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The Talent Identification of Sepak takraw Athletes In *Smash* Specialization: A Research-based on Analytic Hierarchy Process

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Abstract

Talent identification is a significant investment in sports to determine the proficiency of prospective athletes. This study aims to determine the criteria and sub-criteria in identifying talent for Sepak takraw athletes aged 16 to 19 in *smash* specialization. This study aims to determine the criteria and sub-criteria in identifying athlete talent resulting from the analytic hierarchy process (AHP) of anthropometric, physiological, and motor variables. Data was collected and analyzed using the Analytic Hierarchy Process (AHP) with Ms. Excel. The method utilized in this research is mixed-methods research, which involves conducting a literature review and providing questionnaires to 30 Sepak takraw experts in Indonesia. This research produces nine sub-criteria, with a high percentage of data analysis results using AHP. These sub-criteria are the top nine sub-criteria consisting of Leg Strength (21.8%), Leg Length (21.1%), Aerobic Power (17.2%), Anaerobic (13.0%), Body Height (873%), Flexibility (6.2%), Agility (5.3%), Body Weight (3.5%) and Aerobic (3.3%). Based on the results of data analysis, there are four most important criteria, specifically Leg Strength from the motor aspect, Aerobic Power and Anaerobic from the physiological aspect, and Body Height from the anthropometric aspect.

Keywords: *Smash*, Sepak Takraw, Talent Identification, Analytic Hierarchy Process

INTRODUCTION

The Sepak takraw game is played by two teams; each team consists of three people, is limited by a net, and the two teams compete for points (Semarayasa, 2014). Sepak takraw is one of Indonesia's leading sports in international level matches, i.e., the King's Cup, Sea Games, and Asian Games. A proud achievement in Sepak takraw was obtained through the gold medal at the previous SEA Games in Vietnam (2021) and the Cambodia SEA Games (2023). This achievement complements Sepak takraw's previous

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achievements in the sporting event in the Asian Games from 2010, 2014, and 2018, continued in the 2023 Asian Games in Hang Zhou. Accomplishing achievements in sports requires continuous coaching. However, before the coaching begins, athletes' abilities must be identified accurately to develop their potential (Saripah & Agus Rusdiana, 2023; Bramantha, 2017; Qonitatillah & Wahyudi, 2022).

Sepak takraw game combines several sports: volleyball, soccer, futsal, badminton, basketball, athletics, and gymnastics. Sepak takraw combines elements of gymnastics and acrobatic movements as a basis for skills toward achievement (Slamet Pratama et al., 2017). This game uses the feet and all limbs except the hands. Along with the development of Sepak takraw, some numbers compete in single events and multi-events at national and international levels, such as single teams, double teams, inter teams, quadrants, and mixed.

In Sepak takraw, smash plays a crucial role in a game or match (Jufrianis et al., 2021). The attack or smash is an athlete's ability to hit the ball hard, bend, and use legal limbs in the opponent's area (Rafsanjani & Saparia, 2018). The Sepak takraw game has three types of smash: smash roll (salto), keeping, and scissors. The success of a smash is defined as providing a score for the team that performs the smash or an opportunity to move the ball back after the opponent serves. On the other hand, if the smash fails, the opponent can attack back.

Sports talent identification is talent development at various stages in the coaching process of a sports achievement. It is a crucial part of the nine pillars of sport policy leading to international sporting success (SPLISS). SPILISS is a conceptual model developed by De Bosscher with a tendency for a distinctive combination of system pieces to produce different approaches that lead a country to achieve elite sports success (Siti Nurr Arviyani, 2022). According to Bailey, Collins, and Nurjaya, talent identification is a specific method of converting an athlete's potential into a national athlete. They will be developed by a sports organization or club, and the process of detecting proficiency and then matching their proficiency with the primary and effective criteria in the relevant sport (Vaeyens et al., 2008).

SPILSS developed the application of the analytic hierarchy process to the decision-making system process. This method is believed to have a remarkably high accuracy for sports achievement (Dahlan & Musfira Amahoru Jadiaman Parhusip, 2019;

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Makkasau, 2013). In sports research, the analytic hierarchy process method compares and determines criteria in several aspects, such as anthropometric, physiological, biomechanical, technical, and psychological. The determining criteria in anthropometric aspects are height, weight, arm span, leg length, sitting height, and shoulder width. Physiological aspects concern aerobic, anaerobic, aerobic strength, and vital capacity, while biomechanical aspects are leg, arm, and muscle; technical aspects are catch, drive, and recovery. The psychological aspects concern confidence, motivation, focus, and resistance to fatigue and stress (Nurjaya et al., 2020).

Implementing decisions using the Analytic Hierarchy Process (AHP) in sports research has been widely applied. The analytic hierarchy process has also been used in Turkey in team sports such as volleyball (Budak et al., 2017), badminton (Saripah & Agus Rusdiana, 2023), and wrestling (Ferdiana et al., 2023). However, research on talent identification using AHP in Sepak takraw, especially for smash specialization in Indonesia, gives a broader paradigm for athlete growth. This study aims to determine the criteria for identifying Sepak takraw athlete talent aged 16 to 18 in smash specialization. In this study, the general criteria used are several aspects, such as anthropometric aspects, physiological aspects, and motor aspects. This research also collects arguments from Sepak takraw experts (athletes and coaches, both physical and technical coaches) who have already identified the talents of Sepak takraw athletes in smash specialization.

METHOD

Researchers utilized mixed methods research (MMR) in this study. Mixed Methods Research is an investigative approach that involves collecting quantitative and qualitative data, integrating two forms of data, and using different designs that may involve philosophical assumptions and theoretical frameworks (Creswell, 2009). The research uses exploratory sequential design. This method combines qualitative and quantitative methods in two phases, emphasizing qualitative methods as the main priority (Nurjaya et al., 2020).

Data was collected from 30 participants, consisting of athletes, coaches, and experienced Sepak takraw experts. All participants have experience in national and international Sepak takraw sports events. A focus group discussion (FGD) is conducted through the Zoom meeting during the data collection process. Then, the experts (participants) fill out a questionnaire sent through the Zoom meeting. Participants were

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asked to fill in a priority scale based on criteria based on anthropometric, physiological, and motor aspects. These criteria were selectively chosen by considering various perspectives to identify Sepak takraw athletes in smash specialization. Based on the results of a literature review conducted by the author from various reference sources, 9 sub-criteria are needed to identify the talent of Sepak takraw athletes in smash specialization at various ages.

The decision-making method using the AHP approach was first developed in 1980 by Thomas L. Saaty in his book Hierarchy Process (Saaty & Vargas, 2012). AHP method on multi-criteria decision analysis (MCDA) is adopted in this research as an approach for the reasons (i) complex problems can be decomposed into a hierarchy that can be operated; (ii) pairwise comparison at each level is to ensure a comprehensive investigation; and (iii) a single decision output can be achieved. The
following process is summarized below in four steps:

1. Develop a hierarchy of problems with the aim of talent identification for Sepak takraw in smash specialization.
2. Describe the results of the opinions of athletes and Sepak takraw coaches in numbers.
3. Combining the results of each level of the hierarchy
4. Analyzing sensitivity to changes in assessment

The hierarchical model formulated with the AHP hierarchy description can be reviewed in Figure 1 for the talent identification model of Sepak takraw athletes in smash specialization.

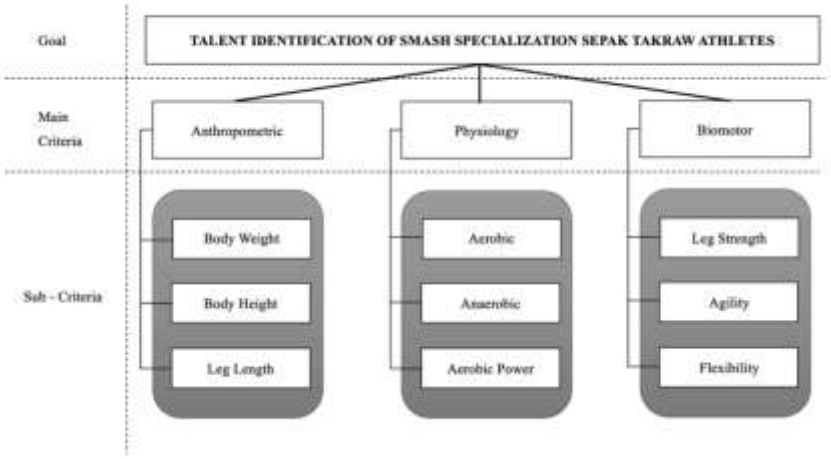

Figure 1 AHP Hierarchy Model Chart

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The comparison rating scale is obtained from the AHP standard scale for assessing an element based on the priority level (Table 1), which then obtains a decision that leads to priority weight.

Table 1. Comparative Rating Scale (Saaty Thomas, 2002)

Level	Definition	Description
1	Both elements are equally important	Two elements have an equal influence on the goal
3	One element is slightly more important than the other element	Experience and judgment slightly favor one element over the other.
5	One element is more important than the other	Experience and judgment strongly favor one element over the other.
7	One element is more important than the other	One element is strongly favored in its dominance, which is already seen in practice.
9	One element is more important than the other	The evidence favoring one element over the other has the highest degree of corroboration possible.
2, 4, 6, 8	Values between two adjacent consideration values.	This score is given when there are two compromises between two options.
Reverse	If element j gets a number compared to element j, then j has the opposite value compared to i.	

RESULT

Table 2 shows the Analytic Hierarchy Process (AHP) questionnaire scores based on anthropometrics, physiology, and motor sub-criteria.

Table 2. Criteria And Sub-Criteria Selected For Evaluation Specialization Smash Of Sepak takraw Athletes

Criteria	Sub-Criteria	Code	Reference
Anthropometric	Body Weight	ANT1	Ball et al., 1992; Hidayat & Hidayah, 2016; Kamarudin et al., 2018; Muazu

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			Musa et al., 2019; Ostojic et al., 2006; Pyne et al., 2006
	Body Height	ANT2	Ball et al., 1992; Hidayat & Hidayah, 2016; Jawis et al., 2005; Kamarudin et al., 2018; Muazu Musa et al., 2019; Ostojic et al., 2006; Pyne et al., 2006; Rashid AZIZ et al., 2003; Sarkar et al., 2019; Xindong,
	Leg Length	ANT3	Ball et al., 1992; Hidayat & Hidayah, 2016; Kamarudin et al., 2018; Muazu Musa et al., 2019; Ostojic et al., 2006; Pyne et al., 2006; Dahlan et al., 2020; Hardianto, 2019; Sukamto, 2021
Physiology	Aerobic	PHY1	Akkase, 2022; Anggriawan, 2015; Aslam et al., 2022; Gaitanos et al., 1993; Green, 1979; Jawis et al., 2005; KÖNIG et al., 2001; Rashid AZIZ et al., 2003; Safitri, 2021; Saharullah, 2023; Tanormsak Senakham et al., 1998
	Aerobic Power	PHY2	
	Anaerobic	PHY3	
Biomotor	Leg Strength	BIO1	Achmad Paturusi et al., 2022; Ali et al., 2021; Bompa & Carlo Buzzichelli, 2019; Hager et al., 2020; Hermawan Iwan, 2015; Hidayat & Hidayah, 2016; Jufrianis et al., 2021; Kusnanik, 2014; Mamu et al., 2022; Rahaji et al., 2017; Rashid AZIZ et al., 2003; Ribeiro et al., 2020; Rusli et al., 2022; Sudirman Burhanuddin et al., 2021; Sukmawati, 2020; Syahban, 2018; Wanda Adrian

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		Ray et al., 2021
Agility	BIO2	Ali et al., 2021; Bompa & Carlo Buzzichelli, 2019; Fatimah, 2022; Hermawan et al., 2022; Hermawan Iwan, 2015; Hidayat & Hidayah, 2016; Siswanto et al., 2017; Sudirman Burhanuddin et al., 2021; Sukmawati, 2020; Yuniawan & Bulqini, 2022
Flexibility	IO3	Ali et al., 2021; Aljundy & Yudi, 2019; Bompa & Carlo Buzzichelli, 2019; Dahrial, 2022; DAR Wulandari & M Irsyada, 2019; Hermawan Iwan, 2015; Jamalong, 2015; Karim, 2018; Mekayanti et al., 2015; Murti et al., 2020; Sahabuddin & Arman Fadillah, 2022; Sardiman et al., 2022; Siswanto et al., 2017; Sudirman Burhanuddin et al., 2021; Suhartiwi, 2017; Sukmawati, 2020; Sulaiman et al., 2020; Syam, 2020

As shown in Table 3, body weight has a value of 0.2 compared to body height; if, on the contrary, body height has a value of 5 compared to body weight, then it shows that body height is more important than body weight. Another example is that leg strength has a value of 5 compared to agility, indicating that leg strength is more important than agility. If, instead, agility has a value of 0.2 of leg strength.

Table 3. Criterion Importance Questionnaire Score

	Body Weight	Body Height	Leg Length
Body Weight	1,00	0,33	0,20
Body Height	3,00	1,00	0,33
Leg Length	5,00	3,00	1,00
	9,00	4,33	1,53

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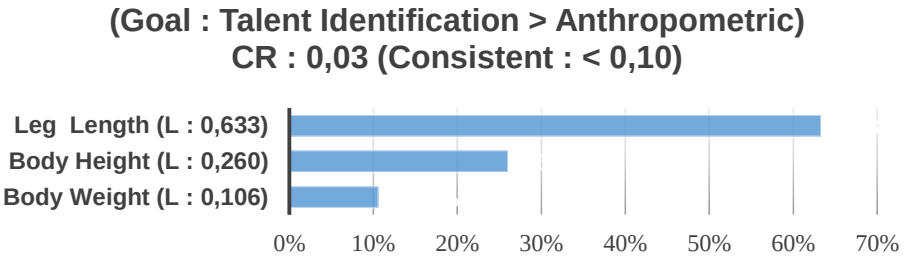
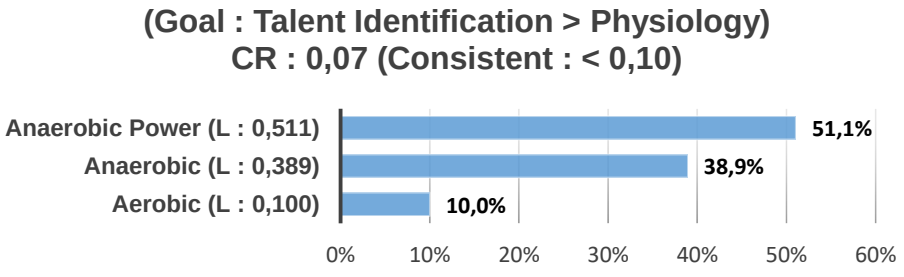
	Aerobic	Aerobic Power	Anaerobic
Aerobic	1,00	0,14	0,33
Aerobic Power	7,00	1,00	1,00
Anaerobic	3,00	1,00	1,00
	11,00	2,14	2,33

	Leg Strength	Agility	Flexibility
Leg Strength	1,00	5,00	3,00
Agility	0,20	1,00	1,00
Flexibility	0,33	1,00	1,00
	1,53	7,00	5,00

To better understand the priorities shown in Table 3, a pairwise comparison of the sub-criteria on each criterion was conducted based on expert opinion (athletes and coaches). In Table 3, the anthropometric criteria have three sub-criteria: body weight, height, and leg length. From the comparison results, leg length is proven to have the most important role of the other criteria, with the priority vector score as follows: Body weight = 0.106, Body Height = 0.260, and Leg Length = 0.633.





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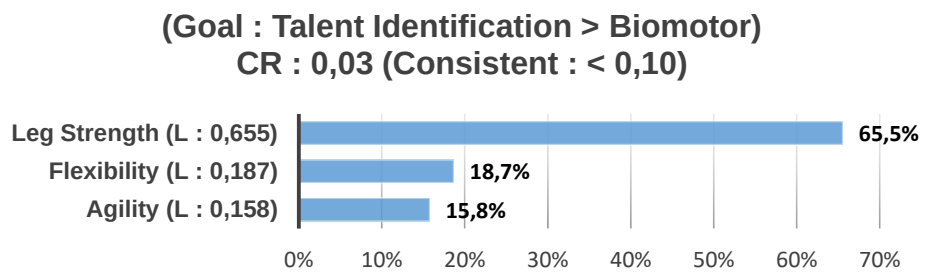

Figure 2. Normalized Data Analysis Results from the Expert Opinion Questionnaire for Anthropometric (Top), Physiology (Middle), and Biomotor (Bottom) Sub-Criteria Categories

The Physiology criteria has three sub-criteria: Aerobic, Anaerobic, and Aerobic Power. From the comparison results, Aerobic Power is proven to have the most important role of other criteria, with the priority vector score as follows: Aerobic = 0.100; Anaerobic = 0.389, and Aerobic Power = 0.511. In comparison, the Biomotor criteria have three sub-criteria: Leg Strength, Agility, and Flexibility. From the results of this comparison, Leg Strength is proven to have the most important role of the other criteria, with the priority vector score as follows: Leg Strength = 0.655, agility = 0.158, and Flexibility = 0.187. Further analysis of each sub-criteria is shown in Figure 2.

Based on Figure 3, the top nine sub-criteria can be classified consisting of Leg Strength (21.8%), Leg Length (21.1%), Aerobic Power (17.2%), Anaerobic (13.0%), Body Height (873%), Flexibility (6.2%), Agility (5.3%), Body Weight (3.5%) and Aerobic (3.3%). This figure shows that Leg Strength is the most important sub-criteria in determining the talent of Sepak takraw athletes in smash specialization compared to other criteria.

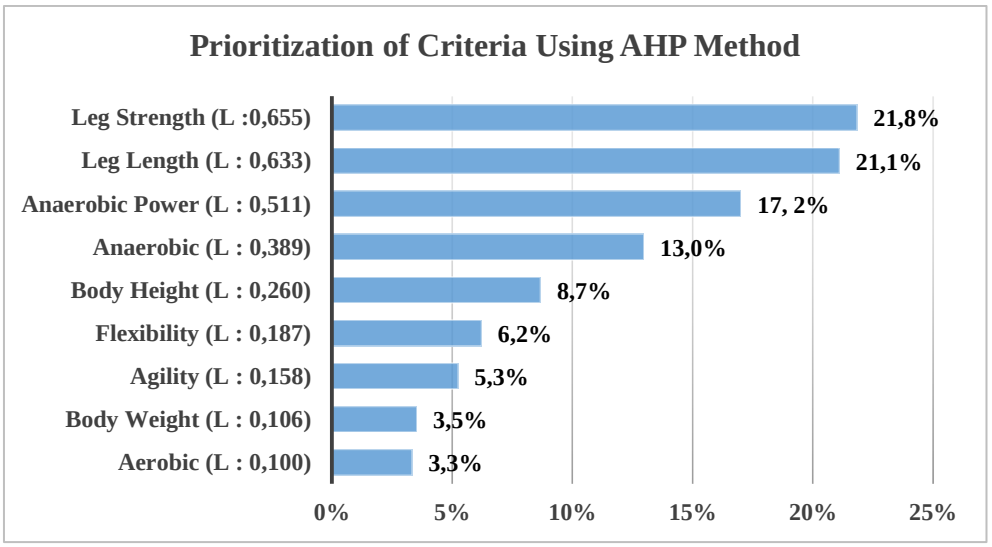

Figure 3. Prioritization Of Criteria With AHP Method

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DISCUSSION

The data analysis results show that the biomotor of a Sepak takraw athlete in the smash specialization has an important role in talent identification. Tall athletes with long limbs tend to be less agile than athletes with short leg lengths but have better agility than those with long limbs. In the biomotor aspect, leg strength is the ability of an athlete's leg muscles to jump as high as possible (explosive). If a Sepak takraw athlete has a significantly high jump, it will make it easier for him to do a good smash. Therefore, to do a good and directed smash, athletes must have significantly good leg muscle strength (Hager et al., 2020). Leg muscles in a smasher can cause injury; this can be seen from the percentage comparison of injuries between smash (50%), tekong (38%), and feeder (12%). In collecting data on injuries to Sepak takraw players by Khairunnisa & Pitriani (2019), it turns out that most of the locations of leg injuries that Sepak takraw players often experience are ankle (27%), then thigh (26%), and knee (17%). Therefore, to increase leg muscle strength, it is necessary to provide leg strength training first, such as training using your body weight (bodyweight training) or internal resistance (Aji et al., 2023) for early childhood, such as squats to be able to adapt first, then box jump or depth jump training for teenage athletes and forms of weight training according to the intensity for elite (expert) level athletes.

Although smash specialization in Sepak takraw athletes requires leg strength and endurance, aerobic power is the priority sub-criterion in the physiology aspect based on AHP weighting. It is in line with Aslam et al. (2022), who argue that based on the duration of the Sepak takraw sport, which uses numbers in each set that has been determined to determine the winner, Sepak takraw can be classified as a sport that uses an aerobic energy system (requires oxygen to produce ATP). However, one component of the Sepak takraw physical condition is agility and reaction speed, which relies on reflexes and speed to move which is commonly used. Agility and reaction speed can occur by relying on anaerobic energy systems. Sepak takraw uses a mixed energy system dominated by the aerobic energy system due to the long time spent in a sports match that uses a timeless set system to determine the winner. In contrast, the anaerobic energy system is only used when players use their physique to perform agility and reaction speed in playing Sepak takraw. So VO2 Max is a vital instrument in physiological analysis in Sepak takraw sports. The type used to measure VO2 Max in Sepak takraw athletes is the bleep test, carried out

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by running a distance of 20 meters back and forth. It starts with a slow run and gradually gets faster until the athlete cannot keep up with the rhythm of running time, meaning his maximum ability at the alternating level (Bausad & Musrifin, 2020).

While in the anthropometric aspect, the leg length sub-criteria has the highest percentage. Leg length, as one of the lower limbs, is important in sports performance, especially in game sports such as Sepak takraw. Dahlan et al. (2020) state that limbs are lower limbs used in smash movements; the higher the leg length category, the higher the smash ability category. On the contrary, the lower the leg length category, the lower the smash ability category. Leg length will affect smash performance because long limbs can perform sharp and steep smashes, making blocking more difficult. Then, Rudiyanto and Musyafari Waluyo clarify that in several sports, especially Sepak takraw, body structure, and posture dominate achievement, especially in long limbs and high postures. So, an athlete with long limbs supports achievement, especially in the Sepak takraw sport.

Although not the only factor determining victory in a match, the advantage of posture also plays a role in energy efficiency. A taller posture saves an athlete energy better than a short one. A taller posture will make it easier to reach the ball in all positions. In terms of energy, it is also very beneficial because energy efficiency can be appropriately adjusted according to needs when compared to a shorter posture (Tangkudung, 2006).

CONCLUSION

This research helps determine priorities in identifying athlete talent that can be done by coaches and *Persatuan Sepak takraw Indonesia* administrators in the field of achievement *(Binpres)* Central and Regional. The selection of criteria and sub-criteria in identifying athlete talent is made through a literature review, which produces three criteria: anthropometrics, physiology, and motor. Experts in Sepak takraw provide an assessment in the form of a score on each sub-criteria to produce the most appropriate sub-criteria in conducting talent identification tests. This study produces nine sub-criteria with the highest percentage of the results of data analysis using AHP. These sub-criteria are Leg Strength, Leg Length, Aerobic Power, Anaerobic, Body Height, Determination, Agility, Body Weight and Aerobics. So that these results can be used as guidelines to determine priorities for coaches in identifying Sepak takraw athletes, especially *smash* specialization.

This study suggests further conducting more in-depth research on anthropometric, physiological, and biomotor aspects needed in Sepak takraw sports for *smash*, *tekong*, and

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feeder specialization. The criteria can be developed again into several sub-criteria based on the results of observations made by the coach so that the priority level can be maximized.

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