



## DESIGN AND USABILITY VALIDATION OF A WEB APPLICATION FOR INJURY PREVENTION EDUCATION IN PHYSICAL EDUCATION: A PILOT IMPLEMENTATION IN SECONDARY SCHOOLS

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### ABSTRACT

|             |                                                                                                                                                                                                                                                                                            |
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| Aim/Purpose | To assess the usability of a web application for PE injuries for teachers.                                                                                                                                                                                                                 |
| Background  | Physical Education (PE) is a fundamental subject in compulsory education that bears witness to the evolutionary process of students. The changes that occur at different stages are accompanied by multiple physiological alterations, during which injury episodes may occur temporarily. |
| Methodology | Eight teachers participated in a cross-sectional, exploratory study, which provided them with access to a web application on injuries to integrate into their                                                                                                                              |

Accepting Editor Benson Soong | Received: January 3, 2026 | Revised: April 9 May 27, 2026 |  
Accepted: June 24, 2026.

Cite as: Martín-Ruiz, J., Ros-Ros, C., Alarcón-Jiménez, J., de Bernardo, N., & Ruiz-Sanchis, L. (2026). Design and usability validation of a web application for injury prevention education in physical education: A pilot implementation in secondary schools. *Journal of Information Technology Education: Innovations in Practice*, 25, Article 25. <https://doi.org/10.28945/5821>

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|                                   |                                                                                                                                                                                                                                                                                                                                        |
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|                                   | lesson plans during the last trimester of the 2024-25 school year. Upon completion, the usability was assessed using an ad hoc questionnaire comprising 49 Likert-type items (1-5).                                                                                                                                                    |
| Contribution                      | This study introduces a validated, systematically tested web innovation for an underexplored domain (injury prevention in PE education) and demonstrates excellent usability as a foundation for broader implementation.                                                                                                               |
| Findings                          | The results indicated that the degree of usability of the web application was excellent (Cronbach's alpha = 0.964). No statistically significant differences were found between the categories or responses based on sex, age, or teaching experience ( $p > 0.05$ ).                                                                  |
| Recommendations for Practitioners | The main conclusions from this work are as follows: the web application has proven to be a highly usable tool, both structurally and intuitively.                                                                                                                                                                                      |
| Recommendations for Researchers   | This study addresses the lack of knowledge, as the scientific literature has focused on injuries at the elite level, with no prior record in the educational field, specifically in Physical Education.                                                                                                                                |
| Impact on Society                 | The positive evaluation of teachers not only in the technical aspect of usability but above all in the quality of the specific content on PE injuries is the most relevant factor to consider, as it implicitly validates the information and deems it appropriate within the current legislative context and curriculum requirements. |
| Future Research                   | Since this is an exploratory study, the results cannot be generalized, although the proposed design appears suitable for implementation with a larger sample.                                                                                                                                                                          |
| Keywords                          | web app, usability, secondary physical education, injury prevention                                                                                                                                                                                                                                                                    |

## INTRODUCTION

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Physical education occupies a central position in compulsory secondary education, serving as the primary context for developing student competencies related to physical activity, health, and safety. However, injuries occurring during PE activities can disrupt educational progress and have long-term health consequences (González-Gálvez et al., 2022). While injury prevention is now explicitly mandated in Spanish curriculum frameworks (Jefatura del Estado, 2020), educators often lack easily accessible, pedagogically aligned tools to integrate this content into existing PE units without disrupting instructional flow.

For international readers, LOMLOE refers to the current Spanish education law that regulates compulsory school curricula using a competency-based approach. Within this framework, PE teachers are expected to address active and healthy lifestyles, including prevention-related content; however, they often lack ready-to-use digital resources grounded in both pedagogy and health education.

Recent advances in educational technology have demonstrated that well-designed web applications can support curriculum implementation when developed with careful attention to both pedagogical rigor and technical usability (Gutiérrez, 2025). However, minimal research has addressed technology-enabled injury prevention education in secondary PE contexts, a notably underexplored domain despite the curriculum imperative and the demonstrated effectiveness of digital resources in supporting teacher adoption (Domene et al., 2020). Most existing educational technology in PE focuses on motor skill development or fitness programs; the integration of injury prevention through accessible web tools remains largely unaddressed in academic literature.

This gap is relevant beyond the Spanish context because school-based injury prevention is a shared concern across educational systems, especially where teachers must balance safety promotion, curriculum delivery, and limited instructional time. Accordingly, the present study is not only a local curricular response but also an example of how digital tools can support health-related teaching practices in PE internationally.

The present study was designed to address this gap by: (1) developing a web application containing evidence-based information on 10 common injuries in secondary PE, explicitly aligned with LOM-LOE curriculum competencies; (2) implementing this tool with secondary PE teachers in authentic educational contexts; and (3) systematically evaluating its usability as a foundation for broader implementation across educational settings.

Our primary objective was to assess the usability of the web application for teachers by evaluating its functionality and efficiency in real-world use. Our main hypothesis is that a pedagogically grounded web application, when designed with careful attention to both medical accuracy and contextual appropriateness, will achieve high usability ratings and be perceived as useful for integrating injury prevention education into existing PE curricula.

Although digital tools in PE have been associated with greater access to content and more flexible teaching support, previous developments have mainly focused on performance, fitness, and motor learning rather than injury prevention education. Moreover, many available resources are informational rather than pedagogically structured, and few studies have reported formal usability validation with teachers in authentic school settings. This lack of critically evaluated, curriculum-aligned tools justifies the development of the web application.

This pilot study contributes to the emerging body of research on technology-enhanced PE curriculum implementation by providing empirical evidence of a systematically validated innovation for an underexplored educational domain, establishing a foundation for future research on technology-enabled curriculum integration and student learning outcomes.

## LITERATURE REVIEW

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### *PHYSICAL EDUCATION AND INJURY PREVENTION IN SECONDARY SCHOOLS*

Physical activity is fundamental in the evolutionary process of adolescent development and must change according to individual needs (Chávez et al., 2025). The origin of all these variations finds its fullest expression in education through movement, as embodied by physical education (PE). PE enables the competent development of motor skills and contributes to achieving the highest individual psychophysical level. However, this process requires adaptations of the locomotor system, which can sometimes overload the musculoskeletal structures, resulting in acute or chronic injuries (Morcillo et al., 2024).

Studies on injuries in the context of physical education are scarce, although some authors believe that certain types of injuries persistently prevail to the extent that they are considered an important public health factor (Taylor & Attia, 2000). Among the most frequently detected injuries are sprains, meniscus tears, lower back pain, muscle contractures, fractures, and dislocations (Gómez Montón & López del Amo, 2019). Some have temporary consequences with hardly any impact, such as muscle bruises or first-degree ankle sprains (Malliaras & O'Neill, 2017), while others become chronic, even in adulthood. Notably, lower back pain, a condition that 43.85% of young people under 15 years of age experience to varying degrees (González-Gálvez et al., 2022), is a significant public health concern that extends beyond the school years.

When injuries occur during PE, they disrupt the normal course of the educational process (Sosnowska & Kostka, 2003), creating economic problems due to increased healthcare costs and reduced

school attendance (Abernethy & MacAuley, 2003; Collard et al., 2011). Consequently, it is important to establish preventive habits early in adolescence, enabling students to understand the different types of physical activities and their associated risks (Freese, 2019). Physical education is the ideal context for assimilating these prevention concepts, as it combines practical experience with the pedagogical structure necessary for sustained behavioral change.

### ***PEDAGOGICAL FRAMEWORK: LOMLOE AND CURRICULUM REQUIREMENTS***

In Spain, the LOMLOE (Jefatura del Estado, 2020) and its regional implementation (Generalitat Valenciana, 2022), provides an explicit framework for students to acquire specific competency 1: to integrate an active lifestyle through self-regulated physical and sports activities, establishing connections between everyday behavioral habits and physical and mental well-being. To facilitate the acquisition of this competency, PE instruction must address knowledge specific to injury prevention and physical safety.

The curriculum specifies two foundational content blocks: (1) active and healthy living, and (2) organization and physical management. Both include basic elements, such as personal responsibility for a healthy body throughout life and aspects related to physical safety (Generalitat Valenciana, 2022). These curricular requirements establish that injury prevention is not an ancillary topic but a core competency that must be systematically developed throughout secondary education.

The role of the teacher is crucial in implementing these measures; in 50% of cases, teacher involvement is essential for identifying situations, taking prompt action, and applying appropriate safety guidelines (Lafuente et al., 2022). This underscores the pedagogical importance of providing teachers with accessible resources specifically designed to facilitate injury-prevention education aligned with curriculum objectives. The transmission of information and the appropriate choice of channel for doing so are of utmost importance because of the variety and intrinsic richness of the PE subject matter (Garduño et al., 2023).

### ***DIGITAL TOOLS IN PHYSICAL EDUCATION: BENEFITS AND CURRENT APPLICATIONS***

Digital tools have become integral to contemporary teaching competencies (Maksimović, 2023; Peña-Troncoso et al., 2023), and their adoption in educational contexts has created new pedagogical paradigms (Rosario et al., 2013). Projects that employ technology strategically offer advantages, including increased student engagement and participation (Gutiérrez, 2025), improved learning and motivation, and enhanced personal satisfaction (García-Valcárcel, 2019).

Web-based tools have gained increasing acceptance in PE. The use of audiovisual media facilitates learning, and teachers who use technology-enhanced materials are often better regarded by students and colleagues (Gallego-Cerveró et al., 2018; Sanchis et al., 2021). Research has demonstrated that specific physical activity programs and teaching materials delivered through web tools improve practitioners' implementation and assessment of usefulness (Gallego-Cerveró et al., 2018; Sanchis et al., 2021). The use of these resources is highly significant for their effectiveness in knowledge acquisition and their capacity to position students as active participants in the learning process (Domene et al., 2020).

To date, digital PE resources have primarily focused on motor-skill techniques or specific fitness programs. Beyond the health monitoring provided by current mobile apps aimed at specific cases (Bosworth et al., 2024; He et al., 2025), the educational field requires tools that go beyond simple quantitative measurement (Bucher et al., 2023), providing valuable information for students that endures beyond the completion of compulsory education and focuses on preventive content (Blázquez et al., 2019).

## ***USABILITY IN EDUCATIONAL TECHNOLOGY: METHODOLOGICAL PRECEDENTS***

The evaluation of web-based tool usability has emerged as a critical dimension in educational technology research. Baylor (2017) conducted a foundational study examining website usability in Self-Organized Learning Environments (SOLE), demonstrating that navigation simplicity and sharing features significantly enhance teacher adoption and pedagogical implementation. More recently, Gutiérrez (2025) compared usability and cognitive load across cloud-based and local database systems in higher education using the System Usability Scale (SUS), reporting a score of 82.4%, which is comparable to established usability benchmarks. These studies establish a methodological precedent for quantifying and validating usability in educational technology contexts, particularly when integrated with pedagogical frameworks and real-world implementation.

## ***RESEARCH GAP AND STUDY INNOVATION***

While extensive literature documents sports injuries at elite performance levels (Gil-Caselles et al., 2023; Olmedilla et al., 2004, 2011), technology-enabled injury prevention education in compulsory Physical Education contexts remains underexplored. This gap is notable given (1) the transversal nature of injury prevention in PE curricula, (2) the explicit LOMLOE mandate for safety competency development, and (3) the demonstrated effectiveness of well-designed digital resources in supporting educational implementation and teacher adoption.

The present pilot study addresses this gap by introducing a systematically tested web application designed specifically for secondary PE teachers to facilitate injury prevention education aligned with LOMLOE curriculum requirements. This research contributes to the literature by validating a pedagogically grounded innovation for an underexplored domain, providing a methodological foundation for broader implementation and future research on technology-enabled curriculum integration in PE contexts.

## **MATERIALS AND METHODS**

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To provide teachers with a useful tool and to optimize secondary school students' knowledge of injuries in Physical Education, a descriptive, cross-sectional, and exploratory study was designed by the Faculty of Physical Activity and Sports Sciences and the Faculty of Medicine and Health Sciences at the Catholic University of Valencia. In this study, a web application was created containing specific information on 10 common injuries among secondary school students, intended for use during the last academic term of the 2024-25 school year. To assess its usability, an ad hoc questionnaire was designed in which, at the end of the process, teachers were required to indicate their level of agreement or disagreement with 49 items.

As a pilot study, the aim was not to test the effectiveness in reducing injuries but to determine whether the tool was sufficiently clear, accessible, and relevant for school use before larger-scale implementation. This design aligns with early-stage educational technology validation, in which usability is a necessary condition for outcome-based evaluation. This study was approved by the Ethics Committee of the Catholic University of Valencia (code UCV/2024-2025/061).

The sample consisted of eight PE teachers from eight schools in the province of Valencia, affiliated with the Department of Education, Universities, and Employment of the Valencian Community (Generalitat Valenciana), and included both private (4) and public (4) schools. The inclusion criteria were as follows. The staffing and resources of educational centers were similar in terms of the number of students, appropriate teaching resources and materials for PE classes, widespread Internet access, and availability of tablets/mobile devices and teaching platforms. The Physical Education teachers had to be actively working and have at least one group from the first to the fourth year of secondary education. The entire PE department or individual teachers can participate. The exclusion criteria

were limited to schools without the necessary multimedia resources for implementation and, with respect to teachers, to those not teaching in the ESO educational cycle.

The sample size represented 10.27% of the population of public and private secondary schools ( $n=79$ ) in the city of Valencia. It is a non-probabilistic, simple random sample, selected according to established guidelines, comprising eight PE teachers: four from public schools and four from private schools. The representativeness of the sample, as perceived by the teachers who are part of it, is reflected in analogous realities, and they share similar personal and professional characteristics. In this case, with  $n=8$ , the results cannot be generalized; therefore, the study is exploratory. Two meetings and preliminary emails were held with the teachers before conducting the study to prevent errors in the process and achieve the highest possible data collection. Emphasis was placed on having teachers respond to all items on the final questionnaire to avoid potential bias.

Ten teachers were contacted to begin the study, and eight of them completed it.

### WEB APPLICATION DESIGN

A web application was designed and integrated into the Joomla content management framework (Open Source Matters, Australia, v. 5.3.2), using PHP (v. 8.1.32) and a relational database (MariaDB v. 10.5.26). It is hosted on a virtual Linux server at <https://prevencioneef.giepafs.net/>, a subdomain of the main site at <https://www.giepafs.net>. An interface where teachers can register is included (Figure 1).

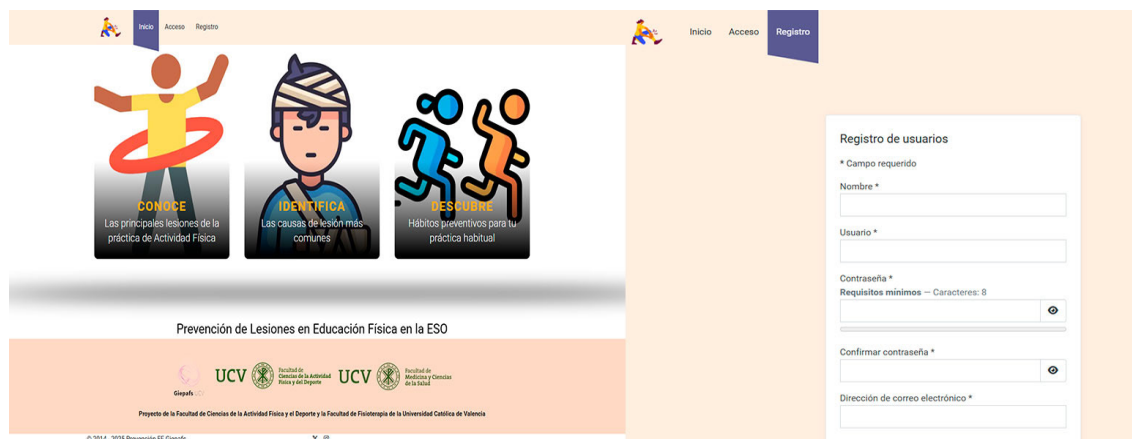


Figure 1. Access to the website and registration are free

Upon assessment, its relevance within the Secondary Education curriculum is indicated under the protection of the current educational law (Figure 2). Next, in the Resources section, tools can be accessed that are mentioned throughout the web application's content, such as the practicality of the Wong Baker Faces scale for subjective pain assessment or recommendations from public authorities on physical activity (Figure 3).

Figure 4 shows the list of injuries included in the study (trochanteric bursitis, muscle contusion, low back pain, epicondylitis, knee sprain, ankle sprain, plantar fasciitis, shoulder dislocation, periostitis, and patellar tendinitis), with their information displayed when clicked. The 10 injuries included in the web application were selected based on: (1) epidemiological prevalence in secondary PE contexts (Gómez Montón & López del Amo, 2019; González-Gálvez et al., 2022), and (2) explicit alignment with LOMLOE competencies (D. 107/2022, Competency 1: "Integration of an Active Lifestyle"; content blocks: "active and healthy living" and "organization and physical management"). This approach ensured that each injury was documented as a health education concern and as relevant curriculum content.



Figure 2. Introductory text for the web application

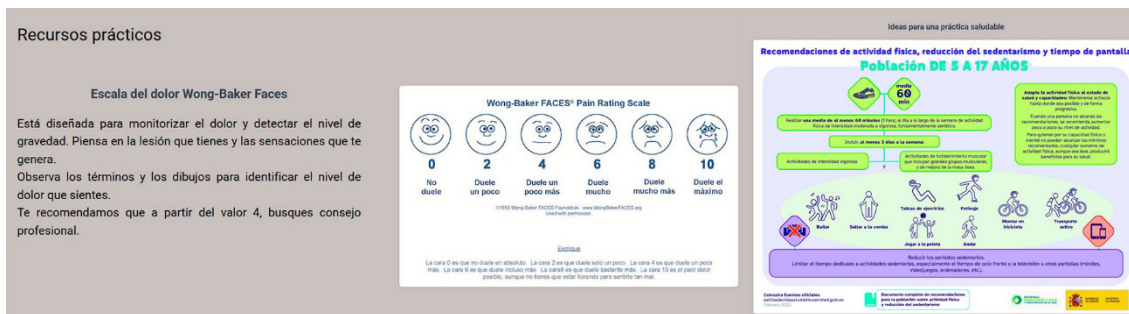


Figure 3. Resources for identifying pain and engaging in physical activities

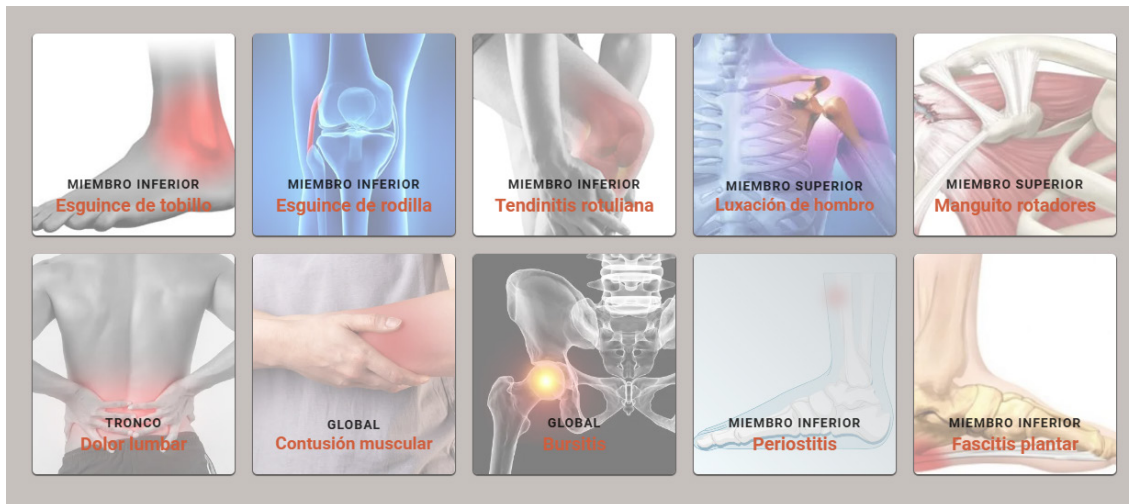
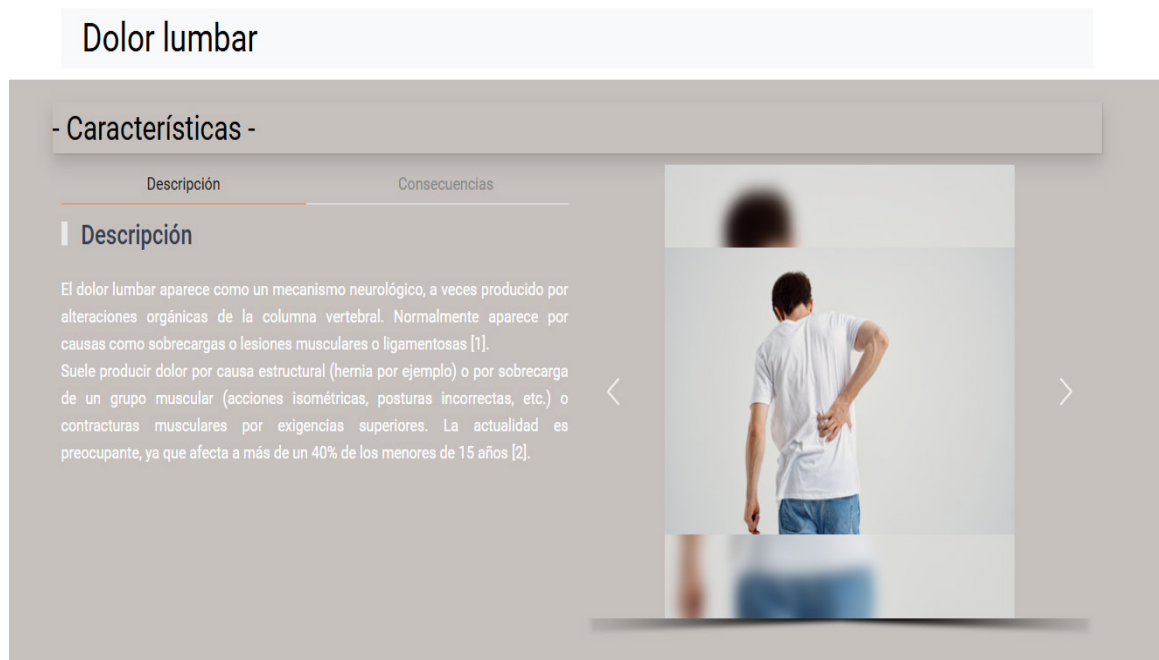


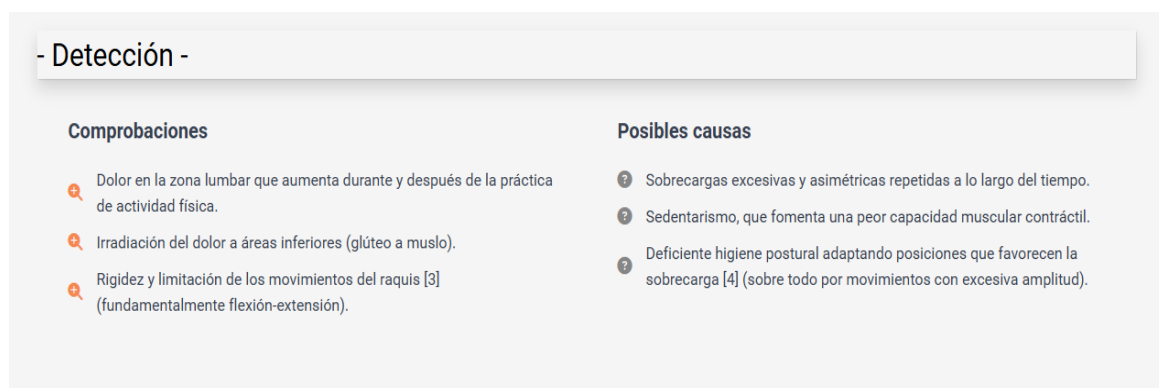
Figure 4. A list of 10 injuries was developed in the web application

Three sections were displayed when an item was accessed. First, there is a description of the injury, including its name and consequences, along with a gallery of selected images designed to have a low impact to avoid discomfort, especially for injuries that show signs of inflammation (Figure 5).



**Figure 5. Details of the injury characteristics and explanatory images are provided**

Second, the identification of the injury with three checks to determine if the participant was actually affected by the injury and the description of three possible causes that may have produced it (Figure 6).



**Figure 6. Details of the utilities for detection and explanation of possible injury mechanisms**

Finally, a list of recommendations on what to avoid and what would be appropriate in the context of PE classes, including video examples and a downloadable poster, was provided to provide access to information in a physical format (Figure 7).



### Field notebook design

The field notebook is an ad hoc application developed by the principal investigator in PHP (v. 8.2.29) and integrated into the web application's database. The user could choose a pseudonym or nickname to preserve their identity and record any injuries that occurred during the study period. The date was automatically recorded, and information on the students' courses, sex, and age was requested. Subsequently, the injury sustained, its cause, and the type of activity during which it occurred were recorded. Finally, users were asked whether it was the first time they had suffered the injury and whether it could be resolved in the classroom.

### Ad hoc questionnaire design

The questionnaire was created ad hoc and accessed through a link in the Microsoft OneDrive application (see here). It consisted of nine categories (personal data, general aspects, contact and help, page structure and interface, control and feedback, multimedia elements, information about injuries on the website, navigation, and usefulness of the content for learning about injury prevention) and 49 closed-ended items to optimize subsequent analysis (excluding those related to personal data).

### Procedure

Physical education teachers from schools that offered secondary education training in the city of Valencia were invited to participate in the study. For those who accepted the invitation, an appointment was scheduled via videoconference, during which the study's guidelines were explained, and they were shown how to register on the website. First, they were informed that they did not have to design a teaching unit about the website but rather integrate it into a unit they had already designed. The following example was provided: in the case of a unit focused on team sports that involve multiple jumping interactions and changes in direction, it would be appropriate to discuss the prevention of ankle and/or knee sprains and to provide recommendations. Therefore, the intention was to integrate this tool as supplementary information, tailored to the content being taught at any given time, without interfering with the natural flow of the classes. Finally, they were asked to complete a usability questionnaire for the web application at the end of the implementation period to evaluate the process. From start to finish, the principal investigator maintained weekly email contact, either to answer questions or to ensure that all teachers completed the final questionnaires.

### Statistical analysis

A descriptive study was conducted to evaluate the usability of an educational web platform using a rating-based questionnaire. Statistical analyses were performed using Python 3.x with NumPy (v. 1.24.3), Pandas (v. 2.0.3), SciPy (version 1.11.1), and Matplotlib (v. 3.7.1). Field notebook data were not analyzed because no injuries were recorded.

**Descriptive analysis.** Measures of central tendency and dispersion were calculated for each of the eight evaluated categories (general aspects, contact and help, page structure and interface, control and feedback, multimedia elements, information on injuries on the web, navigation, and usefulness of content for learning about injury prevention). The 5-point Likert scale responses used from categories 1 to 8 (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree) were converted to numerical values for quantitative analysis.

**Inferential analysis.** To compare mean scores across categories, the Friedman test for related samples and the Kruskal-Wallis test for independent samples were used, with  $\alpha = 0.05$ . Although normality was assessed using the Shapiro-Wilk test ( $W = 0.940$ ,  $p = 0.640$ ), non-parametric tests were used due to the small sample size.

**Analysis by demographic variables.** Differences in scores according to sex, age, and years of experience were analyzed using the non-parametric Mann-Whitney U test and the Friedman statistical test, owing to sample size limitations. In all cases, the significance level was set at  $\alpha = 0.05$ .

**Reliability and overall usability analysis.** Internal consistency was evaluated using Cronbach's  $\alpha$ . A Global Usability Index was calculated by transforming Likert scale scores (1-5) to percentages (0-100%) with linear normalization. Precision was determined by calculating the 95% confidence intervals for the population using the Student's *t*-test.

**Interpretation criteria.** For the Global Usability Index, the following criteria were established: very poor (0-40%), poor (40-55%), acceptable (55-70%), good (70-85%), and excellent (85-100%). For Cronbach's alpha, the criteria used were poor ( $<0.60$ ), questionable (0.60-0.69), acceptable (0.70-0.79), good (0.80-0.89), and excellent ( $\geq 0.90$ ). All statistical analyses were performed at a 95% confidence level.

## RESULTS

Overall, the response patterns suggest a high level of agreement among participants regarding the clarity, structure, and perceived usefulness of the web application. In practical terms, these results indicate that teachers were able to use the resource with minimal difficulty and considered it suitable for integration into PE lesson planning.

### STUDY SAMPLE

Table 1 presents descriptive statistics for the sample, including the mean and standard deviation for age, teaching experience, and weekly hours of physical activity. Frequencies (percentages) were used for qualitative variables, and items with multiple responses were separated into categories.

**Table 1. Descriptive data of the study sample**

| Quantitative variables            | n (%)                |
|-----------------------------------|----------------------|
| Age (years)                       | M = 41.75, SD = 5.80 |
| Years of teaching experience      | M = 14.75, SD = 7.91 |
| Weekly hours of physical activity | M = 5.38, SD = 3.70  |
| Qualitative variables             | n (%)                |
| <i>Sex</i>                        |                      |
| Man                               | 6 (75.00)            |
| Woman                             | 2 (25.00)            |
| <i>Initial training</i>           |                      |
| Graduate                          | 8 (100.00)           |
| <i>Courses offered</i>            |                      |
| 1° Secondary                      | 6 (85.70)            |
| 2° Secondary                      | 5 (71.40)            |
| 3° Secondary                      | 4 (57.10)            |
| 4° Secondary                      | 4 (57.10)            |

*Note:* M = mean; SD = standard deviation

### RESULTS BY CATEGORIES

All categories were analyzed descriptively using a Likert scale (1-5) ranging from strongly disagree to strongly agree, recording the average, standard deviation, and frequency distribution for each item. The interpretation criteria in all cases were as follows: (1) mean  $\geq 4.5$ , excellent; (2) mean 4.0-4.49, good; (3) mean 3.5-3.99, acceptable; and (4) mean  $< 3.5$ , deficient.

**Table 2. Descriptive data of the categories in the usability questionnaire**

| No.                                              | Question statement                                                                                                                    | Mean | SD   |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------|------|
| <b>Category 1. General aspects</b>               |                                                                                                                                       |      |      |
| 1                                                | The information provided has made it possible to understand the purpose of the website.                                               | 4.38 | 0.52 |
| 2                                                | The information regarding the author(s) of the website is specified.                                                                  | 4.38 | 0.52 |
| 3                                                | The website loads quickly.                                                                                                            | 4.12 | 0.99 |
| 4                                                | There is information about the legal regulations on user privacy and data protection.                                                 | 4.50 | 0.53 |
| 5                                                | The website presents a professional and trustworthy image.                                                                            | 4.25 | 0.89 |
| 6                                                | The wording of the text is objective and does not express any opinions.                                                               | 4.62 | 0.52 |
| 7                                                | The text on the page is easy to read (appropriate font size and type).                                                                | 4.62 | 0.52 |
| 8                                                | The color used in the website's background helps maintain attention on the content.                                                   | 4.62 | 0.52 |
| <b>Category 2. Contact and help</b>              |                                                                                                                                       |      |      |
| 9                                                | Internal links that redirect to other sections make navigation easier.                                                                | 4.38 | 0.74 |
| 10                                               | The contact form offers different ways to get in touch.                                                                               | 4.25 | 0.71 |
| 11                                               | The response to inquiries is provided within less than 24 hours.                                                                      | 4.12 | 0.99 |
| 12                                               | The response obtained allows for solving the problem.                                                                                 | 4.12 | 0.99 |
| <b>Category 3. Estructure and page interface</b> |                                                                                                                                       |      |      |
| 13                                               | The visual layout of the page is appropriate (there is no information overload, and it has a clean interface without visual clutter). | 4.25 | 0.71 |
| 14                                               | The sections of the main menu bar are constantly visible.                                                                             | 4.38 | 0.74 |
| 15                                               | The sections of the website are ordered based on their content.                                                                       | 4.12 | 0.83 |
| 16                                               | The amount of information in each section is clear.                                                                                   | 4.62 | 0.52 |
| 17                                               | Dividing information into subspaces makes reading easier.                                                                             | 4.50 | 0.53 |
| 18                                               | This structure makes it easier to understand the content of each section.                                                             | 4.50 | 0.53 |
| <b>Category 4. Control and feedback</b>          |                                                                                                                                       |      |      |
| 19                                               | You have access to all the content on the web.                                                                                        | 4.50 | 0.53 |
| 20                                               | The proliferation of windows on the screen has been avoided.                                                                          | 4.38 | 0.52 |
| 21                                               | Errors are reported clearly.                                                                                                          | 4.25 | 0.89 |
| 22                                               | Feedback helps in making informed decisions.                                                                                          | 4.25 | 0.71 |
| <b>Category 5. Multimedia elements</b>           |                                                                                                                                       |      |      |
| 23                                               | The images are displayed correctly on the website.                                                                                    | 4.38 | 0.52 |
| 24                                               | The use of images reinforces the textual content.                                                                                     | 4.50 | 0.53 |
| 25                                               | The poster helps to better understand the explanations.                                                                               | 4.38 | 0.74 |
| 26                                               | The images are displayed correctly on the poster.                                                                                     | 4.50 | 0.53 |

| No.                                                                               | Question statement                                                                                             | Mean | SD   |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|------|------|
| <b>Category 6. Information about injuries on the web</b>                          |                                                                                                                |      |      |
| 27                                                                                | The written explanation makes it possible to understand the elements of preventing injuries.                   | 4.50 | 0.53 |
| 28                                                                                | Written information facilitates the protocol to follow in case of injury.                                      | 4.50 | 0.53 |
| 29                                                                                | The description of the sections facilitates decision-making in the event of an injury.                         | 4.50 | 0.53 |
| 30                                                                                | The terminology is appropriate for the educational field.                                                      | 4.62 | 0.52 |
| 31                                                                                | The website provides sufficient visual information for understanding the operating protocols.                  | 4.38 | 0.52 |
| <b>Category 7. Navigation</b>                                                     |                                                                                                                |      |      |
| 32                                                                                | The information you are looking for is easy to find.                                                           | 4.38 | 0.74 |
| 33                                                                                | Links are easily recognizable.                                                                                 | 4.38 | 0.52 |
| 34                                                                                | The links lead to the requested information.                                                                   | 4.38 | 0.52 |
| 35                                                                                | I can access the page from any web browser.                                                                    | 4.00 | 0.76 |
| <b>Category 8. Usefulness of the content for learning about injury prevention</b> |                                                                                                                |      |      |
| 36                                                                                | I enjoy physical activity/sports.                                                                              | 4.71 | 0,49 |
| 37                                                                                | Practicing physical activity/sports is important to me.                                                        | 4.71 | 0,49 |
| 38                                                                                | I recommend using websites designed by physical activity specialists for injury detection and prevention.      | 4.75 | 0.46 |
| 39                                                                                | Knowing that this page is designed by physical activity professionals gives me confidence.                     | 4.71 | 0.49 |
| 40                                                                                | The information obtained from this page encouraged me to seek more information about injury prevention.        | 4.75 | 0.71 |
| 41                                                                                | Downloadable posters for each type of injury are suitable for prevention and monitoring in the school setting. | 4.88 | 0.35 |
| 42                                                                                | Having access to the website allows me to access information in any field, not just in PE.                     | 4.50 | 0.76 |
| 43                                                                                | I have learned to identify the most common injuries in PE.                                                     | 4.00 | 0.82 |
| 44                                                                                | I have improved my preventive habits for the regular practice of physical activity and sport.                  | 3.86 | 0.69 |
| 45                                                                                | I can advise you on the actions to avoid in the event of a specific injury.                                    | 4.71 | 0.49 |
| 46                                                                                | I have learned to accurately describe the most common injuries in PE.                                          | 3.71 | 0.95 |
| 47                                                                                | I have learned the importance of doing warm-up exercises (joint mobility) before starting PE.                  | 4.57 | 0.53 |
| 48                                                                                | I have learned to correctly identify the signs of an injury during Physical Education classes.                 | 4.43 | 0.79 |
| 49                                                                                | I would like to obtain more information about injuries to further my knowledge.                                | 4.62 | 0.74 |

Note: SD = standard deviation

In the first category (general aspects), an excellent average of 4.44/5 was obtained, with aspects such as objective writing and readability standing out at 4.62/5; areas for improvement included download speed, with 12.5% of the respondents expressing disagreement. In the second category (contact and help), satisfaction was high (85.7), though there was greater variability, as not all teachers had used all the resources (28.6% indifferent). In the third category (structure and interface), there was 100% agreement on clarity or structure, highlighting aspects for improvement, such as the order of the sections (4.12 points out of 5). In the fourth category (control and feedback), aspects such as full access to content, the absence of distractions (e.g., pop-up windows), and clear feedback were highlighted (100% agreement).

The fifth category (multimedia elements) achieved 96.4% agreement across all aspects, except for the usefulness of the poster for understanding injuries, where 14.3% remained indifferent. The sixth (information about injuries on the website) was the most comprehensive, showing total agreement by providing clear, practical, and applicable information in the field of education. The seventh category (navigation) stands out for its design and functionality, although improvements are needed in the placement of information and in compatibility with different browsers (14.3% indifferent in both cases). The eighth and final category (usefulness of the content for learning about injury prevention) showed strong consensus, with 8 of 14 aspects (57.1%) agreeing on its usefulness in injury prevention in physical education.

### ***COMPARISON OF CATEGORIES BY AGE, SEX, AND TEACHING EXPERIENCE***

In comparing categories, the Friedman test (non-parametric ANOVA for repeated measures) showed no significant differences (statistic = 5.1867,  $p = 0.6372$ ), indicating very similar results across all cases and a consistently positive evaluation.

### ***COMPARISON BY SEX***

Table 3 shows that after applying the Mann-Whitney U test for small samples, there were no significant differences between the sexes.

**Table 3. Differences in the evaluation of web applications based on gender**

| Category                   | Men<br>(average) | Men<br>(SD) | Women<br>(average) | Women<br>(SD) | <i>p</i> -value |
|----------------------------|------------------|-------------|--------------------|---------------|-----------------|
| General Aspects            | 4.408            | 0.379       | 4.688              | 0.442         | 0.402           |
| Contact and Help           | 4.625            | 0.494       | 4.500              | 0.707         | 1.000           |
| Structure and Interface    | 4.361            | 0.499       | 5.000              | 0.000         | 0.201           |
| Control and Feedback       | 4.500            | 0.474       | 4.500              | 0.707         | 1.000           |
| Multimedia Elements        | 4.500            | 0.447       | 4.500              | 0.707         | 1.000           |
| Information about Injuries | 4.500            | 0.452       | 4.500              | 0.707         | 1.000           |
| Navigation                 | 4.375            | 0.494       | 4.500              | 0.707         | 1.000           |
| Usefulness of the Content  | 4.554            | 0.394       | 4.929              | 0.101         | 0.180           |

*Note:* SD = standard deviation

There were no differences between men and women, and although women showed slightly higher scores, this cannot be taken as a reference due to the small sample size ( $n=2$ ).

### ***COMPARISON BY AGE***

Age did not show significant differences according to the Mann-Whitney U test and the Friedman test (statistic = 3.1593,  $p = 0.8699$ ) (Table 4).

**Table 4. Differences in the evaluation of the web application according to age**

| Category                   | Group 30-39 (average) | Group 30-39 (SD) | Group 40-49 (average) | Group 40-49 (SD) | <i>p</i> -value |
|----------------------------|-----------------------|------------------|-----------------------|------------------|-----------------|
| General aspects            | 4.315                 | 0.290            | 4.570                 | 0.429            | 0.453           |
| Contact and help           | 4.333                 | 0.577            | 4.750                 | 0.433            | 0.414           |
| Structure and interface    | 4.667                 | 0.577            | 4.430                 | 0.522            | 0.744           |
| Control and feedback       | 4.333                 | 0.577            | 4.600                 | 0.454            | 0.530           |
| Multimedia elements        | 4.333                 | 0.577            | 4.600                 | 0.418            | 0.528           |
| Information about injuries | 4.333                 | 0.577            | 4.600                 | 0.424            | 0.530           |
| Navigation                 | 4.333                 | 0.577            | 4.450                 | 0.512            | 0.744           |
| Usefulness of the content  | 4.536                 | 0.467            | 4.710                 | 0.354            | 0.548           |

Note: SD = standard deviation

Older people scored higher in almost all categories, except for the structure and interface.

### ***COMPARISON BY TEACHING EXPERIENCE***

After using the same tests (Mann-Whitney U and Friedman tests), which are suitable for small sample sizes, no significant differences were found (Table 5).

**Table 5. Differences in the evaluation of the web application based on teaching experience**

| Category                   | Group <4 years (average) | Group <4 years (SD) | Group >4 years (average) | Group >4 years (SD) | <i>p</i> -value |
|----------------------------|--------------------------|---------------------|--------------------------|---------------------|-----------------|
| General aspects            | 4.424                    | 0.322               | 4.531                    | 0.483               | 0.771           |
| Contact and help           | 4.500                    | 0.577               | 4.688                    | 0.473               | 0.874           |
| Structure and interface    | 4.750                    | 0.500               | 4.292                    | 0.479               | 0.342           |
| Control and feedback       | 4.500                    | 0.577               | 4.500                    | 0.456               | 1,000           |
| Multimedia elements        | 4.500                    | 0.577               | 4.500                    | 0.408               | 1,000           |
| Information about injuries | 4.500                    | 0.577               | 4.500                    | 0.416               | 1,000           |
| Navigation                 | 4.500                    | 0.577               | 4.312                    | 0.473               | 0.874           |
| Usefulness of the content  | 4.652                    | 0.446               | 4.643                    | 0.364               | 1,000           |

Note: SD = standard deviation

In line with the previous comparison, the most experienced group (> 4 years) gave the highest scores to the different categories. The fact that no differences were found indicates that experience is not a determining factor in evaluating web applications.

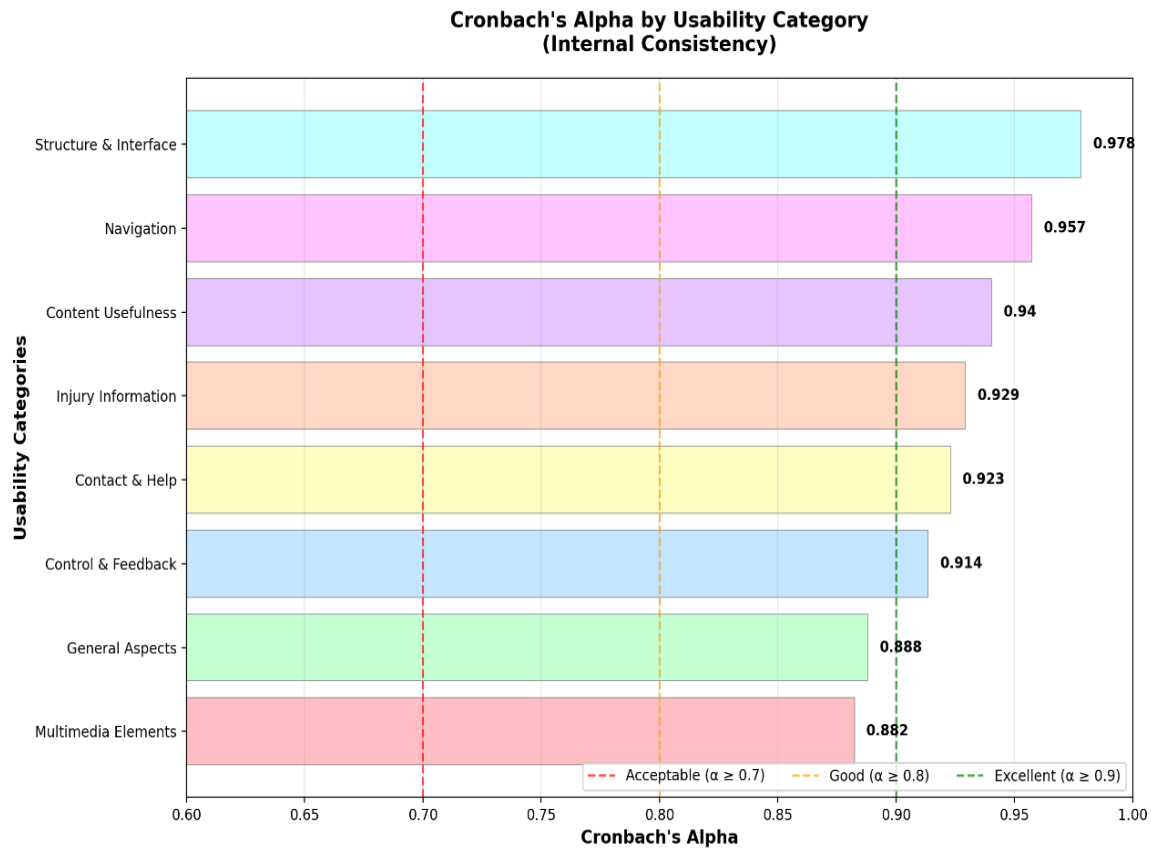
### ***USABILITY OF THE WEB APPLICATION***

Cronbach's alpha was calculated, yielding excellent consistency of 0.9645 (with the reduced sample from the study) and a high usability of 87.8% (Table 6).

**Table 6. Cronbach's alpha for the usability of the web application**

| Scale                      | Items | Cronbach's alpha | Interpretation |
|----------------------------|-------|------------------|----------------|
| Overall usability scale    | 49    | 0.964            | Excellent      |
| General aspects            | 8     | 0.888            | Good           |
| Contact and help           | 4     | 0.923            | Excellent      |
| Structure and interface    | 6     | 0.978            | Excellent      |
| Control and feedback       | 4     | 0.913            | Excellent      |
| Multimedia elements        | 4     | 0.882            | Good           |
| Information about injuries | 5     | 0.929            | Excellent      |
| Navigation                 | 4     | 0.957            | Excellent      |
| Usefulness of the content  | 14    | 0.940            | Excellent      |

In Figure 10, an overall score is shown, with six categories showing excellent consistency above 0.9 and only two below this threshold (general aspects: 0.888; multimedia elements: 0.882).

**Figure 10. Cronbach's alpha for usability categories of the web application**

Given the small sample size, it can be cautiously inferred that the web application shows internal consistency, confirming that all items measure the construct of the web and that the instrument is reliable for assessing the usability of similar educational applications.

## DISCUSSION

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Digital tools are a reality in all contexts and have become commonplace for both simple and sophisticated tasks (Metzendorf et al., 2024). Its increasing demand requires classrooms to meet these expectations in a way that is appropriate to the subject and adaptable to the needs of the teaching staff, always providing support when a validation process with guarantees is followed (Gómez-Hernández et al., 2023). In this sense, webquests were pioneering as the stage where this type of activity was showcased, marking the global introduction of these educational resources (Castro-Lemus et al., 2005), which have now been replaced by educational blogs with specific information and resources for teachers.

Beyond the health monitoring provided by current tools in the form of mobile apps aimed at specific cases (Bosworth et al., 2024; He et al., 2025), the educational field, and physical education in particular, requires tools that go beyond simple quantitative measurement (Bucher et al., 2023), providing valuable information for students that can endure even after the completion of compulsory education, focusing attention on content with a preventive purpose (Blázquez et al., 2019), and contributing ideas that can be put into practice easily and efficiently.

The web application demonstrated robustness and an excellent level of usability, proving useful to the teachers who participated in this exploratory study, regardless of their sex, age, or professional experience. No statistically significant differences were found in these comparisons ( $p > 0.05$ ), although older and more experienced teachers tended to score slightly higher, which may cautiously indicate a positive predisposition toward these tools.

The questionnaire categories received very good ratings, and it is worth highlighting the structure and interface category (3rd overall), in which there was consensus on the clarity of the selected content (100% agreement), as well as the category related to injury information on the website (6th overall), which yielded similar results. These two categories are the core of the research and set its direction; therefore, such a high level of consensus supports the main hypothesis. In this sense, although it is not possible to generalize the result, the Cronbach's alpha obtained (0.964) indicates that this tool is on the right path for use in contexts with greater participation and serves as a model to be considered in future investigations on this subject.

This is in line with other studies related to web usability (Baylor, 2017) and with physical activity sciences that use this statistical test to verify the reliability of a study (Castañeda et al., 2024) in tasks that involve implementing a questionnaire, such as the study by Gómez et al. (2015) regarding the relationship between overweight and physical activity in adolescents, or the need to update an educational curriculum.

In this regard, the positive evaluation by teachers not only in the technical aspect of usability, but above all in the quality of the specific content on PE injuries, is the most relevant factor to consider, as it implicitly validates the information and deems it appropriate within the current legislative context and curriculum requirements (Hernández et al., 2024). The 87.8% Global Usability Index enables teachers to seamlessly integrate injury prevention content into existing PE units, supporting the LOMLOE competency for 'active and healthy living'. This app makes it easier to meet this requirement by being user-friendly.

Beyond the statistical outcome, this finding has practical educational value because teachers are more likely to adopt digital resources that do not increase their planning burdens. Therefore, a usable injury-prevention tool may support more consistent inclusion of safety content in PE, helping bridge the gap between curriculum requirements and day-to-day classroom practice.

A highly usable tool removes technical barriers, allowing teachers to focus on pedagogical design rather than platform navigation, potentially increasing the depth of injury prevention education. This

study addresses this need, as the scientific literature has focused on injuries at the elite level (Gil-Caselles et al., 2023; Olmedilla et al., 2004, 2011), with no prior record in the educational field, specifically in PE. This usable foundation enables future studies to measure the impact of this innovation on students' knowledge of injury prevention and behavioral change.

In this sense, the present study advances the field by moving beyond the mere proposal of a digital resource and offering an initial empirical validation of the resource under authentic school conditions. This is especially relevant in underexplored areas where teacher-oriented, curriculum-linked injury-prevention technologies remain scarce.

Despite these findings, the study has some limitations, including a sample that does not allow generalization; therefore, the findings should be evaluated objectively and discreetly. One of the greatest challenges is finding centers willing to carry out medium-term projects. However, the implementation period was short; applying it over a full school year would help analyze the stability or change in responses, and it might also be possible to analyze the field notebook to highlight the injuries that occurred during the academic year. In future projects, it would also be interesting to assess the web application's effectiveness in reducing injuries after improvements to the sections suggested by the teachers in this study.

## CONCLUSIONS

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The web application proved to be a highly usable and pedagogically relevant resource for teaching injury prevention in secondary education. Positive evaluations were consistent across sex, age, and teaching experience, supporting their potential applicability across diverse teacher profiles. Although the exploratory design and small sample size limit generalizability, this study provides an initial, validated model for integrating injury-prevention content into PE through digital support. Future research should include larger samples, validation across different educational contexts, and longitudinal designs to examine whether sustained use improves student knowledge, preventive behaviors, or injury-related outcomes.

## REFERENCES

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- Abernethy, L., & MacAuley, D. (2003). Impact of school sports injury. *British Journal of Sports Medicine*, 37(4), 354–355. <https://doi.org/10.1136/bjism.37.4.354>
- Baylor, M. (2017). *Usability study on a website integrating self-organized learning environments (SOLE) and Google Apps for Education (GAPE)* [Master's thesis, University of Hawai'i at Mānoa]. <https://scholarspace.manoa.hawaii.edu/bitstreams/fe3a4d0e-550a-4457-b3d6-85739408a194/download>
- Blázquez, D., Domedel, N., & Supital, R. (2019). El problema de la obesidad infantil. ¿De qué hablamos? Causas y sus posibles consecuencias. In *Innovación e investigación en la sociedad digital* [Innovation and research in the digital society] (pp. 11–48). <https://dialnet.unirioja.es/servlet/articulo?codigo=6657488>
- Bosworth, K. T., Ghosh, P., Flowers, L., Proffitt, R., Koopman, R. J., Tosh, A. K., Wilson, G., & Braddock, A. S. (2024). The user-centered design and development of a childhood and adolescent obesity Electronic Health Record tool, a mixed-methods study. *Frontiers in Digital Health*, 6, 1396085. <https://doi.org/10.3389/fdgth.2024.1396085>
- Bucher, S. L., Young, A., Dolan, M., Padmanaban, G. P., Chandnani, K., & Purkayastha, S. (2023). The Neo-Roo mobile app: Initial design and prototyping of an Android-based digital health tool to support kangaroo mother care in low/middle-income countries (LMICs). *PLOS Digital Health*, 2(10), e0000216. <https://doi.org/10.1371/journal.pdig.0000216>
- Castañeda, T., López, A., Collazo, V. d. C., & Moirón, O. M. (2024). Fiabilidad instrumental para medir la aplicación de técnicas estadísticas en cultura física: Alfa de Cronbach [Instrumental reliability for assessing the application of statistical techniques in physical education: Cronbach's Alpha]. *Transformación*, 20(1), 128–144.

- Castro-Lemus, N., Corral Pernía, J. A., & Chacón Borrego, F. (2005). Las webquest en EduSport [Webquests on EduSport. *Comunicación y Pedagogía: Nuevas Tecnologías y Recursos Didácticos*, 206, 63–69. <https://dial-net.unirioja.es/servlet/articulo?codigo=1998021>
- Chávez, A. I., Islas, S. A., Ortiz, C. J., Orona, A., & Martínez, A. (2025). Intervenciones en educación física para la promoción de estilos de vida activos en niños y adolescentes: Una revisión sistemática [Physical education interventions to promote active lifestyles among children and adolescents: A systematic review]. *Retos*, 62, 503–512. <https://doi.org/10.47197/retos.v62.109485>
- Collard, D. C. M., Verhagen, E. A. L. M., van Mechelen, W., Heymans, M. W., & Chinapaw, M. J. M. (2011). Economic burden of physical activity-related injuries in Dutch children aged 10–12. *British Journal of Sports Medicine*, 45(13), 1058–1063. <https://doi.org/10.1136/bjsm.2010.082545>
- Domene, S., Puig, M., & Morales, J. A. (2020). Análisis de narrativas digitales en las ideas previas del alumnado. In *Innovación e investigación en la sociedad digital [Innovation and research in the digital society]* (pp. 9–22).
- Freese, J. (2019). Fitness terapéutico (Bicolor) [Therapeutic fitness (Two-tone)]. Paidotribo. <https://www.per-lego.com/book/2043434/fitness-terapeutico-bicolor-pdf>
- Gallego-Cerveró, C., Martín-Ruiz, J., Ruiz-Sanchis, L., & Ros-Ros, C. (2018). Pain perception in clarinetists with playing-related pain after implementing a specific exercise program. *Medical Problems of Performing Artists*, 33(4), 238–242. <https://doi.org/10.21091/mppa.2018.4035>
- García-Valcárcel, A. (2019). *Entornos virtuales de enseñanza-aprendizaje. tecnologías para la educación y el conocimiento [Virtual teaching and learning environments. Technologies for education and knowledge]*. Dykinson.
- Garduño, J., Ruiz, J. V., Velázquez, C., & Valero, A. (2023). *Modelos pedagógicos en la educación física y el deporte [Pedagogical models in physical education and sport]*. Qartuppi eBooks.
- Generalitat Valenciana. (2022). Decreto 107/2022, de 5 de agosto, del Consell, por el que se establece la ordenación y el currículo de Educación Secundaria Obligatoria. *Diari Oficial de la Generalitat Valenciana*, núm. 9403, de 11 de agosto de 2022. <https://dogv.gva.es/es/eli/es-vc/d/2022/08/05/107/>
- Gil-Caselles, L., Martínez-López, M., González-Hernández, J., & Olmedilla-Zafra, A. (2023). Historia de lesiones, perfeccionismo, catastrofismo y vulnerabilidad a la ansiedad en triatletas [History of injuries, perfectionism, catastrophising and vulnerability to anxiety in triathletes]. *Cuadernos de Psicología del Deporte*, 23(3). <https://doi.org/10.6018/cpd.550281>
- Gómez, R., Arruda, M., Camargo, C., & Cossio, M. A. (2015). Confiabilidad de un cuestionario que valora la actividad física en adolescentes normopeso y con exceso de peso [Reliability of a questionnaire assessing physical activity in normal-weight and overweight adolescents]. *Nutrición Hospitalaria*, 31(5), 2205–2211.
- Gómez-Hernández, M., Ferre, X., Moral, C., & Villalba-Mora, E. (2023). Design guidelines of mobile apps for older adults: Systematic review and thematic analysis. *JMIR mHealth and uHealth*, 11, e43186. <https://doi.org/10.2196/43186>
- Gómez Montón, F., & López del Amo, J. L. (2019). Injuries to physical education teachers in Catalonia: Analysis of ergonomic perception in their workplace. *Apunts: Educació Física i Esports*, 135, 48–67. [https://doi.org/10.5672/apunts.2014-0983.es.\(2019/1\).135.04](https://doi.org/10.5672/apunts.2014-0983.es.(2019/1).135.04)
- González-Gálvez, N., Carrasco-Poyatos, M., Vaquero-Cristóbal, R., & Marcos-Pardo, P. J. (2022). Dolor de espalda en adolescentes: Factores asociados desde un enfoque multifactorial [Back pain in adolescents: Associated factors with a multifactorial approach]. *Retos*, 43, 81–87. <https://doi.org/10.47197/retos.v43i0.87389>
- Gutiérrez, G. (2025). Evaluating usability and cognitive load: A comparative study of cloud-based and local database systems in higher education. *Journal of Information Technology Education: Innovations in Practice*, 24, 3. <https://doi.org/10.28945/5435>
- He, X., Bian, J., Berlinski, A., Guo, Y., Simmons, A. L., Marshall, S. A., Greene, C. J., Brown, R. H., Turner, J., & Perry, T. T. (2025). Mobile health app for adolescent asthma self-management: Development and usability study of the pulmonary education and knowledge mobile asthma action plan. *JMIR Formative Research*, 9, e64212. <https://doi.org/10.2196/64212>

- Hernández, L. d. J., Tandron, B., & Bilueth, D. (2024). Actualización curricular en teoría y metodología del entrenamiento deportivo (TMED): Validación de un cuestionario mediante el coeficiente alpha de Cronbach [Curriculum update on sports training theory and methodology (TMED): Validation of a questionnaire using Cronbach's alpha coefficient]. *MLSS Sport Research*, 4(2). <https://doi.org/10.54716/mlssr.v4i2.3384>
- Jefatura del Estado. (2020). *Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación* [Organic Law 3/2020, of 29 December, amending Organic Law 2/2006, of 3 May, on Education]. Boletín Oficial del Estado, (340), 122868–122953. <https://www.boe.es/eli/es/lo/2020/12/29/3>
- Lafuente, C., González-Raboso, J., & González-Raboso, A. (2022). Los profesores de educación física y los servicios de urgencias [PE teachers and A&E departments]. *Human Review International Humanities Review*, 11, 2–8. <https://doi.org/10.37467/revhuman.v11.4104>
- Maksimović, J. (2023). Competences of physical education teachers in education supported by digital technology. *International Journal of Cognitive Research in Science, Engineering and Education*, 11(2), 331–341. <https://doi.org/10.23947/2334-8496-2023-11-2-331-341>
- Malliaras, P., & O'Neill, S. (2017). Factores de riesgo potenciales que conducen a la tendinopatía [Potential risk factors leading to tendinopathy]. *Apunts Sports Medicine*, 52(194), 71–77. <http://www.apunts.org/es-factores-riesgo-potenciales-que-conducen-articulo-X021337171761317X?referer=buscador>
- Metzendorf, M.-I., Wieland, L. S., & Richter, B. (2024). Mobile health (m-health) smartphone interventions for adolescents and adults with overweight or obesity. *The Cochrane Database of Systematic Reviews*, 2(2), Article CD013591. <https://doi.org/10.1002/14651858.CD013591.pub2>
- Morcillo, R., Falcones, E., Calderón, C., & Abad, A. (2024). Prevención de las lesiones deportivas en la educación física [Prevention of sports injuries in physical education]. *Arrancada*, 24(49), 290–294. <https://dialnet.unirioja.es/servlet/articulo?codigo=9948283>
- Olmedilla, A., Laguna, M., & Blas, A. (2011). Lesiones y características psicológicas en jugadores de balonmano [Injuries and psychological characteristics in handball players]. *Revista Andaluza De Medicina Del Deporte*, 4(1), 6–12. <https://doi.org/10.32348/1852.4206.v2.n3.5243>
- Olmedilla, A., Ortín, F. J., & Ortega, E. (2004). Un análisis descriptivo de la percepción de los jugadores de fútbol respecto a los factores que pueden provocar lesiones [A descriptive analysis of footballers' perceptions of the factors that can lead to injuries]. *Cuadernos De Psicología Del Deporte*, 4
- Peña-Troncoso, S., Toro-Arévalo, S., Vega-Ramírez, J., Gallardo-Fuentes, F., & Pazos-Couto, J. M. (2023). A look at the interconnection of dimensions of knowledge in physical education teacher training in Chile. *International Journal of Environmental Research and Public Health*, 20(4), 3249. <https://doi.org/10.3390/ijerph20043249>
- Rosario, J. R., Lobo, H., Rivero, D., Briceño, J., & Villarreal, M. (2013). Las TIC para el proceso enseñanza-aprendizaje en los laboratorios de física en el nivel universitario en el estado de trujillo, Venezuela [ICT for the teaching and learning process in physics laboratories at university level in the state of Trujillo, Venezuela]. *Techno review:International Technology, Science and Society Review/Revista Internacional De Tecnología, Ciencia Y Sociedad*, 2(2), 53–66. <https://doi.org/10.37467/gka-revtechno.v2.1278>
- Sanchis, L. R., Grancha, I. T., & Ruiz, J. M. (2021). Valoración del alumnado sobre el boxeo y taekwondo en la educación física [Pupils' views on boxing and taekwondo in physical education]. *KRONOS*, 20(1-2). <https://doi.org/10.64197/Kronos.20.01-02.900>
- Sosnowska, S., & Kostka, T. (2003). Epidemiology of school accidents during a six school-year period in one region in Poland. *European Journal of Epidemiology*, 18(10), 977–982. <https://doi.org/10.1023/a:1025802203726>
- Taylor, B., & Attia, M. (2000). Sports-related injuries in children. *Academic Emergency Medicine*, 7(12), 1376–1382. <https://doi.org/10.1111/j.1553-2712.2000.tb00495.x>

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