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Developing A Sports Injury Prevention Model in Physical Education for Non-Sports Majors: A Case Study at Sai Gon University, Vietnam

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ABSTRACT:
Objectives: This study was conducted to identify, screen, and evaluate the effectiveness of injury prevention measures for non-sports majors during mandatory Physical Education (PE) modules at Sai Gon University. Set against the backdrop of increasing school-based injury rates and a scarcity of specific quantitative research in Vietnam, the project aims to develop a standardized, evidence-based solution framework through expert consensus.
Methods: A mixed-methods research design was employed, incorporating in-depth literature review, field pedagogical observations, and expert interviews using a modified Delphi technique. Data were collected from 50 highly qualified lecturers, coaches, and sports managers in Ho Chi Minh City. Statistical methods, including Spearman's correlation test, were utilized to analyze the relationship between the urgency and the feasibility of the proposed measures.
Results: From an initial pool of 10 measures, the study identified 08 core measures with a high level of consensus (≥75% "Very Important" rating), including: Enhancing self-protection awareness; Improving technical precision; Implementing sport-specific warm-ups; Load management and pedagogical systematization; Recovery optimization; Rules of play education; First aid competency; and Facilities management. Correlation analysis revealed a strong positive link between urgency and feasibility (r ranging from 0.75 to 0.89), confirming the high practical value of the proposed model.
Conclusion: The synchronous integration of multi-layered prevention measures ranging from cognitive and technical to environmental factors is a prerequisite for minimizing injury risks in university PE environments. This research provides a crucial database for educational policymakers to restructure curricula, ensuring safety and enhancing athletic performance for students.

Keywords: Injury prevention, physical education, university students, load management, sports medicine, Sai Gon University.

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1. INTRODUCTION

Physical Education (PE) within the higher education system serves as the core foundation of public health strategies and holistic human development. In Vietnam, the objective of PE is not only to enhance physical strength but also to improve students' adaptive capacity and basic motor skills within the context of

industrialization and modernization (Nguyen & Pham, 2020). However, a concerning reality is the increasing rate of sports injuries in school environments, particularly among non-sports majors. These students often enter mandatory PE modules with limited physical fitness foundations, unformed technical skills, and a lack of fundamental knowledge regarding exercise safety.

International epidemiological data indicate that injury rates among university students participating in general physical activities reach approximately 1.60 per 1,000 hours of participation. Despite this significance, sports science research in Vietnam has predominantly focused on high-performance sports or professional athletes. This has created a "knowledge gap" in developing specific injury prevention strategies for non-specialized university students (Finch, 2006). Injuries not only cause physical pain and costly medical expenses but also lead to "kinesiophobia" (fear of movement), directly impacting the higher education goal of forming a lifelong habit of physical exercise.

This study is built upon the TRIPP (Translating Research into Injury Prevention Practice) theoretical framework to ensure that the proposed measures are not merely theoretical but tailored to the practical context in Vietnam (Finch & Donaldson, 2010). The specific context at Sai Gon University a multi-disciplinary institution with a large student population typifies the challenges of facilities, class density, and diverse initial motor skill levels. Identifying risk factors and building a systematic prevention model is an urgent requirement to protect student health and enhance training quality.

2. RESEARCH METHODS

To ensure objectivity and scientific rigor, the study applied a mixed-methods approach, combining qualitative and quantitative analyses.[2] The core of the methodology is a modified Delphi technique to leverage collective intelligence from leading experts in PE and sports medicine.[2]

2.1 Study Design and Participants

The research was conducted in two main phases. Phase 1 focused on synthesizing and screening prevention measures from scientific literature (2015–2025) and the current teaching status at Sai Gon University. Phase 2 utilized expert interviews to evaluate and refine the model. The sample included N = 50 experts selected based on strict criteria: at least 5 years of experience in teaching, coaching, or sports management; holding a Master's degree or higher; and having contributed to sports science research.

2.2 Data Collection Instruments

The primary tool was an expert questionnaire designed on a 5-point Likert scale to evaluate two critical criteria: "Urgency" and "Feasibility". Urgency reflects the importance of the measure in preventing common injuries, while feasibility assesses the practical implementation capability based on the university's current resources.

Table 1. Structure of the 5-point Likert Scale for Expert Evaluation

Level	Urgency	Feasibility
5	Very Urgent	Very Feasible
4	Urgent	Feasible
3	Moderate	Moderate
2	Low Urgency	Difficult to Implement
1	Not Urgent	Not Feasible

2.3 Statistical Processing

Data were processed using SPSS 26.0 software. Descriptive statistics included frequency, percentage, and Mean. To analyze the relationship between urgency and feasibility, Spearman's rank correlation coefficient (P) was used :

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

Where d_i is the difference between the ranks of urgency and feasibility scores, and n is the number of observations. The statistical significance threshold was set at $p < 0.05$.

3. RESEARCH RESULTS

3.1. Screening of Prevention Measures

The 10 proposed measures were screened based on the consensus rate for the **"Very Important"** category. Table 2 presents the final selection results.

Table 2. Expert Interview Results for Selecting Student Injury Prevention Measures (n=50)

No.	Proposed Measures	Very Important (n / %)	Important (n / %)	Unimportant (n / %)	Decision
1	Enhancing self-protection awareness	46 (92.0%)	3 (6.0%)	1 (2.0%)	**Selected**
2	Physical fitness enhancement training	29 (58.0%)	17 (34.0%)	4 (8.0%)	*Rejected*
3	Improving technical precision	41 (82.0%)	6 (12.0%)	3 (6.0%)	Selected
4	Optimizing warm-up protocols	43 (86.0%)	7 (14.0%)	0 (0.0%)	Selected
5	Systematic instruction and load manageme	47 (94.0%)	3 (6.0%)	0 (0.0%)	Selected
6	Protective gear and self-defense maneuvers	25 (50.0%)	23 (46.0%)	2 (4.0%)	*Rejected*
7	Enhancing post-exercise recovery	46 (92.0%)	3 (6.0%)	1 (2.0%)	**Selected**
8	Sports rules and ethics education	44 (92.0%)	4 (8.0%)	2 (4.0%)	Selected
9	Mastery of first aid methods	45 (90.0%)	2 (4.0%)	3 (6.0%)	Selected
10	Facilities maintenance and appropriate attire	48 (96.0%)	2 (4.0%)	0 (0.0%)	Selected

The data reveal a distinct differentiation in expert evaluations:

Selected Group (8 measures): Measures related to facilities (Measure 10 - 96%), pedagogical methods (Measure 5 - 94%), and student awareness (Measure 1 - 92%) received near-unanimous consensus. This reflects a modern perspective that injury prevention is a holistic process, originating from a safe environment and correct cognitive awareness.

Excluded Group (2 measures): Measure 2 (Physical fitness enhancement - 58%): Although fitness is the cornerstone of movement, in the context of general PE for non-sports majors, emphasizing "fitness enhancement" as a primary prevention measure may lead to overtraining risks if not strictly individualized. Experts tend to prioritize technical proficiency and awareness over pure training volume for this demographic.

Measure 6 (Protective gear & self-defense maneuvers - 50%): This low rate likely stems from feasibility constraints. Requiring all students to equip themselves with specialized protective gear (such as expensive knee or ankle braces) is difficult for mass implementation. Furthermore, reliance on protective gear can create a "false sense of security," potentially prompting students to attempt higher-risk maneuvers.

3.2. Correlation Analysis between Urgency and Feasibility

Upon identifying the 08 core measures, the study conducted a deeper analysis of the relationship between practical demand (Urgency) and implementation capacity (Feasibility).

Table 3. Correlation matrix between the urgency and feasibility of the measures (n=50)

No	Prevention Measures	Mean Urgency Score ((M1)	Mean Feasibility Score (M2)	Correlation Coefficient (r)	Correlation Strength
1	Enhancing self-protection awareness	4.62	4.45	**0.80**	Strong
2	Improving technical precision	4.88	4.52	**0.89**	Very Strong
3	Optimizing warm-up protocols	4.70	4.65	**0.75**	Strong
4	Systematic instruction and load management	4.55	4.30	**0.84**	Strong
5	Enhancing post-exercise recovery	4.40	4.25	**0.78**	Strong
6	Rules of play education	4.35	4.10	**0.75**	Strong
7	Mastery of first aid methods	4.50	4.35	**0.83**	Strong
8	Facilities and attire maintenance	4.75	4.40	**0.83**	Strong

Note: r denotes Spearman's rank correlation coefficient; all values are significant at $p < 0.05$.

The statistical results indicate that all 08 measures exhibit a very high positive correlation ($r > 0.70$). This yields several significant implications:

Positive Covariation: The measures identified as most urgent (such as technical precision and facility safety) are also those deemed fully attainable by the experts within the university's current capacity. No measures fell into the category of being "Essential but Infeasible."

Technical Emphasis: The measure "Improving technical precision" yielded the highest correlation coefficient (r = 0.89). This reaffirms the central role of pedagogical methodology: providing correct technical instruction is the most effective and feasible way to protect students. Unlike infrastructure upgrades, this approach does not require heavy financial investment but instead demands high instructional competency from the faculty.

4. DISCUSSION

Based on the research findings and in comparison with international scientific literature, this section provides an in-depth analysis of the mechanisms, significance, and implementation of each group of measures, while highlighting the study's novel contributions to the Physical Education (PE) context in Vietnam.

4.1. Cognitive and Behavioral Measures

Enhancing Self-Protection Awareness: The 92% consensus rate aligns with health behavior theories, where risk perception is a prerequisite for safety-related behavior. Non-sports majors often underestimate risks or engage in hazardous behaviors due to a lack of knowledge.

Mechanism of Action: Cognitive education shifts students from a passive state to proactive risk management. When students understand the biomechanics of injury (e.g., the mechanism of an ACL tear due to improper landing), they voluntarily adjust their posture and avoid dangerous movements.

Practical Implementation: This education must be integrated into specific training sessions. Goossens et al. (2024) indicated that psychological support from instructors enhances students' intrinsic motivation for injury prevention.

Rules of Play and Sports Ethics Education: This measure (r = 0.75) addresses injuries caused by collisions and aggressive behavior. In contact sports (e.g., football, basketball), a significant proportion of injuries stem from rule violations or foul play (Dong Van Trieu & Le Anh Tho, 2000).

4.2. Professional and Technical Measures

Improving Technical Precision: This measure showed the highest correlation between urgency and feasibility (r = 0.89). In sports biomechanics, technical errors lead to abnormal force distribution across the musculoskeletal system, serving as the primary cause of both acute and chronic injuries.

Biomechanical Mechanism: Proper technique optimizes the kinetic chain, reducing the load on joints and ligaments. For instance, correct landing technique with flexed knees and a slight trunk lean helps absorb ground reaction forces, reducing ACL injury risk by up to 50%.

Pedagogical Implications: For non-sports majors, instructors should prioritize technical proficiency over intensity or performance. The motor skill acquisition process must be closely monitored to provide immediate corrective feedback, preventing the formation of ingrained faulty movement patterns.

Optimizing Warm-up Protocols: Warm-up (86% consensus) is a classic yet essential measure. Modern meta-analyses have shifted the paradigm from "static stretching" to Neuromuscular Training (NMT) programs, such as FIFA 11+.

Scientific Evidence: Structured warm-ups increase muscle temperature (improving elasticity), accelerate nerve conduction velocity, and activate the proprioceptive system. Research shows that NMT programs can reduce lower-extremity injury rates by 35–45% in youth and students.

Application: At Sai Gon University, warm-up routines should be standardized to include low-intensity running, dynamic movements, supplementary strength exercises, and balance drills, rather than simple joint rotations.

4.3. Load Management and Recovery Measures

Systematic Instruction and Load Management: The concept of "Load Management" is currently a dominant trend in sports science. Injuries often occur during sudden spikes in workload that exceed the student's cumulative chronic capacity.

Prevention Paradox: Managing training intensity is the key to prevention. However, high-intensity training, if accumulated appropriately, actually creates a protective effect for students (Gabbett, 2016).

Application: Instructors should adhere to the principle of progression and monitor students' Rating of Perceived Exertion (RPE). Curriculum design must alternate between high and low-intensity exercises to avoid localized overloading.

Enhancing Post-Exercise Recovery: Recovery (92% consensus) is the process through which the body regenerates and adapts. Insufficient recovery leads to accumulated fatigue, impaired neuromuscular coordination, and increased injury risk.

Strategies: Students should be guided in active cool-downs and static stretching to reduce lactate levels and facilitate muscle relaxation. Furthermore, educating students on the roles of sleep and nutrition is crucial, as they often have irregular lifestyle habits.

4.4. Environmental and Medical Measures

Mastery of First Aid Methods: Proper first aid knowledge is the final safeguard to minimize injury consequences. Incorrect initial handling (e.g., applying heat to a bleeding wound or massaging a sprain with oil) can exacerbate the damage.

Current Status and Solutions: Many studies indicate that first aid knowledge among both students and PE teachers remains limited. Basic first aid modules, such as the RICE/PRICE protocol (Rest, Ice, Compression, Elevation), should be integrated into the curriculum.

Facilities Maintenance and Appropriate Attire: This measure achieved the highest consensus (96%), reflecting the prerequisite role of a safe environment. Poor quality facilities (slippery or uneven surfaces) and inappropriate equipment are direct extrinsic causes of injury.

Management Responsibility: The university needs a routine maintenance schedule and safety inspections before every class. Students must be guided in selecting sport-specific footwear (e.g., firm-soled shoes for football, cushioned shoes for running) to protect the musculoskeletal system.

5. CONCLUSION

The study has successfully developed a comprehensive sports injury prevention model for students at Sai Gon University, comprising 08 core measures. The strong correlation between urgency and feasibility ($r > 0.75$) confirms the high practical viability of this model. The findings reflect a paradigm shift from passive to proactive prevention: instead of focusing solely on injury treatment, emphasis must be placed on cognitive education, technical proficiency, and scientific load management. This approach aligns with global trends in sports medicine and addresses the pressing demands of modern physical education.

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