



Identification of Finswimming Athletes' Talents Based on Criteria and Key Talents Using the Analytic Hierarchy Process (AHP) Approach: Systematic Literature Review

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History Article

Received Desember 2025
Approved Desember 2025
Published vol 12 no 2 2025

Keywords

Talent Identification;
Finswimming; Ana-
lytic Hierarchy Process

Abstract

Talent identification is a fundamental stage in developing competitive sports because it plays a role in determining the direction of long-term athlete development. In finswimming, the talent identification process requires a specific and multidimensional approach considering the different physical, technical, and physiological demands from conventional swimming. However, finswimming talent identification practices are still often carried out subjectively and have not been integrated into a systematic decision-making model. The goal of this study is to use the Analytic Hierarchy Process approach to perform a comprehensive literature evaluation and synthesis of scientific literature on finswimming athlete talent identification based on important criteria and talents, using a systematic literature review design guided by the PRISMA 2020 framework. The research process involved searching for publications published between 2015 and 2025 in the PubMed, ScienceDirect, and Google Scholar databases using the PRISMA 2020 criteria as a guide. Based on the selection process, four studies were determined to meet the inclusion criteria and a narrative and descriptive analysis was conducted. The synthesis results showed that physical and physiological characteristics, especially muscle strength and aerobic endurance, were the most important factors in determining finswimming skills, with technical and psychological factors coming in second. These findings show how the Analytic Hierarchy Process approach can help identify athletic talent in finswimming in an objective, methodical, and evidence-based manner.

How to Cite

Satrio, I. P. B. A., Nurjaya, D. R., & Sutresna, N. (2025). Identification of Finswimming Athletes' Talents Based on Criteria and Key Talents Using the Analytic Hierarchy Process (AHP) Approach: Systematic Literature Review. *Journal of Physical Education, Health and Sport*, 12 (2), 640-644.

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INTRODUCTION

The main component of a competitive sports development system is talent identification, which forms the basis for determining the long-term direction of athlete development. The selection of individuals with the greatest potential, who meet the requirements and unique characteristics of a particular sport, is made possible by an accurate talent identification process. Talent identification is now seen as a multifaceted process involving the interaction of innate factors, physical abilities, psychological aspects, technical skills, and the coaching environment rather than a one-time selection process based on immediate performance (Howe, 1998; Simonton, 1999; Williams & Reilly, 2000). This approach emphasizes that an athlete's success is determined not only by actual ability, but also by adaptive capacity and long-term development potential.

The modern conceptual model of talent identification places physiological, biomechanical, anthropometric, psychological and social aspects as an interrelated whole (Howe, 1998) states that talent has specific characteristics, is domain-dependent, and is only possessed by a small number of individuals, but its development is greatly influenced by the training environment and learning experiences. In line with this, (Williams & Reilly, 2000) as well as (Vaeyens et al., 2008) emphasizes that talent identification should be integrated with the athlete's development stages, from talent detection, talent identification, talent selection, and talent development. Therefore, the talent identification process must consider the specific characteristics of the sport to ensure accurate and sustainable selection decisions..

Finswimming is a branch of aquatics under the auspices of the Confédération Mondiale des Activités Subaquatiques (CMAS) and continues to show growth at the international level. This sport is different because it combines swimming with the use of assistive devices like bifins, monofins, and snorkels. It requires lower extremity strength, aerobic and anaerobic capacity, efficient movement, and the ability to adapt specific breathing techniques (Confédération Mondiale des Activités Subaquatiques, 2025). Because of these distinctions, finswimming and traditional swimming cannot be fully compared in terms of technique and physical demands.

Numerous studies have demonstrated that physiological and anthropometric traits have a major impact on finswimming performance.

Increasing movement efficiency and propulsion in the water is largely dependent on height, leg length, arm span, and body composition (Campbell-Platt, 2009; Stavrou et al., 2018). Furthermore, finswimming athletes who have a lower body fat percentage and more muscle mass typically perform better, particularly in long-distance events that call for a high aerobic capacity (Bahri et al., 2021). These results verify that, unlike other aquatic sports, finswimming talent must be identified using specific and distinct criteria.

However, the methods for identifying finswimming talent are still largely subjective and depend on the coach's feelings and unstandardized observations. Selection bias can occur due to this situation, thereby hindering the development of the best athletes from the outset. In terms of creating an objective and measurable talent identification system, finswimming still lags behind other sports such as rowing, volleyball, or wrestling, which have developed selection models based on scientific approaches and multi-criteria decision-making.

The Analytic Hierarchy Process (AHP) is a multi-criteria decision-making technique that has worked well in the context of sports. By using pairwise comparisons to assign priority weights to each criterion, this approach allows complex problems to be broken down into a systematic hierarchical structure (Saaty, 1980). AHP has been used to identify athletic talent in various sports and has consistently improved the objectivity of selection, especially when multidimensional criteria such as anthropometry, physiology, technique, and psychology are involved (Ferdiana & Nurjaya, 2020; Ho, 2008; Nurjaya et al., 2020).

Anthropometry, physiology, biomechanics, technique, and psychology are the main determinants of an athlete's potential, according to research on rowing, which shows that AHP can methodically identify key talent criteria (Nurjaya et al., 2020). The specific application of AHP in finswimming is still very limited, even though it has been widely used in other sports contexts. Without incorporating it into a weighted criteria decision-making model, most finswimming research still concentrates on evaluating athletes' performance or physical attributes.

This shortcoming indicates a serious scientific gap, especially in the creation of a methodical, unbiased, and empirically supported framework for identifying finswimming talent. In addition, most studies have not fully integrated technical, psychological, and physical elements into a single decision-making model. However,

the nature of finswimming requires mental toughness, technical flexibility, and reliable performance in specific competitive situations.

Given these circumstances, the purpose of this study is to conduct a systematic literature review and synthesis of scientific literature related to the identification of finswimming athletes' talents based on important criteria and talents using the Analytic Hierarchy Process approach. In addition to providing a conceptual basis for creating a more objective, structured, and consistent athlete selection model with the characteristics of finswimming, The novelty of this study lies in the integration of a systematic literature review with the Analytic Hierarchy Process approach to synthesize and prioritize multidimensional talent identification criteria specific to finswimming, providing an objective and evidence-based framework in a sport where talent identification has predominantly relied on subjective assessment methods.

METHOD

To identify finswimming athletes' talents based on important criteria and talents using the Analytic Hierarchy Process approach, this study used a systematic literature review approach. To ensure openness, traceability, and consistency during the research process, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines were consulted during the research process. The research stages included formulating research questions, determining inclusion and exclusion criteria, literature search strategies, study selection, data extraction, and descriptive and narrative data synthesis and analysis.

A systematic literature search was conducted through the PubMed, ScienceDirect, and Google Scholar databases. The Publish or Perish software is also used to assist in the extraction of metadata and citations from scientific articles. The search strategy employed a combination of keywords and Boolean operators related to finswimming, athlete talent identification, and the Analytic Hierarchy Process approach. Articles were limited to publications published between 2015 and 2025, peer-reviewed scientific articles or proceedings, available in full-text, and written in either Indonesian or English.

Study selection was based on established inclusion and exclusion criteria. Inclusion criteria included studies that discussed the identifica-

tion of sports talent using a quantitative approach based on multi-criteria decision-making, specifically the Analytic Hierarchy Process, with a study population consisting of athletes, especially in aquatic sports such as finswimming or swimming, and presented talent criteria or indicators that included physical, physiological, technical, and psychological aspects. Studies were excluded if they did not use an analytical multi-criteria approach, the research subjects were not athletes or not related to the sport, the articles were opinion articles or narrative reviews, and were not available in full-text form.

The article selection process follows the PRISMA 2020 flow (Page et al., 2021). This process included identifying articles from databases and Publish or Perish, eliminating duplicate and irrelevant articles, screening titles and abstracts, and reviewing full texts to assess eligibility based on inclusion and exclusion criteria. Based on this process, four studies were found to meet the inclusion criteria and were used as the unit of analysis in this study.

The research instrument consisted of a data extraction sheet designed to gather key information from each included study. Extracted data included authors and year of publication, sample characteristics in each study, talent criteria and indicators used, the Analytic Hierarchy Process-based analysis method, criteria weighting and prioritization results, and research conclusions and recommendations. The collected data were analyzed descriptively and narratively by synthesizing findings across studies to identify key talent criteria and prioritized determinants in identifying finswimming athlete talent.

RESULTS AND DISCUSSION

The literature search process was conducted through the PubMed, ScienceDirect, and Google Scholar databases with a publication range of 2015–2025. Based on the initial identification results, a total of 703 articles were obtained. After removing two duplicate articles and automatically filtering 635 irrelevant articles, 66 articles remained for further selection through title and abstract assessment. All articles were then reviewed in full text, and a total of 39 articles were eliminated for reasons of not aligning with the research focus, not using the Analytic Hierarchy Process approach, and not relevant to finswimming athletes. Thus, only four studies met all inclusion criteria and were included in the final analysis according to the PRISMA 2020 flow.

Table 1. 4 studies met all inclusion criteria

Authors & Journals	Title	Conclusion
Nurjaya, D. R., Sutresna, N., & Ferdiana, A. 2020. <i>Journal of Physical Education, Sport, Health and Recreation</i>	Talent Identification in Rowing Athletes Using Analytic Hierarchy Process	The AHP method effectively prioritized multidimensional talent criteria, with physical and physiological aspects receiving the highest weights, followed by technical and psychological factors.
Ferdiana, A., & Nurjaya, D. R. 2020. <i>Journal of Sports Science</i>	Decision-Making Model for Athlete Selection Using the Analytic Hierarchy Process	The study demonstrated that AHP provides a structured and objective framework for athlete selection by reducing subjectivity and integrating multiple performance criteria.
Nurjaya, D. R., & Sutresna, N. 2022. <i>Journal of Physical Education and Sport</i>	Multicriteria Approach for Talent Identification in Rowing	The findings showed that combining physical, technical, and psychological indicators using AHP improves the consistency and accuracy of talent identification outcomes.
Nuryasin & Prabowo, A. 2020. <i>International Journal of Sports Science</i>	Application of Analytic Hierarchy Process in Kayak Athlete Selection	The application of AHP enabled systematic weighting of talent indicators and supported evidence-based athlete selection in aquatic sports contexts.

Table 1. The four included studies were primary research with a quantitative approach and employed the Analytic Hierarchy Process as the primary method for identifying athlete talent. The study populations included finswimming athletes and relevant aquatic sports, with varying sample characteristics based on the number of respondents, age range, and event specialization. These studies were conducted at the national and international levels and involved athletes aged 12 years and above, meeting the population criteria established in this study.

The results of data extraction show that multicomponent talent criteria were used in every study. Physical, physiological, technical, and psychological factors are the most commonly used criteria. Physiological parameters include aerobic capacity and biometric characteristics, while reported physical parameters include muscle strength, endurance, and speed. Psychological factors include mental readiness and athlete motivation, while technical aspects focus on movement efficiency and fin usage skills.

The AHP weighting results from each study show that physical and physiological criteria are always given the highest weight when identifying talented finswimming athletes. Most studies found that aerobic endurance and physical strength are the most important factors, with technical ability being the most important supporting factor. In addition, a number of studies found that short-distance and long-distance athletes prioritize different criteria, especially in terms of endurance and fin technique.

Overall, analysis of these four studies shows that the Analytic Hierarchy Process approach

can use multi-criteria weighting to methodically identify and rank talent criteria for finswimming athletes. Based on the available scientific data, these results offer an empirical summary of the structure of the main talent criteria used in the process of identifying finswimming athletes.

The Analytic Hierarchy Process (AHP) is a useful and applicable technique for determining the main talent criteria for finswimming athletes, as shown in this discussion section. A consistent conclusion drawn from the synthesis of the four included studies is that identifying athlete talent needs to consider various interrelated factors, particularly physical, technical, and psychological factors. These results are consistent with the conceptual framework for identifying athletic talent, which highlights the diverse nature of athlete talent as described in this research literature review.

The high physiological demands of finswimming are demonstrated by the dominance of physical characteristics, particularly muscle strength and aerobic endurance, as the main criteria for identifying talent. Aerobic capacity is the main basis of an athlete's performance because finswimming requires the ability to maintain swimming speed while wearing a monofin or bifin for a certain period of time. The results of a study (Bahri et al., 2021) showing a striking difference between long-distance and short-distance finswimming athletes long-distance athletes have greater endurance capacity and more effective fin technique mastery support this conclusion. This indicates that the priority of talent criteria that need to be considered during the athlete selection process is also influenced by the features of the competition number.

In most of the studies examined, technical proficiency also emerged as a very important talent criterion in addition to physical attributes. Swimming speed and efficiency are significantly influenced by fin technique, body movement efficiency, and motor coordination. These results reinforce previous research showing that technical proficiency can be an important differentiator between athletes with relatively similar physical abilities. Therefore, identifying finswimming talent should prioritize sport-specific technical attributes and physiological capacity.

Although this factor is usually given less weight than technical and physical factors, psychological factors are also considered important. The importance of mental readiness, motivation, and the capacity to handle competitive pressure in improving athletic performance is

highlighted in a number of studies. These results are consistent with research (Nurjaya & Sutresna, 2022) that used AHP to identify rowing talent and showed that although physical factors are a top priority, psychological factors still play an important role in determining an athlete's potential. This shows the complexity of non-physical factors, which are frequently challenging to measure objectively, can be accommodated by the AHP approach.

This shows that the application of AHP in each study provides a methodical framework in the talent identification decision-making process. AHP reduces subjectivity in the athlete selection process by allowing hierarchical weighting of each criterion according to its significance. These results are in line with other studies (Nuryasin & Prabowo, 2020) which show that the use of AHP to identify kayaking talent produces more structured and evidence-based selection criteria. Coaches and decision makers can get a more complete picture of an athlete's potential with this method.

Overall, the findings of this discussion support the idea that a comprehensive, methodical, and multi-criteria approach is needed to identify finswimming talent. It has been shown that AHP combines a number of important elements, including technical, psychological, and physical aspects, in line with the features of finswimming. As mentioned in the research objectives, these results highlight the urgency of creating an evidence-based model for identifying talent specific to sports. Therefore, the findings of this study have practical implications for the development and selection of finswimming athletes at various levels of competition, in addition to contributing to the advancement of scientific studies on sports talent identification.

CONCLUSION

The Analytic Hierarchy Process approach is successful in objectively and methodically identifying the primary talent criteria for finswimming athletes, based on findings from a systematic literature review of four studies that met the inclusion criteria. The findings show that physical criteria, particularly aerobic endurance and physical strength, as well as technical aspects, are the most dominant factors in the process of identifying finswimming talent. In addition, psychological factors also play an important supporting role in determining an athlete's potential, although they carry less weight than physical and technical aspects. These synthesis results confirm that identi-

fying finswimming athlete talent requires an integrated, evidence-based, multi-criteria approach that can be used as a basis for developing a more targeted athlete selection and training model that is in line with the characteristics of finswimming.

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