

The Validation of Scientific Tools in Officiating During Sports

Mansi Kaushik¹, Manjeet Singh², Dr. Paramvir Singh³

¹Research Scholar, Department of Sports Science, Punjabi University, Patiala

²Research Scholar, Department of Sports Science, Punjabi University, Patiala

³Professor, Department of Sports Science, Punjabi University, Patiala

Abstract

Sports organization, administration and officiating are a broad area in the management skills of competitive world of sports. More specifically officiating, the sports events, being very important role during the tournament, there are so many techniques and technologies used for assistance in officiating. This paper entitle “The validation of Scientific Tools in officiating during Sports” evaluated the validity of the different tools to identify the impact of officiating. To establish the validation of the questionnaire, ‘two validity methods are used’: face and content validity. For assessing the face and content validity a panel of 10 Sports officiating experts has been engaged. The experts were selected from different area related to sports and based on academic qualifications, professional experience, coaching and research contribution. The questionnaire was sent to experts in the form of soft copy and hard copy. In face validity, the experts were sent the suggestions for the improvement in the questionnaire. Based on expert’s suggestions, modifications were made to correct the structure and content of the items in the questionnaire further sent to the same experts for content validity to assessed the relevancy of the questionnaire. To assess content validity, the I-CVI (Item-Content Validity Index) and S- CVI (Scale-Content Validity Index) was calculated. The items that did not fulfill the minimum values were revised or eliminated from the questionnaire. For the each item the calculated values were, I-CVI Score was (0.92) and S-CVI Score was (0.92) and was quite satisfying for the statistical consideration for the sake of research and evaluations.

Keywords: Officiating, technology, performance expectancy, Players, scale development

Introduction

Sports organization, administration and officiating are a broad area in the management skills of competitive world of sports. Officials are those who make sure about the rules and regulations followed in the game properly. Traditionally, officiating has depended on human judgment, which, despite its competence, was susceptible to human error because of things like bias, exhaustion, or the extreme pace of contemporary sports. Refereeing is essential for ensuring fairness, integrity, and orderly conduct of sports, with enforcing the rules, making key decisions, and maintaining a level of playing field. Referees decisions and behaviour significantly influence game outcomes, player behaviour, and the overall standards and spirit of competitions (Goel A., 2024). As a result, the fairness of the game was impacted. To reduce the human error and biasness in the sport events, from the last decade, officiating technologies have employed in many sport competitions for example- Hawk-Eye in tennis, VAR in football (Kim J. et

al., 2023). The evolution of sports science and use of technology, modern officiating has increasingly incorporated advance tools and techniques to enhance decision-making accuracy and transparency in the sports competitions. The implementation of decision-aid technology not only limits the power of referees during games but also undermines the capacity to make the correct judgments at crucial points of the games (Winand, M. et al., 2018). However, the primary objective of each technology is the same: to enhance the caliber of refereeing judgments, keep out of controversial errors, and optimize fairness—all three are the most important principles of athletic competition (Kim J. et al., 2023). These advancements, ranging from video assistant referee (VAR) systems to wearable sensors and data analytics, have transformed the landscape of sports officiating, aiming to minimize human errors and improve fairness.

Methodology

To collect the data, firstly ethical approval were taken from the Institutional Ethical Committee, Faculty of Medicine, Punjabi University Patiala. All the steps were followed for the approval. The requesting letter was sent for consent obtained from the participants/experts before giving the questionnaire.

To develop the questionnaire the items/questions were taken after the consultation of experts and the literature review. This is closed-ended questionnaire with 5-point Likert Scale. First, 29 items were made and distributed in only 3 domains i.e., demographic data, knowledge of game and impact of officiating. To validate these items the face validation were done by three experts. For the pilot study, face validation of the questionnaire was carried out by taken the suggestions from three experts. To conducting the pilot study, 60 officials and coaches were taken as subjects. Before giving the questionnaire to the subjects the purpose to develop the questionnaire was explain (Bish, V. B. S. (2016). After the face validation and collection of data, the reliability was calculated by using the Cronbach's alpha formula for internal consistency, which shows the questionnaire was highly reliable, but after this process, a discussion with officials and coaches held, there was gap in the questionnaire. After following certain experts' advice and study review of literature the questionnaire was modified in which more items were added and then total number of items were 48.

Further, the panel of 10 experts were selected from different area related to sports and based on academic qualifications, experience, coaching and research contribution to develop the modified questionnaire. To calculate the validity of the tool two methods were used i.e., face and content validity. For the face validity the questionnaire were sent to the experts through e-mail with cover letter the experts give their suggestions to simplify the language and for improvement. After the recommendation of the experts, questionnaire was further modified. Now the tool has total 79 items, with 5 domains (demographic data, knowledge, impact, fairness and diverse views of players, officials and coaches). The questionnaire was sent to the experts for the relevancy of the items and scale to establish the content validity. In which experts give the rating to each item for the relevancy:

- 1- item is not relevant to the measured domain, coding as 0
- 2- item is somewhat relevant to the measured domain, coding as 0
- 3- item is quite relevant to the measured domain, coding as 1
- 4- item is highly relevant to the measured domain, coding as 1

and give certain advice for further improvement. The whole process of validation took more than 6 months. Content validity was assessed quantitatively using the Item Content Validity Index (I-CVI) and the Scale Content Validity Index (S-CVI) based on experts evaluation.

Result

Content validity Index Score (I-CVI and S-CVI) of the questionnaire												
Ques S.No .	Expert -1	Expert -2	Expert -3	Expert -4	Expert -5	Expert -6	Expert -7	Expert -8	Expert -9	Expert -10	Experts in agreement	I-CVI Score
Demographic Data												
Q-1	1	0	1	1	1	1	1	1	1	0	8	0.8
Q-2	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-3	1	1	1	1	1	1	1	1	1	1	10	1
Q-4	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-5	1	1	1	1	1	1	1	1	1	1	10	1
Q-6	1	1	1	1	1	1	1	0	1	1	9	0.9
Q-7	1	1	1	1	1	1	1	0	1	0	8	0.8
Q-8	1	1	1	1	1	1	0	1	1	0	8	0.8
Q-9	1	1	1	1	1	1	1	1	1	1	10	1
Q-10	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-11	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-12	1	1	1	1	1	1	1	1	0	1	9	0.9
Q-13	1	1	1	1	1	1	1	0	0	1	8	0.8
Q-14	1	0	1	1	1	1	1	1	1	0	8	0.8
Q-15	1	0	1	1	1	1	1	1	1	1	9	0.9
Q-16	1	1	1	1	1	1	1	1	1	1	10	1
Q-17	1	1	1	1	1	1	1	1	1	1	10	1
Q-18	0	1	1	1	1	1	1	1	1	1	9	0.9
KNOWLEDGE OF THE GAME												
Q-1	1	1	1	1	1	1	1	1	1	1	10	1
Q-2	1	1	1	1	1	1	1	1	1	1	10	1

Q-3	1	1	1	1	1	1	1	1	1	1	10	1
Q-4	1	1	1	1	1	1	1	1	1	1	10	1
Q-5	1	1	1	1	1	1	1	1	1	1	10	1
Q-6	1	1	1	1	1	1	1	1	1	1	10	1
Q-7	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-8	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-9	1	1	1	1	1	1	1	1	1	1	10	1
Q-10	1	1	1	1	1	1	1	1	1	1	10	1
IMPACT OF TECHNOLOGY												
Q-11	1	1	1	1	1	1	1	1	1	1	10	1
Q-12	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-13	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-14	1	1	1	1	1	1	1	0	1	1	9	0.9
Q-15	1	1	1	1	1	1	1	1	1	1	10	1
Q-16	1	1	1	1	1	1	0	0	1	1	8	0.8
Q-17	1	0	1	1	1	1	1	1	1	0	8	0.8
Q-18	1	1	1	1	1	1	0	1	1	0	8	0.8
Q-19	1	1	1	1	1	1	1	1	1	1	10	1
Q-20	1	1	1	1	1	1	1	1	1	1	10	1
Q-21	1	1	1	1	1	1	1	1	1	1	10	1
Q-22	1	1	1	1	1	1	1	1	1	1	10	1
Q-23	1	1	1	1	1	1	1	1	1	1	10	1
Q-24	0	1	1	1	1	1	0	1	1	1	8	0.8

Q-25	0	1	1	1	1	1	1	1	1	0	8	0.8
Q-26	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-27	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-28	1	1	1	1	1	1	1	1	1	1	10	1
Q-29	1	1	1	1	1	1	1	1	1	1	10	1
FAIRNESS												
Q-30	1	1	1	1	1	1	1	1	1	1	10	1
Q-31	1	1	1	1	1	1	1	1	1	1	10	1
Q-32	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-33	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-34	1	0	1	1	1	1	1	1	1	0	8	0.8
Q-35	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-36	1	0	1	1	1	1	1	1	1	0	8	0.8
Q-37	1	1	1	1	1	1	1	1	1	1	10	1
Q-38	1	1	1	1	1	1	1	0	1	1	9	0.9
Q-39	1	1	1	1	1	1	1	1	0	0	8	0.8
Q-40	1	1	1	1	1	1	1	1	1	1	10	1
Q-41	1	0	1	1	1	1	0	1	1	1	8	0.8
Q-42	1	0	1	1	1	1	1	1	1	0	8	0.8
Q-43	1	1	1	1	1	1	1	1	1	0	9	0.9

Q-44	1	1	1	1	1	1	1	1	0	1	9	0.9
Q-45	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-46	1	1	1	1	1	1	1	1	0	0	8	0.8
Q-47	1	1	1	1	1	1	1	1	0	0	8	0.8
Q-48	1	1	1	1	1	1	1	1	1	0	9	0.9
Q-49	1	1	1	1	1	1	1	1	1	1	10	1
Officials, Coaches and Players: Diverse views												
Q-1	1	0	1	1	1	1	1	1	1	1	9	0.9
Q-2	1	1	1	1	1	1	1	1	1	1	10	1
Q-3	1	1	1	1	1	1	1	1	1	1	10	1
Q-4	1	1	1	1	1	1	1	1	1	1	10	1
Q-5	1	1	1	1	1	1	1	1	1	1	10	1
Q-6	1	1	1	1	1	1	1	1	1	1	10	1
Q-7	1	1	1	1	1	1	1	1	1	1	10	1
Q-8	1	1	1	1	1	1	1	1	1	1	10	1
Q-9	1	1	1	1	1	1	1	1	1	1	10	1
Q-10	1	1	1	1	1	1	1	1	1	1	10	1
Q-11	1	1	1	1	1	1	1	1	1	1	10	1
Q-12	1	1	1	1	1	1	1	1	1	1	10	1
SUM	76	70	79	79	79	79	74	73	73	50	732	73.2
S-CVI	0.96	0.88	1	1	1	1	0.93	0.92	0.92	0.63	9.26	0.92
											0.92	

The study entitled “The Validation of Scientific Tools in Officiating during Sports” is aim to established the Validation of the questionnaire. During this study, on the first stage the questionnaire has 29 items only, the face validation was done by 3 experts of these items and reliability 0.92 was calculated by the cronbach alpha formula. Modification was done after the discussion with the experts and coaches. The

modified questionnaire was validated by following the face validation and content validity assessed by calculating the I-CVI and S-CVI score on the basis of the evaluation and rating on relevancy of each item which is given by the 10 experts. After expert evaluation, the I-CVI values for the individual items ranged from 0.80 to 1.00, indicating strong item-level relevance. No item was removed from the final scale because all items achieved acceptable content relevance. The S-CVI (Average) score for the entire scale was 0.92, demonstrating excellent overall content validity. This score indicates a high degree of agreement among experts regarding the relevance and comprehensiveness of the items included in the questionnaire.

Discussion

During this study, a panel of 10 experts was selected from various fields of sports. They give certain suggestions, on the basis of these suggestions the questionnaire were modified and then calculated the content validity score which shows high content validity score. An S-CVI value of 0.92 exceeds the commonly accepted standard of 0.80, suggesting that the items collectively provide comprehensive coverage of the construct being measured. This demonstrates that the scale successfully represents relevant dimensions such as knowledge of officiating technology, fairness, and decision-making accuracy. The high agreement among experts also implies that the questionnaire items are clear, appropriate, and reflect the current trends in officiating influenced by technological advancement.

Conclusion

The present study aimed to develop and validate a questionnaire that assesses the use and influence of scientific tools in sports officiating. The validation process, in which expert review and statistical evaluation is included, and resulted in strong content validity scores. It is noted that very few studies have been conducted on these parameters, especially in the context of officiating practices and the influence of modern technology in Indian Context.

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