Available online at: http://journal.unj.ac.id/unj/index.php/gjik
Gladi: Jurnal Ilmu Keolahragaan, 16 (03) 2025, 469-484
Permalink/DOI: https://doi.org/10.21009/GJIK.163.15

APPLICATION OF THE ANALYTIC HIERARCHY PROCESS IN IDENTIFYING TALENT OF KARATE ATHLETES AGED 6-12 YEARS

Ananda Ammar Fauzan[1*], Agus Rusdiana[1], Tono Haryono[1], Iwa Ikhwan Hidayat[1], Tian Kurniawan[1], Finaldhi Palgunadhi[1]

[1]Sports Science, Faculty of Sports and Health Education, Universitas Pendidikan Indonesia

Corresponding Author. Email: anandaammarfauzan@upi.edu

(Submission Track: Received: 02-09-2025, Final Revision: 12-09-2025, Available Online: 30-09-2025)

Abstract. Talent identification in young karate athletes is a crucial phase for optimizing targeted achievement development programs. This study aims to apply the Analytic Hierarchy Process (AHP) method to establish a priority hierarchy of criteria and sub-criteria in talent development for karate athletes aged 6–12 in West Java Province. This study involved 22 karate experts, consisting of coaches and accomplished athletes, to assess the weighting of three main criteria:*antropometer,*biomotor, and*somatotype*, which were further broken down into 14 sub-criteria. Quantitative data analysis was performed using Expert Choice 11 software. The results of the analysis show that in the domain*antropometer*, height (0.173) is the indicator with the highest priority. In the biomotor domain, agility (0.225) shows the highest weight value compared to strength, endurance, speed, and flexibility. Meanwhile, in the domain*somatotype*, body typology*mesomorf*(0.418) ranks as the top priority, followed by endomorph (0.379) and ectomorph (0.202). Comprehensively, the criteria*somatotype*(34%) made the most significant contribution to the overall talent identification model, followed by biomotor and*antropometer.*These findings affirm the AHP's capability in developing a systematic and objective talent identification model, which can serve as a strategic guideline for coaches in the selection and development process of potential karate athletes from an early age.

Keywords: Talent Identification Karate; Analytic Hierarchy Process (AHP); Antropometer

INTRODUCTION

Talent Identification (TI) is often more associated with the entertainment industry rather than the sports world. In fact, the process of identifying talented athletes requires a precise, systematic, and accurate analysis so that the potential of children or teenagers can be identified from an early age (Barreiros et al., 2014; Dahlan et al., 2023). Talent Identification (TI) is essentially the process of identifying an individual's abilities and then matching those abilities with specific skills that are considered relevant within a particular sport. This process is carried out scientifically, measurably, and systematically, with the ultimate goal of maximizing an athlete's potential in order to achieve optimal performance (Ferdiana et al., 2023). Furthermore, Talent Identification (TI) is also a strategic approach to transform an athlete's inherent potential into functional abilities. These abilities can be honed and improved through continuous development at various levels, including the club, sports school, or the national sports organizations that oversee the specific sport (Bailey & Collins, 2016; Pickering et al., 2019). In the context of modern sports, Sports Talent Identification (STI) serves as a comprehensive approach with key indicators that can yield significant findings related to an athlete's success (Breitbach et al., 2014).

Karate itself is a self-defense martial art originating from Japan, which began to gain popularity in Indonesia since 1963 through the return of Indonesian students from Japan, such as Baud A. D. Adikusumo, Kariantoi Djoijoineigoiroi, Moichtar Ruskan, and Oittoiman Noih, who founded dojos and introduced the Shotokan style in Jakarta. This initiative eventually led to the formation of the Indonesian Karate Federation (POIKRI) on March 10, 1964. As public interest grew, various schools with different styles emerged, which in turn caused internal divisions. To unify the organization, the Indonesian Karate-Do Federation (FORKI) was established during the IV POIKRI Congress in 1972, and has since become the national governing body for karate in Indonesia. As a martial art, karate not only serves as a means of self-defense but also as a competitive sport that demands optimal physical condition, reaction speed, agility, strength, and proper strategy (Dan, 2014).

One of the scientific methods commonly used in sports research is the Analytic Hierarchy Process (AHP). This method has been applied to several sports, one of which is rowing. Research results show that AHP can produce an objective assessment model

that can also serve as a scientific reference. In this model, there are three main criteria: (1) anthropometry; (2) physiology; (3) biomechanics (Ferdiana et al., 2023). On the other hand, in sports such as karate, many coaches still rely on simple measurements based on anthropometry or even just visual observations to select potential athletes (Gencer & Öztürk, 2018). Such an approach has its weaknesses, as athlete selection actually involves a variety of complex criteria. Without a systematic procedure, errors in identifying potential athlete candidates are highly likely to occur. In several previous studies, the AHP method has been applied in the field of sports (Nisel & Özdemir, 2016). For the sport of karate, there has yet to be a decision-making process for talent identification based on AHP. As seen in previous studies in wrestling, the AHP method was used in decision-making to assess aspects such as anthropometry, physiology, and biomechanics (Ferdiana et al., 2023). This comprehensive model illustrates that AHP can integrate various factors into a measurable decision-making system.

In practice, anthropometry and biomechanics are key indicators that are almost always used in the talent identification process across various sports. Empirical data from international competitions and the Olympics also show that an athlete's success is not only determined by technical skills but also by biomechanical factors, body proportions, and body composition or somatotype. Therefore, comparing the somatotype profiles of young athletes with the standards of elite athletes can serve as one of the most effective predictive methods for forecasting future success potential(Mirzaei et al., 2009). Based on this foundation, this research focuses on the use of three main criteria—anthropometry, biomechanics, and somatotype—in the talent identification process for karate athletes aged 6–12 years. This age group was chosen because childhood is a critical period for balance development, where various fundamental abilities can be optimally nurtured when directed properly. Using the AHP approach, this study aims to formulate an objective, measurable, and suitable talent identification model to meet the needs of karate athlete development in Indonesia. Opinions from experts and coaches were gathered through a questionnaire instrument, and the data were analyzed using Expert Choice version 11 software. The results of this analysis are expected to provide valuable insights for the world of sports, particularly in shaping a generation of karate athletes who can achieve success from an early age.

METHOD

This research uses a mixed-methods research design (MMR) that combines both qualitative and quantitative approaches. This method is considered capable of providing a more comprehensive understanding compared to using only one approach (Mengshoel, 2012). Although the concept of MMR has been refined since the 1950s, its application in sports studies only gained momentum around 2005 (Abeza et al., 2015). MMR is widely used to overcome the limitations of both qualitative and quantitative research when used independently (Jones, 1997). Therefore, MMR functions to enrich sports research through the combination of both approaches (Kay & Kucera, 2018).

In this study, MMR is used to develop a talent identification framework for karate athletes, specifically in the kumite category. Two main methods were employed: discussions with karate coaches and the development of an AHP-based framework. The discussion aimed to gather information on identification criteria in accordance with Olympic standards. The process was conducted online using Google Forms to make it more efficient and accessible to a wider range of coaches. Respondents were asked to provide priority ratings for the criteria of anthropometry, biomechanics, and somatotype. The criteria and sub-criteria were selected purposively, taking into account various perspectives to align with international standards. A total of 14 (fifteen) sub-criteria that directly influence athlete ranking were used, and their selection was based on credible literature, as explained in Table 1.

Table 1. Criteria and Sub-criteria Selected for Evaluating Karate Athlete Talent Identification

Criteria	Sub-Criteria	Reference
Anthropometry	Body Weight	1.(Genç, 2020) 2.(Gürsoy & Canli, 2021) 3.(Marinho et al., 2016) 4.(Ramirez-Velez et al., 2014)
	Height	1.(Genç, 2020) 2.(Gürsoy & Canli, 2021) 3.(Marinho et al., 2016) 4.(Ramirez-Velez et al., 2014)
	Body Mass Index (BMI)	1.(Genç, 2020)

		2.(Gürsoy & Canli, 2021)
		3.(Ramirez-Velez et al., 2014)
	Body Fat Percentage	1.(Marinho et al., 2016)
		2.(Ramirez-Velez et al., 2014)
	Arm Length	1.(Marinho et al., 2016)
	Leg Length	1.(Ramirez-Velez et al., 2014)
	Sitting Height	1.(Gürsoy & Canli, 2021)
Biomechanics	Cardiovascular	1. (HELMI CHAABENE et al., 2017)
	Endurance	2. (Genç, 2020)
		3. (Gürsoy & Canli, 2021)
		4.(Ramirez-Velez et al., 2014)
	Speed	1. (HELMI CHAABENE et al., 2017)
		2. (Genç, 2020)
		3. (Gürsoy & Canli, 2021)
		4.(Ramirez-Velez et al., 2014)
	Strength	1. (HELMI CHAABENE et al., 2017)
		2. (Genç, 2020)
		3. (Gürsoy & Canli, 2021)
	Agility	1. (HELMI CHAABENE et al., 2017)
		2. (Gürsoy & Canli, 2021)
		3.(Mirzaei et al., 2009)
	Flexibility	1. (HELMI CHAABENE et al., 2017)
		2. (Genç, 2020)
		3. (Gürsoy & Canli, 2021)
Somatotype	*Endomorph*	1.(Marinho et al., 2016)
		2.(Ramirez-Velez et al., 2014)
	Mesomorph	1. (Marinho et al., 2016);
		2. (Ramirez-Velez et al., 2014)
	Ectomorph	1. (Marinho et al., 2016);
		2. (Ramirez-Velez et al., 2014)

The respondents of this study were gathered from 22 (twenty-two) karate experts from West Java, consisting of both accomplished athletes and experienced coaches with

diverse backgrounds. This diversity provides a broader perspective, as each respondent brings insights influenced by their training experience, their role in supporting athletes in competitions, and their achievements. Such a range of experiences is highly valuable, as the considerations provided are not only based on theory or literature but also on practical fieldwork. As a result, the data collected is richer, more representative, and more relevant within the context of youth karate development. The evaluation results from the respondents in this study were processed using the Analytical Hierarchy Process (AHP), which is a decision-making method balanced for resolving complex problems through a hierarchical framework. This method is extremely useful for identifying karate athlete talent across various criteria. The analysis process using AHP begins with making pairwise comparisons between elements to determine the relative importance of each factor. In this way, AHP provides numerical weights for each criterion, which simplifies the process of setting priorities for the researcher (Budak et al., 2017).

According to Thomas L. Saaty, the basic theory of the Analytic Hierarchy Process (AHP) includes hierarchical principles, pairwise comparisons, and a synthesis process to ensure consistency in the values. This framework guarantees that decisions are based not only on intuition but also on mathematically justifiable calculations (Saaty, 2013). Meanwhile, by balancing various AHP models and applications that can be systematically applied across different fields, including sports, the use of AHP in this study is expected to provide an objective procedure for assessing the potential of young karate athletes (Saaty, 1999).

Overall, this research was conducted through four main stages. First, the problem hierarchy was developed to formulate the goals and criteria for evaluation. Second, the expert karate evaluations were converted into numerical data based on the AHP comparison scale. Third, the results of all comparisons were synthesized to derive the priority weights for each criterion and sub-criterion. Fourth, a sensitivity analysis was conducted to assess the stability of the results in case of changes in the criteria values. Through these four stages, the research aims to produce an accurate, systematic, and applicable talent identification model for athlete development in children aged 6-12 years. In summary, this research was carried out in four main stages:

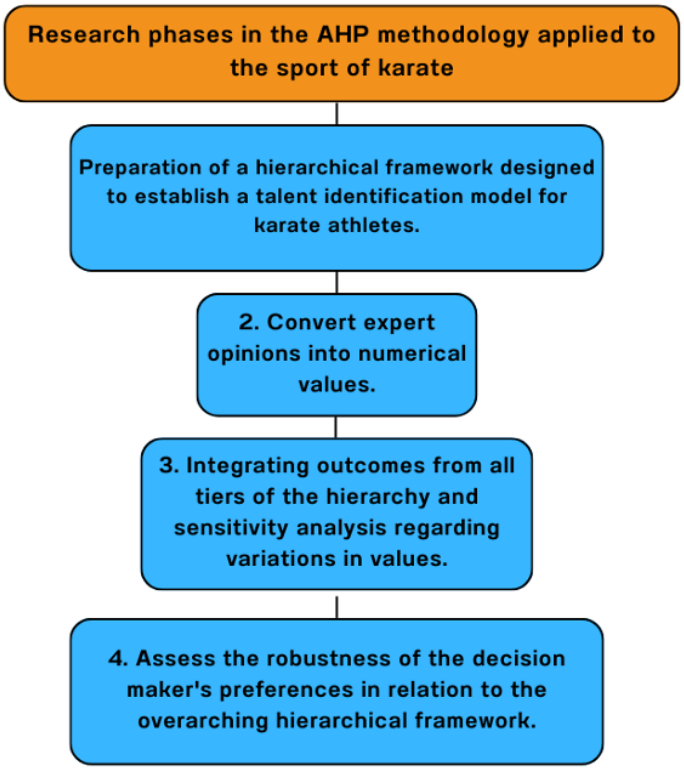


Figure 1. Research Stages.

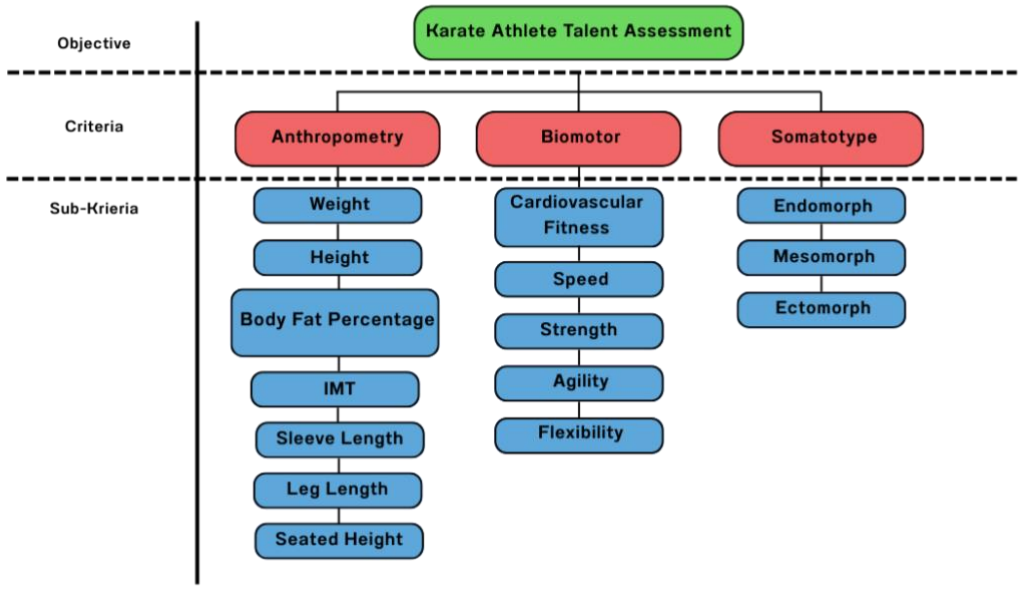
The initial step in determining priorities is by making comparisons between sub-criteria within the hierarchy. The results of these comparisons, processed in the Expert Choice 11 computational system using mathematical language, are presented in the form of a matrix and analyzed numerically. The main criteria, such as anthropometric aspects, biomotoric aspects, and somatotype aspects, are determined using the AHP method based on their validity levels. Each element in the hierarchical structure must be logically connected to each other. The comparisons between criteria are made using a rating scale from 1 to 9, as outlined in the table 2.

Table 2. Comparison Between Criteria in the Hierarchy Using a Scale of 1 to 9

Level	Definition	Description
1	Equally Important	Both elements are equally important.
3	Slightly More Important	One element is slightly more important than the other
5	More Important	One element is essential or much more important than the other

7	Very Important	One element is clearly more important than the other
9	Absolutely More Important	One element is absolutely more important than the other.
2, 4, 6, 8	Intermediate Values	Values between two comparisons that are related.
Reciprocity	If activity A receives a certain value when compared to activity B, then B will have the reciprocal value when compared to activity A.	

The hierarchical structure in this study is organized into four levels. At the first level, the main objective of the research is established. The second level includes three main criteria that serve as assessment aspects. Each of these criteria is further broken down into sub-criteria, which form the third level. The hierarchical structure referred to here is visualized in Figure 2.



Gambar 2. AHP Model for Evaluating Karate Athlete Candidates

RESULT

An example of the AHP questionnaire application is shown in Table 2. As an illustration, the comparison between height and body fat results in a value of (0.33),

indicating that body fat has a higher level of importance compared to height. Additionally, the comparison between body fat and height yields a value of (0.14), which is equivalent to approximately one-seventh. For more details, see tables 3,4 and 5

Table 3. Results of the AHP Anthropometric Questionnaire

	Body Weight	Height	Body Fat	IMT	Arm Length	Leg Length	Sitting height
Body Weight	1	5	7	1	1	1	5
Height	0,2	1	0,33	1	1	1	1
Body Fat	0,14	3	1	1	1	3	1
IMT	1	1	1	1	5	1	7
Arm Length	1	1	1	5	1	3	0,33
Long Legs	1	1	0,33	1	0,33	1	1
High Sit down	0,2	1	1	0,14	3	1	1

Table 4. Results of the AHP Biomotoric Questionnaire

	Lung Endurance	Speed	Strength	Agility	Flexibility
Lung Endurance	1	3	3	3	3
Speed	0,33	1	3	1	3
Strength	0,33	0,33	1	0,33	3
Agility	0,33	1	3	1	3
Flexibility	0,33	0,33	0,33	0,33	1

Table 5. Results of the AHP Somatotype Questionnaire

	Ectomorph	Endomorph	Mesomorf
Ectomorph	1	0,33	0,14
Endomorph	3	1	0,2
Mesomorf	7	5	1

The description of the questionnaire scores according to karate coaches spread throughout West Java province is presented in the form of a histogram diagram in Figure 3.

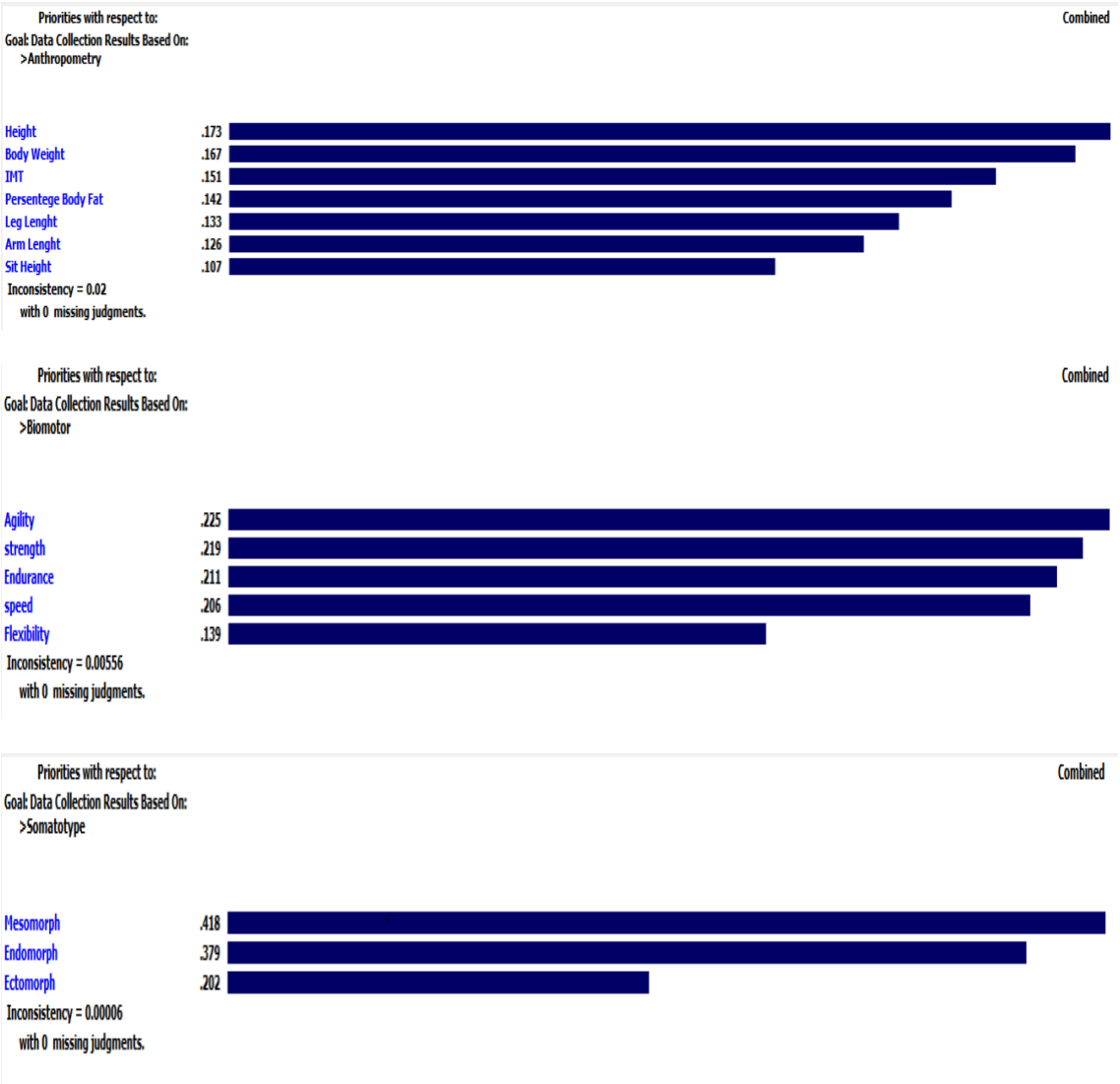


Figure 3. Determination of main criteria and criteria weighting using the AHP method

Based on Figure 3, the anthropometric criterion consists of 7 sub-criteria, with height proven to be the most important compared to the other 6 criteria: body weight, BMI, body fat percentage, leg length, arm length, and sitting height. Their priority scores are as follows: 0.173; 0.167; 0.151; 0.142; 0.133; 0.126; and 0.107, respectively. In the biomotoric aspect (BIO), agility is considered the most important sub-criterion with a priority score of 0.225. Meanwhile, strength, endurance, speed, and flexibility follow with priority scores of 0.219, 0.211, 0.206, and 0.139, respectively. For the somatotype criterion (SOM), mesomorphy is regarded as the most important with a priority score of 0.418. In contrast, the other two somatotype types, endomorphy and ectomorphy, are considered less important, with priority scores of 0.379 and 0.202, respectively.

Criteria	value
Mesomorph	0.139
Endomorph	0.126
Agility	0.075
Strength	0.073
Durability	0.07
Speed	0.069
Ectomorph	0.067
Height	0.058
Weight	0.058
IMT	0.05
Body Fat Percentage	0.047
Flexibility	0.046
Leg Length	0.044
Leg Length	0.042
Sit Height	0.036

Figure 4. Determination of Weights and Main Criteria Using the AHP Method

Based on Figure 4, further analysis was conducted on each sub-criterion. The weighting of sub-criteria shows that the three most important sub-criteria are mesomorphy, endomorphy, and ectomorphy, with respective percentages of 13.9%, 12.6%, and 7.5%, which are part of the somatotype criterion, totaling 34%. The classification based on all 12 sub-criteria includes agility (7.5%), strength (7.3%), endurance (7%), speed (6.9%), ectomorphy (6.7%), height (5.9%), body weight (5.6%), BMI (5%), body fat percentage (4.7%), flexibility (4.6%), leg length (4.4%), arm length (4.2%), and sitting height (3.6%), which represent the least weighted sub-criteria. Therefore, it can be concluded that the mesomorphy sub-criterion is the most important compared to the other sub-criteria.

DISCUSSION

Talent identification for developing young athletes is based on the coaches' ability to predict future success in sports (O'Connor et al., 2016). Talent identification can reveal an athlete's current potential to become an elite athlete (Yasin et al., 2020). To produce competitive athletes, talent identification is essential. However, talented athletes cannot be developed through a single effort. Talent identification must be specific and tailored to each sport. This study used a multi-criteria decision analysis method and concluded that the Analytic Hierarchy Process (AHP) model is effective for identifying talent (Lai & Ishizaka, 2020). The use of AHP provides a decision-making weight for each sub-

criterion in identifying talented karate athletes. AHP measures the decision-making level across all criteria using comparative data (Ferdiana et al., 2023). Furthermore, the AHP model has been applied in determining key success factors in developing male wrestlers in West Java and improving coaches' abilities to generate new talen (Ferdiana et al., 2023). The testing involved three criteria: anthropometric, biomotoric, and somatotype.

The study results indicate that among the anthropometric criteria, height scored the highest priority (0.173) compared to other indicators such as body weight, BMI, body fat percentage, leg length, arm length, and sitting height. This suggests that height proportion is a dominant factor in supporting the performance of young karate athletes. Ideal height provides advantages in reach, effective striking, and the ability to maintain body position during matches. These findings align with previous studies that show anthropometric parameters, especially height, correlate with success in combat sports relying on speed and attack range (Blerim et al., 2018; "Relationship between Agility, Speed, Leg Muscle Strength, Dynamic Balance with Mawashi Geri Kick Accuracy in Karate," 2022; Sidoarjo, 2018). In the biomotoric criteria, agility emerged as the most important factor (0.225), followed by strength (0.219), endurance (0.211), speed (0.206), and flexibility (0.139). These results correspond to the characteristics of karate, which demands rapid, precise body movements and the ability to dynamically respond to opponents' attacks. Good agility allows athletes to perform various techniques effectively, both in offense and defense. Although flexibility ranked lowest, it still plays an important role in supporting movement fluidity and injury prevention. Thus, biomotoric abilities form the physical foundation determining an athlete's success in adapting to the technical and tactical demands of karate (Blerim et al., 2018; "Relationship between Agility, Speed, Leg Muscle Strength, Dynamic Balance with Mawashi Geri Kick Accuracy in Karate," 2022; Sidoarjo, 2018).

Meanwhile, in the somatotype criteria, the mesomorphic body type received the highest priority score (0.418), followed by endomorphic (0.379) and ectomorphic (0.202). The dominance of mesomorphy indicates that athletes with a muscular, proportional body and natural strength are considered best suited for karate performance. This body type offers advantages in strength, power, and stability needed during competition. The study also emphasized that the somatotype criterion contributes 34%, more than biomotoric and anthropometric criteria, making the ideal body type the main reference in the talent

identification process for young karate athletes (Blerim et al., 2018; Slankamenac et al., 2021; Sterkowicz-Przybycień, 2010).

Overall, the findings confirm that the Analytic Hierarchy Process (AHP) method provides a more objective and systematic approach in identifying talented karate athletes. By prioritizing mesomorphy, agility, and height as dominant indicators, this model can serve as a practical guideline for coaches in designing selection and development programs from an early age. Such measurable approaches are expected to minimize coach subjectivity, which often relies solely on visual observation, and help produce high-potential karate athletes at national and international levels. Based on biomotoric criteria, karate athletes should possess strength, lung endurance, anaerobic capacity, agility, flexibility, and maximal strength. The study results show that somatotype is the most important priority in identifying karate talent, with mesomorphy as the key sub-criterion. Previous research also found that somatotype is crucial in determining karate talent because it predicts athletes who will compete in weight classes suitable to their body composition (Neogi et al., 2019). Since mesomorphy is relatively common among males, and karate competitions have more male participants than females, the mesomorphic body composition is more important than other sub-criteria.

CONCLUSION

This study aims to determine the priorities in identifying talented karate athletes aged 6 to 12 years, as assessed by coaches. The selection of criteria and sub-criteria for talent identification was based on a literature review, resulting in three main criteria: anthropometric, somatotype, and biomotoric. Coaches provided numerical scores for each sub-criterion to identify the most relevant sub-criteria for talent identification in young karate athletes. The study identified three key sub-criteria with the highest priority in the AHP analysis: mesomorphy, endomorphy, and agility. The limitations of this study include its exclusive focus on karate and the evaluation of only anthropometric, biomotoric, and somatotype criteria. Testing using AHP for technical and psychological criteria was not conducted due to the complexity of integrating comparative data into the system. The comparative data used in this study refer to criteria for athlete norms in the Junior World Karate Championships.

REFERENCE

Abeza, G., O'Reilly, N., Dottori, M., Séguin, B., & Nzindukiyimana, O. (2015). Mixed methods research in sport marketing. *International Journal of Multiple Research Approaches*, *9*(1), 40–56. https://doi.org/10.1080/18340806.2015.1076758

Bailey, R., & Collins, D. (2016). The Standard Model of Talent Development and Its Discontents. *Kinesiology Review*, *2*(4), 248–259. https://doi.org/10.1123/krj.2.4.248

Barreiros, A., Côté, J., & Fonseca, A. M. (2014). From early to adult sport success: Analysing athletes' progression in national squads. *European Journal of Sport Science*, *14*(SUPPL.1), 37–41. https://doi.org/10.1080/17461391.2012.671368

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 - Анеирон*, *14*(2), 108–111. https://doi.org/10.7251/ssh1702108b

Breitbach, S., Tug, S., & Simon, P. (2014). Conventional and Genetic Talent Identification in Sports: Will Recent Developments Trace Talent? *Sports Medicine*, *44*(11), 1489–1503. https://doi.org/10.1007/s40279-014-0221-7

Budak, G., Kara, İ., & İç, Y. T. (2017). Weighting the Positions and Skills of Volleyball Sport by Using AHP: A real life application. *IOSR Journal of Sports and Physical Education*, *4*(01), 23–29. https://doi.org/10.9790/6737-0401012329

Dahlan, F., Amahoru, musfira nurul, & Muslim. (2023). Analytical Hierarchy Process (AHP) sebagai Solusi Pembinaan Sepakbola Amatir: Literatur Review. *Jurnal Pendidikan Kesehatan Rekreasi*, *9*(2), 274–285.

Dan, S. I. (2014). *Universitas darma persada*. *3*(021), 8649057.

Ferdiana, F., Rusdiana, A., Imanudin, I., Badruzaman, B., Syahid, A. M., Haryono, T., & Hidayat, I. I. (2023). Identifikasi bakat atlet gulat menggunakan pendekatan analytic hierarchy process method. *Sriwijaya Journal of Sport*, *3*(1), 1–15. https://doi.org/10.55379/sjs.v3i1.965

Genç, A. (2020). The Effect of Wrestling Education on Some Physical and Motoric Parameters in High School Students. *International Education Studies*, *13*(4), 100. https://doi.org/10.5539/ies.v13n4p100

Gencer, E., & Öztürk, A. (2018). The Relationship Between the Sport-Confidence and the Coach-Athlete Relationship in Student-Athletes. *Journal of Education and Training Studies*, *6*(10), 7. https://doi.org/10.11114/jets.v6i10.3388

Gürsoy, H., & Canli, U. (2021). Identification of elite performance characteristics specific to anthropometric characteristics, athletic skills and motor competencies of combat athletes. *Baltic Journal of Health and Physical Activity*, *13*(4), 47–57. https://doi.org/10.29359/BJHPA.13.4.06

HELMI CHAABENE, 1, YASSINE NEGRA, 2, RAJA BOUGUEZZI, 2, & BESSEM MKAOUER, 3 EMERSON FRANCHINI, 4 URSULA JULIO, 4 AND YOUNE´ S HACHANA. (2017). P p a w : a u. *Journal OfStrength and Conditioning Research*, *31*(5).

Jones, I. (1997). Mixing Qualitative and Quantitative Methods in Sports Fan Research. *The Qualitative Report*, *3*(4), 1–8. https://doi.org/10.46743/2160-3715/1997.2014

Kay, M. C., & Kucera, K. L. (2018). Mixed Methods Designs for Sports Medicine Research. *Clinics in Sports Medicine*, *37*(3), 401–412. https://doi.org/10.1016/j.csm.2018.03.005

Lai, Y. L., & Ishizaka, A. (2020). The application of multi-criteria decision analysis

methods into talent identification process: A social psychological perspective. In *Journal of Business Research* (Vol. 109). https://doi.org/10.1016/j.jbusres.2019.08.027

Marinho, B. F., Follmer, B., Del Conti Esteves, J. V., & Andreato, L. V. (2016). Body composition, somatotype, and physical fitness of mixed martial arts athletes. *Sport Sciences for Health*, *12*(2), 157–165. https://doi.org/10.1007/s11332-016-0270-4

Mengshoel, A. M. (2012). Mixed methods research - So far easier said than done? *Manual Therapy*, *17*(4), 373–375. https://doi.org/10.1016/j.math.2012.02.006

Mirzaei, B., Curby, D. G., Rahmani-Nia, F., & Moghadasi, M. (2009). Physiological profile of elite Iranian junior freestyle wrestlers. *Journal of Strength and Conditioning Research*, *23*(8), 2339–2344. https://doi.org/10.1519/JSC.0b013e3181bb7350

Neogi, A., Tiwari, A., Medabala, T., Adhikari, S., & Dey, S. K. (2019). Somatotype, Body Composition and Anthropometric Profiles of Indian Male Greco-Roman Wrestlers. *International Journal of Sport Studies for Health*, *2*(2), 5–12. https://doi.org/10.61838/kman.intjssh.2.2.2

Nisel, S., & Özdemir, M. (2016). ANALYTIC HIERARCHY PROCESS & ANALYTIC NETWORK PROCESS in SPORT: A COMPREHENSIVE LITERATURE REVIEW. *International Journal of the Analytic Hierarchy Process*, *8*(3), 405–429. https://doi.org/10.13033/ijahp.v8i3.448

O'Connor, D., Larkin, P., & Mark Williams, A. (2016). Talent identification and selection in elite youth football: An Australian context. *European Journal of Sport Science*, *16*(7), 837–844. https://doi.org/10.1080/17461391.2016.1151945

Pickering, C., Kiely, J., Grgic, J., Lucia, A., & Del Coso, J. (2019). Can genetic testing identify talent for sport? *Genes*, *10*(12), 1–13. https://doi.org/10.3390/genes10120972

Ramirez-Velez, R., Argothyd, R., Meneses-Echavez, J. F., Sanchez-Puccini, M. B., Lopez-Alban, C. A., & Cohen, D. D. (2014). Anthropometric characteristics and physical performance of Colombian elite male wrestlers. *Asian Journal of Sports Medicine*, *5*(4), 2–5. https://doi.org/10.5812/asjsm.23810

Relationship between Agility, Speed, Leg Muscle Strength, Dynamic Balance with Mawashi Geri Kick Accuracy in Karate. (2022). *International Journal of Multidisciplinary Research and Analysis*, *5*(9), 2424–2431. https://doi.org/10.47191/ijmra/v5-i9-17

Saaty, T. L. (1999). *The Seven Pillars of the Analytic Hierarchy Process*. 1–15. https://doi.org/10.13033/isahp.y1999.073

Saaty, T. L. (2013). The modern science of multicriteria decision making and its practical applications: The AHP/ANP approach. *Operations Research*, *61*(5), 1101–1118. https://doi.org/10.1287/opre.2013.1197

Sidoarjo, D. A. N. K. (2018). *ANALISIS HASIL TES KONDISI FISIK ATLET KARATE TAHUN Kurniawan Adi Putra Susilo , Oce Wiriawan*. 142–148.

Slankamenac, J., Bjelica, D., Jaksic, D., Trivic, T., Drapsin, M., Vujkov, S., Modric, T., Milosevic, Z., & Drid, P. (2021). Somatotype profiles of montenegrin karatekas: An observational study. *International Journal of Environmental Research and Public Health*, *18*(24), 1–9. https://doi.org/10.3390/ijerph182412914

Sterkowicz-Przybycień, K. L. (2010). Body composition and somatotype of the top of polish male karate contestants. *Biology of Sport*, *27*(3), 195–201. https://doi.org/10.5604/20831862.919339

Yasin, S. N., Ma'mun, A., Rusdiana, A., Abdullah, A. G., & Nur, L. (2020). The talent identification of Kayak athletes: A research-based on analytic hierarchy process. *International Journal of Human Movement and Sports Sciences*, *8*(6), 395–402. https://doi.org/10.13189/saj.2020.080611