Development of junior football skills test based on validity and reliability through expert judgment

Desarrollo de una prueba de habilidades de fútbol juvenil basada en la validez y confiabilidad mediante juicio de expertos

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Abstract

Introduction: This study aimed to develop a reliable and valid junior football skills test through expert judgment.
Objective: To assess and confirm the validity and reliability of the developed football skills test using evaluations from academic and professional experts.
Methodology: A team of ten experts, consisting of five academics with doctoral degrees and five nationally certified coaches, was enlisted to assess the test's validity and reliability. A quantitative descriptive method with a survey technique employing the Delphi approach was used to conduct the study.
Results: The results demonstrated high validity across all six indicators, with values of 0.967, 0.900, 0.867, 0.833, 0.933, and 0.833 for Indicators 1 through 6, respectively. Reliability was measured using Cronbach's Alpha, producing a score of 0.729, which indicates high inter-rater reliability. Additionally, the Intraclass Correlation Coefficient (ICC) test also yielded a value of 0.729, showing strong agreement among raters.
Conclusions: These findings confirm that the junior football skills test developed in this study exhibits strong validity and reliability, making it an appropriate tool for evaluating the skills of young football players.

Keywords

Football skills; junior player; reliability; test; validity

Resumen

Introducción: Este estudio tuvo como objetivo desarrollar una prueba de habilidades de fútbol juvenil fiable y válida mediante la evaluación de expertos.
Objetivo: Evaluar y confirmar la validez y fiabilidad de la prueba de habilidades de fútbol desarrollada mediante evaluaciones de expertos académicos y profesionales.
Metodología: Se contrató a un equipo de diez expertos, compuesto por cinco académicos con doctorado y cinco entrenadores con certificación nacional, para evaluar la validez y fiabilidad de la prueba. Se empleó un método descriptivo cuantitativo con una técnica de encuesta mediante el método Delphi para realizar el estudio.
Resultados: Los resultados demostraron una alta validez en los seis indicadores, con valores de 0,967, 0,900, 0,867, 0,833, 0,933 y 0,833 para los indicadores 1 a 6, respectivamente. La fiabilidad se midió mediante el Alfa de Cronbach, obteniendo una puntuación de 0,729, lo que indica una alta fiabilidad interevaluador. Además, la prueba del Coeficiente de Correlación Intraclase (CCI) también arrojó un valor de 0,729, lo que demuestra una fuerte concordancia entre los evaluadores.
Conclusiones: Estos hallazgos confirman que la prueba de habilidades de fútbol juvenil desarrollada en este estudio presenta una sólida validez y fiabilidad, lo que la convierte en una herramienta adecuada para evaluar las habilidades de los jóvenes futbolistas.

Palabras clave

Habilidades futbolísticas; jugador juvenil; fiabilidad; prueba; validez

Introduction

Football is a prevalent sport in Indonesia and worldwide, enjoyed by diverse groups ranging from children to adults, including women (Hulteen et al., 2017; Knoop et al., 2013; Nasution & Daulay, 2022). The rapid growth of youth football coaching, evident in the proliferation of football schools and academies, reflects the public's increasing expectations for enhanced player achievements (Akbar et al., 2024). To meet these expectations, essential elements include the quality of coaching, adequate facilities, structured training programs, age-appropriate competitions, and effective evaluation tools (Arrum et al., 2024; Gozzoli et al., 2023; Knoop et al., 2013; Roberts et al., 2019). However, interviews with nine national coaches revealed that Indonesian junior players, particularly in terms of VO_2 max and agility, still lag behind their international counterparts. This performance gap is attributed to age-inappropriate training programs and the use of invalid testing instruments.

Assessment plays a crucial role in providing feedback for both athletes and coaches (Mason et al., 2020); For athletes, it offer measurable insights into their skill levels, helping them understand areas for improvement; For coaches, the results serve as a basis for refining training methods and tailoring programs to meet athletes' needs better. Research supports the idea that evaluation is a core component of the training process, contributing to the continuous development of athletic performance (Gabbett & Seibold, 2013; Girard & Millet, 2009; Rahman et al., 1970).

According to Launder & Piltz (2013), the physical and mental growth of junior athletes progresses significantly, allowing various aspects of training to be integrated and structured to maximize their potential. Additionally, enhancing high-speed skills enables quicker responses in tactical situations during matches. Emphasis at this stage is placed on executing actions with speed, accuracy, and precision, including passing, control, feinting, dribbling, turning, shooting, and heading. Football is not merely about being the fastest, strongest, or most aggressive, but rather about the synergy of physical, tactical, mental, and technical attributes that distinguish individuals across levels of competition (Paisal et al., 2024).

Research indicates that existing football skills training programs are often ineffective in achieving optimal performance (Mooney et al., 2011; Rossignol et al., 2014; Ryan et al., 2017); furthermore, current test instruments used to assess football skills are limited, as they lack accuracy in measuring the full range of skills and often evaluate each skill in isolation rather than holistically (B. C. Huijgen et al., 2013; B. C. H. Huijgen et al., 2010, 2012); Additionally, biomotor assessment tools for evaluating essential physical attributes, such as strength, speed, endurance, reaction time, explosive strength, and agility—are often fragmented, reducing their effectiveness in providing a comprehensive picture of players' athletic abilities (Mohammed et al., 2016).

The David Lee football skill test was developed by David Lee as an efficient tool for evaluating various aspects of football performance; However, agility, speed, and accuracy are not included in this skills-based test; Moreover, the precision of technical execution such as ball feeling, long pass, and shooting has also not been assessed in the test yet. To develop a comprehensive skill test, incorporating these elements would provide a more complete evaluation of a player's skills and better reflect the demands of real-match situations; Furthermore, to develop effective skill tests, it is essential to support these tests with rigorous validity and reliability evaluations.

Validity ensures that the test instrument accurately measures the specific attributes it intends to assess, such as VO_2 max or agility, which are critical for football performance, allowing meaningful and precise assessment of player development. Reliability, on the other hand, confirms the consistency of test results over time or across different evaluators, ensuring that the data produced is dependable and can be trusted for making evaluations about player progress. Together, validity and reliability create a solid foundation for skill tests that can accurately and consistently track athletic development.

Therefore, the purpose of this study is to develop a reliable and valid junior football skills test through expert judgment, including both technical elements (ball feeling, long pass, shooting, receiving, dribbling, and placing) and physical elements (agility, speed, and accuracy).

Method

This quantitative descriptive study utilizes a survey technique combined with the Delphi method, focusing on expert validation to evaluate each proposed physical condition test. This method was selected to facilitate independent input from subject-matter specialists, promoting consensus without the need for face-to-face meetings (Budiarti et al., 2022; Galanis, 2018). The procedure was conducted in two rounds (Okoli & Pawlowski, 2004; Varela et al., 2012), incorporating both expert content validity testing and inter-rater reliability assessment. Feedback and recommendations were systematically analyzed, leading to revisions and resubmissions until consensus was achieved, requiring no further modifications (Fraenkel et al., 2012).

Subject

The study involved 10 experts with skills in sports evaluation, including five academics with doctoral degrees and a minimum academic rank, and five football coaches with at least a national certification. The selection of experts was carried out based on Singh (2007) approach using "expert sampling." This procedure ensures that the chosen judges have demonstrable specific experience relevant to the study. Additionally, Escobar-Pérez & Cuervo-Martínez (2008) highlight that certain attributes must be met to be part of a panel of judges in a validation process, including experience level, reputation, availability, motivation, and impartiality. In light of these considerations, the criteria (C) for selecting the panel members were as follows: (Ct 1) Has been a member of a professional football club, (Ct 2) possesses specialized knowledge in football management, (Ct 3) has experience as a football coach at the regional, national, or international level, (Ct 4) has experience in football club management, (Ct 5) has knowledge and experience in research in sports science, (Ct 6) has an academic background that is aligned with sports science, and (Ct 7) holds the status of an academic expert, such as a professor or senior lecturer, recognized for their expertise in sports science.

Table 1. Evaluation of the criteria met by the expert judges

	Ct 1	Ct 2	Ct 3	Ct 4	Ct 5	Ct 6	Ct 7	Expertise (years)
Football Coaches								
Exp 1	√	√	√	√				20
Exp 2	√	√	√		√	√		17
Exp 3	√		√		√	√		10
Exp 4	√	√			√	√		7
Exp 5	√	√			√	√		5
Academicians								
Exp 6		√	√	√	√	√	√	20
Exp 7					√	√	√	35
Exp 8					√	√	√	20
Exp 9					√	√	√	31
Exp 10					√	√	√	19

Table 1 presents data on 10 experts with expertise in sports evaluation, each possessing between 5 and 35 years of experience. Additionally, for inclusion in this study, the experts were required to meet at least 3 out of 7 criteria and have a minimum of 5 years of demonstrable experience.

Procedure

The study began with a literature review, managed using Mendeley for reference organization; Relevant journals were sourced from PubMed and Google Scholar; A qualitative narrative review approach was used, focusing on compiling conceptual and operational definitions of junior football skills tests; and an initial review phase led to a proposed framework for constructing a junior football skills test.

Following this, experts reviewed the preliminary test framework, providing assessments and feedback on its components; and based on their input, key elements agreed upon for inclusion in the junior football skills test were shooting, dribbling, lower and higher passing, controlling, and ball control.

The second phase commenced with further expert input, focusing on refining the junior football skills test design. Once the test instrument was drafted, experts evaluated it using an assessment questionnaire. After conducting a focused literature review, a questionnaire titled "Development of a

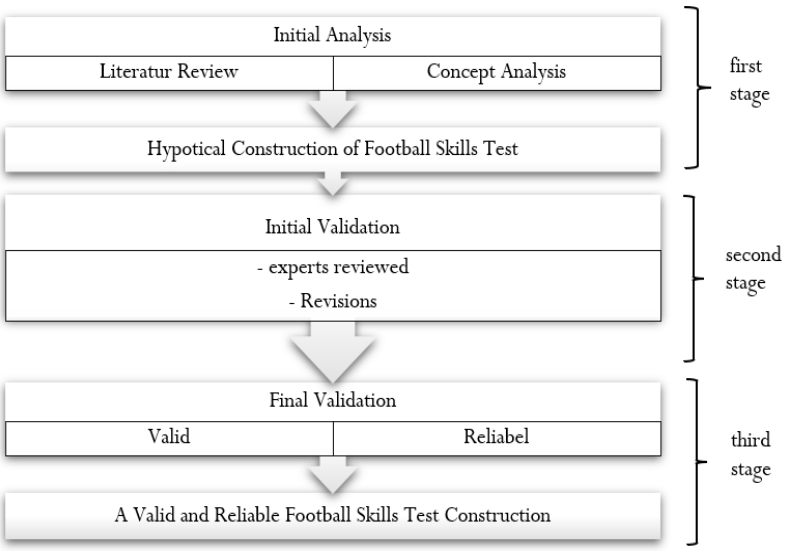
Junior Football Skills Test Based on Validity and Reliability through Expert Judgment" was created. The initial version was structured around six indicators. The table below presents the assessment indicators used to evaluate content validity in this developmental research.

Table 2. Content Validity Indicators Assessed by Expert Judges.

No	Indicators	Description
1	The conceptual definition aligns with football gameplay.	Ensuring that the concepts used in the football skills test have a clear theoretical foundation and align with the principles of football gameplay.
2	The operational definition aligns with football gameplay.	Determining how the concept is translated into a measurable form. With a clear operational definition, each skill being tested can be measured objectively and consistently.
3	The construction of the skills test aligns with football gameplay.	Examining whether the form, structure, and elements of the skills test accurately reflect the activities that occur in football gameplay. This is crucial to ensuring the content validity of the test.
4	The diagram of the skills test construction is clear.	Ensuring that the illustrations or diagrams in the test instrument are easily understood by coaches and players to avoid misinterpretation during test implementation.
5	The skill test items align with football gameplay.	Confirming that each test item is truly relevant to the skills required in football gameplay so that the results can be used to accurately assess players' abilities.
6	The skill test procedures are easy to implement.	Ensuring that the test can be easily implemented in various conditions without requiring complex equipment, making it widely applicable for evaluating football skills.

In this evaluation, experts rated each component for relevance, clarity, and ease, using a four-point scale: 1 for “not relevant/clear/easy,” 2 for “less relevant/clear/easy,” 3 for “relevant/clear/easy,” and 4 for “very relevant/clear/easy.” These scores were then used to assess the validity and reliability of the junior football skills test instrument. Figure 1. shows the process of developing a valid and reliable test construct.

Figure 1. Flowchart of the Research



Data analysis

The item validity test in this study utilizes Aiken’s formula, which is appropriate due to the polytomous scale format of the expert assessment data (Aiken, 1985). This method calculates content validity by assessing the degree of agreement among experts on each test item, which measures how well the items represent the evaluated construct. The formula for Aiken’s validity coefficient is as follows:

$V = \sum s / [n(C-1)]$

V : rater agreement index

S : r – lo

Lo : lowest rating score

C : highest rating score

R : figures given by the examiners

To interpret the results of Aiken's V calculation, the V value obtained is compared to the critical value in the V table. With 10 raters, a four-point scale, and a 5% confidence level, the calculated V is considered valid if it exceeds the V table value of 0.73 (Aiken, 1985).

A reliability test was conducted using Cronbach's Alpha to assess the internal consistency of the junior football skills test. Ten assessors observed and evaluated the test's construction design. The reliability test, with a sample size (n) of 10, resulted in a Cronbach's Alpha value exceeding the critical r table value of 0.632 at a significance level of 5%.

To further evaluate the reliability of the junior football skills test, this study employed the Intraclass Correlation Coefficient (ICC) to assess inter-rater consistency. Combining the results of Cronbach's Alpha and ICC tests provides a comprehensive understanding of reliability, encompassing both internal consistency within the test and agreement among raters. ICC values close to one indicate excellent instrument reliability, whereas values near zero suggest instability or inconsistency in the measurements. This study utilizes norms adopted from (Portney & Watkins, 2009) to interpret the ICC results:

Table 3. ICC Value Category

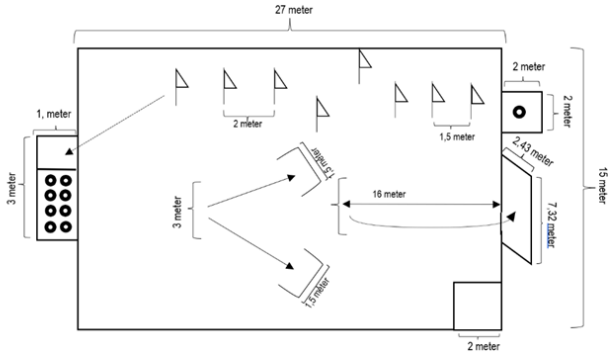
ICC Value	Interpretation
0.00 - 0.50	Poor Reliability
0.51 - 0.75	Moderate Reliability
0.76 – 0.90	Good Reliability
0.91 – 1.00	Excellent Reliability

Results

First Stage

This study employed a qualitative narrative review of existing literature to develop conceptual and operational definitions for junior football skills tests. This process led to the formulation of a hypothesis regarding the construction of such tests, which experts subsequently evaluated. The resulting junior football skills test incorporated elements of agility, speed, and accuracy, alongside ball skills including ball feeling, dribbling, keeping, passing a moving ball, controlling, and shooting a moving ball. The test was conducted holistically, utilizing equipment such as a size 5 ball, large cones, small goals for passing targets, large goals for shooting, chalk or paint, and a stopwatch. Figure 2 shows the Design of the Football Skills Test Construction for Junior Players.

Figure 2. Design of the Football Skills Test Construction for Junior Players



Second Stage

The second stage is initial validation (review and revision), which involved 10 experts who assessed the construction of the football playing skills test measurement instrument. They provided several recommendations, including:

Table 4. Recommendation by Expert Judges

Coaches	Academicians
The passing and shooting lines are replaced with a passing or shooting box area. Increase the number of repetitions in the passing test item. The execution sequence needs to be numbered. There should be clear start and finish boundary markers. The image descriptions need to be clarified.	The purpose of the product design needs to be clarified (to measure boys' football playing skills). More than one test should be conducted for comparison.

After receiving input from the experts, the test construction was thoroughly reviewed and analyzed. Modifications were made based on the experts' recommendations, resulting in the final version of the football skills test instrument.

Third Stage

The experts utilized a Likert scale ranging from 1 (not relevant) to 4 (very relevant) to evaluate the instrument's relevance. The assessment results were then analysed using Aiken's validity test, as depicted in Figure 4.1. The analysis revealed that there was no significant improvement in the construction of the football playing skills test measuring instrument.

Table 5. Aiken's Validity Test Results

Examiner	Indicator 1		Indicator 2		Indicator 3		Indicator 4		Indicator 5		Indicator 6	
	score	s	score	s	score	s	score	S	score	s	score	s
Exp 1	4	3	4	3	4	3	4	3	4	3	4	3
Exp 2	4	3	3	2	4	3	4	2	4	3	4	3
Exp 3	4	3	4	3	3	2	4	2	4	3	4	3
Exp 4	4	3	4	3	4	3	3	2	4	3	4	3
Exp 5	4	3	3	2	3	2	4	3	4	3	3	2
Exp 6	4	3	4	3	4	3	3	2	4	3	3	2
Exp 7	4	3	4	3	3	2	3	2	4	3	3	2
Exp 8	3	2	3	2	3	2	3	2	3	2	3	2
Exp 9	4	3	4	3	4	3	3	2	4	3	3	2
Exp 10	4	3	4	3	4	3	4	3	3	2	4	3
∑s	29		27		26		25		28		25	
V	0.967		0.900		0.867		0.833		0.933		0.833	

Based on Table 5, the validity results in this study show that all indicators fall into the high validity category. The first indicator, "The conceptual definition aligns with football gameplay," received a score of 0.967. The second, "The operational definition aligns with football gameplay," obtained a score of 0.900. The third, "The construction of the skills test aligns with football gameplay," recorded a score of 0.867. The fourth, "The diagram of the skills test construction is clear," received a score of 0.833. The fifth, "The skill test items align with football gameplay," achieved the second-highest score of 0.933. Lastly, the sixth, "The skill test procedures are easy to implement," received a score of 0.833. Overall, each indicator of the junior football skills test instrument demonstrated high validity, with calculated V values exceeding the V table value of 0.73. These findings confirmed the instrument's appropriateness for use. After establishing content validity, a reliability analysis was conducted. The results of the inter-rater reliability assessment are presented in the following table.

Table 6. Inter-Rater Reliability Results with Cronbach's Alpha

N of Rater	R-Table (5%)	Cronbach's Alpha	Status
10	0.632	0.729	Reliabel

The reliability test yielded a Cronbach's Alpha value of 0.729 for the 6-item junior football skills test instrument. This value surpasses the critical r-table value of 0.632, indicating high internal consistency and confirming the reliability of the instrument.

An Intraclass Correlation Coefficient (ICC) test was conducted to assess inter-rater reliability. The results of this test are presented in the following table:

Table 7.Results of the Inter-Rater Reliability Test with ICC

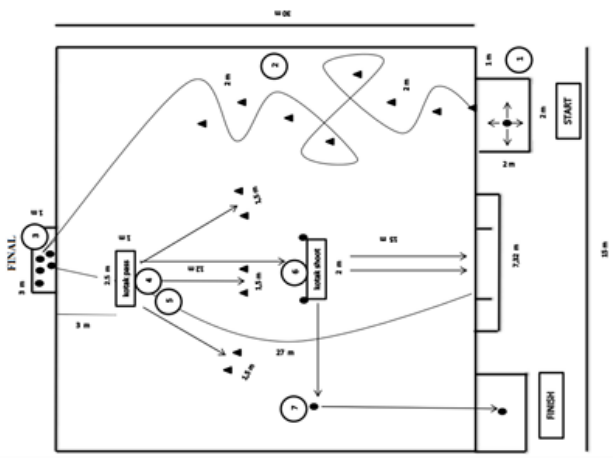
	Intraclass Correlation	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.230[a]	.063	.565	3.693	9	72	.001
Average Measures	.729[c]	.378	.921	3.693	9	72	.001

The ICC analysis yielded a value of 0.729, indicating moderate reliability or moderate/fairly good agreement between raters, as classified by the ICC statistical criteria. This result is presented in Table 4.

Final Product

Based on the research objectives outlined in Development of a Valid and Reliable Junior Football Skills Test through Expert Judgment, the study followed a structured research process to ensure the accuracy and applicability of the developed instrument. The final outcome was achieved through several key phases, including an initial needs analysis, expert consultation, and iterative validation to refine the test components. The validation process involved assessments by expert judges to ensure that each element of the test met the required standards of validity and reliability. As a result, this study successfully developed a comprehensive, valid, and reliable Junior Football Skills Test, which serves as a standardized assessment tool for evaluating young players' technical and physical abilities in a structured and objective manner. Figure 3 shows the final construction of a valid and reliable Junior Football Skills Test.

Figure 3. Junior Football Skills Test Design



Junior Football Skills Test:

1. Ball Feeling: Controlling the ball by pushing in various directions within a $2m^2$ area to improve ball control.
2. Zig-zag and Spinning Dribble: The distance between the cones is 2m to dribble the ball, helping players pass opponents without difficulty.
3. Keeping: The ability to keep the ball while dribbling through the cones is essential to deal with the opponent's defense.

4. Lower Ball Control: Stopping the ball in the stop box to practice lower ball control in various situations.
5. Rolling the Ball: Rolling the ball before passing and shooting to test skills in real conditions.
6. Lower Passing: An important horizontal passing technique, used for short passes and maintaining ball control.
7. Passing Distance to Target: A distance of 12m to measure lower passing ability, according to the actual game distance.
8. Goal or Target Width: 1.5m, so that players can control the ball easily.
9. Long Passing: The ability to make effective long-distance passes is essential in the game.
10. Long Pass Distance: 27m according to the junior player's ability.
11. Shooting: Practice shooting at the goal, focusing on finishing to achieve victory.
12. Shooting Distance: 17m for common game situations.
13. Goal Width for Shooting: 7.32m wide and 2.43m high according to standard goal size.
14. Ball Size: Use a size 5 ball according to PSSI and FIFA regulations for junior age.

Discussion

The study's findings indicate that the test instrument is valid, with a validity value exceeding the V table value (0.73). This conclusion is supported by the Aiken's V coefficient values for each indicator: 0.967 for first indicator (concept definition), 0.900 for second (operational definition), 0.867 for third (skill test construction), 0.833 for forth (skill test construction image), 0.933 for fifth (skill test items), and 0.833 for sixth (test procedure implementation). These findings consistently demonstrate the test's validity.

The study also assessed reliability by using Cronbach's Alpha and Intraclass Correlation Coefficient (ICC) tests. Cronbach's Alpha measures internal consistency among test items, while ICC evaluates inter-rater reliability (agreement between raters). The Cronbach's Alpha test yielded an r-count value of 0.729, exceeding the r-table value of 0.632, which indicates that the junior football skills test instrument is reliable, demonstrating consistent results and making it suitable for further use in this research population.

The ICC reliability test, using expert ratings, yielded an average agreement value of **0.729**. According to ICC statistical criteria, this value falls within the moderate reliability range, indicating a moderate to fairly good level of agreement between experts. This finding further supports the conclusion that the junior football skills test instrument is suitable for use in this population and can be applied in the next stage of research.

This finding aligns with the research by (Ali et al., 2007), which also reported high validity and reliability in assessing basic football skills such as dribbling and shooting. The present research extends these insights by integrating a range of physical and technical skill components into a single, unified test—an approach that had not been fully explored in previous studies. While earlier research predominantly focused on evaluating the reliability of individual skill tests in isolation, this study offers a more comprehensive contribution by developing an integrated testing system that reflects the multifaceted nature of football performance in real match situations. Unlike prior research emphasizing separate ball-related skills, such as isolated dribbling or shooting tests, this study successfully merges these components into one cohesive test sequence, providing a more realistic and game-relevant assessment. Expert evaluations were employed to assess the relevance, clarity, and significance of each test item, ensuring that the developed instrument is theoretically robust and practically applicable for the training and evaluation of young football players.

In addition, research by the Australian Soccer Federation presented in the *Coach's Manual* (Worthington, 1979), which utilizes a circuit test (battery test) to assess football skills, also incorporates

various elements such as a 20-meter sprint test, fundamental movements, and ball-related techniques. Although the test includes similar components, the study does not provide detailed information regarding its validity and reliability. Therefore, this study offers a more significant contribution by evaluating the validity and reliability of the instrument in a more detailed and systematic manner. Much prior research has consistently emphasized the significance of validity and reliability in sports assessment instruments (Grgic et al., 2020; Redondo Tébar et al., 2025; Salafi et al., 2023; Sant' Ana et al., 2019). For instance, (Yudhistira & Tomoliyus (2020) demonstrated that incorporating expert judgment into the development process enhances the comprehensiveness and accuracy of test instruments, ensuring they meet the quality standards necessary for measurement and evaluation.

This validated and reliable test instrument is designed to provide an accurate assessment of football players' skills, particularly those of junior players. Its application can benefit various academic institutions, schools, and football clubs, facilitating structured assessment, evaluation, and development of player potential. The test results can serve as a foundation for coaches to create individualized training programs, tailored to each player's needs, thereby accelerating their skill development.

While the researchers have conducted their study to the best of their ability, it is important to acknowledge certain limitations. The reliance on expert judgment may introduce subjective bias; Furthermore, the instrument has not been tested in diverse contexts or across a wider range of age groups, potentially limiting the generalizability of the findings. Future research could benefit from incorporating more diverse validation methods, such as field tests (construct validity) or comparisons with established skills tests (criterion validity); Additionally, examining the instrument's reliability across different age groups and skill levels would provide a more comprehensive understanding of its effectiveness.

Conclusions

This study successfully developed a valid and reliable junior football skills test that comprehensively measures key physical and technical skills, including speed, agility, accuracy, and ball control techniques such as dribbling and shooting, which are critical elements in real football gameplay. The test demonstrates high validity, with indicators scoring between 0.833 and 0.967. Reliability testing using Cronbach's Alpha and the Intraclass Correlation Coefficient both resulted in a value of 0.729, indicating good reliability.

With its proven validity and reliability, this test provides a systematic and consistent way to assess the skills of young athletes. School football clubs can use this test to identify strengths and weaknesses in individuals and track progress over time to meet the specific needs of each player. This can lead to more focused coaching, better performance outcomes, and a more structured approach to skill development.

Additionally, using a validated and reliable test fosters a fair and objective evaluation system, which is essential for identifying talent and supporting decisions about football player selection, skill level assessments, and individual player improvement strategies. The ability to track improvements and set clear benchmarks also helps in motivating players, ensuring they are continuously challenged and engaged in their development; Therefore, this test is suitable for evaluating the skills of junior football players.

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Conflicts of Interest

The authors declare that there are no conflicts of interest.

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