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Evaluating Validity and Test-retest Reliability on Indonesian Basketball Talent Scouting Model for Athletes Aged 10 to 14

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Abstract

Background. Identifying talent in young athletes is crucial for effective sports coaching. However, in Indonesia, early detection of basketball talent is often hindered by the limitations of current identification methods and tools.

Objectives. This study aimed to enhance the current aptitude test for basketball players aged 10 to 14. To assess the effectiveness of the revised model, the study evaluated its validity and test-retest reliability using data from both male and female athletes.

Materials and methods. To ensure validity, four doctoral-qualified experts and seven experienced basketball coaches with an average of 12.78 ± 2.2 years coaching experience, with a type B license and bachelor's degree in sports, evaluated the test. The test-retest reliability was assessed including 40 athletes aged 10 to 14 with an average age of 12.3 ± 1.0 years, consisting of 20 males (height 160.2 ± 1.3 cm, weight 47.5 ± 7.2 kg, average training 3.5 ± 1.12 years) and 20 females (height 157.2 ± 3.7 cm, weight 44.5 ± 6.3 kg, average training 3.2 ± 1.06 years). All participants were regional champions. The test was administered twice, with a one-week interval between sessions.

Results. The study produced three types of tests, namely anthropometry (height, weight, fat range, arm length), biomotor (endurance, strength, flexibility, speed, reaction, balance, general motion), basketball skills (dribbling, passing, shooting) with Aiken V >0.8 validity, test-retest with a product moment correlation of $p < 0.05$ and $r = 0.786$, and independent t-test on male athletes and female athletes sig. 0.134 or $p < 0.05$.

Conclusions. The findings indicate that the talent scouting model of Indonesian basketball athletes aged 10 to 14 has proven to be valid and reliable from the aspects of anthropometric tests, biomotor tests and basketball skills tests. The ease of implementation, clarity of instructions, and security of the test also add to the advantages of this model. In addition, this model can be applied to male and female athletes without significant differences. Further research is needed to facilitate ongoing development by adding psychological tests and expanding the number of samples.

Keywords: basketball, talent scouting, talent development, basketball measurements, sports testing.

Introduction

Previous research has highlighted the importance of early talent identification in basketball. However, in Indonesia, this process is often hindered by inadequate methods and instruments (Fariz et al., 2023). Previous research entitled "Development Assessment Model for Talent Identification of Young Indonesian Basketball Players: Anthropometrics, Biomotor, Technical, and Tactical Skills" has made a significant contribution in the development of a comprehensive assessment model (Susanto et al., 2024). While a comprehensive assessment model has been developed, it requires further refinement in terms of validity and reliability. Additionally, the validation process has relied on a limited number of coaches, and the experience level of the basketball players involved has not been clearly defined. Therefore, this study, in addition to testing the validity and

reliability, will increase the number of large and competent samples.

Validity is an important aspect in ensuring that this assessment model is able to measure what should be measured accurately (Susiono et al., 2024; Wedi et al., 2024), while test-retest reliability is needed to determine whether the model is consistent in providing the same results when it is reapplied under similar conditions (Salafi et al., 2023). The importance of this retesting becomes particularly relevant when the model is used in young age groups that are still in a rapidly changing stage of physical and skill development. If this scouting Indonesian basketball athletes model is valid and has high reliability, coaches will be able to identify athletes' talents more accurately, understand their strengths and weaknesses, and design more effective training programs (Quílez-Maimón et al., 2023).

Based on previous literature studies, another positive benefit is that sports schools and academies will more easily select and recruit talented athletes, as well as monitor their development with measurable data, improving the school's reputation in producing quality athletes (Ribeiro Junior et al., 2021). The sports organization sector will also benefit from a more transparent and systematic talent identification process, enabling the organization to foster long-term athletes and improve team quality (Doncaster et al., 2020; Kalén et al., 2021). Then, for parents, a clear and tested talent scouting model provides clarity about their child's potential, increases confidence in the child's athletic development, and helps them provide more appropriate support (Prieto-Ayuso et al., 2017; Ribeiro et al., 2021). Overall, this model will create a better sports coaching ecosystem and improve basketball achievement in Indonesia.

In addition, to provide a more comprehensive picture, a comparison between the perception and performance of male and female athletes in using this model is needed. Previous study showed that there are physiological, biomotor, and cognitive differences between men and women that might affect the results of the aptitude assessment, which makes this test even more relevant (Han et al., 2023). By making this comparison, this study is expected to identify whether there is a need to modify the model to suit specific needs based on gender. This study aims to improve the existing talent assessment model and test the validity and test-retest reliability of basketball athletes aged 10-14, for both men and women, in order to create a more precise, accurate, and useful model for the talent coaching of basketball athletes in Indonesia.

Materials and Methods

Study Participants

The population of this study was a basketball club located in Yogyakarta Province. The sample of this study involved 11 experts as validators, consisting of four lecturers from basketball coaching with a minimum of doctoral qualifications and seven experienced basketball coaches, aged 36-40 years, have 12.8 ± 2.2 years average career as a coach, had a type B license, and had a bachelor's degree in sports. Then, 40 basketball athletes (20 male and 20 female) were selected using purposive sampling. Their characteristics included aged 10 to 14 with an average age of 12.3 ± 1.0 years. In male athletes with a height of 160.2 ± 1.3 cm, body weight of 47.5 ± 7.2 kg, the average training time is 3.5 ± 0.6 years. In female athletes with a height of 157.2 ± 3.7 cm, body weight of 44.5 ± 6.3 kg, the average training time is 3.2 ± 0.6 years. Then, other characteristics of basketball athletes were that they had participated in competitions, had been champions at the regional level, and were undergoing training for tournament events.

Study Organizations

This quantitative research aimed at measuring the effectiveness level of the model by validity test and test-retest reliability test. This study examined a model of scouting for basketball athletes in Indonesia aged 10 – 14 that has been developed by Susanto et al (2024). The first procedure was examining the results of the study Susanto et al (2024) and then modify them to match aged 10 to 14, so that the results of the study obtained anthropemetry test models, biomotor tests, basketball skills tests (Table 1). Then, the research was translated into Indonesian language. The results of the translation were used during the validation assessment. The second procedure was developing a questionnaire aimed at assessing the test model. The questionnaire was answered by validators and basketball athletes for reliability testing. The third procedure was conducting a validation test followed by four lecturers and seven coaches. The validation test aimed to assess, provide input or modify the talent scouting model. After the talent scouting model was valid, the fourth procedure was followed by testing on athletes. Athletes tried a form of talent scouting test then filled out a questionnaire. Athletes ran the first test and the second test with a one-week time lag (Król-Zielińska et al., 2019; Tenelsen et al., 2019physically active adults participated in the validity study, and 49 subjects were recruited for the reliability study. The motor task required subjects to perform two-legged drop jumps using drop heights of 24, 43, and 62 cm as well as one-legged drop jumps with the left and right leg using a drop height of 24 cm. Ground contact times were simultaneously quantified with an electronic contact mat, a force plate (i.e., gold standard; Hollstadt et al., 2020; Robinson et al., 2024), in order to optimally maintain the consistency of test results. The fifth procedure was reporting the results of research by publishing this scientific paper. Data collection in this study was conducted following the Declaration of Helsinki and received approval from the University Ethics Committee with the number B/1112/UN.34/16/PT.01.03/2024.

Assessment Questionnaire

This talent scouting model was part of the procedure in the second stage. This questionnaire was used to assess the Anthropometry test model, Biomotor test, basketball skills test on the scouting test of basketball athletes in Indonesia. Those four aspects consisted of 13 statement items: four general aspects items, three Anthropometric aspects, three Biomotor aspects items, three basketball skills items. The preparation of statement items in this questionnaire referred to the results of previous research on aptitude scouting tests (Gál-Pottyondy et al., 2021; Pino-Ortega et al., 2021the need for data mining leads to the use of data re-duction techniques such as Principal Component Analysis (PCA; Kelly et al., 2021the selection into and successful transition out of a national talent pathway in basketball is yet to be explored. Thus, the primary aim of this study was to explore

Table 1. Design of talent scouting tests on basketball athletes aged 10 to 14

Indicator	Tests	
Anthropometric Test	Body Height	
	Body Weight	
	Fat Range: Body Fat (triceps, subscapular)	
	Arm Length	
Biomotor Test	Cardiovascular	multistage fitness test
	Strengths	push ups, sit ups, back ups, pull ups, wall sit
	Suppleness	Sit and reach
	Speed	30-meter sprint
	Reaction	Smart WBR 515-GM
	Balance	Smart Balance Test 515-JY
	General gestures	Soken / Power Ball Overhead Throw (Backwards)
Basketball Skills Test	Dribbling	Crossover Dribble and Reverse Dribble
	Passing	Chest Pass and Bounce Pass
	Shooting	Free throw

the influence of relative age, gender, and playing time based on the selection into the Regional Talent Hubs and Basketball England youth teams (U16, U18, and U20; Larkin et al., 2023) which were then converted into a statement item. The scale used in the questionnaire was 1-4: 1 for 'strongly disagree', 2 for 'disagree', 3 for 'agree', and 4 for 'strongly agree'.

Statistical Analysis

The data analysis in the first test was a validity test using the Aiken formula (Aiken, 1985) in Figure 1 below. The second test was a reliability test, namely test-retest. The test-retest in this study used product moment correlation by correlating the results of the first test and the second test. The third test was independent t-test, the purpose of this test was to analyze the difference in answers in male and female athletes with a value of sig. 0.05. However, before the product moment correlation analysis and independent t-test were conducted, normality test was done first if it was needed. Data analysis of this study used the help of SPSS 26.

$$\text{V Aiken's: } \frac{\sum s}{n\,(c-1)}$$

S : r – lo
Lo : lowest rating score
C : highest rating score
r : the score given by the assessor

Fig. 1. Aiken V Formula

Results

The results of this study showed that the first analysis was a validity test using the Aiken V formula. The validity test was carried out by 11 validators, namely four lecturers and seven basketball coaches, who assessed this talent scouting test based on the assessment questionnaire (Table 2).

Table 2. Aiken V Validity Test Results

Item	Statement	ΣS	n(c-1)	V
	General			
Item 1	This test can be done in the field or at school or in a closed room	27	33	0.818
Item 2	These test instructions are easy to understand and perform	27	33	0.818
Item 3	This test is safe for athletes aged 10-14	28	33	0.848
Item 4	This series of tests doesn't take many days	28	33	0.848
	Anthropometric Test			
Item 5	This anthropometric test is able to accurately measure body composition (height, weight, fat range, arm length)	29	33	0.878
Item 6	This anthropometric measurement is relevant in assessing the physical potential of young basketball athletes	28	33	0.848
Item 7	The instruments used in anthropometric tests are sufficient and up to standard	27	33	0.818
	Biomotor Test			
Item 8	This biomotor test can accurately assess the physical abilities of young athletes	27	33	0.818
Item 9	This biomotor test is in accordance with the physical components needed during the basketball game	28	33	0.848
Item 10	This biomotor test provides clear information about the basic physical skills needed in basketball	29	33	0.878
	Basketball Skills Test			
Item 11	This technique skill test can assess the basic ability to play basketball (dribbling, passing, shooting) well	28	33	0.848
Item 12	This technical skill test already covers all the basic techniques that young basketball players need	28	33	0.848
Item 13	The results of the technical skills test provide an accurate picture of the basic technical abilities of the athlete's basketball	27	33	0.818

Based on table 2, four aspects consisting of 13 statement items showed that the Aiken V value is >0.8, so that the scouting test for basketball athletes in Indonesia for ages 10 – 14 years consisting of Anthropometry test, Biomotor test, Basketball Skills test was declared to have a high validity value (Aiken, 1985).

The next test was carried out by basketball athletes, 20 male and 20 female athletes, as a test-retest reliability test using product moment correlation and independent t-test. However, the normality test used Shapiro-Wilk ($p>0.05$) which showed that test value 1 was 0.093 and test 2 was 0.065, so test 1 and test 2 showed that the data were normally distributed. Then, product moment correlation was proceed as shown in Table 3 below.

Table 3. Product Moment Correlation results

		Test 2
Test 1	Pearson Correlation	0.786
	Sig. (2-tailed)	0.000
	N	40

Based on the results of Table 3, the correlation of test 1 and test 2 showed a significance value of 0.000 or $p<0.05$, and the pearson correlation value showed $r=0.786$. The test-retest results meant that there was a relationship between Test 1 and Test 2 with a correlation of 0.786. The next test was done to test the test assessment questionnaire of the talent scouting model between male and female athletes as shown in Table 4 below.

Based on the results of Table 4, the significance value was $0.05<0.134$, i.e. $p>0.05$, meaning that there was no difference in the answers of male and female athletes, aged 10-14, in Test 1 and Test 2 of the Indonesian basketball scouting test.

Discussion

Based on the results of the study, anthropmetric tests, biomotor tests, basketball skill tests resulted in a good level of validity and strong reliability. It showed that the scouting test for Indonesian basketball athletes aged 10-14 can be used for the search and scouting process of prospective basketball athletes in the future.

In the general aspect, this model showed the ease of test implementation, easy-to-understand test instructions, and a safe and simple form of test. It is important because in an early age sports environment, easy-to-implement and understandable test procedures are key in maintaining the measurement consistency and active participation of young athletes. It was explained by the results of previous research on soccer talent scouting tests in Indonesia for children aged 9 – 11, providing four types of tests such as basic ball juggling test, shuttle ball passing test, zigzag ball dribbling test, agility run test showing high validity and reliability values (Saputra & Hadinata, 2017; Lubis et al., 2020). Simplicity in this set of tests could minimize procedural errors, both by examiners and participants, which in turn contributes to the validity and reliability of the test results. Previous research has explained that the simplicity of talent scouting tests makes athletes more serious in conducting tests, such as the talent test of tennis athletes aged 12-14 with seven test instruments (Prasetiono & Gandasari, 2018). Then, in combat sports such as talent scouting tests for pencak silat athletes aged 12 – 14, there were also three test models, namely five anthropometric tests, five physiological tests and five biomotor tests, all of which were assembled like posts that must be done by athletes (Syaifullah & Doewes, 2020). With these results, this talent scouting model deserves to be widely implemented, as it meets the basic technical requirements in athlete auditions.

The anthropometric test aspect in this model was valid and reliable in measuring the physical potential of young basketball players. Talent test research for 13-year-olds in Australia, discussed that the anthropometry of an athlete can predict the level of speed and strength ability (Larkin et al., 2023). The accuracy of anthropometric measurements such as height, arm length, and weight provides important data for coaches in assessing the physical readiness of athletes in accordance with the physical demands of basketball such as endurance, speed, agility, strength (Lu & Yin, 2022; Yılmaz, 2022; Florensa et al., 2023). Therefore, this test was relevant to the physical potential needed by a basketball player, because anthropometric factors have a significant role in determining athlete performance. In addition, anthropmetric tests on athletes from an early age can provide options for young athletes to be directed to determine the type of sport to be chosen (Kaynar & Bilici, 2019). Thus, the anthropometric tests in this model not only meet the exact measurement standards, but are also directly relevant to the potential evaluation of basketball athletes, especially in terms of physical growth that is essential for on-court performance.

In the aspect of biomotor tests, which included measurement, endurance, strength, agility, were also considered valid and reliable. The results of this test indicated that the scouting model can accurately assess the needs of important physical components in basketball matches. Biomotor tests are very important in scouting the talent of basketball athletes aged 10-14 because they can measure the basic physical abilities and potential of athletes which in turn supports performance during training or competition (Han et al., 2023). Basketball as a sport relies heavily on biomotor components such as speed and agility, making the measurement of these physical components particularly relevant for identifying athletes' potential (Susanto et al., 2023). To date, the biomotor test or physical skill test is the

Table 4. Independent T-test Results

		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Assessment Questionnaire	Equal variances assumed	1.515	78	0.134	0.875	0.577
	Equal variances not assumed	1.515	77.862	0.134	0.875	0.577

basic foundation of every basketball scouting test of every sport that requires physical ability (Abazi et al., 2023). The high validity and reliability of this test gives coaches and sports organizations the confidence that this model can be used to accurately assess an athlete's biomotor potential. In addition, talent scouting tests on team sports can also be used as a basis for the development of more specific training programs (Kalén et al., 2021).

In the aspect of basketball skill test assessment, which included the assessment of the ability of basic basketball playing techniques such as dribbling, passing, and shooting, it was considered valid and reliable. It is important because basic engineering skills are the main foundation for every basketball player (Begu et al., 2023). In addition, children aged 10 – 14 are an important time to develop advanced movement skills needed to master basic techniques such as throwing and catching (Koryahin & Hrebinka, 2023; Santoso et al., 2024). This basketball coaching test model covered all the basic techniques needed to comprehensively assess an athlete's talent, providing coaches with important insights into a player's technical ability. Some previous research studies, talent scouting tests can also be done by simply combining technical and physical skills tests such as running then shooting, passing by running, or dribbling by zig-zagging (Joseph et al., 2021; Larkin, Sanford, et al., 2023). In addition, good technical skills allow athletes to adapt more quickly to game situations, improve individual and team performance, increase motivation and confidence, and make decisions quickly (Çetinkaya et al., 2024; Djaba et al., 2024; Latief et al., 2024). The success of this test in evaluating basic technical skills validly and reliably provides a solid foundation for the selection and coaching process of young athletes who focus on mastering the fundamentals of the game.

Then, the results of this study also showed that there were no significant differences between the answers of male and female athletes in assessing this talent scouting model. It showed that the model can be applied universally to both sexes and can be used effectively to identify potential talents in both male and female athletes. It opened up wider opportunities in the coaching and development of young basketball athletes in Indonesia without gender differences (Oliveira Castro et al., 2022), as well as providing a solid basis for expanding their application at various levels of coaching. This valid and reliable talent scouting model makes it easier for coaches, basketball clubs, schools and parents of athletes to comprehensively assess the physical potential, techniques and tactics of young basketball athletes (Juita et al., 2024). Then, a deeper analysis is also needed on talent development in the training environment using the Talent Development Environment Questionnaire (TDEQ-5) especially in basketball (Putro et al., 2025). The limitation of this study is the relatively small sample size, which included athletes from basketball clubs in Yogyakarta Province. Future research should aim to develop aptitude scouting tests that incorporate psychological assessments and involve a larger sample.

Conclusion

Based on the results of the study, the talent scouting model for Indonesian basketball athletes aged 10-14 proved to be valid and reliable in measuring the potential of athletes from the aspects of anthropometric tests, biomotor tests and basketball skills tests. The ease of implementation, clarity of instructions, and safety of the test also add to the advantages of this model, making it effective and easy to implement in an early sports environment. Every aspect of the test, namely physical tests and basketball skills tests, can be used to assess the potential of athletes with high accuracy, ensuring that this model is able to identify the talent of athletes comprehensively. In addition, this model can be applied to male and female athletes without significant differences, demonstrating its suitability for widespread use in the talent scouting process in Indonesia. Nevertheless, for the future, further development is needed by adding psychological tests and expanding the number of samples.

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Conflict of Interest

The author has no conflict of interest regarding the author or results of other studies.

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Оцінювання валідності та тест-ретестової надійності індонезійської моделі пошуку талантів у баскетболі для спортсменів віком від 10 до 14 років

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 8 с., 4 табл., 1 рис., 34 джерела.

Історія питання. Виявлення талантів у молодих спортсменів має вирішальне значення для забезпечення ефективного спортивного тренування. Однак в Індонезії розкриття талантів у баскетболі на ранньому етапі часто ускладнюється обмеженістю сучасних ідентифікаційних методів та інструментів.

Мета дослідження. Метою цього дослідження було вдосконалити існуючий тест для визначення здібностей баскетболістів віком від 10 до 14 років. Щоб проаналізувати ефективність переглянутої моделі, в дослідженні проведено оцінювання її валідності та тест-ретестової надійності, використовуючи дані як спортсменів-хлопців, так і спортсменок-дівчат.

Матеріали та методи. Задля забезпечення валідності оцінювання тесту проводили чотири експерти з докторським ступенем та сім досвідчених баскетбольних тренерів із середнім стажем тренерської роботи 12,78 ± 2,2 років, які мають ліцензію категорії «B» та ступінь бакалавра зі спортивних наук. Для оцінки тест-ретестової надійності було залучено 40 спортсменів віком від 10 до 14 років, середній вік яких становив 12,3±1,0 років, до складу яких входили 20 хлопців (зріст 160,2±1,3 см, вага 47,5±7,2 кг, середній досвід тренувань 3,5±1,12 років) та 20 дівчат (зріст 157,2±3,7 см, вага 44,5±6,3 кг, середній досвід тренувань 3,2±1,06 років). Усі учасники дослідження були регіональними чемпіонами. Тест застосовувався двічі з тижневим інтервалом між сеансами.

Результати. У дослідженні проведено три типи тестів з метою визначення антропометричних показників (зріст, вага, рівень жирової маси, довжина рук), біомоторних (витривалість, сила, гнучкість, швидкість, реакція, рівновага, загальні рухи), баскетбольних навичок (дриблінг, передача, виконання кидків) із застосуванням коефіцієнта валідності Айкена V >0,8, тест-ретесту з кореляційним моментом добутку p<0,05 та r=0,786, а також t-критерію незалежних вибірок для спортсменів-хлопців та спортсменок-дівчат з рівнем значущості p<0,05. 0,134 або p<0,05.

Висновки. Отримані результати свідчать про те, що модель пошуку талантів індонезійських баскетболістів віком від 10 до 14 років виявилася валідною та надійною з точки зору проведення антропометричних тестів, біомоторних тестів та тестів для визначення баскетбольних навичок. До переваг цієї моделі також можна віднести простоту реалізації, зрозумілість інструкцій та безпечність тесту. Крім того, зазначену модель можна застосовувати до спортсменів і спортсменок без суттєвих відмінностей. Необхідно провести подальші дослідження з метою сприяння продовженню розвитку шляхом додавання психологічних тестів і розширення кількості вибірок.

Ключові слова: баскетбол, пошук талантів, розвиток талантів, вимірювання показників у баскетболі, спортивне тестування.

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