



Identifying the Dimensions and Presenting Managerial Strategies for Improving the Status of Sports Accidents in Schools

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ABSTRACT

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Purpose: The present study aimed to identify the managerial dimensions affecting the occurrence of sports accidents in schools and to develop practical managerial strategies for improving prevention, supervision, crisis response, documentation, and follow-up processes related to school sports accidents.

Methods and Materials: This study was conducted within the interpretive–constructivist paradigm using a qualitative descriptive–analytical approach. Data were collected through semi-structured in-depth interviews and qualitative document analysis. The human participants consisted of 29 experts, including official sports experts, lawyers, judges, school principals, and university specialists in sports management, who were selected through purposive and snowball sampling. Data collection continued until theoretical saturation was achieved. In addition, 90 legal, managerial, educational, and safety-related documents were analyzed, including regulations, safety standards, ministerial directives, accident-related procedures, and supervisory documents. Data were analyzed using thematic analysis and qualitative content analysis. MAXQDA 2022 software was used for coding, classification, and organization of qualitative data.

Findings: The findings showed that weak active supervision by physical education teachers, absence of operational safety standards, non-standard sports spaces and equipment, overcrowded classes, lack of initial student health assessment, and insufficient safety education were the most influential managerial factors contributing to sports accidents in schools. The results also revealed a significant gap between the current managerial status of schools and desirable international standards in the areas of risk management, crisis management, emergency preparedness, safety documentation, and root-cause analysis. The analysis demonstrated that latent systemic conditions within higher-level educational management structures had the greatest share in the occurrence of accidents. In addition, the safety culture of most schools was found to be at an initial or emerging level, characterized by weak reporting systems, absence of safety committees, lack of organizational learning, and dominance of blame-oriented approaches. Based on the findings, a comprehensive set of managerial strategies was developed focusing on prevention, risk management, human resource empowerment, documentation systems, insurance reform, electronic accident surveillance, safety culture development, and specialized supervision.

Conclusion: The study concluded that sports accidents in schools are primarily the result of systemic managerial deficiencies rather than isolated individual failures.

Therefore, improving the status of school sports accidents requires the establishment of an integrated managerial framework based on preventive risk management, operational safety standards, compulsory staff training, systematic supervision, organizational learning, and accountability-oriented safety culture. Effective reduction of sports accidents depends on coordinated action among educational authorities, school administrators, teachers, parents, and health-related institutions.

Keywords: *School sports accidents, sports safety management, risk management, school health, crisis management, safety culture, physical education, accident prevention.*

1. Introduction

Sports participation in schools is an essential component of students' physical, social, emotional, and educational development. Physical education classes, school competitions, recreational activities, and organized extracurricular sports provide opportunities for movement competence, teamwork, health promotion, discipline, and the development of lifelong active habits. However, these benefits are accompanied by a persistent managerial challenge: the occurrence of sports accidents in school settings. School sports accidents may include falls, fractures, sprains, head injuries, dental trauma, heat-related illness, collisions, injuries caused by defective equipment, and complications resulting from delayed or inappropriate emergency response. Although injury risk cannot be completely eliminated from physical activity, schools have an institutional responsibility to identify preventable risks, reduce exposure to hazardous conditions, establish safe procedures, train staff, document incidents, and respond effectively when accidents occur. Therefore, the issue of sports accidents in schools should not be treated merely as an unavoidable by-product of physical education, but as a multidimensional managerial, educational, legal, and public health concern.

In contemporary school health discourse, safety is increasingly viewed as a core element of the educational mission rather than a secondary administrative duty. The future of school health education has been conceptualized around integrated systems that connect health literacy, prevention, environmental safety, student participation, and institutional accountability, suggesting that schools must move beyond fragmented health programs toward coherent and operational health-supportive structures (Kolbe, 2024). Similarly, school-based prevention programs in areas such as nutrition, physical activity, wellness, and health education demonstrate that the school environment is a strategic setting for reducing health risks before they become more serious problems (Nury et al., 2021; Skarbek et al., 2023). From this perspective, sports safety is not restricted to the moment of injury; it begins with curriculum design, teacher preparation, facility inspection, student education, emergency planning,

and a culture that encourages reporting and learning from unsafe conditions. The managerial significance of sports accidents in schools is therefore rooted in the fact that accidents often emerge from organizational deficiencies before they appear as individual events.

A major body of recent research has focused on concussion prevention, management, reporting, and return-to-learn procedures in secondary schools. This literature is directly relevant to school sports accidents because concussion management illustrates how a specific injury type requires coordinated policies, trained personnel, clear communication, documentation, and post-injury academic support. Studies have shown considerable variability in concussion education requirements and policy implementation, particularly across jurisdictions and school systems, which creates unequal levels of protection for students (Asgari et al., 2024). Research on school district concussion policies indicates that the presence and quality of policies are associated with concussion-related practices among students and schools, highlighting the practical value of formalized policy structures (Miller et al., 2021). At the same time, analyses of concussion-related policies in public school districts show that policy presence alone is insufficient unless it is implemented, monitored, and translated into daily practice (Miller et al., 2020). These findings suggest that the prevention and management of sports accidents depend not only on the existence of regulations but also on operational procedures, professional training, and compliance mechanisms.

The importance of implementation becomes more visible when examining the roles of school nurses, athletic directors, coaches, and administrators in concussion and injury management. Studies on concussion management policies in high schools emphasize the critical role of school nurses in identifying symptoms, coordinating communication, supporting return-to-learn processes, and ensuring continuity between health and educational systems (Hess et al., 2023). Policy analysis of return-to-learn after sports- and recreation-related concussion further demonstrates that school nurses and school-based health personnel require clear responsibilities within post-injury academic reintegration systems (Fetta et al., 2023). Consensus work

on essential elements of returning to learn after concussion also shows that recovery is not a purely medical process but an educational and managerial process involving planning, accommodation, monitoring, and stakeholder coordination (McAvoy et al., 2020). In schools where these procedures are unclear, students may return too early, injuries may be underestimated, and communication among families, teachers, administrators, and healthcare providers may remain incomplete.

Emergency preparedness is another central dimension of school sports safety. Evidence from secondary schools shows that emergency action plans, trained responders, access to medical equipment, and rehearsed procedures are critical for preventing severe outcomes after injury (Williams et al., 2021). Research on emergency preparedness in geographically remote and socioeconomically disadvantaged schools highlights that inequalities in healthcare access, distance from emergency services, and limited resources can reduce schools' capacity to respond to acute sports injuries (Roiger et al., 2025). These findings are highly relevant to national school systems in which urban and rural schools may differ substantially in facility quality, staffing, resources, and access to emergency medical support. A sports accident that might be managed quickly in a well-equipped urban school may become more serious in an under-resourced school lacking trained staff, first-aid equipment, communication protocols, or transportation arrangements. Thus, improving the status of school sports accidents requires attention to both universal safety standards and contextual inequalities among schools.

The literature on catastrophic injury prevention and state-level school health policies also underscores the need for mandatory standards and systematic oversight. State-level implementation of health and safety policies aimed at preventing sudden death and catastrophic injuries in high schools indicates that formal policy requirements can shape institutional preparedness, although implementation remains uneven across systems (Scarneo-Miller et al., 2021). More specifically, emergency planning policy requirements have been found to influence secondary school adoption of emergency action plans, demonstrating that policy design can affect school-level safety behavior (Scarneo-Miller et al., 2020). However, the mere adoption of a plan does not guarantee quality, practice, or accountability. Schools must ensure that plans are updated, communicated, rehearsed, and integrated into staff responsibilities. Therefore, the challenge is not only to require safety policies but also to build a managerial cycle that includes risk identification,

planning, training, implementation, documentation, evaluation, and revision.

Heat-related illness and environmental hazards represent another important category of school sports accidents. The implementation of heat-acclimatization guidelines in high school football has been shown to face both barriers and facilitators, including resource limitations, organizational culture, administrative support, and stakeholder knowledge (Kossmann et al., 2020). These findings are important because they show that even when scientifically supported safety guidelines exist, their effectiveness depends on the practical capacity and willingness of school systems to enforce them. Similar concerns apply to other risks in physical education, such as unsafe flooring, overcrowded classes, poor ventilation, inadequate hydration practices, and inappropriate use of equipment. Injury prevention in schools therefore requires a risk management approach that is proactive rather than reactive. Instead of responding only after an accident occurs, schools must continuously identify hazards, assess the probability and severity of harm, implement control measures, and monitor whether those controls are effective.

Sports accidents also involve communication, culture, and stakeholder relationships. Qualitative research on middle school athletes, parents, and staff has shown that sport culture and communication patterns strongly influence how risks are perceived, discussed, and reported (Kerr et al., 2023). If students fear losing playing time, if teachers fear blame, or if parents are not informed about safety procedures, injuries and near-miss events may remain hidden. Research on concussion disclosure among middle and high school youth similarly indicates that safety depends on whether students know whom to tell, whether adults are trained to receive reports, and whether the school climate supports disclosure (Wicklund et al., 2020). Studies on school concussion policy in Colorado further show that lack of knowledge and limited access to information are barriers to effective education and implementation (Wicklund & Coatsworth, 2020). These findings imply that accident management is inseparable from school culture. A blame-oriented culture discourages reporting, whereas a learning-oriented culture treats incidents and near-misses as opportunities to improve systems.

The role of administrators is especially important because school sports safety depends heavily on managerial decisions regarding staffing, facilities, supervision, budgeting, inspection, documentation, and crisis response. Research on interscholastic sports administration has

identified various administrative issues affecting school sports, including resource limitations, role ambiguity, communication problems, and competing institutional priorities (Forsyth et al., 2020). Studies of secondary school administrators' knowledge and perceptions of the athletic training profession show that athletic directors and principals may not always fully understand the scope, value, or operational significance of specialized sports health personnel (Lacy et al., 2020a, 2020b). Similarly, work on high school athletic directors' legal duties suggests that administrators must be adequately prepared to understand supervision, equipment safety, emergency planning, risk communication, and duty of care (Smith et al., 2023). These studies collectively indicate that many sports accidents are not isolated failures at the classroom level, but consequences of managerial systems that may lack training, clarity, accountability, or sufficient professional support.

The legal and policy environment surrounding school sports further reinforces the need for structured managerial action. Parents' familiarity with concussion legislation and their perceptions of such laws influence whether safety policies are understood and supported outside the school environment (Kim et al., 2022). Focus group findings from athletic directors regarding implementation of sports concussion regulations show that legal rules must be translated into feasible school routines and supported by practical guidance (O'Hara et al., 2020). The availability of injury surveillance systems and school-based concussion programs has also been shown to improve the identification, monitoring, and management of sports-related concussion, demonstrating the value of data-driven safety systems (Griffin et al., 2025). These findings support the argument that legal norms and managerial mechanisms must operate together. Regulations define duties, but management systems determine whether those duties are enacted in daily school practice.

Sports safety must also be understood as a broad educational issue that includes students' bodily awareness, injury prevention knowledge, and safe movement behavior. Postural education programs for school children, for example, demonstrate the importance of teaching students correct body mechanics and preventive health behaviors during school years (Araújo et al., 2023). Research on orofacial trauma and mouthguard use among contact sports players illustrates that specific injuries can be reduced through targeted education, protective equipment, and sports dentistry initiatives (Udayamalee et al., 2023). Studies on stakeholder perspectives regarding headgear in girls'

lacrosse further show that protective equipment decisions are shaped by perceptions of safety, sport culture, comfort, and institutional policy (Iyer & Bachynski, 2023). These examples show that the improvement of school sports safety requires both environmental controls and educational interventions. Students, teachers, parents, and administrators must all understand the nature of risk and the preventive measures appropriate to different activities.

The concept of safe school sport also intersects with broader questions of inclusion, access, and the physical school environment. Research on shared use of school play spaces indicates that school administrators' knowledge and perceptions influence how school facilities are opened, managed, and regulated for physical activity (Spengler & Stasi, 2020). Studies on school mobility among autistic students show that educational environments must consider diverse student needs, transitions, vulnerabilities, and support systems (Mitchelson et al., 2022). Although this literature is not limited to sports accidents, it is relevant because students differ in physical, sensory, developmental, and health-related characteristics that may affect their exposure to risk and their need for supervision or adaptation. A safety-oriented school sports system should therefore include initial health assessments, inclusive planning, individualized precautions where necessary, and coordination with families and health professionals.

Managerial best practices in coaching and sports leadership also provide useful insight into the prevention of school sports accidents. Phenomenological research on successful coaches has emphasized the importance of leadership, preparation, discipline, communication, athlete-centered attention, and reflective practice in effective coaching environments (Cacayan & Villocino, 2024). A public health lens in athletic training education similarly stresses that sports health professionals should be prepared not only to treat injuries but also to understand prevention, population-level risk, and systems-based safety (Hoffman et al., 2020). These perspectives are directly applicable to schools, where physical education teachers and coaches function as frontline safety agents. Their responsibilities include not only instruction but also risk anticipation, environmental monitoring, student guidance, emergency response, and reporting.

The diversity of school health and safety literature also suggests that lessons can be drawn from other educational risk domains. For example, water management education research demonstrates that sustainable safety-related education requires attention to policy, infrastructure, local

context, and capacity building (Nalumenya et al., 2023). School health questionnaire reliability studies show the importance of valid and consistent data collection tools for assessing school practices and identifying areas needing improvement (Jones et al., 2024). These insights are important for school sports accidents because many systems lack standardized reporting forms, inspection checklists, and national databases for accident surveillance. Without reliable data, policymakers and school managers cannot determine the most frequent accident types, high-risk locations, recurring managerial failures, or the effectiveness of preventive interventions.

In many school systems, sports accidents continue to be addressed through fragmented and reactive mechanisms: a teacher responds to the injured student, the principal informs parents, insurance procedures begin, and the incident gradually disappears from institutional memory. This approach leaves deeper causes unexamined. It does not ask whether the class was overcrowded, whether equipment was inspected, whether the teacher had received recent safety training, whether the student had a known medical condition, whether a similar near-miss had occurred before, or whether the school had a functioning emergency action plan. The current body of research shows that effective sports safety requires a systemic model composed of prevention, preparedness, immediate response, recovery, documentation, root-cause analysis, and organizational learning (Griffin et al., 2025; Scarneo-Miller et al., 2021; Williams et al., 2021). Therefore, identifying the dimensions of sports accidents in schools is a necessary step toward designing managerial strategies that shift school systems from blame and compensation toward prevention and continuous improvement.

Given the educational, managerial, legal, and public health significance of this issue, the aim of the present study was to identify the key dimensions of sports accidents in schools and to present managerial strategies for improving the prevention, management, documentation, and follow-up of such accidents in the country's schools.

2. Methods and Materials

2.1. Study Design and Participants

This study was conducted within the interpretive–constructivist paradigm, which assumes that social and managerial realities are not objective and fixed entities but are constructed through human interactions, subjective interpretations, and shared meanings. Since the primary aim

of the research was to achieve an in-depth understanding of the dimensions of sports accidents in schools and to identify effective managerial strategies for improving existing conditions, the interpretive qualitative framework provided an appropriate philosophical foundation for exploring the experiences, perceptions, and interpretations of key stakeholders involved in school sports environments. Accordingly, a qualitative research approach was adopted because of its exploratory and interpretive nature and its suitability for examining complex phenomena within their natural contexts. Unlike quantitative approaches that focus on statistical generalization and numerical measurement, the present study sought to obtain a rich and contextualized understanding of the managerial, organizational, safety-related, and preventive dimensions associated with sports accidents in schools through the experiences and viewpoints of knowledgeable participants and the analysis of relevant documents.

In terms of purpose, the study was applied research because it aimed to provide practical managerial solutions for improving the prevention and management of sports accidents in schools. From the perspective of methodological orientation, the research was descriptive–analytical and employed qualitative thematic analysis and qualitative content analysis as complementary strategies for data interpretation. Data were collected through two parallel and interconnected sources, including semi-structured in-depth interviews and document analysis. This methodological triangulation enhanced the comprehensiveness and credibility of the findings by allowing the comparison and integration of different forms of qualitative evidence.

The spatial scope of the study was limited to Iran, and the participants were selected from experts and practitioners directly involved in school sports safety and management. The human research population consisted of four groups of participants, including sports management specialists, school principals, legal and judicial experts familiar with school sports incidents, and professionals involved in sports safety and risk management. Participants were selected through purposive sampling based on predefined inclusion criteria such as professional experience, academic expertise, and direct involvement with school sports accidents or sports safety management. Snowball sampling was also employed to identify additional knowledgeable participants through referrals from initial interviewees, particularly for accessing highly specialized experts.

The final human sample included 24 participants who possessed substantial professional experience in areas related to school sports management, sports safety, crisis management, educational administration, and accident prevention. Sampling continued until theoretical saturation was achieved, meaning that no new themes or conceptual insights emerged from subsequent interviews. The process of reaching saturation occurred progressively as recurring concepts and patterns became evident across participant responses. Interviews were conducted during the second half of 2024 and the first quarter of 2025. Each interview lasted between 60 and 120 minutes and was conducted either face-to-face or through secure online communication platforms depending on participant accessibility and logistical conditions.

In addition to human participants, the study also incorporated a documentary research population composed of approximately 90 relevant documents. These documents included educational regulations, school safety guidelines, sports facility standards, ministerial directives, accident reporting procedures, insurance-related documents, risk management protocols, and national and international standards associated with sports safety in educational environments. The documentary sources were selected purposively based on their direct relevance to the management, prevention, and control of sports accidents in schools.

2.2. Data Collection Tools

Data collection in this study relied on two principal qualitative instruments designed specifically in accordance with the objectives and conceptual framework of the research. The first instrument was a semi-structured interview guide developed to explore participants' experiences, perceptions, and recommendations regarding the dimensions and management of sports accidents in schools. The interview guide was prepared based on the theoretical foundations of risk management, school safety management, crisis management, and sports administration, as well as the central objectives of identifying accident-related dimensions and proposing managerial improvement strategies.

The interview guide contained 15 open-ended main questions organized around several major thematic areas, including factors contributing to sports accidents in schools, managerial weaknesses and challenges in sports safety systems, human resource issues related to physical education

teachers and school staff, risk management practices, safety standards for sports facilities and equipment, crisis management procedures before and after accidents, reporting and monitoring systems, and proposed managerial strategies for reducing accident occurrence and improving school safety conditions. Follow-up and probing questions were used during interviews whenever additional clarification or deeper explanations were required. The open-ended structure of the interviews enabled participants to provide detailed and experience-based responses and allowed the researcher to capture nuanced managerial and organizational perspectives regarding school sports accidents.

The second data collection instrument was a document analysis checklist designed to systematically extract and categorize information from the selected documentary sources. The checklist included categories such as document type, publication year, issuing organization, major provisions related to school sports safety, managerial responsibilities, accident prevention measures, identified weaknesses, implementation challenges, and suggested improvement mechanisms. The checklist facilitated a structured and consistent review of official documents, safety protocols, educational regulations, standards, and managerial guidelines related to sports accident prevention and management in schools.

To establish the validity of the research instruments, several qualitative validation procedures were implemented. Content validity was assessed through expert review by university professors and specialists in sports management, educational administration, and qualitative research methodology. The interview guide and document analysis checklist were revised based on their feedback regarding clarity, comprehensiveness, and relevance to the research objectives. Face validity was also evaluated through pilot testing. A preliminary interview was conducted with an experienced specialist who was not included in the final sample, and necessary modifications were applied to improve question clarity and sequencing. Similarly, several documents were analyzed on a trial basis to refine the document analysis checklist and ensure the adequacy of coding categories.

The credibility and trustworthiness of the study were further strengthened through methodological triangulation, participant diversity, prolonged engagement with the data, and peer review procedures. Member checking was used by discussing interpretations and preliminary findings with

selected participants to confirm the accuracy and consistency of the extracted meanings and themes.

2.3. Data Analysis

The collected data from interviews and documentary sources were analyzed using thematic analysis and qualitative content analysis. Interview data were analyzed based on the six-step thematic analysis procedure proposed by Virginia Braun and Victoria Clarke. Initially, all interviews were transcribed verbatim and reviewed multiple times to achieve deep familiarity with the data. During the second stage, meaningful statements and relevant textual segments were identified and assigned initial codes. More than 340 initial codes were extracted from the interview transcripts.

In the subsequent stage, related codes were grouped together to form preliminary themes and subthemes associated with the dimensions of sports accidents and managerial improvement strategies in schools. These themes were then reviewed, refined, and compared to ensure internal consistency and conceptual distinction. Through continuous comparison and analytical reflection, the themes were finalized and clearly defined to represent the core dimensions emerging from the participants' experiences and viewpoints.

The documentary data were analyzed through inductive qualitative content analysis. Relevant concepts, managerial patterns, safety procedures, implementation gaps, and institutional weaknesses were identified and categorized systematically. The integration of findings from interviews and documents enabled the researcher to compare formal regulations and standards with the practical experiences and observations of experts and practitioners. This triangulation

process contributed to a more comprehensive understanding of the current status of sports accidents in schools and facilitated the development of practical and evidence-based managerial strategies.

To facilitate the organization, coding, retrieval, and analysis of qualitative data, the software MAXQDA was used throughout the analytical process. The software assisted in managing interview transcripts, coding textual data, organizing thematic categories, and generating analytical reports. However, all interpretations and final thematic constructions were conducted by the researcher within the conceptual and theoretical framework of the study.

3. Findings and Results

The participants consisted of 29 experts in five professional groups: 12 official experts, 4 lawyers, 5 judges, 4 school principals, and 4 university professors in sports management. In terms of gender, 20 participants were male and 9 were female. The participants' age ranged from 35 to 70 years, with most falling between 40 and 55 years. Regarding educational level, 15 participants held doctoral degrees and 14 held master's degrees or equivalent professional qualifications. Their areas of expertise included sports management, sports medicine, sports engineering, sports pathology, sports psychology, HSE, sports physiology, sports insurance, private law, medical law, administrative law, criminal law, judicial law, child law, educational management, crisis management, risk management, sports law, and sports equipment safety. Their professional experience ranged from 8 to 35 years, indicating that the sample included experienced specialists with substantial knowledge of school sports accidents, risk management, safety, and related legal-managerial issues.

Table 1

Classification of Managerial Factors Affecting the Occurrence of Sports Accidents in Schools

Factor Category	Concrete Examples in Schools	Impact Intensity	Relative Frequency
Weak active supervision by the teacher	Leaving the class, using a mobile phone, passive supervision	Very high	More than 80%
Absence of operational safety standards	Lack of inspection checklists, absence of written safety guidelines	High	About 75%
Non-standard sports spaces and equipment	Inappropriate flooring, worn-out equipment, improper installation	High	About 65%
Inappropriate student density	Ratios of 1:45 or higher, compared with the global standard of 1:25 to 1:30	Moderate to high	About 50%
Lack of initial health assessment	Failure to complete health forms, absence of student screening	Moderate	About 80%
Weakness in teaching movements and safety rules	Incorrect instruction of risky movements, insufficient safety warnings	Moderate	About 60%

The results in Table 1 show that weak active supervision by physical education teachers was the most important managerial factor affecting school sports accidents, with a relative frequency of more than 80% and a very high level

of impact. This weakness appeared in forms such as leaving the sports class unattended, using a mobile phone or engaging in unrelated activities during class, and merely observing students without preventive intervention. The

absence of operational safety standards ranked second, with a frequency of about 75%, indicating that many schools lacked written inspection checklists, clear safety guidelines, and formal accident-response protocols. Non-standard sports spaces and equipment, with a frequency of about 65%, and inappropriate student density, with a frequency of about

50%, were also among the major accident-generating conditions. A notable finding was that the lack of initial health assessment had a very high frequency of about 80%, although its impact intensity was assessed as moderate. This indicates a systematic neglect of a simple but essential preventive procedure.

Table 2

Current and Desirable Status of Key Managerial Protocols

Protocol or Procedure	Current Status in Iranian Schools	Desirable Status Based on Global Standards	Existing Gap
Risk management protocol	No written protocol; at most 15% of schools have informal checklists	Four-stage cycle: risk identification, risk assessment, risk control, and risk monitoring	Very high
Crisis management protocol	Only 30% of schools have incomplete protocols, mostly focused on post-accident actions	Three stages: preparedness/prevention, response during the accident, and recovery after the accident	Very high
Safety performance evaluation procedure	Sports safety has no role in the evaluation of principals and teachers in 95% of schools	Safety as one of the main indicators of performance evaluation	Very high
Safety inspection procedure	Annual and occasional inspections; 70% of identified defects are not corrected	Seasonal inspections using standard checklists and follow-up of corrective actions	High
Accident documentation procedure	75% of schools lack standard accident-reporting forms; documentation is not performed	Standard form with more than 20 information fields, photos/videos, and witness statements	Very high
Root-cause accident analysis procedure	90% of schools do not perform any root-cause analysis	Accident investigation team, analysis of causes rather than blame, and preventive recommendations	Very high
Crisis communication procedure	50% of schools have no protocol for informing families and authorities	Clear communication chain: teacher → principal → district office → family	High

As shown in Table 2, there is a deep gap between the current situation of Iranian schools and desirable managerial standards. In risk management, schools generally lack the four-stage cycle of risk identification, assessment, control, and monitoring, and instead rely on informal and inconsistent practices. In crisis management, the existing protocols in approximately 30% of schools are incomplete and mainly focused on post-accident compensation rather than preparedness, prevention, immediate response, and

organizational learning. The most serious gaps were observed in accident documentation and root-cause analysis. About 75% of schools did not have a standard accident-reporting form, and 90% did not conduct root-cause analysis to learn from accidents and prevent recurrence. Moreover, sports safety had no role in the performance evaluation of principals and teachers in 95% of schools, which reduces managerial motivation to comply with safety requirements.

Table 3

Assessment of the Adequacy of Managerial and Supervisory Frameworks

Framework Level	Current Status	Main Weaknesses	Negative Effects
Higher-level laws and ministerial regulations	Scattered, general, and non-operational	Absence of a specific school sports safety law; lack of mandatory national standards	Poor alignment with field realities
Internal school regulations	Non-existent or highly general	No clear division of duties among principal, teacher, and supervisor; lack of objective indicators	Ambiguity in safety responsibilities
Implementation supervision framework	Occasional and formalistic supervision	Absence of specialized safety supervisors in educational districts; annual inspections only	Discretionary implementation and unresolved defects
Training and empowerment framework	Optional and irregular training courses	No compulsory training in risk management and first aid	Weakness in selection and empowerment of human resources
Safety budgeting framework	No independent budget for safety	Safety costs covered through current expenditures with low priority	Continued use of non-standard equipment
Teacher qualification assessment framework	Absence of practical safety competency tests	No technical safety qualification assessment for temporary or hourly instructors	Professional inadequacy among some teachers

Teacher-to-student ratio framework	No legally defined maximum	No statutory maximum ratio; high class density in practice	Excessive workload and inadequate supervision
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Table 3 indicates that the current system suffers from deep structural weaknesses in managerial, supervisory, and planning frameworks. At the level of higher-level laws and regulations, the absence of a specific law on school sports safety is evident, and the existing regulations lack objective and operational indicators. At the supervisory level, the absence of specialized safety supervisors in educational districts and the formalistic nature of periodic inspections cause many identified defects to remain unresolved. In human resource management, the lack of compulsory and continuous training in risk management and first aid, together with the absence of practical safety competency testing for physical education teachers, particularly temporary instructors, represents a major managerial deficiency. The absence of a legal ceiling for the teacher-to-student ratio and the lack of an independent budget for sports safety further increase the likelihood of accidents.

The analysis of managerial fault distribution showed that responsibility for sports accidents in schools is not limited to the direct actions of the physical education teacher or the school principal. The Ministry of Education had the highest estimated share of managerial fault, approximately 40% to 50%, because of its systemic responsibilities in developing standards, allocating budgets, and exercising macro-level supervision. This fault reflects first-layer latent conditions, including the absence of mandatory national standards, weak macro-supervision, inadequate safety budgeting, and the lack of compulsory teacher training programs. District or regional education offices accounted for approximately 10% to 15% of managerial fault because of their intermediary supervisory role in monitoring schools, providing resources, and following up identified defects. School principals accounted for approximately 15% to 20% because of their responsibility for implementing standards, providing a safe environment, and managing school-level safety budgets. Physical education teachers also accounted for

approximately 15% to 20% because of their direct frontline responsibility for supervising students, teaching safe movements, and responding to accidents. Parents accounted for approximately 5% to 10% through their complementary responsibility to inform schools of students' special medical conditions and reinforce safety education at home. Contractors and sports equipment suppliers also accounted for approximately 5% to 10% because of their technical and contractual responsibility for standard equipment supply, installation, maintenance, and repair. This distribution shows that many failures attributed to principals and teachers are rooted in latent systemic conditions rather than purely individual negligence.

The assessment of safety culture also showed that most schools are at an initial or emerging level of safety maturity. Leadership commitment to safety was assessed at level 2, because about 60% of principals perceived safety as an obstacle to accelerating the curriculum. The existence of safety committees was assessed at level 1, because 85% of schools lacked any formal safety committee. Near-miss reporting culture was also at level 1, as 95% of teachers did not report near-miss incidents. Organizational learning from accidents remained at level 1 because 90% of schools did not conduct root-cause analysis or disseminate lessons learned. The role of parent-teacher associations was assessed at level 2, since 70% of these associations had no role in monitoring sports safety. Safety reward and sanction systems were at level 1, because 90% of schools lacked any reward or corrective feedback mechanism related to safety. The culture of accountability versus blame was also at level 1, as 75% of principals tended to search for an individual culprit when faced with a safety defect rather than investigating systemic causes. Student awareness and participation in safety were also at level 1, since 80% of schools did not provide any safety education program for students.

Table 4

Managerial Strategies for Improving the Status of Sports Accidents in Schools

Stage	Strategy Area	No.	Strategic Action	Implementation Details	Proposed Responsible Body	Measurable Output
Prevention	Risk and safety management	1	Design and implement a four-stage risk management cycle in all schools	Establish regular identification, assessment, control, and monitoring of risks in school sports spaces, equipment, and activities	Ministry of Education, General Office of Physical Education	30% reduction in preventable accidents within 2 years
Prevention	Risk and safety management	2	Develop and issue a standard safety inspection checklist for sports spaces and equipment	National checklist covering flooring, walls, lighting, ventilation, fixed and movable equipment, and teacher-to-student ratio	Ministry of Education; School Renovation Organization	Checklist available in 100% of schools by the end of the first year
Prevention	Risk and safety management	3	Enforce standard teacher-to-student ratios	Legal ceiling of 1:25 in elementary schools and 1:30 in secondary schools	Ministry of Education; Administrative and Employment Affairs Organization	Reduction of density to below 1:30 in 80% of schools within 3 years
Prevention	Risk and safety management	4	Mandatory standardization of gym and schoolyard flooring	Replace worn asphalt, concrete, and slippery tiles with shock-absorbing and friction-appropriate flooring	School Renovation Organization; Ministry of Education	40% reduction in fall-related injuries
Prevention	Human resource management	5	Implement compulsory annual empowerment programs for physical education teachers	Training in risk management, first aid, CPR, sports law, and safety standards as a condition for renewing teaching authorization	Ministry of Education; Farhangian University	100% of physical education teachers certified within 2 years
Prevention	Human resource management	6	Create a practical safety competency assessment system for physical education teachers	Practical safety tests at recruitment and periodic reassessment every 3 years	Ministry of Education; National Organization of Educational Testing	Removal of unqualified teachers from sports instruction
Prevention	Human resource management	7	Require initial health assessment forms for all students	Screening of health conditions, special diseases, injury history, and physical limitations before the school year	Ministry of Education; Ministry of Health	Health forms completed for 100% of students
Prevention	Managerial frameworks	8	Develop clear safety duty guidelines for principals, teachers, and supervisors	Precise separation of duties and authority during prevention, accident response, and post-accident follow-up	Ministry of Education	50% reduction in duty ambiguity
Prevention	Managerial frameworks	9	Allocate an independent annual budget for school sports safety	Specific budget for standardizing spaces, purchasing equipment, and teacher training	Plan and Budget Organization; Ministry of Education	Safety budget increased to 5% of total physical education credits
Prevention	Managerial frameworks	10	Establish a sports safety committee in every school	Committee including principal, physical education teacher, parent representative, and student representative; monthly meetings	School principals	Committees established in 100% of schools within 1 year
During accident	Crisis management	11	Develop and issue a comprehensive three-stage crisis management protocol	Protocol covering preparedness, immediate response, and recovery with clear operational steps	Ministry of Education; National Crisis Management Organization	Protocol available in 100% of schools within 1 year
During accident	Crisis management	12	Equip all sports spaces with standard first-aid kits	Kits including bandages, disinfectants, artificial ice, splints, disposable gloves, and instruction booklet	School Renovation Organization; Ministry of Education	100% of sports spaces equipped within 1 year
During accident	Crisis management	13	Train all physical education teachers in immediate crisis response	Training in initial injury assessment, emergency contact, accurate reporting, and pre-ambulance actions	Ministry of Education; National Emergency Organization	20% reduction in secondary injury complications
Post-accident follow-up	Documentation and analysis	14	Design and mandate a standard accident-reporting form	Form with more than 20 fields including accident information, probable causes, actions taken, witnesses, environmental conditions, photos/videos	Ministry of Education	Form completed for 100% of reported accidents
Post-accident follow-up	Documentation and analysis	15	Establish a root-cause accident analysis procedure in schools	Accident review team formed within 72 hours, including principal, teacher, and expert; analysis of systemic causes rather than individual blame	Ministry of Education; school principals	Root-cause analysis conducted for 100% of severe accidents

Post-accident follow-up	Insurance system	16	Provide 100% civil liability insurance coverage for physical education teachers	Mandatory insurance for all official, contractual, and hourly teachers with sufficient liability ceiling of at least 200 million tomans	Ministry of Education; Central Insurance Organization	100% coverage of physical education teachers within 1 year
Post-accident follow-up	Insurance system	17	Increase the liability ceiling of student accident insurance	Full coverage of severe treatment costs, including fractures, surgery, rehabilitation, and disability without restrictive ceilings	Ministry of Education; Health Insurance Organization	50% reduction in costs outside insurance coverage
Post-accident follow-up	Insurance system	18	Simplify and shorten the insurance compensation process	Reduce payment time to less than 1 month, minimize documents, and enable online tracking	Central Insurance Organization; insurance companies	Compensation time reduced from 6 months to 1 month
Post-accident follow-up	Accident registration system	19	Create a national electronic system for registering and monitoring school sports accidents	Electronic registration of all accidents, including minor incidents and near-misses, with injury pattern analysis and annual reporting capacity	Ministry of Education in cooperation with Ministry of Health	System launched by the end of the first year
Post-accident follow-up	Accident registration system	20	Develop a no-blame reporting culture	Guarantee job security for reporting teachers, focus on learning rather than punishment, and reward reporters	Ministry of Education; school principals	Reporting rate increased to 80% within 2 years
Post-accident follow-up	Accident registration system	21	Publish an annual report on school sports accident patterns	Analyze system data, identify high-risk points, and provide feedback to schools and policymakers	Ministry of Education	Regular annual report published
Cultural-organizational	Safety culture	22	Shift from a blame culture to an accountability culture	Train principals to search for systemic causes of error instead of individual culprits and eliminate ineffective punishments	Ministry of Education; Management and Planning Organization	50% reduction in blame-oriented approaches within 3 years
Cultural-organizational	Safety culture	23	Design and implement a safety reward system	Reward schools with the lowest accident rates, recognize reporting teachers, and grant annual awards	Ministry of Education	Increased motivation to comply with safety standards
Cultural-organizational	Safety culture	24	Improve safety culture maturity from level 1 to level 3	Three-year plan including safety committee formation, systematic reporting, and organizational learning	School principals; Ministry of Education	Safety culture upgraded to level 3
Cultural-organizational	Public education	25	Include safety and sports law education in physical education textbooks	Age-appropriate content on inherent sports risks, safety rules, and reporting methods	Educational Research and Planning Organization	Safety education provided to 100% of students
Cultural-organizational	Social supervision	26	Activate the role of parent-teacher associations in sports safety supervision	Safety committee within parent-teacher associations, monitoring visits, and reports to the principal and district office	Ministry of Education; parent-teacher associations	50% of parent-teacher associations involved in safety monitoring
Supervision and evaluation	Safety inspection	27	Appoint specialized sports safety supervisors in educational districts	Recruit and train technically and legally qualified supervisors for continuous inspection of school sports spaces and equipment	Ministry of Education, General Office of Physical Education	At least 1 specialized safety supervisor in each district
Supervision and evaluation	Safety inspection	28	Conduct standard seasonal inspections using a unified checklist	Seasonal inspections, registration of defects in the system, deadlines for correction, and reinspection	Specialized district safety supervisors	70% reduction in identified defects
Supervision and evaluation	Performance evaluation	29	Add a sports safety indicator to the performance evaluation forms of principals and teachers	Safety as a main indicator, accounting for at least 20% of the annual evaluation score	Ministry of Education; Administrative and Employment Affairs Organization	Increased motivation to comply with safety standards
Supervision and evaluation	Defect follow-up	30	Create effective enforcement mechanisms for correcting safety defects	Written warnings, temporary suspension of sports activities, score reduction for principals, and penalties for repeated defects	Ministry of Education; General Inspection Organization	80% reduction in recurring defects

Overall, the findings indicate that sports accidents in schools are not merely the result of individual negligence by teachers or principals but are produced through a combination of active errors and latent systemic weaknesses. The most critical managerial problems include weak active supervision, lack of standard protocols, insufficient

documentation, absence of root-cause analysis, poor safety culture, inadequate teacher training, non-standard facilities and equipment, high student density, and weak supervisory enforcement. Therefore, improvement requires a comprehensive managerial model that moves from prevention to immediate crisis response and post-accident

organizational learning. The proposed strategies emphasize standardization, human resource empowerment, risk management, safety budgeting, electronic accident registration, insurance reform, parent participation, specialized supervision, and the institutionalization of a learning-oriented safety culture.

4. Discussion and Conclusion

The findings of the present study showed that sports accidents in schools are not isolated or accidental events caused only by the immediate behavior of students or physical education teachers; rather, they are the outcome of a multilayered managerial system in which supervision, facility safety, risk management, teacher competence, emergency preparedness, documentation, insurance, reporting culture, and institutional accountability interact with one another. The first major finding indicated that weak active supervision by physical education teachers, absence of operational safety standards, non-standard sports spaces and equipment, inappropriate student density, lack of initial health assessment, and insufficient safety instruction were the most important managerial factors contributing to sports accidents in schools. This finding is consistent with studies emphasizing that school sport safety depends on structured supervision, clear administrative responsibility, and informed professional action rather than informal or experience-based practice alone (Forsyth et al., 2020; Smith et al., 2023). When teachers are physically present but do not actively monitor movement quality, spacing, equipment use, student fatigue, or risky peer interactions, supervision becomes passive and loses its preventive function. This result also aligns with research on sport culture and communication in school settings, which shows that safety-related behaviors are shaped by how students, parents, teachers, and staff communicate about risk, injury, and responsibility (Kerr et al., 2023). Therefore, the high frequency of weak supervision in the current study should be interpreted not only as an individual teacher problem but also as a reflection of insufficient organizational expectations, lack of monitoring standards, and weak safety culture.

Another important result was the wide gap between current school practices and desirable managerial protocols. Schools were found to lack systematic risk management cycles, comprehensive crisis management protocols, standardized accident documentation, and root-cause analysis procedures. These findings are strongly supported

by previous research on emergency preparedness and school sports injury management. Williams et al. showed that emergency preparedness in secondary schools requires explicit policies and procedures rather than improvised reactions after injury (Williams et al., 2021). Scarneo-Miller et al. also found that policy requirements influence whether secondary schools adopt emergency action plans, indicating that formal managerial requirements can shape actual safety behavior (Scarneo-Miller et al., 2020). However, the findings of the present study indicate that even when some schools have partial crisis protocols, these protocols are mostly focused on post-accident response and compensation, while prevention, preparedness, recovery, and learning are neglected. This pattern is also consistent with the literature on concussion regulation and return-to-learn policies, where effective management requires early identification, communication, monitoring, and academic reintegration, not merely post-injury documentation (Fetta et al., 2023; McAvoy et al., 2020). Thus, the absence of a complete crisis cycle in schools can increase the probability that accidents are repeated because the system does not learn from previous incidents.

The finding that accident documentation and root-cause analysis are among the weakest managerial procedures is particularly significant. In this study, most schools lacked standard accident-reporting forms, and root-cause analysis was rarely performed. This result is consistent with injury surveillance research showing that schools need reliable systems for recording, tracking, and analyzing sports injuries in order to identify patterns and improve prevention policies (Griffin et al., 2025). Without documentation, schools cannot determine whether accidents are concentrated in certain spaces, sports, age groups, seasons, equipment types, or supervision conditions. Similarly, without root-cause analysis, responsibility remains limited to blaming the nearest individual instead of identifying systemic causes. The importance of reliable data systems is also supported by studies on school health questionnaires and surveillance tools, which emphasize that valid and consistent data collection is necessary for assessing school practices and designing evidence-based interventions (Jones et al., 2024). Therefore, the lack of documentation in the present study represents more than an administrative weakness; it is a barrier to organizational learning, policymaking, and accountability.

The results also showed that existing managerial and supervisory frameworks are structurally inadequate. Higher-level regulations were found to be scattered, general, and

non-operational; internal school regulations were either absent or vague; implementation supervision was mostly formalistic; safety budgeting was not independent; teacher qualification assessment lacked practical safety testing; and the teacher-to-student ratio was not legally limited. These findings are aligned with research showing that school sport safety depends heavily on administrative knowledge, legal awareness, resource allocation, and professional support (Lacy et al., 2020a, 2020b). Smith et al. similarly demonstrated that athletic directors need adequate preparation regarding legal duties, supervision, equipment safety, and emergency planning (Smith et al., 2023). The present findings extend this argument to the school system as a whole by showing that even competent teachers may be unable to ensure safety when the institutional framework lacks clear duties, resources, enforceable standards, and specialized supervision. In this respect, the weakness of safety budgeting is especially important because non-standard flooring, worn equipment, and poor maintenance cannot be corrected through teacher commitment alone. These deficiencies require planning, funding, inspection, and enforcement at higher administrative levels.

The managerial fault analysis demonstrated that the Ministry of Education and other upper-level institutions carry the largest share of systemic responsibility because they are responsible for national standards, budget allocation, macro-supervision, and compulsory teacher training. This finding is compatible with the broader public health approach to sports safety, which views injuries not simply as individual events but as preventable outcomes shaped by systems, policies, environments, and organizational culture (Hoffman et al., 2020). Studies on state-level implementation of health and safety policies for preventing catastrophic injuries in high schools also show that macro-level policy and oversight play a central role in determining school-level preparedness (Scarnio-Miller et al., 2021). The present results therefore challenge approaches that focus only on punishing the teacher or principal after an accident. Although teachers and principals have direct duties, many failures at the school level are rooted in latent conditions such as lack of national standards, lack of safety budgets, absence of mandatory training, and weak district supervision. This interpretation is also consistent with research showing that barriers to implementing heat-acclimatization guidelines include organizational and administrative limitations, not only individual non-compliance (Kossman et al., 2020).

The results concerning safety culture revealed that most schools are at an initial or emerging level of maturity. Schools often lacked safety committees, near-miss reporting systems, reward mechanisms, student safety education, and a learning-oriented response to accidents. This finding is consistent with studies showing that injury reporting and disclosure are strongly influenced by school culture, communication pathways, and trust among students and adults (Kerr et al., 2023; Wicklund et al., 2020). When teachers fear punishment, they may avoid reporting near-misses; when students fear exclusion or blame, they may conceal pain or injury; and when principals treat accidents as threats to school reputation, they may minimize documentation. Wicklund and colleagues also showed that lack of knowledge and access to concussion policy education can become a barrier to effective implementation (Wicklund & Coatsworth, 2020). Therefore, improving school sports safety requires movement from a blame culture to a reporting and learning culture. In such a culture, near-misses are not ignored, incident reports are not treated as accusations, and accident analysis is used to redesign unsafe conditions.

The proposed managerial strategies in this study, including the establishment of a four-stage risk management cycle, standard inspection checklists, teacher training, practical safety qualification tests, initial student health assessment, safety committees, crisis protocols, first-aid equipment, accident-reporting forms, root-cause analysis, insurance reform, electronic accident registration, and specialized district-level safety supervisors, are consistent with the evidence base in school sport safety and health promotion. Research on emergency preparedness supports the need for written protocols, equipment access, and trained responders (Roiger et al., 2025; Williams et al., 2021). Concussion management studies support the need for clear return-to-learn and communication pathways involving school personnel, families, and health professionals (Fetta et al., 2023; Hess et al., 2023). Studies on parents' familiarity with concussion legislation also show that family knowledge and participation are important for effective implementation of safety policies (Kim et al., 2022). Accordingly, the activation of parent-teacher associations in sports safety supervision, as proposed in the present study, is supported by the broader literature on stakeholder participation in student health and safety.

The findings also support the need for student-centered safety education. The proposed inclusion of safety and sports law education in physical education textbooks is consistent

with evidence that school children can benefit from preventive education related to posture, safe movement, and body awareness (Araújo et al., 2023). It is also compatible with research on specific injury prevention practices, such as mouthguard use in contact sports and stakeholder views on protective headgear, which show that protective behavior depends on awareness, acceptance, and institutional support (Iyer & Bachynski, 2023; Udayamalee et al., 2023). Moreover, the literature on school health education suggests that safety education should be embedded in the broader health mission of schools rather than treated as occasional warning messages (Kolbe, 2024). Therefore, students should not be passive recipients of supervision; they should be trained to recognize unsafe conditions, follow activity rules, report hazards, and understand the shared nature of safety.

Finally, the emphasis on teacher and coach empowerment in the present study is supported by research on effective coaching practices and athletic training education. Successful coaches rely on preparation, communication, discipline, reflective practice, and athlete-centered management (Cacayan & Villocino, 2024). Similarly, the public health orientation in athletic training highlights the importance of prevention, systems thinking, and population-level injury reduction (Hoffman et al., 2020). In school settings, physical education teachers should therefore be trained not only in sport instruction but also in risk assessment, emergency response, first aid, student screening, legal duties, and documentation. The present findings also show that such training should not be optional or irregular; it must be compulsory, recurrent, competency-based, and connected to teacher evaluation. This recommendation is further supported by research on school health and wellness, which emphasizes the importance of structured, sustainable, and institutionally supported interventions rather than short-term or fragmented activities (Nury et al., 2021; Skarbek et al., 2023). Overall, the findings indicate that improving the status of sports accidents in schools requires a comprehensive managerial model that connects prevention, supervision, emergency response, reporting, insurance, accountability, and organizational learning.

The present study was qualitative and relied on interviews with selected experts and analysis of relevant documents; therefore, the findings provide deep conceptual and managerial understanding but are not intended for statistical generalization to all schools. Some participants may have emphasized problems based on their professional background, and access to some official accident records,

internal school reports, or unpublished administrative documents may have been limited. In addition, the study examined the issue at the national level and did not separately compare schools by province, gender, school type, socioeconomic status, urban-rural location, or level of available sports facilities.

Future studies should examine sports accidents in schools through mixed-methods designs that combine qualitative interviews with national accident data, school surveys, and direct field observations. Comparative studies can also be conducted across provinces, public and private schools, elementary and secondary levels, and schools with different facility conditions. Future researchers should design and test practical safety checklists, teacher competency assessment tools, electronic accident-reporting systems, and school-based risk management models, and then evaluate their effectiveness in reducing accident frequency and severity over time.

Educational authorities should move from a reactive and blame-oriented approach to a preventive and system-oriented model of school sports safety. Schools need mandatory safety committees, standard inspection checklists, trained physical education teachers, clear crisis protocols, adequate first-aid equipment, systematic accident documentation, and root-cause analysis after serious incidents. At the policy level, school sports safety should be included in the performance evaluation of principals and teachers, an independent safety budget should be allocated, and specialized district-level supervisors should monitor the correction of safety defects.

Authors' Contributions

Authors equally contributed to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

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Declaration of Interest

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