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Development of a game-based situational training model for volleyball talent identification

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ABSTRACT

The success of Indonesian volleyball in Southeast Asia depends on effective talent development programs that identify and nurture promising athletes. Therefore, a valid and reliable talent identification method is essential for selecting athletes with the potential to achieve high performance. This study aimed to develop and validate a game-based situational training model for volleyball talent identification. The study employed a research and development (R&D) approach combined with an experimental design. The development process followed a ten-step procedural model, including needs analysis, information gathering, product design, expert validation, design revision, product testing, product refinement, field testing, final revision, and product finalization. The participants consisted of 14 male volleyball athletes (aged between 18 and 25 years) and 3 coaches from West Sumatra, Indonesia. The developed model was evaluated for validity, practicality, and effectiveness. The results demonstrated that the developed training model met the required standards of validity, practicality, and effectiveness, indicating that it is suitable for identifying volleyball talent in game situations. The proposed model provides coaches with a practical and evidence-based tool to support talent identification and athlete development in volleyball.

KEYWORDS

Game-Based Situational Training; Talent Identification; Volleyball; Research and Development; Athlete Assessment

1. INTRODUCTION

Indonesia is currently ranked among the top three volleyball nations in Southeast Asia. Volleyball is an intermittent sport consisting of periods of low-intensity activity interspersed with short bursts of high-intensity exercise (Alnedral et al., 2020). Physical fitness is essential for supporting players' performance (Rifki & Ariston, 2021). To achieve a professional level of performance, athletes must master volleyball techniques while possessing the physical attributes required to execute them effectively.

Achieving this level of success requires a long-term development process, beginning with the identification of talented athletes in volleyball clubs across Indonesia and continuing through training camps. Talent identification is influenced by multiple factors, with growth and maturation representing key concepts for understanding the identification, selection, and development of young athletes (Gonçalves et al., 2012). Before athletes participate in training camps, they undergo selection at the provincial, regional, and national levels. Prior to this process, they acquire fundamental skills through training at their respective clubs. Based on these considerations, the current approach to recruiting young volleyball talent appears to be inadequate, making talent identification a significant challenge for volleyball clubs in Indonesia.

The challenges encountered are diverse, including coaches' difficulties in delivering training programs and athletes' varying abilities to understand and implement them. These challenges were identified through interviews, which revealed considerable differences in athletes' capacity to comprehend and apply the prescribed training programs. Athletic potential or talent is determined not only by high intellectual ability but also by motivation and hard work (Bakhtiar et al., 2023). To develop this potential and talent, appropriate interventions are required, particularly through differentiated training programs (Hasanah et al., 2022).

Achieving excellence in sport requires systematic preparation from an early age. This process begins with the development of fundamental multilateral movement skills, followed by the identification of appropriate sporting potential and the implementation of training programs that are aligned with children's growth and development. These factors play a crucial role in athletes' performance during their peak competitive years. Therefore, talent identification should include assessments of kinesthetic ability, intelligence, psychological characteristics, and external factors such as heredity and environmental influences. However, based on the current survey, volleyball in

Indonesia still lacks a standardized instrument to assess athletes' potential and talent, particularly in relation to their ability to respond effectively to club training programs.

Therefore, it is necessary to develop an instrument to address this issue. In the present study, the development process was conducted in stages, with the initial focus on developing a kinesthetic assessment instrument for volleyball.

2. METHODS

2.1. Study Design and Participants

This study employed a Research and Development (R&D) design based on the theory of Borg and Gall to develop a product, namely a talent identification instrument (Akhsan et al., 2020). The development process was informed by the findings of a preliminary qualitative study. The study consisted of several stages, including a preliminary study, expert validation, a practicality test, and an effectiveness test. The expert validation involved three experts: two volleyball experts and one expert in model development.

To establish a standardized instrument, three types of evaluation were conducted: (1) a validity test to determine the extent to which the instrument measures the intended construct; (2) a practicality test to evaluate the ease and feasibility of using the instrument; and (3) an effectiveness test to assess the efficiency of the instrument in practice (Cury et al., 2019; Kane, 2013).

An experimental design was subsequently employed to evaluate the developed instrument by examining its ability to measure children's capacity to understand and effectively respond to the training program.

The participants in this study were 14 male volleyball athletes from the West Sumatra PON Training Center (*Pelatda PON*). The participants were between 18 and 25 years of age. A total sampling technique was employed, in which all eligible athletes were included in the study. In addition, approval to conduct the study and collect the required data was obtained from the institution where the research was carried out.

2.2. Instruments and Procedures

The product developed in this study was a game-based situational training model designed for volleyball talent identification. The model consisted of a series of standardized game situations, including: (1) a game situation using a court measuring 18 m in length and 4.5 m in width; (2) a game situation in which the court was divided diagonally between Position 2 and Position 5; (3) a

game situation emphasizing attacks from Position 1 directed toward Positions 5 and 6; (4) a game situation emphasizing attacks from Position 6 directed toward Positions 5 and 1; and (5) a game situation emphasizing attacks from Positions 6 and 1, with attacks directed toward Positions 5, 6, and 1.

2.3. Statistical Analyses

All statistical analyses were performed using IBM SPSS Statistics version 24 (IBM Corp., Armonk, NY, USA). Descriptive statistics were calculated and are presented as means (M), standard deviations (SD), frequencies, and percentages, as appropriate. Content validity was evaluated based on expert judgments. The practicality of the developed instrument was assessed using percentage scores obtained from the usability questionnaires completed by the coaches. The effectiveness of the instrument was examined using paired-samples *t*-tests by comparing participants' performance before and after the intervention for each volleyball skill (bottom pass, smash, top service, block, and overhead pass). Statistical significance was established at $p < 0.05$.

3. RESULTS

The validity of the volleyball skills assessment instrument was evaluated through expert judgment by examining the correspondence between the assessment indicators and the evaluation criteria. The results of the content validity assessment are presented in Table 1.

Table 1. Expert evaluation of the content validity of the volleyball skills assessment instrument

No	Validator (Initials)	Average	Category
1	S	4.97	Valid
2	A	4.97	Valid
3	AH	4.53	Valid
Overall average		4.82	

As shown in Table 1, the experts' evaluation indicated that the developed instrument demonstrated good content validity. The three experts assigned mean validity scores of 4.97, 4.97, and 4.53, respectively, with all ratings falling within the valid category.

Following the validity assessment, the practicality of the developed instrument was evaluated by selected volleyball coaches. The purpose of this stage was to determine the usability of the instrument in practice. The coaches completed a practicality (usability) questionnaire after using the instrument. The results of the practicality assessment are presented in Table 2.

Table 2. Practicality (usability) assessment of the developed instrument

No	Validator (Initials)	Amount	Achievement (%)	Interpretation
1	S	30	90.91	Very Practical
2	A	31	93.94	Very Practical
3	AH	30	90.91	Very Practical

As shown in Table 2, the three volleyball coaches who evaluated the practicality of the developed instrument assigned practicality scores of 90.91%, 93.94%, and 90.91%, respectively. All three evaluations were classified as very practical.

The effectiveness of each volleyball skill assessed by the instrument is presented below. To evaluate the effectiveness of the standardized bottom pass assessment, a paired-samples *t*-test was conducted (Table 3).

Table 3. Effectiveness of the bottom pass assessment

Treatment	Group	M	SD	df	*p* value
Bottom Pass	Post-test	31.43	2.59	14	0,000

As shown in Table 3, the post-test mean score for the bottom pass assessment was 31.43 (SD = 2.59). The paired-samples t-test indicated a statistically significant difference ($p < 0.05$). To evaluate the effectiveness of the standardized smash assessment, a paired-samples t-test was conducted (Table 4).

Table 4. Effectiveness of the smash assessment

Treatment	Group	M	SD	df	*p* value
Smash	Post-test	29.86	0.535	14	0,000

As presented in Table 4, the post-test mean score for the smash assessment was 29.86 (SD = 0.535). The paired-samples t-test indicated a statistically significant difference ($p < 0.05$). To evaluate the effectiveness of the standardized top service assessment, a paired-samples t-test was conducted (Table 5).

Table 5. Effectiveness of the top service assessment

Treatment	Group	M	SD	df	*p* value
Top Service	Post-test	38.43	1.39	14	0,000

As shown in Table 5, the post-test mean score for the top service assessment was 38.43 (SD = 1.399). The paired-samples t-test indicated a statistically significant difference ($p < 0.05$). To evaluate the effectiveness of the standardized block assessment, a paired-samples t-test was conducted. As shown in Table 6, the post-test mean score was 28.21 (SD = 2.914). The paired-samples t-test indicated a statistically significant difference ($p < 0.05$).

Table 6. Effectiveness of the block assessment

Treatment	Group	M	SD	df	*p* value
Block	Post-test	28.21	2.91	14	0,000

To evaluate the effectiveness of the standardized overhead pass assessment, a paired-samples *t*-test was conducted. As shown in Table 7, the post-test mean score was 31.57 (SD = 1.555). The paired-samples *t*-test indicated a statistically significant difference ($p < 0.05$).

Table 7. Effectiveness of the overhead pass assessment

Treatment	Group	M	SD	df	*p* value
Overhead Pass	Post-test	31.57	1.55	14	0,000

4. DISCUSSION

Several studies have identified three main categories for predicting athletic talent: cognitive/psychological ability, physical profile, and previous performance or experience (Grouios, 2004). These components exhibit considerable variability because the task requirements, rules, activities, and motor skills differ across sports (Gonçalves et al., 2012). In recent years, advances in technology (Torres-Luque et al., 2020), together with observational methodology (Fernandes et al., 2019), have enabled researchers to obtain valuable information on sport-specific movement patterns, providing a better understanding of athletes' movement behaviors during competition.

Effective ball control requires athletes to possess well-developed motor skills that support the execution of volleyball techniques (Syamsuryadin & Mansur, 2019). In addition, physical fitness plays a fundamental role in enhancing players' performance (Rifki & Ariston, 2021). Identifying talented athletes at an early stage is essential for predicting their ability to sustain long-term training and achieve high performance. According to Conny Semiawan, two key principles should be considered when identifying talent: (1) talent is an innate characteristic that develops through interaction with environmental influences, and (2) talent is also shaped by the cultural context in which an individual develops (Vater et al., 2017).

Talent has been conceptualized as an innate, multidimensional, emergenic, dynamic, and symbiotic construct (Syväoja et al., 2021). Accordingly, talent reflects biological predispositions while continuously evolving through interactions among cognitive, physical, psychological, environmental, and social factors. Although physical and physiological capacities can be improved through training, the effectiveness of athlete development is also influenced by kinesthetic ability, psychological characteristics, genetic factors, and environmental conditions. These four dimensions are essential for understanding athletes' ability to learn, adapt to, and successfully implement training programs, thereby improving the efficiency of the talent development process.

Kinesthetic intelligence is closely associated with an individual's ability to perform coordinated and efficient movements that contribute to superior athletic performance. Motion analysis can be used to evaluate athletes' movement patterns and identify their technical performance during sport-specific actions. High-quality technique is characterized by efficient movement execution, making motor competence a fundamental component of volleyball performance (Rifki et al., 2022). The development of kinesthetic intelligence depends on several basic motor abilities, including body coordination, agility, strength, balance, and hand–eye coordination (Wallack et al., 1988). These abilities facilitate learning, skill acquisition, and long-term athletic development, particularly during the early stages of training (Pearson et al., 2006).

Talent identification should emphasize children's capacity for long-term athletic development as well as the psychological factors that support this process. Consequently, talent identification and development should adopt a multidimensional approach that recognizes the important role of psychological characteristics in helping athletes realize their sporting potential. Motivation and effective learning strategies are key determinants of athletic development because they enable individuals to engage successfully with the training opportunities provided by their environment (Rifki & Syafrizar, 2018).

Genetic and environmental factors should also be considered during talent identification. Although there is no conclusive evidence that sporting achievement is directly inherited from parents, both heredity and environmental influences contribute to athletes' long-term development (Webborn et al., 2015). Other studies have shown that genetic factors influence several somatic and physiological characteristics associated with performance in specific sports (Simonton, 2005). Similarly, high-level athletic performance results from the interaction of environmental conditions, genetic characteristics, training, and nutrition (Macarthur & North, 2005). Therefore, changes in athletic performance should be interpreted by considering both genetic and environmental influences, as well as the interaction between these factors (Williams et al., 2000).

Despite these findings, some researchers have questioned the extent to which exceptional athletic talent and performance ultimately depend on genetic characteristics (Roth, 2012). Furthermore, placing excessive emphasis on genetic traits during talent selection may discourage individuals who are less genetically predisposed to a particular sport and may increase the pressure imposed by parents regarding sport selection (Ozcaldiran et al., 2014).

A comprehensive research approach is therefore needed to clarify the relative contributions of heredity and environmental influences to motor performance and athletic development (Grouios, 2004). Directing children toward sports that do not match their physical characteristics or abilities—for example, encouraging children without the required height to pursue basketball or volleyball—may reduce motivation and lead to negative sporting experiences (Rifki et al., 2022). Therefore, although innate talent remains an important concept, its practical application in high-performance sport is limited unless it is considered alongside developmental and environmental factors. Based on these considerations, the present study proposes a volleyball talent identification method that integrates four components: kinesthetic, psychological, genetic, and environmental factors. The developed system uses technology integrated into a web-based platform, allowing coaches to obtain assessment results immediately after data collection.

5. CONCLUSIONS

Talent identification enables coaches to recommend athletes for sports that best match their abilities. This process assesses athletes' movement capabilities and determines their suitability based on the fundamental movement requirements of a specific sport. In volleyball, the dominant technical skills include the bottom pass, overhead pass, smash, block, and top service. Based on these fundamental techniques, a game-based situational training model was developed to identify

volleyball talent. The developed model demonstrated satisfactory validity, practicality, and effectiveness.

The training model consists of several standardized game situations, including: (1) a game situation using a court measuring 18 m in length and 4.5 m in width; (2) a game situation in which the court is divided diagonally between Position 2 and Position 5; (3) a game situation emphasizing attacks from Position 1 directed toward Positions 5 and 6; (4) a game situation emphasizing attacks from Position 6 directed toward Positions 5 and 1; and (5) a game situation emphasizing attacks from Positions 6 and 1, with attacks directed toward Positions 5, 6, and 1.

The proposed game-based situational training model provides coaches with a valid, practical, and effective tool for identifying volleyball talent and addresses the need for a more systematic talent identification process in volleyball clubs.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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