TEMPORAL QUALITY OF RECORDS IN HANDBALL

La calidad temporal de registros en balonmano

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Abstract

This work is an exploratory study to increase data quality control, by using temporal correlation coefficients. The consolidation of the observational methodology (Anguera, 2017) has been preceded by improvements of a different nature. It was based on an observational registration tool applied to handball and made up of criteria and categories. The study design corresponded to quadrant III, as a) nomothetic, isolated, and multidimensional. Two observers recorded handball matches (N = 4) with the help of Lince software. Statistical packages, SPSS v. 24 and JASP v. 0820, were used to associate the times of each inter-observer register and calculate the correlation coefficients among other analysis. The practical application of the work would have in the analysis of motor behavior an application but that is not the only one. Addressing the synchronization of observers when registering is a procedure open to improvement both in reliability and accuracy.

Keywords: observational methodology; time; observer.

Resumen

Este trabajo es un estudio exploratorio para incrementar el control de la calidad del dato, mediante el empleo de coeficientes de correlación temporal. La consolidación de la metodología observacional (Anguera, 2017) ha venido precedida por mejoras de distinta índole. Se partió de una herramienta de registro observacional aplicada al balonmano y compuesta por criterios y categorías. El diseño del estudio se correspondió con el cuadrante III, a) nomotético, puntual, multidimensional. Dos observadores registraron partidos de balonmano (N=4) con ayuda del software Lince. Se emplearon los paquetes estadísticos SPSS v. 24 y JASP v. 0820 para así asociar los tiempos de cada registro inter observador y calcular los coeficientes de correlación entre otros análisis. La aplicación práctica del trabajo tendría en el análisis del comportamiento motor un campo de aplicación pero no el único. Abordar la sincronización de los observadores al registrar es un procedimiento susceptible de avanzar en fiabilidad y precisión.

Palabras clave: metodología observacional; tiempo; observador.

Introduction

Building and improving sophisticated registration tools is essential in research, but particularly in observational methodology. The possibilities of this methodology to capture spontaneity (Anguera, 2017) are further evidence of its usefulness to undertake research studies without detriment to its precision. This methodology is relatively new, although it is already well supported by its relevance in both national and international scientific panorama. Thus, despite the success achieved, it is necessary to continue advancing in essential aspects such as data quality control. Advancing in science implies conceiving a dynamic form of science which is open to criticism and analysis. Thus, it is based on some objections regarding the reliability (O'Donoghue, 2007) of studies that use an observational methodology to initiate a work that does not assume an alternative to the already classic procedures on the treatment of data quality (Anguera & Hernández-Mendo, 2013). On the other hand, it may be practical to contemplate the temporal dimension of observation logs in order to gain reliability.

Some of the revisions that have been carried out on observational methodology have highlighted that the sports field is a fertile ground (Anguera & Hernández-Mendo, 2013). The mixed methods (Anguera & Hernández-Mendo, 2016) from an observational approach were also studied in-depth, as well as the analysis techniques used in observational studies (Anguera & Hernández-Mendo, 2015).

Some of the collective sports that were investigated by means of observational methodology were rugby (Ollis, Macpherson, & Collins), football (Zurloni, Cavalera, Diana, Elia, & Jonsson, 2014; volleyball (Hileno & Buscà, 2012), basketball (Arias, Argudo, & Alonso, 2012), handball (Montoya, Moras & Anguera, 2013; García, García, & Aniz, 2004; Santos, Fernandez, Oliveira, Leitão, Anguera, & Campaniço, 2009; Gutiérrez-Santiago, Prieto, Camerino, & Anguera, 2012), among others.

Individual sports such as tennis (Gorospe & Anguera, 2000) have also been the subject of analysis, as well as contact sports such as judo (Gutiérrez-Santiago, Prieto, Camerino, & Anguera, 2011), karate (Lapresa, Ibanez, Arana, Amatria, & Garzón, 2011) or successful boxing actions (Pic-Aguilar, López-Sánchez & Blanco-

Villaseñor, 2016). However, expressive manifestations were also addressed from similar approaches in dance (Torrents, Castañer, & Anguera, 2011) or corporal expression (Castañer, Torrents, Dinušová, & Anguera, 2008).

It was possible to verify (Blanco-Villaseñor, Castellano, Hernández-Mendo, Sánchez-López & Usabiaga, 2014; Castellano, Hernández-Mendo, Gómez de Segura, Fontetxa, & Bueno, 2000; Fernández, Sánchez, Jiménez, Navarro & Anguera, 2012) that the reliability of the registers could be performed by a double process: a) Firstly, it consisted of the calculation of the intraobserver and interobserver concordance, namely by the Pearson (Hauke & Kossowski, 2011; Pic, 2017), Tau Kendall (Kendall, 1938; Lü et al., 2016), and Spearman indexes (Spearman, 1904; Hauke & Kossowski, 2011; Pic, 2018), as well as even by Cohen's Kappa index. This index concordance had the advantage of being able to correct the selection of a category by the observer through the chance effect. In this sense, Cohen's Kappa index was more restrictive (Cohen, 1960; 1968), b) On the other hand, reliability could also be calculated by applying the theory of generalizability.

To address intrasessional stability, the involved sources of variance were calculated between observer (C / O) facets in the selection of categories. Thus, results were obtained in the work of Blanco-Villaseñor et al., 2014, pointing out that 100% of the variance resided in the categories, while 0% of the variance was exercised by the comparison of the observers (inter-observers). On the other hand, intersessional stability could be achieved by the inclusion of different sessions (S/O) in relation to observers or also by inclusion of categories (SC/O). The estimation of the sources of variance to find measurement plans was also implemented through the theory of generalizability (Usabiaga, Castellano, Blanco-Villaseñor, & Casamichana, 2013) which optimized the resources of the investigations, clearly revealing the sources of error. Methodological studies have also been undertaken by taking handball among research purposes (Morillo & Hernández-Mendo, 2015).

Concordance among observers is increasingly used by consensus (Anguera, 1990), but it should not be forgotten that the strength of the system of registration resulting from consensus must be combined with the hierarchical risks that could be established among observers. Recently, results have been presented that point to a connection with a qualitative perspective by consensus among observers and the introduction of an 'advisory' role (Arana, Daniel Lapresa, Anguera & Garzón, 2016) and, on the other hand, the quantitative perspective through Cohen's Kappa coefficients. The introduction of the order parameter was also a viable novelty. In contrast, other authors (Losada & Manolov, 2015) along the same lines were more interested in the training process and the observers, and they applied Cohen's Kappa index (Fleiss & Cohen, 1973) to the observers' records at different times.

Other practical applications used the classic correlation coefficients (Rodgers, & Nicewander, 1988) specifically intraclass correlation coefficient (ICC) (Koo & Li, 2016; Fleiss, 1975; Fleiss, & Shrout, 1978). However, some voices (Altman & Bland, 1983) have questioned the use of correlation coefficients to measure concordance or agreement (Bland & Altman, 1986) by applying Bland-Almand plots to motor experiences, among other examples (Hopkins, 2000). A combined positioning was the one proposed (De la Cruz et al., 2015) when analyzes integrating both approaches were carried out.

For all of the previously mentioned points, we agree with some of the authors on emphasizing the importance of the order parameter. In addition, perhaps the consideration of the temporal parameter could give the registry greater accuracy, so that a measure of the temporary closeness or remoteness of the records between two observers (inter-observers) could be obtained. Therefore, the objective of the present work was to develop a procedure to obtain an indicator related to the temporality of observation records. Thus, comparing different temporal measurements was a priority objective.

Method

Observational design and participants

The matches selected for the analysis were (N = 4), and involved the final handball phases of the London 2012 Olympics. The study was based on quadrant III (Anguera, Blanco-Villaseñor, Hernández-Mendo & Losada, 2011; Anguera & Hernández-Mendo, 2013). This quadrant implied that the behaviors or categories of several teams were registered and, for that reason, it was nomothetic. The records were made without performing a specific follow-up of the teams, so it was isolated. At the same time, the design was multidimensional because of the large number of criteria available to carry it out.

Observational Tool

The observation instrument that is presented was designed 'ad hoc'; by merging the basic features of field and category systems. it was composed of 5 criteria scattered across 15 categories (Table 1). Each criterion had a categorical correspondence.

Table 1. Mixed recording system used by the evaluators

Criteria	Codes and categorical description
Teams	The analyzed teams received the name of (X) or (Z).
Throws	Launches/throws made with feet supported and arm over shoulder (a); hip or lower throws (b). The throws (a) but made in suspension or jump were denominated (as) while the low throws also in the air (bs).
Effectiveness	Effective offensive ending action or fine shot by the throwing player (e); ineffective or failed offensive ending action by the throwing player (ne)
Zone	When the ball of the team possessing the ball crosses the half-way line (h), if the 9-meter line is crossed with the ball in the direction of the opposing goal (nf); but when crossing the line of 9 meters to retreat (nh).
Referee	When a player on the ball team receives a foul and is sanctioned with a free throw (gf); the penalty sign or 7 meters (si); rest requested by coaches (br); while concluding one of the party halves (Ou).

Thus, some criteria had only two categories such as the team criterion or effectiveness, while other criteria such as throws had more categories when distinguishing between throws after a jump and high throws (from the shoulder up) (a) or from the shoulder down (b). The jumps were developed by (as) and (bs), and were only different from the previous ones because of an aerial phase. By means of the criterion zone, the passage of the ball was verified by the zones of the half field (h) and the line of 9 meters in the direction of the rival goal (nf) or the opposite (nh). Lastly, some signings made by the referee were also reflected, such as fouls on opponents punished with a free throw (gf), penalties (si), breaks (br) and completion of the first and second parts of the match (Ou).

It was the observers themselves who agreed on the registration tool in order to adjust the responses based on the definition, examples and counterexamples that had previously been agreed upon. After performing different tests with other images, the observers with the Lince (Gabin, Camerino, Anguera, & Castañer, 2012) registration program, which led to the making of the final registration.

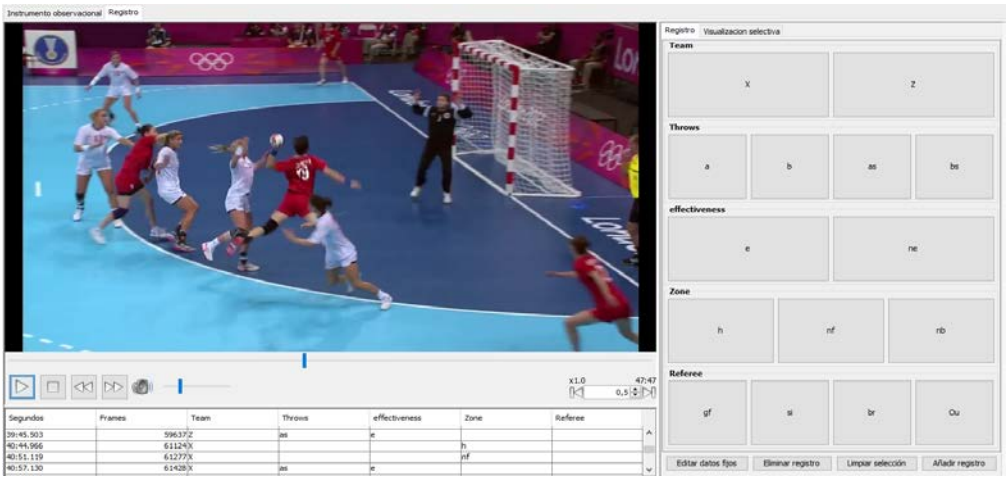

Figure 1. Recording instrument: LINCE v.1.1 (Gabin et al., 2012)

Procedure and data analysis

To carry out the register, images from the Youtube portal were downloaded. We used LINCE software to perform the registrations made by two neutral observers with a contrasted experience of around five years as handball players and two years in the performance of observational tasks. At a second time, the same software v.1.1 was again used, and the records were selected in a format compatible with subsequent data analysis packages, and the temporal dimension was extracted in Frames JASP v. 0820 software program and the statistical analysis program SPSS v. 24 were used to find the correlation coefficients of the temporal registers.Therefore, the correlation coefficients were applied to the frames of each record and not to the categorical variables from the mixed record system (Table 1). Specifically, the parametric test a) Pearson correlation coefficients was applied, which measure the degree of covariation between linearly related variables; and non-parametric b) Spearman and Kendall's Tau-b correlation coefficients.

On the other hand, and following the correlation approach, intraclass correlation coefficient (Koo & Li, 2016) would be applied, with 95% confidence intervals and absolute agreement, specifically two way mix. Finally, procedures were followed to analyze not only the correlations but also the differences between the records made by observers A and B (Bland-Altman, 1986). In order to do this, the differences between the measurements of the two observers were calculated first, and the average between both measurements was addressed afterwards. First, one sample T test was applied, followed by linear regression taking the differences between both observers as a dependent variable, while the mean values of the same records were considered as independent variable. Statistical analyses were conducted with a criterion for significance set at ($p < .05$).

Results

The bivariate correlation coefficients of the categories were found, reaching satisfactory values with the lowest correlation (0.961) using the Kendall's Tau-b index, while similar values were reached with Spearman (0.988) and Pearson (0.997).

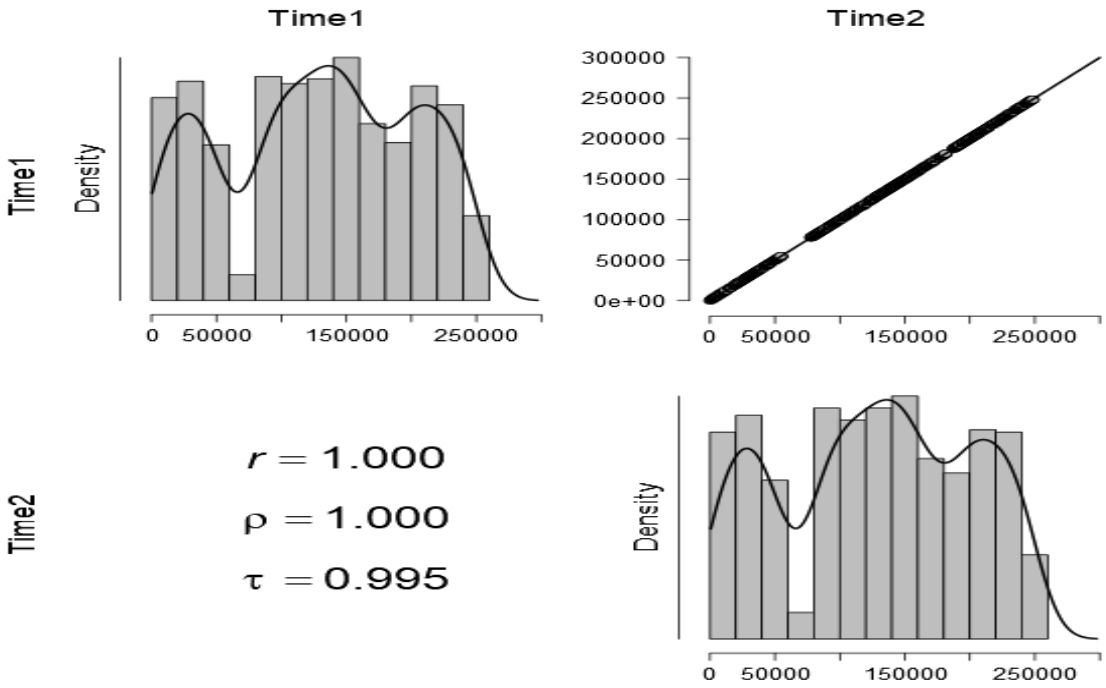

Figure 2. The correlation evolution of the temporal registers.

In figure 2, time1 corresponded to an observer, while time2 corresponded to the second of the observers. In general, it can be confirmed that Pearson's r and Spearman's rho correlation coefficients were very good because the unit was reached, that is to say the highest correlation index possible between both measures. While Kendall's tau B indexes declined (0.995). In the same sense, the main result obtained when applying intraclass correlation coefficient was the evidence that in the section of average measures between observers excellent results were achieved with values of correlation of 1.

On the other hand, the differences between the two measurements obtained by using one sample T test were inconsistent (p>.05). That is, it was confirmed that the differences between the two measurements (Time1 and Time2) were not significant. Furthermore, and following the procedures of Bland-Altman (1986), linear regression also found statistically irrelevance (p> .05) between the values of the difference in the measurements and the mean values of the same measurements. Thus, the quality of the records is certified by using the time dimension of the records coming from handball matches.

Discussion

The present study addressed a procedure for enriching data quality in observational studies (Anguera & Hernández-Mendo, 2013). This priority objective was successfully achieved by providing results that indicated the registration of each category as a dimension susceptible of being controlled. Thus, in spite of the increase in the observational methodology, which has been contrasted in sports such as rugby (Ollis et al., 2006), football (Zurloni et al., 2014) or handball (Santos et al., 2009; Gutiérrez-Santiago et al., 2012) and other sports, it would be advisable to continue developing tools and / or procedures with which to undertake the quality of the data (Arana et al., 2016).

The behaviors recorded by the observers have traditionally been controlled in observational studies by the literature that preceded us, as previously mentioned. the calculation of the sources of variance and their origin through sessions, criteria, categories and observers was a considerable progression (Blanco-Villaseñor et al., 2014, Fernández et al., 2012). The observers are one of the most faithful allies in the process of increasing the quality of observational studies. Although the present study did not influence the observer training process (Losada & Manolov, 2015), it is also considered necessary. The novelty of this research was the time control of each category record measured in frames. The correlation measures used showed that time was an indicative dimension of the greater or lesser inter-observer temporal closeness. On the other hand, the use of procedures to study the reliability of records away from correlation coefficients (Altman, & Bland, 1983) helps to complete the consistency of the work presented, overcoming the exclusivity of the classic correlation coefficients or intraclass correlation coefficient (Koo & Li, 2016).

This article can be used to include the time of the records among the procedures that make up the quality of the data in observational studies. In our view, what to record during the process is the cornerstone on which to make the biggest effort. However, it should be noted that a conduct recorded over a period of time that is excessively different from another one could raise serious doubts about the registered conduct. It is in these cases when it would be daring to assert that the behaviors pointed out by observer 1 (Time 1) and by observer 2 (Time 2) truly correspond.

Among the limitations and scope for improvement of the present study, increasing the number of criteria and categories could provide a more accurate description of motor events in handball. Criteria such as the scoreboard or keeping track of each player and not just focusing attention on the ball, could lead to other different interpretations. However, addressing the temporal dimension likely to become an increased interjudge reliability was a priority. Although the correlation coefficients of Kendall Tau-b and Spearman are usually applied as an alternative to Pearson, when the normality assumptions are not met, it would be appropriate to highlight the exploratory nature of the present study. On the other hand, perhaps it would be practical to include some training to be able to synchronize 'when' the button should be pressed. Another limitation which could be improved in future research would be to consider that the temporal mismatches at the beginning of the register offered a greater incidence on the correlation coefficients than at the end of it, since this was cumulative.

Conclusions

A methodological procedure, as was the inclusion of the temporal dimension, was approached to enrich the control of data quality with observational records. The experience allowed us to verify the feasibility of the procedure, as well as to verify the increase in accuracy and reliability experienced during the registration of handball teams. The results confirmed the temporal synchronization of the observers that were part of the study, although it would be advisable to include ‘discussions’ with the observers as to the exact timing of the categories being recorded.

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