by (Dwiyanti et al., 2020) also showed that the somatotypes of takraw and soccer athletes were not appropriate. Based on the results of the data that has been analyzed using anthropometric tests and measurements to measure the body type of the Tarung Derajat martial arts athlete in the Fighter category and the athlete's achievement data, 46% have 5 local, 1 national, and 1 international achievement with an endomorph-mesomorph somatotype. Central 40% consists of 4 local while 2 national, 7% endomorph with national achievement and 7% ectomorph-endomorph with local achievement.

Explanation of some of these studies so that this research can reference somatotypes in martial arts. The results of this study provide evidence of the dominant endomorph-mesomorph in the Tarung Derajat martial arts category in the Fighter category. This is different from the lightweight type of female judo, which has somatotype ectomorph mesomorph and mesomorph ectomorph in male athletes (Roklicer et al., 2020).

CONCLUSION

Based on the results of the discussion, endomorph mesomorph somatotypes have a high percentage of fighters in the category of 46%, central 40%, endomorph 7%, and ectomorph mesomorph 7% with local, national, and international achievements, so it can be concluded that somatotype does not have a significant influence on achievement in Tarung Derajat martial arts branch in the Fighter category. The limitations of this study are the small research sample, recommendations for further research using a more comprehensive sample and population.

REFERENCES

Aini, K., & Kemala, A. (2020). The Nutritional Status of Athletes in the Athletics Branches of DKI Jakarta During the Covid-19 Period Based on Anthropometry. *JUARA : Jurnal Olahraga*, *6*(1), 11–21. https://doi.org/10.33222/juara.v6i1.1028

Alnedral, Bakhtiar, S., & Umar. (2018). Strategies to improve intelligent characters and fighting ability of self-defense athletes of Tarung Derajat. *International Journal of Mechanical Engineering and Technology*, *9*(11), 1003–1013. http://repository.unp.ac.id/id/eprint/27798

Ardi Wira Azhari, Fajriudin, & Yosep Mardiana. (2018). Perkembangan seni beladiri tarung derajat di indonesia tahun 1972-2017. *Historia Madania*, *2*(2), 135–160. https://doi.org/https://doi.org/10.15575/hm.v2i2.9162

Arya Putrawan, I. P., Sudarma, M., & Arsa Suyadnya, I. M. (2018). Sistem pendukung keputusan seleksi atlet tarung derajat dengan metode promethee. *Jurnal SPEKTRUM*, *4*(2), 122–129. https://doi.org/10.24843/spektrum.2017.v04.i02.p16

Asmara, Y., Pitriani, P., & Mulyana, M. (2020). Suspension Training dan Weight Training Menurunkan Berat Badan, Visceral Fat dan Subcutaneous. *JUARA : Jurnal Olahraga*, *5*(2), 184–191. https://doi.org/10.33222/juara.v5i2.886

Badaruddin, & Rusli, M. (2019). Kontribusi potensi fisik dan struktur tubuh terhadap prestasi atlet dayung provinsi sulawesi tenggara 2019. *Jurnal Ilmu Keolahragaan*, *18*(2), 120–128. https://doi.org/https://doi.org/10.24114/jik.v18i2.15851

Belli, T., Meireles, C. L. D. S., Costa, M. de O., Ackermann, M. A., & Gobatto, C. A. (2016). Somatotype, body composition and performance in ultramarathon. *Revista Brasileira de Cineantropometria & Desempenho Humano*, *18*(2), 127–135. https://doi.org/10.5007/1980-0037.2016v18n2p127

Bile, R. L., & Suharharjana, S. (2019). Efektivitas Penggunaan Model Latihan Kebugaran "Bbc Exercise" Untuk Pemeliharaan Kebugaran Jasmani Mahasiswa. *SPORTIVE: Journal Of Physical Education, Sport and Recreation*, *3*(1), 30–37. https://doi.org/10.26858/sportive.v3i1.16857

Blerim, S., Zarko, K., Visar, G., Agron, A., & Egzon, S. (2018). Differences in Anthropometrics Characteristics, Somatotype and Motor Skill in Karate and Non-Athletes // Razlike u antropometrijskim karakteristikama, somatotipu i motoričkim sposobnostima karatista i nesportista. *Спортске Науке и Здравље - АПЕИРОН*, *7*(2), 108–111. https://doi.org/10.7251/ssh1702108b

Caballero-Ruíz, A., Carrasco-Legleu, C. E., De León, L. G., Candia-Luján, R., & Ortiz-Rodríguez, B. (2019). Somatotipo de mujeres futbolistas universitarias por posición en el terreno de juego (Somatotype of university female soccer players by playing position on the field). *Retos*, *36*, 228–230. https://doi.org/10.47197/retos.v36i36.63840

Cárdenas-Fernández, V., Chinchilla-Minguet, J. L., & Castillo-Rodriguez, A. (2019). Somatotype and Body Composition in Young Soccer Players According to the Playing Position and Sport Success. *Journal of Strength and Conditioning Research*, *33*(7), 1904–1911. https://doi.org/10.1519/JSC.0000000000002125

Castañeda-Babarro, A., Viribay-Morales, A., León-Guereño, P., Urdanpilleta-Otegui, A., Mielgo-Ayuso, J., & Coca, A. (2020). Anthropometric profile, body composition, and somatotype in stand-up paddle (Sup) boarding international athletes: A cross-sectional study. *Nutricion Hospitalaria*, *37*(5), 958–963. https://doi.org/10.20960/nh.03021

Chiu, C. Y., Ciems, R., Thelwell, M., Bullas, A., & Choppin, S. (2021). Estimating somatotype from a single-camera 3D body scanning system. *European Journal of Sport Science*, *21*(4), 1–7. https://doi.org/10.1080/17461391.2021.1921041

Chrisly M., P., Djon, W., & Shane H. R., T. (2015). Manfaat Latihan Olahraga Aerobik Terhadap Kebugaran Fisik Manusia. *Jurnal E-Biomedik*, *3*(1), 316–321. https://doi.org/https://doi.org/10.35790/ebm.v3i1.7127

Çinarli, F. S., & Kafkas, M. E. (2019). The effect of somatotype characters on selected physical performance parameters. *Physical Education of Students*, *23*(6), 279–287. https://doi.org/10.15561/20755279.2019.0602

De La Fuente, P., González-Jurado, J. A., García-GimÉnez, A., Gallego Tobón, F., & Castellar Otín, C. (2019). Anthropometric Characteristics Of Elite

Paddle Players. Pilot Study. *Revista Internacional de Medicina y Ciencias de La Actividad Fisica y Del Deporte*, *19*(74), 181–195. https://doi.org/10.15366/rimcafd2019.74.001

Dharma, U. S., & Boy, E. (2020). Peranan Latihan Aerobik dan Gerakan Salat terhadap Kebugaran Jantung dan Paru Lansia. *MAGNA MEDICA: Berkala Ilmiah Kedokteran Dan Kesehatan*, *6*(2), 122–129. https://doi.org/10.26714/magnamed.6.2.2019.122-129

Drapsin, M., Bojanic, D., Ljubojevic, M., Sadri, F., Jaksic, D., Trivic, T., & Drid, P. (2020). Somatotype profiles of male and female montenegrin judokas. *International Journal of Morphology*, *38*(5), 1244–1249. https://doi.org/10.4067/S0717-95022020000501244

Drywień, M., Frackiewicz, J., Górnicka, M., Kowalczyk, M., Umecka, A., & Kulik, S. (2017). The relationship of somatotype with the consumption of selected cereal and dairy products. *Anthropological Notebooks*, *23*(2), 39–49. http://ojs.westeurope.cloudapp.azure.com/Notebooks/article/view/79

Drywień, M., Górnicki, K., & Górnicka, M. (2021). Application of artificial neural network to somatotype determination. *Applied Sciences (Switzerland)*, *11*(4), 1365. https://doi.org/10.3390/app11041365

Dwiyanti, D., Hasneli, H., & Khairunnisa, K. (2020). The Correlation Between Dietary Habits and Physical Activity with the Somatotype of Game Sports Athletes. *JUARA : Jurnal Olahraga*, *6*(1), 39–49. https://doi.org/10.33222/juara.v6i1.1004

Endrianto, E., & Ma'mun, A. (2019). MKDU Olahraga dan Waktu Aktif Berolahraga Hubunganya dengan Kebugaran Jasmani dan Keterampilan Sosial. *Jurnal Penelitian Pendidikan*, *18*(3), 318–326. https://doi.org/10.17509/jpp.v18i3.15003

Espinoza-Navarro, O., Lizana, P. A., Gómez-Bruton, A., Brito-Hernández, L., & Lagos-Olivos, C. (2019). Anthropometric characteristics, body composition and somatotype of elite pan-american race walking 20K. *International Journal of Morphology*, *37*(4), 1220–1225. https://doi.org/10.4067/S0717-95022019000401220

Fikri, A. (2017). Meningkatkan Kebugaran Jasmani Melalui Metode Latihan Sirkuit Dalam Pembelajaran Pendidikan Jasmani Olahraga Dan Kesehatan Di SMA Negeri 1 Lubuklinggau. *Jurnal Pembelajaran Olahraga*, *3*(1), 89–102.

Firmana, I. (2018). Kontribusi Kegiatan Hiking Terhadap Kebugaran Jasmani Anak Perempuan Yang Gemar Bermain Futsal. *JUARA : Jurnal Olahraga*, *3*(1), 36–41. https://doi.org/10.33222/juara.v3i1.214

Gajardo-Burgos, R., Barría Vargas, C., Flández Valderrama, J., Avendaño Chipón, R., Barría Pailaquilén, R. M., & Monrroy Uarac, M. (2018). Anthropometric profile of chilean under-14 basketball players. *International Journal of Morphology*, *36*(3), 943–947. https://doi.org/10.4067/S0717-95022018000300943

Gorla, J. I., e Silva, A. de A. C., de Campos, L. F. C. C., dos Santos, C. F., de Almeida, J. J. G., Duarte, E., & Queiroga, M. R. (2017). Composição corporal e perfil somatotípico de atletas da seleção brasileira de futebol de 5. *Revista Brasileira de Ciencias Do Esporte*, *39*(1), 79–84. https://doi.org/10.1016/j.rbce.2015.12.016

Gutnik, B., Zuoza, A., Zuoziene, I., Alekrinskis, A., Nash, D., & Scherbina, S. (2015). Body physique and dominant somatotype in elite and low-profile athletes with different specializations. *Medicine (Lithuania)*, *31*(7), 2 4 7 – 2 5 2. https://doi.org/10.1016/j.medici.2015.07.003

Hadi. (2019). Efektifitas latihan beban dan tingkat kebugaran terhadap kemampuan otot atlet pusat pembibitan olahraga prestasi. *Disertasi*.

Hayudi, & Pratama, L. (2019). Pelatihan olahraga permainan kecil untuk peningkatan kebugaran jasmani di kampung weyengkede. *Jurnal ABDIMASA Pengabdian Masyarakat*, *2*(2), 8–11. https://unimuda.e-journal.id/jurnalabdimasa/article/view/471

Julianto, I. (2016). Upaya Meningkatkan Kebugaran Jasmani Melalui Sirkuit Training Kids pada Siswa. *JUARA : Jurnal Olahraga*, *1*(1), 7–14. https://doi.org/10.33222/juara.v1i1.56

Kaplan, D. Ö., & Yıldıran, İ. (2018). Comparison of Somatotype Characteristics and Anthropometric Proportional Relations of Elite Wrestlers Between Styles and Weights. *Journal of Education and Training Studies*, *6*(6), 147–156. https://doi.org/10.11114/jets.v6i6.3103

Kaplánová, A., Šagát, P., Gonzalez, P. P., Bartík, P., & Zvonař, M. (2020). Somatotype profiles of Slovak and Saudi Arabian male soccer players according to playing positions. *Kinesiology*, *52*(1), 143–150. https://doi.org/10.26582/k.52.1.17

Khairil Shazmin, K., & Wan Abdul Manan, W. M. (2019). Body somatotype and dietary intakes of government employees in Kuala Terengganu. *Malaysian Applied Biology*, *5*(2), 144–154. https://doi.org/https://doi.org/10.26656/fr.2017.5(2).449

Khairunnisa Balqis, Simanjuntak, V., & Wati, I. D. P. (2020). *Pemetaan somatotype karateka kota pontianak*. *3*(1), 71–78. https://doi.org/10.26418/jilo.v3i1.40793

Kouamé, N., Coulibaly, S., Beugré, J. B., Kouassi, F. K., Kouadio, J. K., Kouassi, J. R., Assi, A. R., Gouthon, P., & Pineau, J. C. (2017). Somatotype and cardiovascular endurance within young students after the secondary school cycle in Ivory Coast. *Gazzetta Medica Italiana Archivio per Le Scienze Mediche*, *176*(4), 162–170. https://doi.org/10.23736/S0393-3660.16.03372-6

Kuswari, M., Handayani, F., Gifari, N., & Nuzrina, R. (2019). Relationship of Energy Intake, Macro and Micro Nutrients to Physical Fitness of Athletes of Dyva Taekwondo Centre Cibinong. *JUARA : Jurnal Olahraga*, *5*(1), 19–30. https://doi.org/10.33222/juara.v5i1.572

Majid, W. (2020). Perilaku aktivitas olahraga terhadap peningkatan kebugaran jasmani pada masyarakat. *Seminar & Conference Nasional Keolahragaan*, *1*, 74–80.

Milošević, N., Mekić, A., Stanković, N., & Purenović-Ivanović, T. (2016). Somatotype of serbian judokas. *Homo Sporticus*, *2*, 24–27.

Noh, J. W., Yang, S. M., Kim, J. H., Lee, J. U., Kim, M. Y., Lee, L. K., Park, B. S., Lee, W. D., Shin, Y. S., Kim, D. H., Kim, S. J., Kim, I. H., Kwak, T. Y., Lee, T. H., Kim, J. Y., & Kim, J. (2018). Somatotype analysis of Korean combat sport athletes based on weight divisions. *Archives of Budo*, *14*, 169–178. https://www.semanticscholar.org/paper/Somatotype-analysis-of-Korean-combat-sport-athletes-Woong-Min/711ee84f1df900ce226449c5d111efa84e61370d#citing-papers

Noviatmoko, F. (2016). Analisis komponen

kondisi fisik dominan dalam cabang olahraga tarung derajat. *Jurnal Kesehatan Olahraga*, *6*(2), 441–449.

Penggalih, M. H. S. T., Dewinta, M. C. N., Solichah, K. M., Pratiwi, D., Niamilah, I., Nadia, A., & Kusumawati, M. D. (2019). Identifikasi status gizi, somatotipe, asupan makan dan cairan pada atlet atletik remaja di Indonesia. *Journal of Community Empowerment for Health*, *1*(2), 85–95. https://doi.org/10.22146/jcoemph.38410

Penggalih, M. H. S. T., Dewinta, M. C. N., Solichah, K. M., Pratiwi, D., Niamilah, I., Nadila, A., Kusumawati, M. D., Siagian, C. M., & Asyulia, R. (2019). Anthropometric characteristics and dietary intake of swimming athletes with disabilities before the competition. *Jurnal Gizi Dan Dietetik Indonesia (Indonesian Journal of Nutrition and Dietetics)*, *6*(1), 33–41. https://doi.org/10.21927/ijnd.2018.6(1).33-41

Penggalih, M. H. S. T., Juffrie, M., Sudargo, T., & Sofro, Z. M. (2017). Correlation between dietary intake with anthropometry profile on youth football athlete in Indonesia. *Asian Journal of Clinical Nutrition*, *9*(1), 9–16. https://doi.org/10.3923/ajcn.2017.9.16

Perroni, F., Vetrano, M., Camolese, G., Guidetti, L., & Baldari, C. (2015). Anthropometric and Somatotype Characteristics of Young Soccer Players: Differences among Categories, Subcategories, and Playing Position. *Journal of Strength and Conditioning Research*, *29*(8), 2097–2104. https://doi.org/10.1519/JSC.0000000000000881

Petković, E., Bubanj, S., Marković, K., Kocić, M., & Stanković, D. (2019). Position-related somatotype of elite female handball players. *Acta Facultatis Medicae Naissensis*, *36*(4), 316–325. https://doi.org/10.5937/AFMNAI1904316P

Prativi, G. O. (2013). Pengaruh Aktivitas Olahraga Terhadap Kebugaran Jasmani. *Journal of Sport Sciences and Fitness*, *2*(3), 32–36. https://doi.org/10.15294/JSSF.V2I3.3870

Prayoga, A. S. (2020). Menjaga Kebugaran Dan Imunitas Tubuh Dengan Bermain Olahraga Petanque Di Rumah Pada Masa Pandemi Covid 19. *Jurnal Keolahragaan*, *1*(1), 1–5. http://publikasi.stkippgri-bkl.ac.id/index.php/senopati/article/view/500

Quintero, A. M., Orssatto, L. B. da R., Pulgarín, R. D., & Follmer, B. (2019). Physical performance, body composition and somatotype in Colombian judo athletes. *Ido Movement for Culture*, *19*(2), 56–63. https://doi.org/10.14589/ido.19.2.8

Rifki, M. S., Rahmat, A., & Welis, W. (2020). Somatotype pemain bola voli indoor putra pekan olahraga mahasiswa nasional kontingen sumatera barat. *Journal of Chemical Information and Modeling*, *3*(2), 219–231. https://doi.org/https://doi.org/10.31539/jpjo.v3i2.1202

Rivas, L. G., Mielgo-Ayuso, J., Norte-Navarro, A., Cejuela, R., Cabañas, M. D., & Martínez-Sanz, J. M. (2015). Body composition and somatotype in university triathletes. *Body Composition and Somatotype in University Triathletes*, *32*(2), 799–807. https://doi.org/10.3305/nh.2015.32.2.9142

Rivera-Sosa, J. M. (2016). Anthropometric properties and somatotype of basketball players from different competition level. *International Journal of Morphology*, *34*(1), 179–189. https://doi.org/10.4067/S0717-95022016000100026

Roklicer, R., Atanasov, D., Sadri, F., Jahic, D., Bojanic, D., Ljubojevic, M., Trivic, T.,

& Drid, P. (2020). Somatotype of male and female judokas according to weight categories. *Biomedical Human Kinetics*, *12*(1), 34–40. https://doi.org/10.2478/bhk-2020-0005

Sánchez-Muñoz, C., Muros, J. J., Cañas, J., Courel-Ibáñez, J., Sánchez-Alcaraz, B. J., & Zabala, M. (2020). Anthropometric and physical fitness profiles of world-class male padel players. *International Journal of Environmental Research and Public Health*, *17*(1), 508. https://doi.org/10.3390/ijerph17020508

Şenol, D., Özbağ, D., Kafkas, M. E., Açak, M., Baysal, Ö., ŞahiN Kafkas, A., Taşkiran, C., Çay, M., Yağar, D., Özen, G., & Ögetürk, M. (2018). Analysis of the influence of somatotype difference on motoric parameters such as vertical jump, sit and reach flexibility and 30-m sprint. *Medicina Dello Sport*, *71*(3), 345–357. https://doi.org/10.23736/S0025-7826.18.03194-0

Stanković, D., Raković, A., Petković, E., Petrović, I., & Savanović, V. (2020). Analysis of somatotype of top young race walkers by means of the heath-carter method. *Facta Universitatis, Series: Physical Education and Sport*, *17*(3), 608–618. https://doi.org/10.22190/fupes19111905

5s

Sukmawarti, A., Akbar, D., & Doewes, M. (2019). Hubungan Somatotipe dan Passing Accuracy Pemain Futsal AFK Sukoharjo. *Jurnal Penelitian Kesehatan*, *8*(2), 50–56. http://journal.stikvinc.ac.id/index.php/jpk/article/view/78

Suryadi, D., Samodra, Y. T. J., & Purnomo, E. (2021). Efektivitas latihan weight training terhadap kebugaran jasmani. *Journal Respecs Research Physical Education and Sports*, *3*(2), 9–19. https://doi.org/https://doi.org/10.31949/respecs.v3i2.1029

Top, E., Celenk, C., Marangoz, I., Aktug, Z., Yilmaz, T., & Akil, M. (2018). The Effect of Somatotype Characteristics of Athletes on the Balance Performance. *Journal of Education and Learning*, *7*(5), 174–180. https://doi.org/10.5539/jel.v7n5p174

Yuliana. (2020). Olahraga yang Aman di Masa Pandemi COVID-19 untuk Meningkatkan Imunitas Tubuh. *Jurnal Bali Membangun Bali*, *1*(2), 104–110. https://doi.org/10.51172/jbmb.v1i2.112