

ORIGINAL RESEARCH ARTICLE

Open Access



# A comprehensive functional performance assessment battery development and validation among football players

Harshita Rajan Ghosalker<sup>1,2</sup>, Vandana Esht<sup>3</sup>  and Sohel Ahmed<sup>4,5\*</sup> 

## Abstract

**Background** Skill and health-related components are required for the assessment of football players' functional performance, and there is a lack of literature available to measure football players' functional performance. The study mostly focuses on developing and validating the tool for football players between the ages of 18 and 25.

**Methods** This study used a research methodology that focused on the development and verification of a scale. The research consisted of two distinct stages, namely tool development and validity testing. Firstly, the expert panel did a comprehensive analysis of the items and domains of the questionnaire. Subsequently, the Delphi approach was used to assess the content validity of the questionnaire. Later on, the evaluation tool was officially named the complete functional performance assessment battery (CFPA) for football players in India.

**Result** The CFPA's newly developed tool has excellent scale-level content validity, which was more than 0.78 for each item in the tool, i.e., 1 (indicated as extremely relevant), the content validity ratio was bigger than 0.49, and each item's kappa value was found to be 1, which is excellent. Each item's universal acceptance was found to be 1 for both the item's quality and content and Aiken's *V* index is also greater than 0.81.

**Conclusion** The CFPA is a valid tool in India that can be used to check the functional performance of football players.

**Keywords** Physical functional performance, Questionnaires and surveys, Footballers, Tool establishment, Content validity

## Introduction

Football is the most intricate and popular endurance sport in the world. It is a collective form of poly-structural activities [1]. Around the world, 260 million people are enrolled in football clubs, and hundreds of millions more play football without belonging to a national or international football organization [2]. The success of football players is determined by their physical makeup, technical proficiency, and tactile performance [3]. Motor skills, physiological factors, technological-tactical abilities, psychological development, kin anthropometric features, socioeconomic situation, and a few other outside elements all have an impact on player success [4].

A football game uses a variety of intermittent anaerobic and aerobic energy sources, and players must perform well in areas including primary and motor skills [1]. For

\*Correspondence:

Sohel Ahmed  
ptsohel@gmail.com

<sup>1</sup> Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation, Maharishi Markandeshwar (Deemed-to-Be) University, Mullana 133207, Haryana, India

<sup>2</sup> Department of Sports and Youth Services in Athletic Project, Odhisa, India

<sup>3</sup> Department of Physical Therapy, Faculty of Applied Medical Sciences, Jazan University, Jazan, Kingdom of Saudi Arabia

<sup>4</sup> Ahmed Physiotherapy & Research Center, 151, Lake Circus, Kalabagan, Dhaka 1205, Bangladesh

<sup>5</sup> Physiotherapy Research Foundation, Dhaka 1205, Bangladesh



© The Author(s) 2024. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

athletes to perform at a higher level, they need to have high levels of speed, muscular strength, aerobic fitness, explosive jumping power, agility, and other physiological qualities [5]. Strength and endurance are the main regulators of football-specific tasks [6]. Speed, or the capacity to complete a maneuver in a short amount of time, is another crucial element in football. In football, it is crucial for different body parts to move quickly and over short distances. Speed and strength are vigorously performed by power. Balance is a dynamic, static process that includes several neural connections. For a football game, balance is essential in order to maintain body posture during acceleration and deceleration. The ability of the body to alter bodily parts is known as agility [4]. Flexibility is the ability to rotate a single series of joints smoothly and easily through an unrestricted, pain-free range of motion [7]. Coordination is defined as insufficiency tackled from the perspective of the particular event and of training [8]. The reaction time is the amount of time between the application of a stimulus by the central nervous system and the resulting motor response [9]. With the aid of psychological examination, it is easier to comprehend the psychological and mental factors that affect physical and psychological performance in sports [10]. For professional football players to develop and improve their physical performance, nutrition and making smart dietary choices are crucial [11].

A comprehensive functional performance evaluation is a set of standardized tests used to gauge players' physical prowess and skill level as well as track their recovery from football-related injuries [12]. Evaluation of Functional Performance Batteries offers both qualitative and quantitative sports information. It often evaluates player performance and demonstrates the skill and caliber of football players [6]. Also, it has improved the ability to identify a player's functional level, which establishes whether or not they are prepared to resume playing [7]. The main purpose of developing the comprehensive functional performance tool is to evaluate the functional performance of Indian football players, which has not been developed in India yet. Functional performance tests are often used to decide whether or not a player can return to sports. According to a systematic review and meta-analysis, functional performance capacity is linked to a return to sports in high-impact sports [13]. It is also used for player skill evaluations and advancement so that injuries can be prevented and players can have good performance in sports. It is also useful to assess the physical fitness level to reduce the risk of injury in football players. Creating and validating the comprehensive functional performance assessment battery (CFPA) for Indian football players was the main aim of the study, as there

is no such tool developed in India to check functional performance for football players.

### Methods

A methodical way to foresee that makes use of panel members' collective opinions is the Delphi technique. A number of medical specialties have come to adopt the Delphi approach, which is an organized way for panel members to reach a consensus [14]. The principal aim of the Delphi technique is to produce a trustworthy consensus opinion from a group of experts through an iterative questionnaire process with controlled feedback thrown in. The Delphi process has been applied to a variety of healthcare-related tasks, including assessing existing knowledge and creating assessment tools and indicators [15, 16].

### Ethical approval

The institutional review board has granted ethical approval for the study protocol. The Indian Council of Medical Research's (ICMR 2017) National Ethical Standards for Biomedical and Health Research Involving Human Participants and the Helsinki Declaration (Revised 2013) were followed during research execution.

### Recruitment criteria

A group of 10 experts, including two for the focal discussion and eight for the content validity process, were asked to participate in the study. Participants having master's degrees in sports physiotherapy, with  $\geq 5$  years of experience, and who are working as academicians were selected for the functional performance evaluation battery of athletes. To qualify as an expert, every subject chosen for the research must meet the enumerated requirements for inclusion.

### Study design and setting

This study is about the design and validation of an instrumental investigation. This study was conducted from March 2020 to March 2021 at the department of sports physiotherapy at a reputed university. All experts signed digital informed consent before taking part in the development of the study. The items needed to assess the functional performance of football players were first developed in consultation with two expert panels who have more than 5 years of experience working as sports academicians. The tool was created, and the necessary components were prepared based on comments and suggestions given by the experts. To create the survey, we used the Google Forms platform. Eight experts who completed their post-graduation in sports physiotherapy and had  $> 5$  years of experience working as sports academicians received the

questionnaire through Google Forms via email or a WhatsApp link for confirmation. The experts' involvement was entirely voluntary, and they did not get any compensation for it.

**Procedure**

**Phases of CFPA tool development**

The study had two main phases: tool development and validity testing. A detailed description of the phases is described in Fig. 1.

**Phase 1: tool development**

This phase of the study used to generate items used literature search to develop the tool's items linked to the functional performance assessment skill test, nutritional evaluation, and psychological evaluation, which are related to football, are taken into consideration [6, 12, 17–19]. The following sub-phases comprise the stages:

- a. Developing the problem and construct determination

The experts defined the proposed construct and content of the tool. There was no tool to develop to assess the severity, reduce the risk of injury, and improve the functional performance of football players in India.

- b. Item generation

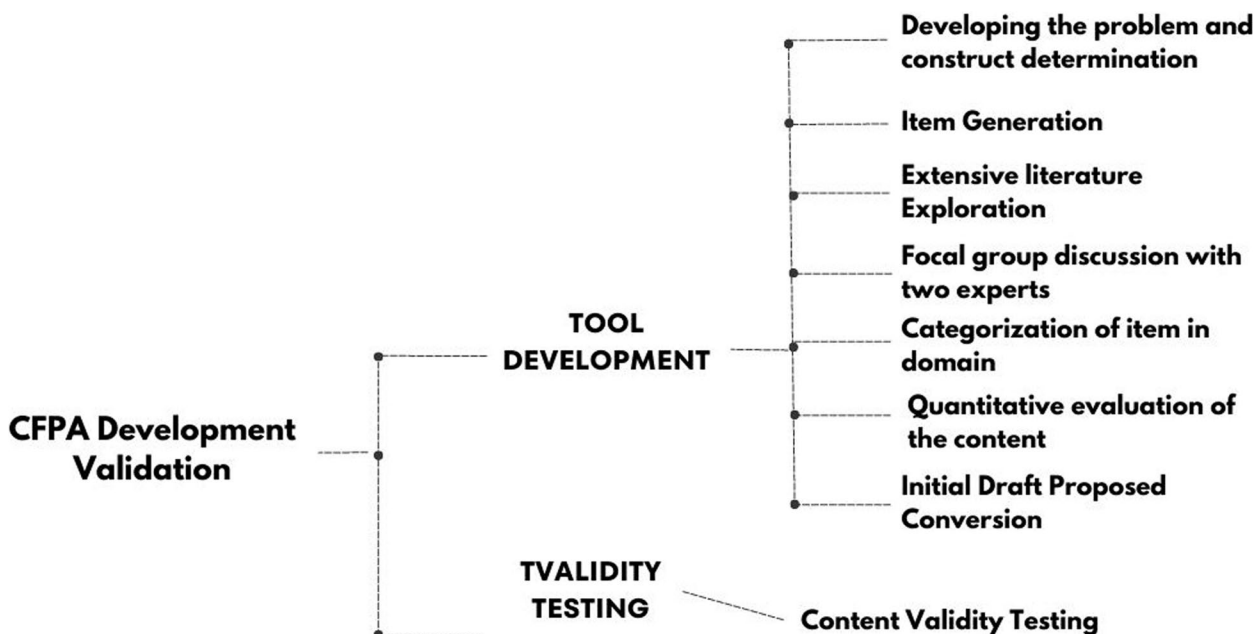
There was a sizable pool of goods that would reflect the construction. The tool produced items for the Comprehensive Functional Performance Assessment Battery (CFPA) utilizing literature searches on muscle strength, endurance, speed, power, agility, balance, coordination, response time, psychological health, and nutritional evaluation [6, 12, 17–19].

- c. Extensive literature exploration

Physiotherapy Evidence Databases (Pedro), Scopus, and PubMed/MEDLINE were searched in English using the following keywords: Balance, coordination, response time, psychological health, and nutritional assessment were included in the literature study, as well as muscle strength, endurance, speed, power, and agility. The tool and questionnaire for players were restricted based on age filters.

- d. Focal group discussion with the two experts

Based on the results obtained from the literature search, the tool item developed to assess football players' functional skills was first discussed with two experts with a PhD degree in the field of sports physiotherapy and >5 years of experience. After the initial review by the experts, the tool was developed according to their opinions and suggestions.



**Fig. 1** Study phases of CFPA development and validation

e. Categorization of the item in the domain

After the production of items in the comprehensive functional performance assessment battery (CFPA) by using literature exploration and focal discussion, the item was first closely recognized and then categorized in the comprehensive functional Performance assessment battery (CFPA). Items that are categorized for the battery are placed in the Comprehensive Functional Performance Assessment battery (CFPA) of football players.

f. Quantitative evaluation of the content

A group of specialists evaluated the item's quantitative evaluation for each of the domains (a sample of 14 items). The level of agreement amongst experts was utilized to assess the content evaluation of items and domains and only one Delphi round was conducted as 80% of experts agreed on an item in the tool, and then it was included for the next round of content validity.

g. Initial draft proposed conversion

After the changes and opinions given by the group of experts for the comprehensive Functional Performance Assessment battery (CFPA), the initial draft was proposed, and then the content validity of the tool was validated by the panel of 8 experts who had completed their post-graduation in the field of sports physiotherapy and held an experience of more than >5 years in the field of sports physiotherapy.

**Phase: 2 validity testing**

a. Content validation by the Delphi method

- I. The Sample size for the content validity round: eight experts for content validity in the Delphi round
- II. Content validation of the instrument was carried out by a panel of experts

The item's content and quality were both evaluated by a group of eight sports academicians. Using a 4-point ordinal scale, both quality and content were evaluated. The scale runs from 1 to 4, with 1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, and 4 = highly relevant [20, 21]. According to Lynn's guideline, there had to be 80% agreement between the experts for the item-level content validity index (I-CVI) for eight experts to be 0.83. A minimal I-CVI > 0.78 met Lynn's (1986) criterion as being extremely important [21]. Experts chose the item pool based on its quality and content relevance for the extensive

Functional Performance Assessment battery. A Google Forms link was sent to the panel of experts via email, a message, or WhatsApp. Five days following the invitation, they received a call, an email, a message, or WhatsApp asking them to take part in the content validation phase. Each expert evaluated the tool's viability before validating it. The content validity round lasted for a total of 2 weeks.

**Statistical analysis**

SPSS for Windows was used to conduct the statistical analysis (version 25, SPSS Inc., Chicago, IL, USA). To begin with, a four-point ordinal scale was employed to assess the 14 items' content validity. The content validity index (CVI) was calculated by dividing the number of experts that arrived at an acceptable test grade of 3 (quite relevant) or 4 (highly relevant) by the total number of assessments of the test ( $CVI > 0.78$  represents excellent level). Index content validity (I-CVI) = (agreed item)/(number of experts). Scale-level content validity index (S-CVI/Ave) = (Sum of all I-CVI Scores)/(Number of the item); S-CVI/Ave = (Sum of Portion Relevance)/(Number of the item). Scale-level content validity index based on universal agreement method (S-CVI/UA) = (Sum of UA scores/Number of the item) [17–19].

The content validity ratio (CVR) is calculated as  $ne - N/2/N/2$ , where  $ne$  = the total number of experts divided by the number of experts saying the item is essential, and  $N$  = the total number of experts in the panel. Kappa value ( $k$ ) =  $(CVI - Pc)/(1 - Pc)$ . Where  $Pc$  is the probability of a chance occurrence ( $k = 0.75$  indicates an excellent value). Aiken  $V$  was calculated as  $V = s/[n(c - 1)]$ ;  $s = r - lo$ ;  $lo$  = lowest value.  $c$  = highest value  $r$  = numbers given by the rater [17–19].

**Results**

A group of eight physiotherapists with backgrounds in sports evaluated the Functional Performance Assessment Battery (CFPA). In first the round, each of the functional performance assessment tests received 100% of the response rate.

The development of a Functional Performance Assessment Battery (CFPA) for Indian football players was the main objective. The steps involved in developing the tool were as follows: choosing the item, formulating the problem, choosing the construct, creating the item, conducting a literature review, categorizing the item in the domain, evaluating the content's quality, creating an initial draft, and producing the final document. In response to feedback from experts in the Delphi rounds, the instrument was modified for the content validity round. The details of the Performa are presented in Supplementary files 1 and 2.

The content validity ratio for the CFPA was greater than 0.89, and the scale level of content validity for

each tool item—including item 1 (described as highly relevant)—was greater than 0.78 (Table 1). The item’s quality and content were both universally accepted at 1 (Table 1). Each item’s content validity at the item level was 1 (Table 2). The kappa value for each item

was found to be 1, which is excellent (Table 3). Aiken’s V index was greater than 0.81, which indicated that the examiners strongly agreed with each other’s opinions (Tables 4 and 5).

**Table 1** Relevance rating on 14 items in tool by eight experts for the content of the item and quality of the item

Relevance rating for content of the item									Experts’ agreement	I-CVI	UA
Item	E1	E2	E3	E4	E5	E6	E7	E8			
Q1	1	1	1	1	1	1	1	1	8	1	1
Q2	1	1	1	1	1	1	1	1	8	1	1
Q3	1	1	1	1	1	1	1	1	8	1	1
Q4	1	1	1	1	1	1	1	1	8	1	1
Q5	1	1	1	1	1	1	1	1	8	1	1
Q6	1	1	1	1	1	1	1	1	8	1	1
Q7	1	1	1	1	1	1	1	1	8	1	1
Q8	1	1	1	1	1	1	1	1	8	1	1
Q9	1	1	1	1	1	1	1	1	8	1	1
Q10	1	1	1	1	1	1	1	1	8	1	1
Q11	1	1	1	1	1	1	1	1	8	1	1
Q12	1	1	1	1	1	1	1	1	8	1	1
Q13	1	1	1	1	1	1	1	1	8	1	1
Q14	1	1	1	1	1	1	1	1	8	1	1
									S-CVI/Ave	1	
Portion relevance	1	1	1	1	1	1	1	1	S-CVI/UA		1
Average portion of item judged as relevance across the 8 experts = 1											
S-CVI/Ave-Sum of all i-CVI scores/No. of item = 14/14 = 1											
S-CVI/Ave-Sum of proportion relevance rating/Number of expert = 8/8 = 1											
S-CVI/UA-Average score of UA Scores across all the item / No of item = 14/14 = 1											
Relevance rating for quality of the item									Experts’ agreement	I-CVI	UA
Item	E1	E2	E3	E4	E5	E6	E7	E8			
Q1	1	1	1	1	1	1	1	1	8	1	1
Q2	1	1	1	1	1	1	1	1	8	1	1
Q3	1	1	1	1	1	1	1	1	8	1	1
Q4	1	1	1	1	1	1	1	1	8	1	1
Q5	1	1	1	1	1	1	1	1	8	1	1
Q6	1	1	1	1	1	1	1	1	8	1	1
Q7	1	1	1	1	1	1	1	1	8	1	1
Q8	1	1	1	1	1	1	1	1	8	1	1
Q9	1	1	1	1	1	1	1	1	8	1	1
Q10	1	1	1	1	1	1	1	1	8	1	1
Q11	1	1	1	1	1	1	1	1	8	1	1
Q12	1	1	1	1	1	1	1	1	8	1	1
Q13	1	0	1	1	1	1	1	1	7	0.87	0
Q14	1	1	1	1	1	1	1	1	8	1	1
									S-CVI/Ave	0.99	
Portion relevance	1	0.92	1	1	1	1	1	1	S-CVI/UA	0.92	1
Average portion of item judged as relevance across the 8 experts = 0.99											
S-CVI/Ave-Sum of all i-CVI scores/No. of item = 13.87/14 = 0.99											
S-CVI/Ave-Sum of proportion relevance rating/Number of expert = 7.92/8 = 0.99											
S-CVI/UA-Average score of UA Scores across all the item/No. of item = 13/14 = 0.92											

**Abbreviations:** I-CVI = Item-Content Validity index, UA = universal agreement, S-CVI = Scale Content Validity index, Relevance rating recorded as 1 = (relevance scales 3 and 4, relevance rating recorded as 0 = (relevance scales 1 and 2)

**Table 2** Item generated domains and percentage level of agreement between the experts of item-level content validation for the content of the item and quality of the item

Items	Comprehensive functional Performance assessment battery (CFPA)	Content of the item	
		I-CVI	I-CVI
1	Question: 1 Demographic details	1.00	1.00
2	Question: 2 Body composition	1.00	1.00
3	Question: 3 General examination	1.00	1.00
4	Question: 4 Strength Single Hop Test	1.00	1.00
5	Question: 5 Endurance Yo-Yo intermittent Test	1.00	1.00
6	Question: 6 Speed Shuttle run test	1.00	1.00
7	Question: 7 Agility T-test	1.00	1.00
8	Question: 8 Power Vertical Jump test	1.00	1.00
9	Question: 9 Balance Stork Stand Balance Test	1.00	1.00
10	Question: 10 Flexibility Sit and Reach Test	1.00	1.00
11	Question: 11 Coordination Alternate Hand ball toss test	1.00	1.00
12	Question: 12 Reaction Time Visual and Acoustic Reaction Time	1.00	1.00
13	Question: 13 Psychological Evaluation State trait Anxiety Inventory (STAI)	1.00	0.87
14	Question: 14 Nutritional Evaluation 3-day Dietary Recall	1.00	1.00

Abbreviations: I-CVI = Item-Content Validity Index

## Discussion

A comprehensive functional performance assessment battery was created and validated to help football players evaluate their physical fitness, functional performance, and risk of injury during gameplay. It is necessary to assess the injury risk and effectively manage the recovery of injured players [22]. The validation of the tool necessitates the expertise of professionals. Various factors, including the quality of the inclusion criteria, the number of experts needed, guidelines for preparing evaluation templates, methods for collecting quantitative and qualitative data, and appropriate statistical analysis, should all be carefully considered.

A group of panels of experts validated the tool, and the tests that received  $\geq 80\%$  of the response rate were selected for the content validity round. Between the experts, the strength of the consequences reached in the study is reflected in the remarkably high level of agreement. Each item's content validity (I-CVI) in the battery for the functional performance assessment test for both content and quality of the item was greater

than the accepted value (0.78). It indicated that each item included in the tool was highly relevant. The S-CVI UA (universal acceptance) for the content of the item was 1 and the quality of the item was 0.92. The tool S-CVI/UA value was within the acceptable range, which was more than ( $\geq 0.8$ ), suggesting the relevant content the tool can measure. The S-CVI/Ave for the Functional Performance Assessment battery for content was 1 and the quality of the item was 0.99, which was more than the accepted value ( $\geq 0.9$ ). The kappa coefficient ( $k^*$ ) for each item in the functional performance assessment tool is 1, and the psychological evaluation of the item's quality was 0.69, which is excellent and good (values for kappa, as proposed by Cicchetti and Sparrow: fair =  $k^*$  of 0.40 to 0.59, good =  $k^*$  of 0.60 to 0.74, and excellent =  $k^*$  of 0.75 to 1.00). The content validity ratio (CVR) for each item in the comprehensive functional performance assessment test in the tool for content and quality of the item is 1, and the psychological evaluation of the quality of the item is 0.75 which was accepted as a higher degree of relevancy of 0.49. The Aiken's V index for each item in the tool for comprehensive functional performance assessment tool for both content and quality of the item was between V 0.81 and 1.00, which was strongly agreed and relevant [23–26]. The tests selected by the group of experts that had high content validity were demographic details, body composition, general examination, single hop test, Yo-Yo intermittent test, shuttle run test, T-test, vertical jump test, stork stand balance test, sit and reach test, alternate handball toss test, visual and acoustic reaction time, Sports anxiety Trait Inventory and 3-day dietary protocol.

The purpose of the subjective examination including demographic details was to ensure that the player is medically safe for their choice of sporting activity; it is an important component of the assessment in football [27]. Body composition evaluation tracks the changes in the various morphological components to customize training positions and roles within the team and to provide a unique relationship between health and sports performances [28]. General systemic examination maximizes safer participation in sports as it may detect medical conditions that predispose the player to injury and illness hence it is a valid component for assessing the player in football before the game. In reference to other evaluation tests of tools that closely replicate the pattern of movement in football, they were thus found useful and valid in measuring the football players' performance as well as physical fitness. In relation to psychological evaluation state-trait anxiety inventory was used to check issues related to anxiety, depression, self-esteem issues, fear of failure during the games, and stress-related concerns in

**Table 3** The item-content validity index (I-CVI), Probability of Chance Agreement (Pc), and the Kappa designating agreement of relevance ( $k^*$ )

i. The functional performance assessments tests for content of item									Experts' agreement	I-CVI	PC	Kappa
Item	E1	E2	E3	E4	E5	E6	E7	E8				
Q1	1	1	1	1	1	1	1	1	8	1	0	1
Q2	1	1	1	1	1	1	1	1	8	1	0	1
Q3	1	1	1	1	1	1	1	1	8	1	0	1
Q4	1	1	1	1	1	1	1	1	8	1	0	1
Q5	1	1	1	1	1	1	1	1	8	1	0	1
Q6	1	1	1	1	1	1	1	1	8	1	0	1
Q7	1	1	1	1	1	1	1	1	8	1	0	1
Q8	1	1	1	1	1	1	1	1	8	1	0	1
Q9	1	1	1	1	1	1	1	1	8	1	0	1
Q10	1	1	1	1	1	1	1	1	8	1	0	1
Q11	1	1	1	1	1	1	1	1	8	1	0	1
Q12	1	1	1	1	1	1	1	1	8	1	0	1
Q13	1	1	1	1	1	1	1	1	8	1	0	1
Q14	1	1	1	1	1	1	1	1	8	1	0	1
ii. The functional performance assessments tests for quality of item									Experts' agreement	I-CVI	PC	Kappa
Item	E1	E2	E3	E4	E5	E6	E7	E8				
Q1	1	1	1	1	1	1	1	1	8	1	0	1
Q2	1	1	1	1	1	1	1	1	8	1	0	1
Q3	1	1	1	1	1	1	1	1	8	1	0	1
Q4	1	1	1	1	1	1	1	1	8	1	0	1
Q5	1	1	1	1	1	1	1	1	8	1	0	1
Q6	1	1	1	1	1	1	1	1	8	1	0	1
Q7	1	1	1	1	1	1	1	1	8	1	0	1
Q8	1	1	1	1	1	1	1	1	8	1	0	1
Q9	1	1	1	1	1	1	1	1	8	1	00	1
Q10	1	1	1	1	1	1	1	1	8	1	0	1
Q11	1	1	1	1	1	1	1	1	8	1	0	1
Q12	1	1	1	1	1	1	1	1	8	1	0	1
Q13	1	0	1	1	1	1	1	1	7	0.87	0	0.69
Q14	1	1	1	1	1	1	1	1	8	1	0	1

*Abbreviations:* I-CVI = Item-Content Validity index, Pc = probability of chance agreement, S-CVI = scale content validity, Relevance rating recorded as 1 = (relevance scales 3 and 4, relevance rating recorded as 0 = (relevance scales 1 and 2)

players for the game [29]. Finally, in relation to nutritional evaluation a 3-day dietary recall was done for the players to determine how much quantity and type of food they required at specific intervals of the day. The recall was done using the 24-h recall method for three consecutive days. It was done to check the physical demands needed for the body during the training status of the players and to enhance their performance in the game [30].

CFPA had an overall highly relevant and excellent item content validity index, Scale- content validity index for both content and quality of item, universal acceptance, and content validity ratio. Kappa value and Aiken's V coefficient were also excellent for each functional performance test present in the tool for the quality and content

of the item. A CFPA battery can be used to assess the risk of injury and the physical fitness level of football players. It can also be a helpful tool for managing the wounded player's recuperation and predicting the player's performance in the future. The current study will help sports physiotherapists assess the tailored training regimen and track recovery from sports-related injuries as well as football-specific talents.

The full functional performance assessment battery, one of the study's shortcomings, encompasses items and components, making the assessment potentially challenging. It ought to concentrate on just one thing at a time. Sports physiotherapists must go through training before utilizing the CFPA, which will improve player

**Table 4** CVR for items of each dimension where Ne represents the number of experts who rate an item as “essential”

Content of the item				Quality of the item			
Item no	N	Ne	CVR	N	Ne	CVR	
Q1	8	8	1	8	8	1	
Q2	8	8	1	8	8	1	
Q3	8	8	1	8	8	1	
Q4	8	8	1	8	8	1	
Q5	8	8	1	8	8	1	
Q6	8	8	1	8	8	1	
Q7	8	8	1	8	8	1	
Q8	8	8	1	8	8	1	
Q9	8	8	1	8	8	1	
Q10	8	8	1	8	8	1	
Q11	8	8	1	8	8	1	
Q12	8	8	1	8	8	1	
Q13	8	8	1	7	8	0.75	
Q14	8	8	1	8	8	1	

Abbreviations: CVR content validity ratio, N = total no of panelists, Ne = no. of panel lists indicating item essential

**Table 5** The result of content validation test with the Aiken formula for content and quality of item

	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12		Q13		Q14	
	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S
Aiken's V for content of the item																												
E1	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
E2	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
E3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
E4	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
E5	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
E6	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
E7	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
E8	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
ΣS	24		24		24		24		24		24		24		24		24		24		24		24		24		24	
V	1.14		1.14		1.14		1.14		1.14		1.14		1.14		1.14		1.14		1.14		1.14		1.14		1.14		1.14	
Aiken's V for Quality of the item																												
E1	4	3	4	3	4	3	3	2	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
E2	3	2	4	3	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	2	1	3	2		
E3	3	1	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
E4	3	2	3	2	3	2	3	2	4	3	3	2	4	3	4	3	4	3	3	1	4	3	3	1	3	1	3	1
E5	3	2	3	2	4	3	4	3	4	3	4	3	4	3	4	3	4	3	3	2	3	2	3	2	4	3	4	3
E6	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	3	2	4	3	4	3	3	2	3	2
E7	3	2	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
E8	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
ΣS	17		21		21		20		22		21		22		22		22		19		22		20		19		20	
V	0.80		1		1		0.95		1.04		1		1.04		1.04		1.04		0.90		1.04		0.95		0.90		0.95	

V = Aiken's V Index, E = experts in the panel



use of the instrument and their ability to recognize play behavior. Future recommendations call for the creation of standardized protocols so that each appropriate performance test can be selected as a tool and have individual test scores created.

## Conclusion

The Complete Functional Performance Assessment battery is a valid instrument that may be utilized with football players, according to the results of the current study. The instrument may be utilized in a football-specific setting on the field and will aid in maintaining the player's physical condition as well as enhancing individual and team performance. CFPA is the first measurement tool used in India among football players.

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s43161-024-00202-w>.

Supplementary Material 1. List of Item Generated by the Experts in First Round for Content validity Testing.

Supplementary Material 2. Categories of tests which were selected for the inclusion in Content validity testing.

## Authors' contributions

HRG and VE conceived and designed the experiments; performed the experiments, analyzed and interpreted the data, contributed reagents, materials, analysis tools, or data, and wrote the paper. VE and SA analyzed and interpreted the data, contributed reagents, materials, analysis tools, or data, and wrote the paper. HRG and VE performed the experiments and contributed reagents, materials, analysis tools, or data. VE and SA wrote the paper. All the authors read and approved the final manuscript.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or non-profit sectors.

## Availability of data and materials

Data will be made available on request.

## Declarations

### Ethics approval and consent to participate

Approved by the institutional ethical review board of Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana, India, with the reference number ICE-1729.

### Consent for publication

Informed consent was taken from the participants prior to participating in this study.

### Competing interests

The authors declare that they have no competing interests.

Patient and public involvement.

Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

## References

- Helgerud J, Rodas G, Kemi OJ, Hoff J. Strength and endurance in elite football players. *Int J Sports Med.* 2011;32(9):677–82.
- Villaseca-Vicuña R, Otero-Saborido FM, Perez-Contreras J, Gonzalez-Jurado JA. Relationship between Physical Fitness and Match Performance Parameters of Chile Women's National Football Team. *Int J Environ Res Public Health.* 2021;18:8412.
- García-Ceberino JM, Antúnez A, Ibáñez SJ, Feu S. Design and validation of the instrument for the measurement of learning and performance in football. *Int J Environ Res Public Health.* 2020;17(13):4629.
- Liporaci RF, Saad MC, Bevilaqua-Grossi D, Riberto M. Preseason intrinsic risk factors - Associated odds estimate the exposure to proximal lower limb injury throughout the season among professional football players. *BMJ Open Sport Exerc Med.* 2018;4(1):1–7.
- Gabbett TJ. Science of rugby league football: a review. *J Sports Sci.* 2005;23(9):961–76.
- Manske R, Reiman M. Functional performance testing for power and return to sports. *Sports Health.* 2013;5(3):244–50.
- Sporis G, Vucetic V, Jovanovic M, Jukic I, Omrcen D. Reliability and factorial validity of flexibility tests for team sports. *J strength Cond Res.* 2011;25(4):1168–76.
- Weir G, van Emmerik R, Jewell C, Hamill J. Coordination and variability during anticipated and unanticipated sidestepping. *Gait Posture.* 2019;67:1–8.
- Kaluga E, Straburzynska-Lupa A, Rostkowska E. Hand-eye coordination, movement reaction time and hand tactile sensitivity depending on the practiced sports discipline. *J Sports Med Phys Fitness.* 2020;60(1):17–25.
- Junge A, Dvorak J, Rösch D, Graf-Baumann T, Chomiak J, Peterson L. Psychological and sport-specific characteristics of football players. *Am J Sports Med.* 2000;28(5 Suppl):S22–8.
- Devlin BL, Leveritt MD, Kingsley M, Belski R. Dietary intake, body composition, and nutrition knowledge of Australian football and soccer players: implications for sports nutrition professionals in practice. *Int J Sport Nutr Exerc Metab.* 2017;27(2):130–8.
- Rösch D, Hodgson R, Peterson TL, Graf-Baumann T, Junge A, Chomiak J, et al. Assessment and evaluation of football performance. *Am J Sports Med.* 2000;28(5 Suppl):S29–39.
- Vereijken A, Aerts I, Jetten J, Tassignon B, Verschueren J, Meeusen R, et al. Association between functional performance and return to performance in high-impact sports after lower extremity injury: a systematic review. *J Sports Sci Med.* 2020;19(3):564–76.
- Nasa P, Jain R, Juneja D. Delphi methodology in healthcare research: How to decide its appropriateness. *World J Methodol.* 2021;11(4):116–29.
- Vogel C, Zwolinsky S, Griffiths C, Hobbs M, Henderson E, Wilkins E. A Delphi study to build consensus on the definition and use of big data in obesity research. *Int J Obes (Lond).* 2019;43(12):2573–86.
- Boulkedid R, Abdoul H, Loustau M, Sibony O, Albeti C. Using and reporting the delphi method for selecting healthcare quality indicators: a systematic review. *PLoS One.* 2011;6(6):e20476. <https://doi.org/10.1371/journal.pone.0020476>.
- Ibáñez SJ, Martínez-Fernández S, Gonzalez-Espinosa S, García-Rubio J, Feu S. Designing and Validating a Basketball Learning and Performance Assessment Instrument (BALPAI). *Front Psychol.* 2019;10(JULY):1–9.
- Chiwariidzo M, Chandahwa D, Oorschot S, Tadyanemhandu C, Dambi JM, Ferguson G, et al. Logical validation and evaluation of practical feasibility for the SCRuM (School Clinical Rugby Measure) test battery developed for young adolescent rugby players in a resource-constrained environment. *PLoS One.* 2018;13(11):e0207307.
- Malliaropoulos N, Korakakis V, Christodoulou D, Padhiar N, Pyne D, Giakas G, et al. Development and validation of a questionnaire (FASH-Functional Assessment Scale for Acute Hamstring Injuries): to measure the severity and impact of symptoms on function and sports ability in patients with acute hamstring injuries. *Br J Sports Med.* 2014;48(22):1607–12.
- Lynn MR. Determination and quantification of content validity. *Nurs Res.* 1986;35(6):382–5.
- Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Res Nurs Health.* 2007;30(4):459–67.

Received: 24 September 2023 Accepted: 6 May 2024

Published online: 07 June 2024

22. Gómez-Piqueras P, González-Villora S, de SainzBarandaAndújar MDP, Contreras-Jordán OR. Functional assessment and injury risk in a professional soccer team. *Sport (Basel, Switzerland)*. 2017;5(1):9.
23. Zamanzadeh V, Ghahramanian A, Rassouli M, Abbaszadeh A, Alavi-Majid H, Nikanfar AR. Design and implementation content validity study: development of an instrument for measuring patient-centered communication. *J caring Sci*. 2015;4(2):165–78.
24. Cicchetti DV, Sparrow SA. Developing criteria for establishing interrater reliability of specific items: applications to assessment of adaptive behavior. *Am J Ment Defic*. 1981;86(2):127–37.
25. Ayre C, Scally AJ. Critical values for Lawshe's content validity ratio: revisiting the original methods of calculation. *Meas Eval Couns Dev*. 2013;47(1):79–86. <https://doi.org/10.1177/0748175613513808>.
26. Yudhistira D, Tomoliyus. Content validity of agility test in karate kumite category. *Int J Hum Mov Sport Sci*. 2020;8(5):211–6.
27. D'Isanto T, D'Elia F, Raiola G, Altavilla G. Assessment of sport performance: Theoretical aspects and practical indications. *Sport Mont*. 2019;17(1):79–82.
28. Mills C, De Ste CM, Cooper SM. The importance of measuring body composition in professional football players: a commentary. *Sport Exerc Med - Open J*. 2017;3(1):24–9.
29. Satori A, Stegall R. State and Trait Anxiety : a comparison of the on and off field anxiety levels of athletes and non-athletes. Georgia Southern University; 2016.
30. Raizel R, da Mata GA, Coqueiro AY, Voltarelli FA, Fett CA, Tirapegui J, et al. Pre-season dietary intake of professional soccer players. *Nutr Health*. 2017;23(4):215–22.

### **Publisher's Note**

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.