DELPHI-based expert validation of an instrument for reviewing sports safety in the university curriculum of sports sciences in Colombia

Validación por expertos a través del método DELPHI de un instrumento para la revisión de la seguridad deportiva en el currículo universitario de las ciencias del deporte en Colombia

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Abstract

Ensuring safety in physical and sports practices is a challenge for professionals who are in charge of these activities. However, in Colombia, the level of preparation of these professionals and how sports safety has been developed in the curriculum of university academic programs in sports science is unknown. Therefore, the objective of this research was to validate an instrument for the curricular analysis of degree programs in sports, physical education, or related areas through the expert validation methodology. The selection of experts was carried out using the DELPHI method, and the content validity was evaluated using Aiken's V index. The study resulted in the validation of the instrument with optimal levels of relevance, significance, usefulness, and clarity (average of 0.9 out of 1) through the analysis of 10 national and international thematic experts. Finally, the relevance of the methodology implemented in this type of research is highlighted, and it is expected that the design of this instrument will allow for a clear diagnosis of the inclusion of sports safety in the curricula of degree programs in Colombia.

Keywords: Sports safety, DELPHI method, curriculum, university education, Aiken's V.

Resumen

Garantizar la seguridad en las prácticas físico-deportivas es un reto para los profesionales que están a cargo de dichas actividades. No obstante, en Colombia, se desconoce el nivel de preparación de dichos profesionales y cómo se ha desarrollado la seguridad deportiva en el currículo de la formación académica universitaria en ciencias del deporte. Por tanto, el objetivo de esta investigación fue validar un instrumento para el análisis curricular de los programas de grado en deporte, educación física o áreas afines a través de la metodología de validación por experto. La selección de expertos se realizó a través del método DELPHI y en la validez de contenido se implementó el índice V de Aiken. El estudio resultó en la validación del instrumento con niveles óptimos de pertinencia, relevancia, utilidad y claridad (promedio de 0.9 sobre 1) gracias al análisis de 10 expertos temáticos nacionales e internacionales. Finalmente, se resalta la pertinencia de la metodología implementada en estudios de estas características y se espera que el diseño de este instrumento permita un diagnóstico claro de la inclusión de la seguridad deportiva en los currículos de los programas de grado en Colombia.

Palabras clave: Seguridad deportiva, método DELPHI, currículo, formación universitaria, V de Aiken.

Introduction

In recent decades, the practice of physical and sporting activities has increased worldwide due to the growing recognition of their benefits for individuals and communities in terms of physical, emotional, social, and political well-being (Aragón-Espinel, 2022; Barbosa-Granados & Urrea-Cuéllar, 2018; Fuentes, 2022; López & García, 2022; Roldán-Aguilar & Vergara-Ramos, 2022). For example, in Colombia, the National Survey of Nutritional Status conducted in 2010 revealed that 54% of the population met the global physical activity criteria, with a higher prevalence among men compared to women (ENSIN, 2010).

Due to its significance, prominent international institutions such as the World Health Organization (WHO) have established recommendations for physical exercise in their health promotion and disease prevention efforts, focusing primarily on the duration and intensity of exercise to ensure its effective impact on health (WHO, 2010). In fact, following the COVID-19 pandemic, the WHO has lowered the minimum suggested levels of physical activity, acknowledging that every movement counts for health benefits (WHO, 2020).

However, the dissemination of these benefits has overshadowed the potential dangers associated with physical activity (Colef, 2020; Latorre et al., 2023; López et al., 2019). The practice itself implies risks due to the interaction of objects and people moving at different speeds and directions, in addition to other factors such as weather conditions and the age of participants (Herrador & Latorre, 2005). These circumstances can lead to injuries or more severe consequences for participants and even spectators (Latorre & Pérez, 2012; Magaz & García, 2021).

Despite this, recommendations for safe sports practices are not as widely disseminated, focusing more on promoting sports activities to reduce morbidity rates rather than on the associated risks and how to manage them (Flores-Allende et al., 2020). Therefore, recommendations for sports practice should consider comprehensive safety conditions, managing risks and minimizing the likelihood of accidents. This recognizes safety as the primary objective in the execution and provision of any sports service or product (Magaz & García, 2021).

These risks have resulted in countless accidents during sports activities (Bedoya-Marrugo & Manrique-Julio, 2020; Fuentes, 2022; López et al., 2019; Martínez-de-Quel-Pérez et al., 2019), which have been identified as obstacles to continued sports participation and adherence to physical activity. This is due to repeated injuries, constant accidents, and the difficulty of recovering from these episodes (Donoso et al., 2022; Isorna et al., 2019). Unfortunately, the extent of the problem is unknown, since the consequences of the lack of sports safety have been overlooked. Accidents are often only reported by the media under two specific conditions: the severity of the accident or the significance of the event/location where it occurred (López, 2023; Montenegro, 2023; Redacción Bogotá, 2015; Redacción Nación, 2022). As a result, most accidents remain anonymous and are not systematically recorded, which is evident from the absence of official sports accident statistics in many countries.

In contrast, other types of accidents, such as road or workplace accidents, are meticulously tracked with data, statistics, causes, and consequences. In Colombia, for example, these accidents have dedicated observatories, such as the National Road Safety Agency (referred to as ANSV hereafter) and the Colombian Safety Council (referred to as CCS hereafter) (ANSV, 2023; CCS, 2024). This lack of systematic tracking for sports accidents hinders the recognition of the actual safety conditions in sports practice, limiting its study and importance and making it difficult to accurately diagnose the problem (Valle-Soto & Manolles-Marqueta, 2018).

In Colombia, the field of sports safety (referred to as SS hereafter) has been poorly explored, leaving significant gaps in three areas: legislative, control, and academic. Firstly, there is minimal existing legislation on the subject, with the most notable being Law 1356 of 2009, through which the Law on Safety at Sporting Events is issued. Secondly, as was previously mentioned, there is no official systematization of sports-related accidents unless they are reported as sports injuries in a workplace context (Montañez & Hernández, 2018). Thirdly, the topic is inadequately addressed in the training and research processes of future sports professionals.

Given this reality, there is a clear need in the country to focus efforts on developing sports safety (SS) from both passive and active perspectives (Latorre & Pérez, 2012). Passive safety measures include raising awareness of the importance of SS among administrative entities, enacting laws and regulations to protect users (athletes, coaches, referees, spectators, workers, support staff, etc.), acquiring and maintaining optimal facilities and equipment for sports practice, implementing safety plans, managing risks, and systematizing accident data, among other actions.

On the other hand, active safety involves raising awareness of the importance of comprehensive safety in the sports sector among various stakeholders. This is where educational and training processes play a crucial role in bringing about the desired changes (Herrador & Latorre, 2005; Latorre & Pérez, 2012).

Numerous studies have focused on identifying the role of teachers or coaches in SS, their perceptions, and their level of preparedness regarding this topic (Herrador & García-Tascón, 2016; Latorre, 2006; López, 2014). For example, Latorre (2008) highlights the need for sports professionals to have competencies in evaluating sports spaces and equipment.

The European Higher Education Area (EHEA), established by the Bologna Declaration of 1999 (Garay-Sánchez, 2008), facilitated the adaptation of educational content to market demands, improving the quality of university education and the acquisition of competencies in sports management. Within this framework, Spain has become an international academic and research leader.

Specifically, it is recognized that training sports professionals and encouraging research on sports safety (SS) are essential to achieve specific advancements and real implementation. However, the first step must be taken by academia through educational institutions responsible for training professionals in the sector.

Therefore, several international studies have analyzed the curricula of different universities and academic programs in sports sciences or related fields to identify the inclusion and level of development of SS in their study plans (Conesa-Ros & Angosto, 2017; Espada et al., 2010; Magaz et al., 2022; Morales et al., 2017; Moreno et al., 2006; Tortosa-Martínez et al., 2010). Nevertheless, no studies have been found in Colombia that associate curriculum analysis with SS, making this a pioneering investigation in the area and the country, representing both an opportunity and a limitation for its study.

Given this situation, a first step is to diagnose the current state of SS training in Colombia within undergraduate programs in sports, physical education, and related fields. The regulatory body for higher education in the country is the Ministry of National Education, which sets general conditions that universities and degree programs must meet to operate (Ministry of National Education, 2019). To date, no specific guidelines have been issued by the Ministry regarding competencies, profiles, or curricula, leaving these elements to the autonomy of each institution.

To achieve this diagnosis, it is necessary to have an instrument that can evaluate the different curricula of Colombian universities in a relevant, valid, and coherent manner. Therefore, the study conducted by Gallardo et al. (2021) was analyzed, which examined the teaching guides for Sports Equipment and Facilities courses offered in Spanish higher education. The study found that the instrument used could not be implemented in the same way in Colombia, due to the particularities of its educational system, highlighting the need to validate an instrument for an objective analysis.

Therefore, the objective of the present work was to validate an instrument for the curricular analysis of undergraduate programs in sports, physical education, or related fields through expert validation methodology.

Materials and Methods

This is a descriptive, cross-sectional, and qualitative study that utilized the steps of the DELPHI Method.

Participants

Twelve candidates were proposed, including six men and six women, all professionals with over ten years of experience in the field of sports safety from three different countries, for the selection of the expert sample participating in the instrument validation process. Ultimately, despite the experimental loss of two participants, the instrument validation process was conducted with a sample of ten experts.

Instruments

The design of an evaluation instrument must demonstrate certain elements that ensure the fulfillment of its purpose, such as reliability, simplicity, and clarity. Therefore, it is essential to employ validated methodologies that allow for an objective and consistent design aligned with the proposed objectives (Thomas et al., 2022). Consequently, for the validation of the instrument in this research, experts were first selected through the DELPHI method (López, 2018; Mariño, 2011; Moreno & Hervàs, 2009). Subsequently, Aiken's V index was applied, estimating the content validity coefficient of the instrument (Aiken, 1980).

The DELPHI method has been widely used for remote consensus decision-making, avoiding direct confrontation among experts (Hung et al., 2008; Okoli & Pawlowski, 2004). Some of the most notable characteristics of this method include: 1) appointing a principal investigator to lead the process; 2) carefully selecting a sample of subject matter experts; 3) maintaining the anonymity of the experts as a fundamental principle to prevent mutual influence when forming opinions; 4) facilitating interaction between the principal investigator and the experts based on the judgments provided; and 5) ensuring that the outcome reflects the suggestions and consensus of the experts.

Procedure

The procedure followed in this research consisted of three stages, described as follows:

Stage 1. Selection of Subject Matter Experts and Initial Contact

In this stage, 12 experts were selected (six men and six women), all professionals with the following profiles: six faculty-researchers in sports safety from three different countries (Colombia, Spain, and Mexico), two sports safety

advisors, two faculty members from Spain and Mexico, and two curriculum experts from Colombian universities. This selection aimed to include experts addressing the main categories related to the research object, ensuring a comprehensive view by involving professionals from various fields to reach a consensus on their criteria. In the initial contact, the experts were clearly informed about the research object, the validation method, and a self-assessment process of their knowledge level on the topic on a scale of 1 to 10, with 10 being the highest level of expertise in sports safety within the curriculum.

Stage 2. Understanding of the Topic

In this stage, each expert was contacted via email with three open-ended topic-specific questions to determine their area of greatest expertise. The questions, which were ad-hoc for this study, were as follows: 1) What competencies, skills, and knowledge do you believe a student of sports science (or related fields) should develop regarding safety topics that could later aid their professional development in the sports sector, whether they choose a career in management, coaching, health, education, or other possible paths? 2) What is your opinion on the approach to safety-oriented topics in the curricula of sports science (or related fields)? 3) From your experience, are you aware of the incorporation of sports safety topics in the curricula of sports science (or related fields), and do you consider them sufficient to develop the competencies and skills required by a future professional in the field?

The responses provided allowed for an assessment of their knowledge and level of experience in the central topics of the research. Additionally, the responses allowed performing a qualitative analysis of the results of this study. Each response was rated on a scale of 1 to 10 according to the criteria of the central research group, based on the level of knowledge and information supplied. Based on this evaluation, only those experts who scored above 8.0 in the arithmetic mean (George & Mallery, 1995) were retained in the expert group.

Table 1 shows the evaluation of each of the responses provided by the consulted experts. It is evident that out of the 12 experts consulted, only Expert 10 was excluded, as they did not respond to the proposed questions. Therefore, the research continued with 11 experts.

Table 1
Results obtained by each participating expert

Expert	Question 1	Question 2	Question 3	*M*	*Kc*	*Ka*	*K*
1	10	8	8	8.6	.8	.8	.81
2	8	8	8	8.0	.9	1.0	.95
3	9	8	9	8.6	.8	.9	.89
4	10	10	10	10	1.0	1.0	1.00
5	9	8	7	8.0	.8	.0	.42
6	8	7	9	8.0	.9	1.0	.95
7	10	9	10	9.6	.9	.9	.94
8	10	9	10	9.6	.9	1.0	.99
9	10	10	10	10	1.0	.8	.90
10	NA	NA	NA	NA	NA	NA	NA
11	9	10	10	9.6	.9	.8	.86
12	8	10	10	9.3	.8	.8	.83

Note: *M* = Mean, *Kc* = Knowledge Coefficient, *Ka* = Argumentation Coefficient, *K* = *Competence Coefficient,* NA = Not Answer

Based on the responses to the questions posed and the analysis of each expert's academic, research, and professional profile, and following the guidelines of Robles-Pastor (2018), the Knowledge Coefficient (*Kc*) was calculated using the following formula: *Kc* = *n* (0.1). The results are presented in Table 1.

Considering these values, results of .5 or lower were deemed weak, values between .6 and .8 were considered good, and values above this range were referred to as very good (George & Mallery, 1995). According to this parameter, the 11 experts included met the minimum criteria established to continue participating in the study.

Subsequently, the Argumentation Coefficient (*Ka*) was calculated by evaluating the categories with the greatest influence on the argumentation of the topic. To this end, Table 2 was used as a reference for point allocation.

Table 2
Point allocation based on the sources of reasoning for the Argumentation Coefficient

Point allocation	High	Medium	Low
Own theoretical analysis	.3	.2	.1
Personal experience	.5	.4	.2
National authors' literature	.05	.05	.05
International authors' literature	.05	.05	.05
Knowledge of the international state of the art	.05	.05	.05
Intuition	.05	.05	.05

Using this reference, table 1 presents the Argumentation Coefficient obtained by the experts.

With this information, the Competence Coefficient (*K*) was calculated, which was the determining value for considering the experts in the process. This value was calculated using the following formula: $K = 0.5 (Kc + Ka)$. The results are presented in Table 1.

According to these results and following the criteria established by George & Mallery (1995), a high Competence Coefficient ranges between .8 and 1.0; a medium coefficient ranges between .5 and .79; and a low coefficient is below .5. Therefore, this study only considered experts with a high Competence Coefficient, excluding Expert five, due to loss of communication and the inability to obtain the information needed to establish the Argumentation Coefficient.

In summary, after the expert selection process, out of the initial sample of twelve experts, two experts (experts five and ten) were excluded. The instrument validation was ultimately conducted with ten experts.

Stage 3. Practical Development and Exploration of Results

Finally, in the last stage, each expert received the evaluation instrument, which consisted of three parts: basic data (3 items), university and faculty data (9 items), and course/subject data (8 items). These three parts comprised 20 items, with an evaluation sheet designed ad-hoc using a Likert scale of 1 to 4 for each evaluation item (1 = totally disagree, 2 = partially disagree, 3 = partially agree, and 4 = totally agree). The quality criteria evaluated were "relevance," "importance," "usefulness," and "clarity." For each item, the experts evaluated and provided observations to improve the instrument.

Subsequently, the content validity process was implemented using Aiken's V, which is a coefficient that quantifies the content validity of an instrument through a logical methodology based on the evaluations of judges (Robles-Pastor, 2018).

All items with a rating lower than .85 in Aiken's V were revised or eliminated based on the experts' suggestions. Finally, each expert received the final instrument for their review and final evaluation.

Statistical Analysis

For data analysis, the Office 365 suite was used in the Delphi Method procedure, and Aiken's V was implemented with the statistical package SPSS Inc. Released 2009. PASW Statistics for Windows, Version 18.0. Chicago: SPSS Inc.

Results

The designed instrument was validated through the expert validation methodology and quantified using Aiken's V coefficient, which ranges from 0 to 1, with 1 being the ideal value of agreement among the experts. This study considered four validation criteria: relevance, importance, usefulness, and clarity. The coefficient obtained for each item based on the experts' evaluations is presented below.

As was previously mentioned, all items with a rating lower than .85 in Aiken's V were revised or eliminated based on the experts' suggestions. Additionally, some items, despite having a score above the established threshold, were adjusted to improve their development according to the experts' suggestions. Therefore, the details of the main modifications made to the instrument are presented below:

- Part 1. Basic information: The study title, objective, and investigator's name were included. Finally, items 2 and 3 were moved to Part 2.
- Part 2. University and Faculty information: Items 8, 10, and 12 were found to have little relevance and usefulness and were thus eliminated.
- Part 3. Course/subject information: Item 14 was removed due to the lack of relevance and usefulness of the course/subject

code in the study. Additionally, there was semantic confusion between the terms "course" and "subject," as, in Colombia, they can be used synonymously to refer to a subject, whereas, in Spain, "course" can refer to an academic year and "subject" to a specific subject. Therefore, it was clarified that "course/subject" would be used synonymously, considering that the instrument was created from a Colombian academic perspective. In item 16, a brief explanation was included to clarify the typology, differentiating between completely theoretical courses and those with a practical component. Similarly, in item 17, a brief explanation was added to the methodology to differentiate between courses offered face-to-face, virtually, or in a hybrid format. Finally, an additional classification category called "Others" was included in item 19 to allow for the coding of elements that were not covered by the instrument, and which may appear in the curricula.

The details of these results are presented in Table 3.

Table 3
Results obtained from the expert's evaluation for each item of the instrument

Part	N° item	Item name	*R*	*I*	*U*	*C*	$\bar{X}$
1	1	Evaluation date	.96	.92	.96	.92	.94
	2	Department/Province of the University location	1.00	1.00	1.00	1.00	1.00
	3	City	1.00	.96	.96	1.00	.98
2	4	Name of the University.	1.00	1.00	1.00	1.00	1.00
	5	Type of University.	1.00	1.00	1.00	1.00	1.00
	6	Name of the Faculty.	1.00	.96	.96	1.00	.98
	7	Name of undergraduate program.	1.00	.96	.96	1.00	.98
	8	Date of obtaining the Qualified Registration.	.83	.75	.79	.96	.83
	9	Mode of the undergraduate program.	.92	.92	.92	.92	.92
	10	Total number of credits for the undergraduate program.	.79	.71	.71	.92	.78
	11	Duration of the undergraduate program in semesters.	.88	.79	.79	1.00	.86
	12	Semester cost (Colombian pesos).	.46	.46	.46	.79	.54
3	13	Name of the course/subject	1.00	1.00	1.00	1.00	1.00
	14	Course/subject code.	.71	.58	.58	.88	.69
	15	Number of credits for the course/ subject.	.88	.88	.83	1.00	.90
	16	Course/subject typology.	.88	.79	.83	.83	.83
	17	Course/subject methodology.	.92	.88	.88	.92	.90
	18	Inclusion of sports safety topics.	1.00	1.00	1.00	.96	.99
	19	Classification category.	.83	.83	.83	.75	.81
	20	Observations.	.88	.88	.88	.92	.89

Note: *R* = Relevance; *I* = Importance; *U* = Usefulness; *C* = Clarity, $\bar{X}$ = Mean

Based on the evaluations and comments made by the experts, modifications were done to the proposed instrument. As a result, a validated and relevant instrument was attained for analyzing the inclusion of sports safety as a study topic in the curricula of undergraduate programs in Colombia.

Discussion

The objective of this work was to design and validate an instrument for analyzing sports safety in the curricula of undergraduate programs related to sports at Colombian universities. Based on the obtained results, it is possible to conclude that the final instrument has optimal levels of relevance, importance, usefulness, and clarity. This allows analyzing the inclusion of sports safety as a study topic for future professionals in sports sciences, as well as multiple spatial variables, program focus, orientation, and other factors that may influence this inclusion.

Similarly, the results show significant differences with respect to the instrument used in the study of Gallardo et al. (2021). This is due to several aspects. Firstly, this study included elements of the geospatial location of the institution, as

there is a significant disparity between rural and urban education in Colombia, with the latter showing better indices in quality, access, and retention (UNESCO., 2010). Secondly, elements regarding the naming of the Faculty and academic program were included, as was previously mentioned, since university autonomy in Colombia allows for a great variety of names for academic programs and the faculties that host them, impacting the training expectations and graduate profiles. Thirdly, some semantic differences reflect the specificities of Colombian terminology. Finally, the fourth element is that the instrument resulting from this research is designed to analyze multiple subjects/courses, as there is no common subject for all programs, requiring its application throughout the entire curriculum.

On the other hand, as this study is a pioneering effort in the country regarding the analysis of SS in the curriculum of sports science programs, it presents certain limitations due to the lack of scientific foundations for discussing these results at the national level. However, some studies, such as the one conducted by Conde et al. (2017) on the digital competencies of Sports and Physical Activity Science students in Colombia, the study by Sandoval et al. (2022) on the continuous academic training and experience of performance and high-performance coaches in Colombia, and the research titled "Overview of postgraduate training in physical education, sports, physical activity, recreation, and related fields in Colombia" by González-Hernández et al. (2022), provide important insights for the continuous improvement of the training offered by universities to future professionals in sports sciences, making them competitive and relevant to current social and cultural demands.

Additionally, the relevance of the DELPHI method for research development is highlighted, as it is one of the most used methods for validating evaluation instruments through expert consensus (Aponte et al., 2012; López & Calvo, 2019). Similarly, it is noted that Aiken's V coefficient is appropriate for content validation by judge criteria due to its ease of application and the quality of its results (Robles-Pastor, 2018).

Finally, the main limitation of the study is the scarcity of research on this topic in Colombia, which affected the selection of experts and necessitated the inclusion of international experts. These experts had several concerns due to their unfamiliarity with the country's educational regulations. Additionally, response times and communication between the research team and the experts were identified as limitations, as they slowed down the process and extended the duration of the research. Despite these challenges, the study highlights the great interest and dedication demonstrated by the participants. Furthermore, the interdisciplinary nature of the experts, along with their research qualities and expertise, was fundamental in improving the instrument.

Conclusions

In summary, it is expected that the design of this instrument will allow for a clear diagnosis of the inclusion of sports safety in the curricula of undergraduate programs in Colombia, thereby highlighting the educational challenges and opportunities from this perspective. Therefore, this work opens a future line of research for implementing this instrument in the analysis of the curricula of sports science and related programs in Colombia.

Ethics Committee Statement

Not applicable for this study, the participants (expert group) have been informed about the study and have participated voluntarily in the research.

Conflict of Interest Statement

The authors and participating entity declare that they have no potential conflict of interest regarding the research, authorship, and/or publication of this article.

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Authors' Contribution

Conceptualization K.A.P.R. & M.G.T.; Methodology K.A.P.R., G.F.A., A.M.G.M. & M.G.T.; Software K.A.P.R.; Validation K.A.P.R., G.F.A., A.M.G.M. & M.G.T.; Formal Analysis K.A.P.R.; Investigation K.A.P.R.; Resources K.A.P.R. & M.G.T.; Data Curation K.A.P.R.; Writing – Original Draft K.A.P.R.; Writing – Review & Editing K.A.P.R., G.F.A., A.M.G.M. & M.G.T.; Visualization K.A.P.R. & M.G.T.; Supervision M.G.T.; Project Administration K.A.P.R. & M.G.T.; Funding Acquisition M.G.T. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

The data are available in the results section of the research paper. If more detailed information is needed, you can contact the corresponding author at andreaporrasr93@gmail.com

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