Research Article

Establishing Reliability in Notational Analysis of Soccer of Malaysia

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ABSTRACT

Numerous methods of notational analysis are been used in performance analysis of soccer to provide coaches and players with information on their performance. Creating reliability for notational analysis in soccer is necessary for the information to be relied upon. Nevertheless, most performance analysts seldom report the reliability of their analysis assuming that the present of performance parameters could reflect the reliability of their analysis. The purpose of this study is to establish reliability in the notational analysis of soccer. Performance indicators associated with the demand for the game were identified, operationalized and installed on tablet application. Eleven performance analysts were provided with eleven tablets set up with Statwatch application and instructed to analyse the performance of a particular player during a soccer match based on the performance indicators. Cronbach's alpha and Cohen's Kappa reliability testing was employed to test the consistency as well the level of agreement between the performance analysts at $P \le 0.05$ level of confidence. The result shows $\alpha=0.90$ and $K=0.89$ (0.10, 95%), $P < 0.001$, respectively which suggested a high consistency of their measurement and indicated that the agreement between the performance analysts on their analysis was perfect and far beyond chance. Reliability in the notational analysis of soccer using tablet application could be achieved.

Keywords: Notational Analysis, Reliability testing, Performance analysts, Tablet application, Soccer.

INTRODUCTION

Notational analysis in sports is a process of recording actions of athletes based on specific indicators in relation to performance.[1] The history of the notational system in sports can be traced back to dance notation in about fifteen century and at least five-century efforts had been made to create and develop a system for notational analysis. It was further explained further that movement notation systems progressed in the area of expressive movement and slowly metamorphosed into sports and games analysis. [2]

In a soccer game, a robust shorthand technique for recording the actions of players in the game has been in used since 1950. [3-6] similarly, hand notation system was developed and utilized a combined with an audio tape recorder. [7] They were able to discover the work rates of players in relation to many positions, distance covered and time as well as the intensity, duration, and frequency.[7]

The aim of notational analysis in team sports such as soccer has been the identification of data frequencies or series of actions in view of relevant performance indicators. The notational analysis in soccer is ordinarily regarded as an intentional arrangement of data from players' performance accumulated in an extensive report format directed towards enhancing his advancement. [8] Providing information on performance in soccer is reported to play a significant role in improving the overall performance of a player.[9, 10] However, another study stated that the primary function of performance analysis in soccer is to provide the coach with information about team or individual's performance which can enable the coach to have accurate, objective, and relevant feedback to be available for players. [11] Nonetheless, these could not be achieved when the information is lacking reliability.

Reliability can be seen as the extent to which measurement procedure can be relied upon to produce consistent results upon repeated application. [12] Reliability is a crucial aspect in every field of studies, crosswise over numerous fields, skilled specialists regularly not just neglect to report the reliability of their measures, but miss the mark concerning a connection between scale legitimacy and viable research. [13] Nevertheless, reliability is the extent to which measures are free from blunder and along these lines yield reliable results (i.e. the consistency of an estimation technique). [14] In the event that an estimation gadget or method reliably doles out the same score to people or articles with equivalent values, the instrument is viewed as dependable.

Reliability includes the consistency, or reproducibility, of test scores, i.e., the extent to which one can generally expect consistent deviation scores of people crosswise over testing circumstances on the same, or parallel, testing instruments. [15]

Sports performance information has been measured and gathered via the use of various methods including different measurement devices in the area of notational analysis of sports and games, [16] it is essential consequently, to investigate the reliability tests utilised for such information. Several notational analysis systems are being utilized as a part of the notational analysis in soccer to give coaches and players information on their performance. [17] However, most performance analysts neglect to report the reliability of their analysis assuming that the presence of the clear operational definition of performance parameters ensures the reliability of the information generated. [18] It is vital to note that the presence of precise operational definitions does not guarantee great reliability nor does their deficiency ensure poor reliability. Establishing reliability in performance analysis of any game is fundamental in order for the data to be trustworthy. Consequently, any estimation of a reliability measurement thought to be adequate needs to be legitimised. Limited reliability can bring variability into data that diminishes the possibility of discovering a critical distinction. Reliability is at any rate as imperative when performance analysis is utilised in coaching and judging settings as when it is used for scholarly research. [19] Reliability defined, for sports performance is seen from a specific point of view as a matter of understanding, that is high levels of agreement in the observation process. That the measurement process itself ought to yield dependable information. [20]

Different articles have elaborated about measuring technique, but little have limited its scope to the ways appropriate in the gathering of reliable data through observation process, that is where performance is recorded through a defined set of performance indicators as such in many cases for notational analysis in a game of soccer. This study suggested ways through which reliability measures could be achieved in the notational analysis of soccer via the use of tablet applications. Information that is reliable should reflect the process through which the notational data is interpreted such that conclusion can be drawn in view of how each indicator is coded accurately. [21] Similarly, one more study reported that many studies conducted on the notational analysis in soccer gives inadequate and unclear information related to the reliability measuring technique. [22] However, multiple studies affirmed that the types of statistics employed or whether all the variables were tested in the analysis is not always reported. [23, 24] The purpose of this study is to establish the necessary reliability in the notational analysis of soccer.

MATERIALS AND METHODS

Participants: In the current study, eleven performance analysts were recruited from sports science division of Universiti Sultan Zainal Abidin. One of the elite soccer player competing in one of the clubs at Malaysian Super League (T-Team), where involve in this study.

Data collection procedure

The performance analysts were asked to notate the performance of the player during a soccer match based on certain performance indicators relevant to the demand for the game. We trained the performance analysts to familiarise themselves with the performance indicators. The performance indicators were Passing, Dribbling, Shooting, Heading, Foul, Chasing Loose Ball, Open Space, Through Pass and Clearing notated either success or fail. A Statwatch application, an application developed for notational analysis in sports that is compatible with tablets was installed on eleven tablets and used as a device for data collection.

Statistical analysis

In order to test the consistency of all the performance analysts, we employed a Cronbach's Alpha statistical coefficient as reported to be appropriate when a consistency is to be measured based on certain parameters.[25] To further ensure that the performance analyst agreed beyond chance on actions performs by the player, we randomly picked two performance analysts and instructed them to notate the performance of the player based on the performance indicators and Cohen's Kapper inter-tester reliability testing was used to determine whether the performance analysts agreed unanimously on the actions performed by the player. All the data were analysed using SPSS version 20 for windows at a confidence level of $P \leq 0.05$.

RESULT

Table 1 projects the descriptive statistics Cronbach's alpha conducted among the performance analysts. The Mean, Standard deviation and the number of the variables are shown.

Table 1: Descriptive Statistics for the Cronbach alpha reliability test conducted by the analysts.

Participants	Mean	Std. Deviation	Parameters
Analyst 1	0.65	1.18	20
Analyst 2	0.65	1.18	20
Analyst 3	0.65	1.14	20
Analyst 4	0.70	1.3	20
Analyst 5	0.70	1.17	20
Analyst 6	0.65	1.14	20
Analyst 7	0.75	1.21	20
Analyst 8	0.70	1.17	20
Analyst 9	0.60	1.05	20
Analyst 10	0.60	1.14	20
Analyst 11	0.65	1.18	20

Table 2 shows the Cronbach's alpha coefficient and the number of the participants. The Cronbach's alpha coefficient indicates 0.99 which revealed a high consistency among the performance analysts in their analysis of the player's performance.

Table 2: Reliability Statistical Coefficient for Cronbach's alpha.

Cronbach's alpha coefficient	No of Participants
0.99	11

Table 3 indicates the descriptive statistics for the Cohen's Kappa statistical agreement between the two analysts (Analyst A and Analyst B). The number of variables for the analysis, as well as the total percent, is shown. No missing value is reported.

Table 3: Descriptive Statistics for Cohen's Kappa statistical agreement between the two Analysts

| Participant | CASES | | | | | |
| | Valid | | Missing | | Total | |
	N	Percent	N	Percent	N	Percent
Analyst A* Analyst B	20	100.00%	0	0.00%	20	100.00%

Table 4 shows the contingency tabulation for the agreement between the two analysts, it reveals that the two analysts agreed twice that action was failed by the player and also agreed fourteen times that no action was performed by the player, only one discrepancy was found between the two analysts in which while analyst B viewed action carried out by the player as success, analyst A considered it as fail.

Table 4: Contingency table for the Agreement between the two Analysts.

| Count | Actions | Analyst A | | | Total |
		Action Fail	Action Success	No Action	
Analyst B	Action Fail	2	0	0	2
	Action Success	1	3	0	4
	No Action	0	0	14	14
TOTAL		3	3	14	20

Table 5 shows the inferential statistics of the analysis for the Cohen's Kappa's measure of agreement. The result shows K =0.89, $P < 0.001$, which indicated that the agreements among the performance analysts was beyond any chance and, therefore, they actually agreed on almost the same actions performed by the player.

DISCUSSION

The principle purpose of this study is to establish reliability necessary for notational analysis in soccer. A Statwatch application was installed on eleven tablet phones and utilised as a device for data collection. Eleven performance analysts were prepared to partake in the data collection. The performance of a player was observed during a soccer match based on certain performance indicators relevant to the demand for the game. Cronbach's alpha and Cohen's Kappa statistical technique was implemented to test the consistency as well as the agreement between the performance analysts on their observation. The result shows α = 0.99 and K= 0.89 (0.10, 95%), $P < .001$ respectively which confirmed the reliability of the information collected.

Table 5: Inferential Statistics for Cohen's Kappa between the two Analysts.

	Value	Std. Error	Sig.
Kappa's Measure of Agreement	0.89	0.10	.000*
No of Valid Cases	20.00		

*Significant at $P < 0.001$

The test conducted on the reliability to determine the consistency of the measurements between the performances analysts on their analysis during a soccer match, Cronbach's alpha was used to determine the consistency of their measurement. Cronbach's alpha coefficient indicates 0.99 which confirmed a high consistency level among the analysts on their measurement. It was revealed that a Cronbach alpha coefficient equals or above 0.90 indicates a perfect and excellent consistency among the variables. [25] This explained that the there was a remarkable consistency in terms of the measurements among the performance analysts that reflected a high internal reliability of the information collected from the analysis conducted by the performance analysts. Similarly, another study reported that when a Cronbach's alpha coefficient above or equals 0.90 obtained from a set of inquiries that give back a stable reaction, then the variable is said to be reliable. [26] Cronbach's alpha is a file of reliability related with the variation accounted for by the exact score of the "underlying construct." The construct is the conditional indicator that is being tested. [27]

However, to further solidify the reliability of the information collected, we wanted to find out whether the analysts agreed on the same actions performed by the player. Two analysts were randomly selected among the eleven analysts. Cohen's kappa was run to determine if there was an agreement between the two analysts on the actions performed by the player based on the performance indicators. There was an agreement between the two analysts, as the finding shows K =.89 (0.10, 95%), $P < 0.001$, which indicated that there was a significant agreement on their analysis and suggested

that their level of agreement was perfect and beyond chance. A Cohen's Kappa coefficient that ranges from 0.81 and above indicates a proportion of agreement over and beyond chance. [28] The result of the analysis of the Cohen's Kappa in this study shows K=0.89 which affirmed that the agreements among the performance analysts was beyond any chance and, therefore, they actually agreed on almost the same actions performed by the player beyond just a chance. Table 4 shows the contingency tabulation for the agreement between the two analysts which revealed that the two analysts agreed twice that action was failed by the player and also agreed fourteen times that no action was performed by the player, only one discrepancy was found between the two analysts in which while analyst B viewed action performed by the player as success, analyst A considered it as fail. Another study described that certain discrepancy could be found among two observers since it is hard for two different individuals to agree or disagree hundred percent in a genuine sense, so if the inconsistency is not critical or major, the agreement between the two observers can be considered above chance. [28] Moreover, in agreement, James *et al.*, (2007) inferred that certain discrepancy should be anticipated between two analysts especially when the analysis system involves considerable skills and experience. [21] Therefore, based on the finding of this study, it is tempting to conclude that the agreement observed between the two performance analysts was far beyond chance.

CONCLUSION

The importance of reliability in notational analysis can never be over emphasised. Nevertheless, for any information given to the coach or player to be relied upon, needs to be reliable. This study revealed that reliability in the notational analysis of soccer could be achieved. It further ascertained that the information that could be obtained via the analysis would be more accurate and reliable for the coach and the players to have feedback on their performance. Performance analysts should, therefore, ensure the reliability of any information that could be generated from their notational analysis before transmitting it to the coach or the player.

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