Original Article

Fostering application of more exact methodological and statistical procedures in sport management research

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Abstract:

This study critically examines the basic methodological and statistical characteristics of selected up-to-date sport management researches. They are reviewed in relation to the applied research types, determination, verification and comparison of metrical characteristics of measurement instruments (questionnaires and judgment scales), as well as to the applied multivariate methods in manifest and latent space. In particular, the factor analysis, taxonomic analysis, regression analysis (classical, stepwise, hierarchical), canonical correlation analysis, analysis of covariance and multivariate analysis of variance are reviewed. On the grounds of characteristics of these researches, the endeavours for complex application of methodological statistical procedures are outlined as inevitable for the forthcoming sport management research. The application of multivariate statistical procedures in latent space within the longitudinal and experimental research is particularly accentuated. Lastly, the need for fostering the application of multivariate methodological and statistical procedures in the framework of replicated research of previously factorized results is underscored.

Key Words: metrical characteristics; multivariate methods; factor analysis; regression analysis; longitudinal and experimental research.

Introduction

The impressive and unprecedented development of sport activities – including the affirmation of sport management – is strongly dependent on appropriate scientific knowledge, based on correct methodological and statistical procedures for reliable inference. There is a clear tendency of higher generalization of the acquired scientific and research conclusions, thereby generating conditions for more rapid development of sport management in near future, for the ultimate purpose of realization of the personal and social needs of the humanity.

In the contemporary scientific and research practice of sport management, more exact methodological and statistical procedures are being applied, in order to fulfill more rigorous methodological criteria in favour of acquiring successful and efficient planning, organization, coordination, control and other functions of sport management. The latter appears to be one of the most important factors for social development of sport activities. If these criteria are insufficiently observed, the influence of adequate sport management methods and procedure will be limited. The shortcomings will be evident, both in terms of achieving more rational and successful results in mass sports and in top-level sport activities, which are interdisciplinary related to the corresponding activities in other social spheres.

In this context, the central objective of this article is critically examine the basic characteristics of selected up-to-date research, from the point of view of the appropriateness and exactness of applied methodological and statistical procedures that could serve as scientific contribution in resolution of appropriate sport management aims. The second section elaborates the sport management treatment in the relevant literature, whereas the third section underscores the importance of determination, verification and comparison of the metrical characteristics of measurement instruments. The necessity for greater reliance on multivariate methodological and statistical procedures is discussed in the next section, whereas the use of advanced methodological and statistical procedures is examined in the fifth section.

Sport Management Treatment in Terms of Research Types

At certain scientific sport management events, there is a tendency of presentation of papers that are not quite adjusted to the suggested framework topics. A significant body of the empirical literature is characterized by questionable methodological approach, which is not sufficiently based on scientific findings acquired by

application of accurate scientific methods. Yet, these papers contain a high content of professional and didactical procedures.

At these events, it is common that transversal and operative researches are over-represented in comparison with the fundamental, longitudinal and experimental research. Therefore, fostering the application of experimental methods is indispensable component of the strategy for increasing the number of such researches presented at those events. The greater reliance on quantitative methods is also expected to increase their visibility in the sport management and related journals, thereby discontinuing the practice of deficient interdisciplinary application of descriptive methods. It is clear that fundamental, longitudinal and experimental researches require extensive time dimension and expressive scientific erudition. However, they do provide significant scientific findings relevant for the sport management. For instance, the influential study by Cuskelly, McIntyre and Boag (1998) is based on longitudinal research; employing data for total of 469 subjects who were volunteer administrators in 52 randomly selected sporting clubs and associations. In their research, a hierarchical regression analysis has been applied.

Determination, Verification and Comparison of Metrical Characteristics of Measurement Instruments

In sport management theory and practice, there are numerous cases in which during the realization of certain researches, specific measurement instruments are applied, but they are not previously verified by appropriate methodological and statistical procedures. Furthermore, the measurement instruments often do not determine their satisfactory internal (representativity, homogeneity, reliability, objectivity) or external (logical, factor and prognostic validity) measurement characteristics. For these reasons, Parks, Shewokis and Costa (1999) and Naumovski (2005) argue that statistical power analysis, which is based on the interdependence of sample size, alpha, effect size, and power, must be acknowledged by scholars as an indispensable component of high quality sport management research.

The necessity for verification and determination of those metric characteristics is one of the most severe criteria for sport management research, due to the frequently used methods of questionnaires and scaling within it. This is an outcome of the low degree of exactness of the method of questionnaires, often burdened by nonobjectivity of the responses of the subjects. The fact that metrical characteristics of the measurement instruments are not persistent category should also be taken into consideration. They are dependent on the age and gender of respondents, their ethnical definition, methods of data processing, number of measurement instruments particles, linguistic clarity and similar determinants.

The importance of this need could be detected in numerous researches. For instance, Park and Kim (2000) apply confirmative factor analysis and determine the validity and reliability of the adapted version of the corresponding translated questionnaire for estimation of attitudes on sports and recreational activities of 211 subjects. Chen (2004) test factor validity and reliability of the scale of initiativity on a sample of 415 subjects from 15 professional sport associations. A comparison of predictive validity of the existing multi-item scale and new concept scale for solution of appropriate sport management aims was conducted by Cunningham, Fink and Sagas (2005) on a sample of 214 subjects employed in sport organizations. By application of a confirmative factor analysis, Ross, James and Vargas (2006) tested the reliability and validity of the team brand association (TBA) scale at 11 specific dimensions of professional sports. A different degree of reliability and validity of those dimensions was determined in the research.

Seo and Green (2008), aiming at determination, verification and precision of metrical characteristics, conducted a comparison of the reliability and validity of the motivation scale for sport online consumption (MSSOC) at appropriate sport online users ($N_1 = 175$, and $N_2 = 371$), by applying explorative and confirmative factor analysis. Ross (2008) has applied factor methodological procedure on a sample of 353 sport management and kinesiology students, during his examination of the validity and reliability of the personal scale (BPS), and argued that the scale could be enhanced and improved. Therefore, in subsequent researches, during the appliance of the scale, the specific sport management problems should be taken into account.

Based on a sample of 133 Korean professional baseball league members, Choi et al. (2010) have used an organizational culture assessment instrument (OCAI) composed of 39 questions of psychometrical nature, with original English version and a translation in Korean. The research aim has been to compare the degree of validity and reliability of applied versions. Higher degree of those metrical characteristics has been determined in the translated version. This is another influential research that indicates that metrical characteristics do not have universal meaning.

Necessity for Greater Application of Multivariate Methodological and Statistical Procedures

A considerable body of the current sport management research is featured by an application of univariate methodological and statistical procedures. This tendency is still present, although sport management has multidimensional and multivariate dimensions. It implies that the phenomena are in causal (or *cause-and-effect*) relationship, dependent on supra-summative interactional and multidimensional influence, i.e., relations of phenomena that represent latent dimensions. The analysis of these phenomena is of higher scientific

significance, compared with the manifest dimensions. Therefore, the research of these phenomena should be predominantly realized by application of multivariate scientific and research methods.

Factor analysis researches can also contribute to the conception of new researches with similar methodological and statistical procedures. Factor analysis has been applied independently as a confirmative or explorative in few instances. Its application is mostly present in the context of other multivariate methods. Since its application in combination with other methods is of higher interest (especially, in relation to its independent confirmative application), some of those researches relevant for sport management scientific knowledge should be highlighted.

Pastore, Goldfine and Reimer (1996) use a sample of 173 coaches and apply a questionnaire with 46 items, concerning the support of sport administrators. By the principal component analysis, six important components were acquired. The significance of the difference among the components was tested with the multivariate analysis of variance (MANOVA). The level of scientific significance of this type of researches is notably high, due to the treated differences in the causal relations in sport management.

A similar research was carried out by Barber and Eckrich (1998). They have factorized 389 answers of sport administration managers, regarding the success of the work of cross-country and basketball coaches. Seven factors have been isolated concerning cross-country coaches and eight factor for the basketball coaches. Along with the factor analysis, multivariate analysis of variance (MANOVA) has been applied.

The level of scientific importance is also high in a research conducted by Lambrecht (1991), who apply a taxonomic (cluster) analysis. He has taxonomized 264 answers from a questionnaire related to sport management academic curricula. The questionnaire was used for sport club managers. By data processing, five taxonomic dimensions were obtained, different from the aspect of their application. Two sport management curricula were deemed not acceptable.

A research featured by multivariate methodological and statistical procedures was realized by Cunningham, Conrwell and Coote (2009). Their research examines the linkages between companies and corporate sponsorship in relation with certain sport management activities. For this purpose, on the basis of appropriate reports, 146 companies have been analyzed. The obtained data were processed with taxonomic (cluster) analysis, factor and multinomial regression technique. The results from this research can be used for a more successful sport management.

Sport research – particularly, sport management research – can provide significant scientific information due to the application of regression analysis. Their particular importance derives from the fact that on the basis of the influence of one set of variables, it is possible to predict with large probability the development, i.e. the success in one or several other variables. Hence, regression methods contain prediction relations as one of the most significant scientific findings. Several researches that contain such methods (including combinations with other methods) can be outlined. Armstrong (2002) has treated the influence of psychosocial factors on blacks' consumption of sport. Multivariate multiple regression analysis was applied on data from subjects ($N=278$) involved in sports activities. The results of the analysis have shown that ethnical identification and psychosocial involvement in sports activities have a statistically significant influence. In this context, psychosocial involvement has shown higher influence on blacks' consumption of sport activities.

By using the same model of regression analysis, Greenwood, Kanters and Casper (2006) have examined the relations between sports fan groups motives and professional sport. A sample of 351 entities was used for the analysis. The results have demonstrated that numerous factors influence on the sports fan groups behaviour, including parents and family, birth place, residence, coach role, etc.

Other models of regression analysis are also present in sport management research. This refers to stepwise multiple regression and hierarchical regression analysis. Having in mind that by their application, scientific information of high methodological and statistical exactness is obtained, some of these researches are elaborated below.

McDaniel (2002) has carried out a research with application of stepwise multiple regression at a random sample of 248 subjects, age 18 and above. Two-phase phone conversations concerning demographical, personal and lifestyle characteristics in the context of 1996 Olympics were analyzed in the research. On the basis of the results, it was determined that demographic and lifestyle characteristics have had greatest influence on audience presence at sport events.

Cunningham (2007) used hierarchical regression analysis in his research. It enhanced 174 professional coaches, in order to determine the influence among different subject groups, defined by specific criteria. The results have pointed out that the common identity in different entities groups has positive or negative influence concerning the research aim.

Certain methodological and statistical procedures treating the relations between variables, such as canonical correlation analysis, are underrepresented in up-to-date sport management research. An example of application of this analysis is the study by Ferrand and Pages (1996). They have determined the judgment scales relations for presentation of two different sport events for the purpose of their sponsorship, through the application of canonical correlation analysis. The responses on scales were provided by 162 randomly selected

sport administrators. The result of the canonical correlation analysis indicate different relations of popularity and interest, as well as in other parameters of sport contests image that might influence their sponsorship.

More Complex Application of Methodological and Statistical Procedures

On the basis of the application of up-to-date methodological and statistical procedures in sport management research, as well as the possibilities for their application in subsequent research, several suggestions can be outlined. In any case, they are in the direction of elevating the scientific information level for advancement and acceleration of sport management development.

Certain researches regarding determination of the differences of variables and longitudinal influences of one group of variables over another, not previously mentioned, are researches applying multivariate discriminant analysis (DISCRA) and analysis of covariance (ANCOVA). In the current sport management research, these analyses are not sufficiently represented.

Furthermore, application of these methods in multivariate setting is mostly evident in manifest space and inapparent in latent space. Substantial value added in scientific terms is acquired by complex application of the above mentioned methods on previously isolated latent dimensions. This application would be similar to the methodological and statistical procedure outlined in the mentioned examples in this paper, where multivariate analysis of variance (MANOVA) was applied on the corresponding data, previously obtained with the method of factor analysis.

Such procedures have an elevated scientific significance for original knowledge in sport management, in the context of application of multivariate multiple regression and canonical correlation analyses. This could be achieved through application of such types of regression analyses as a first step, while later on the same data these analyses are applied in latent space, taking latent variables as predictors and as criteria. Similar situation is achieved when manifest variables serve as predictors and latent variables are defined as criteria, or vice versa.

Also, during the application of discriminative analysis in the same order (first in latent and after that in manifest space) with the model of neutralisation and partialization of results in initial stage, as well as in application of analysis of covariance, knowledge of higher scientific significance is being acquired during sport management research. This tendency is even more expressed when this procedure is conducted through application of discriminative analysis and analysis of covariance within longitudinal experimental research in sport management.

Longitudinal experimental research in the mentioned procedural forms with application of factor analyses in current research are also under-represented, as it is the case with the previously stated methods (analyses of covariance, canonical correlation analyses and regression analyses). Longitudinal experimental research with application of factor analyses are of specific scientific interest, specially regarding determination and comparison of metrical characteristics of measurement instruments and comparison of factor structures of certain sport management phenomena. For instance, Heere and Dicson (2008) separate the commitment and loyalty constructs and develop a new attitudinal loyalty to team scale (ALTS), which has resistance to change as a central feature, demonstrates both reliability and validity. The implications for future research, practitioner application, and support of advanced quantitative methods in sport management research are also accentuated by O'Reilly (2011).

Researches with application of factors analyses for determination of the latent structures of certain sport management phenomena are particularly significant when they are applied (not only in the initial, but also in certain transition and final stage) for the purpose of analysis of comparison of transformation of those structures. In this context, application of those analyses, provides to a higher extent, determination, modification, verification and comparison of metrical characteristics of projected questionnaires and judgment scales. Therefore, these cases include application of the multivariate methodological statistical procedures on factorized results in measurements repeated several times. Due to these considerations, one can reaffirm that in subsequent sport management research, there is an urgent need for higher presence of multivariate methods in factor space.

While the use of advanced quantitative methods is expected to significantly improve the validity of the empirical findings, it is important to note that some authors still advocate the use of mixed methods approaches in the sport management research (e.g., Rudd and Johnson, 2010). Their rationale is that causal inference should be based on a mix of qualitative and quantitative methods, providing examples from three areas of sport management research, including marketing, organizational behavior, and finance.

Conclusions

For the purpose of intensified advancements of sport management research, including the development of its function and social advancement, it is indispensable to apply strict, correct and more exact criteria. They should be based not only on univariate statistical techniques, but also on multivariate methodological and statistical procedures in manifest, latent and combined space. Furthermore, longitudinal and experimental research must have priority. In this context, determination, verification and comparison of internal and external metrical characteristics of measurement instruments is of crucial importance.

This particularly refers to survey questionnaires and judgment scales as one of the most commonly used methodological procedures in sport management. Subsequent sport management research should be based on application of the factor analysis method (primarily, of explorative nature), taxonomic (cluster) analysis, multiple regression analysis (classical, stepwise, and hierarchical), discriminant analysis, canonical correlation analysis, multivariate analysis of variance, analysis of co-variance, etc. Due to the verification and generalization of obtained results and conclusions in sport management research, in both univariate and multivariate methodological and statistical procedures, such procedures should be used in near future as integral part of factorized data of certain research.

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