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## Concurrent validity of the U-21 men's soccer physical test battery

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# Concurrent validity of the U-21 men's soccer physical test battery

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## ABSTRACT

This study aims to test the validity of the U-21 men's soccer physical test battery. The method used in this research is an evaluation approach. Data collection techniques in this research used tests and measurements. The subjects involved in this research were U-21 male soccer athletes in Papua. The total number of subjects participating in concurrent validity testing was 31 athletes. The instruments used in this research are body mass index (BMI) to measure body composition, sit and reach to measure flexibility, 30-meter sprint to measure speed, shuttle run to measure agility, leg and back dynamometer to measure muscle strength, and standing board. jump to measure explosive power, and the Multistage Fitness Test (MFT) to measure cardiovascular endurance. Validity testing uses a concurrent validity approach. The data analysis technique used in concurrent validity testing is using correlation product moment. This test is carried out by looking at the relationship between the tests on the first day and the second day. The results showed that each test item on the U-21 men's soccer physical test battery had a calculated  $r$  value greater than the  $r$  table. Thus, it can be concluded that the U-21 Putra football physical test battery has a high validity value. Further research needs to test the reliability of the instrument to get a physical test instrument that meets the standards

**Key words:** Instrument development; Concurrent validity; U-21 football; Papua

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## INTRODUCTION

Football is a sport popular with various levels of society in the world and in Indonesia (Rahman et al., 2024). Every country competes to find the best athletes to represent their country in international matches (Tian & Gai, 2024). To be able to participate in football matches requires athletes who have good physical, technical, tactical, and mental abilities (Paprancová et al., 2024). This ability is obtained from a long training process, both independently and through coaching (Liskustyawati et al., 2024). Training is often carried out through long-term talent development (Bompa & Carrera, 2015). Long-term talent development in the sport of football to obtain superior seeds is starting to be carried out in all provinces in Indonesia, including Papua.

Papua is one of the provinces in Indonesia which broadly consists of mountainous Papua and coastal Papua. These geographical conditions also make athletes have natural talents that come from nature. Long-term talent development in sports in Papua is carried out through the organization of Student Training Education Centers (PPLP) and nurseries according to age groups in football clubs, such as PERSIPURA. The program provided for long-term development is in the form of physical, technical, tactical, and mental training (Umar et al., 2023). The training program provided is tailored to the

athlete's needs and physical readiness concerning age (Sermaxhaj et al., 2024). This is done to avoid giving athletes excessive training programs. Excessive loads placed on athletes can impact physical growth and development (Ernandini & Wiryaputra, 2024). Despite the possibility, excessive loading can also cause injury (Brenner et al., 2024). Injuries and stunted physical growth can affect an athlete's performance in the talent development process (Latif et al., 2022).

Apart from that, the training program provided for talent development is also adapted to the characteristics of the sport (Kul & Audemir, 2024). This is done by one of the training principles, namely specifications (Nurhidayah, Prasetya et al., 2024; Vriana et al., 2024). The physical components that must be possessed in the sport of soccer are cardiovascular endurance, muscle strength and endurance, speed, agility, and power (Paprancová et al., 2024). Each physical component has a different percentage at each stage of talent development. In this way, the training programs provided also have different measurements at each stage of talent development and gender (Pérez-Muñoz et al., 2024). These differences are of course the basis for determining appropriate physical test instruments for measuring training results according to age stages (Taufik et al., 2024). So recently the development of instruments that are suitable for sports and age groups has begun to be developed (Coutinho et al., 2024).

This is done to get accurate measurement results. Accurate measurement results can be used as a basis for evaluating the achievement of the results of the training provided (Weber et al., 2024). Considering that evaluation is also an important factor in the long-term talent development process (Bompa & Carrera, 2015). Several sports branches are starting to develop instruments that suit the sport, such as pencak silat, boxing, futsal, basketball, gymnastics, taekwondo, and tennis (Budiarti et al., 2022; Chen et al., 2024; Hulka et al., 2023; Madureira et al., 2023; Öztürk et al., 2023; Tayech et al., 2022). The instrument developed consists of an instrument for each physical component and an instrument in the form of a test battery (Palevych et al., 2021; Saputro & Siswantoyo, 2018). A good instrument is an instrument that meets standards (Oliveira et al., 2023; Suri et al., 2023). The standards for a good instrument include objective, valid, reliable, easy, and economical (Sudijono, 2016). Validity is the suitability between the measuring instrument and the object to be measured. To measure suitability, this can be done by testing content validity, field validity, and validity based on other factors (Barnett et al., 2023; Prasetyo et al., 2022). Based on a literature review using bibliometric analysis, there has been no research that has specifically developed instruments for the sport of football. Of course, this is an opening for researchers to conduct research related to this theme.

Based on field analysis carried out by football coaches, special physical test instruments for football are needed according to age groups (Nurhidayah et al., 2023). Given that so far, the measurement of training results on U-21 men's soccer players in Papua has been carried out using instruments that are general and changeable. This certainly makes the measurement results less accurate because the instrument used is not in accordance with the characteristics of the age group 21 soccer sport. In addition, measurements made with measuring instruments or tests that change make players need to adjust when conducting measurement tests. This makes the player less optimal in taking measurements. In previous research, researchers developed a physical test instrument for U-21 football together with experts (Adii et al., 2023). So, this research aims to test the validity of the U-21 men's football physical test battery which has been prepared by experts. This test is carried out to obtain a standard football-specific physical test instrument. Standardized instruments can later be used by trainers to evaluate the results of the training that has been given.

## METHOD

This research aims to determine the concurrent validity of the U-21 men's soccer physical test. The method used in this research is an evaluation approach. The data collection technique in this research uses tests and measurements. The subjects involved in this research were U-21 male soccer athletes in Papua. The total number of subjects participating in concurrent validity testing was 31 athletes. The determination of subjects in this study used purposive sampling. Requirements for subjects who can participate are athletes who have been training for at least 5 years, have participated in provincial or national competitions, are members of a football club in Papua, athletes who are in good health and are willing to take measurement tests. The instruments used in this research are (1) body mass index (BMI) to measure body composition, (2) sit and reach to measure flexibility, (3) 30-meter sprint to measure speed, (4) shuttle run to measure agility, (5) leg and back dynamometer to measure muscle strength, (6) standing board jump to measure explosive power, and (7) the Multistage Fitness Test (MFT) to measure cardiovascular endurance. Test service officers prepare the field and test equipment. Athletes register with the officer to get a serial number and assessment sheet. After receiving the assessment sheet, athletes stretch and warm up in preparation for the test. Ready athletes can start the tests sequentially, starting with measurements of body composition, flexibility, speed, agility, strength, power, and cardiovascular endurance. Athletes must carry out tests sequentially according to the provisions. If an athlete performs the test randomly, the test is considered a failure. In addition, athletes who cannot complete the entire series of tests are also considered to have failed. After completing the entire test, the athlete cools

down and submits an assessment sheet to the participant. In concurrent validity testing, athletes carry out a series of tests twice. Tests are carried out on different days. Validity testing uses a concurrent validity approach. The data analysis technique used in concurrent validity testing is using correlation product moment version. This test is carried out by looking at the relationship between the tests on the first day and the second day. If the significance value is  $<0.005$  and the calculated  $r$  is  $>$  from the  $r$  table then the test is considered valid.

## RESULT AND DISCUSSIONS

### Findings

Based on the results of validity testing, validity results were obtained for each U-21 men’s soccer physical test item. The results of testing the validity of the instrument can be seen in table 1.

Table 1. Validity testing results

No	Instrument	Significance Value	r value	r table	Note
1	BMI	0.000	0.990	0.349	Valid
2	Sit and Reach	0.000	0.956	0.349	Valid
3	Sprint 30 M	0.000	0.997	0.349	Valid
4	Shuttle Run	0.000	0.942	0.349	Valid
5	Leg dynamometer	0.000	0.994	0.349	Valid
6	Back dynamometer	0.000	0.985	0.349	Valid
7	Standing Board Jump	0.000	0.715	0.349	Valid
8	Multistage Fitness Test (MFT)	0.000	0.961	0.349	Valid

Based on Table 1 above, it is known that the significance value for each test item is  $<0.005$ , and the calculated  $r$ -value is  $>$  from the  $r$  table, so it can be concluded that each item of the U-21 men’s football physical test battery is declared valid. Based on the table above, it can also be seen the validity value of each physical test item. The instrument for measuring body composition components, namely, BMI (Body Mass Index) has a validity of 0.990. The instrument for measuring flexibility components using sit and reach has a validity of 0.956. The instrument for measuring speed components using a 30-meter sprint has a validity of 0.997. The instrument for measuring agility components using a shuttle run has a validity of 0.942. The instrument for measuring strength components using a leg dynamometer has a validity of 0.994. The instrument for measuring strength components using a back dynamometer has a validity of 0.985. The instrument for measuring power/explosive power components using a standing board jump has a validity of 0.715. The instrument for measuring cardiovascular endurance components using MFT has a validity of

1 0.961. In this way, it can be concluded that the results of the U-21 men's soccer physical test battery have high validity.

## Discussion

The results of validity testing show that the validity value of the U-21 soccer physical test battery is in the strong category. The strong validity value is influenced by several things, such as accurate data. Accurate data is influenced by the data collection process, subject conditions, measuring instruments used, and measurement field conditions (Nurhidayah, Siswantoyo et al., 2024). The data collection process must be carried out according to the measurement operational standards, so that the officer in charge must master the measurement operational standards (Nurhidayah, 2024). Poor or sick subject conditions can make the measurement data biased, so in the measurement process it is necessary to use healthy subjects. The measuring instruments used in the measurement process also need to be considered for feasibility and quantity. This is done to avoid queues in the measurement process. Queuing in the measurement process can make the subject's body temperature drop. In addition, the use of a standardized field needs to be considered to obtain valid data (Masrun et al., 2024).

5 3 Validity means the accuracy of a test or scale in carrying out its measurement function (Palevych et al., 2021). Validity will show empirical facts and theoretical reasons for the interpretation of test scores or scores on an instrument and is related to the accuracy of the measurement (Wahlström et al., 2022). An instrument is said to be valid if the instrument can measure exactly what is being measured (Tayech et al., 2022; Weber et al., 2024). Based on the opinion above, it can be interpreted that an instrument is said to be valid if it produces data that matches the description of the variable being measured or is by the research objectives. For example, in sports measure an athlete's running speed. Trainers or Testers use stopwatches, this is because stopwatches have units of kilometers/hour or describe travel time. Validity is influenced by several things, namely the quality of the measuring instrument, the suitability of the measuring instrument with the subject to be measured, field conditions, the competence of the measuring officer, data analysis, and the condition of the subject taking the measurement (Nurhidayah, Siswantoyo et al., 2024; Masrun et al., 2024).

5 An instrument needs to be tested for validity so that the instrument is truly suitable for use to obtain data (Barnett et al., 2023; Clemente et al., 2021). Validity is the most important consideration in evaluating the quality of a test as a measuring instrument which refers to the concepts of feasibility, meaningfulness, and usefulness of certain inferences that can be made based on the final score of the test results in question (Villarejo-García et al., 2023).



This means that through the validity of the instrument, money is prepared to have appropriateness, meaningfulness, and usefulness when used. The validity of an instrument cannot simply be generalized, this is because no validity applies generally to all measurements, one measuring instrument is designed only for one specific purpose so it only produces valid data for that purpose (Palevych et al., 2021). This means that validity for an instrument only applies to that instrument, not to other instruments. Other instruments will have their validity after going through the validation process (Clemente et al., 2021).

In general, instrument validity is divided into two, namely internal validity and external validity (Azwar, 2012). Validity evidence is grouped into four, namely evidence based on test content, evidence based on the response process, evidence based on internal structure, and evidence based on relationships with other variables (Sudijono, 2016). In the initial stages of instrument development, validity testing was carried out by determining the validity of the instrument's content. Content validity testing is carried out by assessing material experts on the instruments being developed (Adii et al., 2023). Content validity testing requires a minimum of seven experts. Content validity testing can use the CVR formula or Aiken's v formula (Mitsalina et al., 2021; Sumaryanti et al., 2022). Instruments that have been tested for content validity can now be used, but it would be a good idea to test validity based on other factors.

One of the validity tests based on other factors that are often used is concurrent validity (Sudijono, 2016). Concurrent validity testing is carried out by testing the instrument on subjects (Cleland et al., 2024). On the skills instrument, testing was carried out twice at different times (Öztürk et al., 2023). After the instrument has been tested and declared valid, the instrument already has a better standard. Validity testing on each instrument is very important to obtain an instrument that has standards (Oliveira et al., 2023). The results of this study are in accordance with several studies and answer the expectations of previously conducted research. Where in previous studies this validity testing was carried out on the physical test instrument for pencak silat in the youth age group sparring category and further validity testing of the development of the u-21 men's soccer physical test instrument (Adii et al., 2023; Saputro & Siswantoyo, 2018). This research contributes to completing the instruments needed to evaluate the physical condition of soccer players in the development of long-term athletes in Papua. In addition, instrument reliability testing also needs to be carried out in future studies to get an instrument that meets all standard criteria. The results of measurements made using standardized instruments have good accuracy.

## CONCLUSION

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The research results show that each item in the U-21 men's soccer physical test battery consists of (1) body mass index (BMI) to measure body composition, (2) sit and reach to measure flexibility, (3) 30-meter sprint to measure speed, (4) shuttle run to measure agility, (5) leg and back dynamometer to measure muscle strength, (6) standing board jump to measure explosive power, and (7) the Multistage Fitness Test (MFT) to measure cardiovascular endurance. There is a need for instrument reliability testing in further research to obtain physical test instruments that meet standards.

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