

Innovative Research on Risk Prevention and Control and Response Strategies for School Sports Safety

YueLong Chen

Xi'an No. 83 Middle School, Xi'an, Shaanxi, China

Abstract: School sports safety is the cornerstone for ensuring the normal conduct of educational activities and the physical and mental health of students. This research focuses on the systematic prevention and control of school sports safety risks and strategic innovation, aiming to build a more scientific, proactive and efficient management system. The research first conducts multi-dimensional identification and cause analysis of school sports safety risks, and introduces a quantitative assessment model to achieve dynamic risk classification management. Based on this, the paper systematically constructs a full-process prevention and control system covering the prevention mechanism, monitoring and early warning, and emergency response links. Finally, this study proposes an innovative path of comprehensive response strategies that integrate technology empowerment, management collaboration, and educational reinforcement. It emphasizes promoting the transformation of school sports safety management from passive handling to proactive prevention and enhanced system resilience through intelligent applications, the construction of a multi-party governance pattern, and the intrinsic improvement of safety literacy, providing theoretical references and practical guidance for educational practice.

Keywords: School Sports Safety; Risk Prevention and Control; Risk Assessment; Coping Strategies; System Construction

1. Introduction

The prevention and control of safety risks in school sports activities is one of the core issues in the field of educational management. At present, campus sports safety accidents still occur from time to time, revealing the deficiencies of the traditional risk management

model in terms of the forward-looking nature of risk identification, the systematic nature of prevention and control measures, and the modernity of response strategies. These deficiencies are mainly reflected in the following aspects: risk perception is mostly limited to explicit physical harm, with insufficient attention paid to implicit and comprehensive risks; Prevention and control measures often show fragmentation and post-event nature, lacking data-driven closed-loop management throughout the entire process. The integration and application of new technologies and new management models in response strategies are insufficient. Therefore, it is urgently necessary to have a systematic re-understanding of the risks of school sports safety and to construct an innovative prevention and control framework and strategy system that matches them. This research aims to enhance the scientific, refined and intelligent level of school sports safety management by analyzing the mechanism of risk generation, designing a structured prevention and control system, and exploring cutting-edge response strategies, so as to effectively safeguard the sports safety and health rights of the majority of students.

2. Risk Identification and Analysis of School Sports Safety

2.1 Types and Characteristics of School Sports Safety Risks

The risks of school sports safety present diversified characteristics and can mainly be classified into two categories: explicit and implicit. Obvious risks are directly visible, including sports injuries (such as muscle strains, joint sprains, fractures), equipment accidents (such as aging and breakage of equipment, improper installation), and environmental risks (such as slippery venues, heatstroke in high temperatures, extreme weather). Hidden risks are more latent and complex, covering excessive fatigue and chronic injuries caused by

unscientific exercise load design, sudden health incidents triggered by individual health differences among students (such as hidden heart disease and special constitutions), as well as the risk of behavioral loss of control due to psychological stress or teaching conflicts. These risks are generally sudden and unpredictable, and are closely related to the intensity and competitiveness of the sports activities themselves as well as the scientific nature of their organization and management. Accurately identifying risk characteristics is the logical starting point for building an effective prevention and control system, which requires managers to go beyond the traditional understanding of "accidental injury" and establish a multi-level risk cognition framework covering physiology, psychology, environment and management.

2.2 Analysis of the Causes of School Sports Safety Risks

The formation of school sports safety risks is the result of the interwoven effect of multiple factors, and its root cause can be traced back to four core dimensions: people, objects, management, and environment. The human factor is dominant, involving students' insufficient safety knowledge and self-protection ability, teachers' weak risk awareness and lack of emergency response skills, and even including weak sense of responsibility or improper teaching organization. The physical factors are the foundation, including outdated and dilapidated sports facilities and equipment, failure to meet safety standards, omissions in the purchase and acceptance process, as well as the absence or improper allocation of protective equipment. Management factors are the key, which are reflected in the fact that the school's safety management system is merely a formality, the safety responsibility system has not been effectively implemented, the risk assessment of sports activity plans is lacking, and the daily inspection and maintenance mechanism is not sound. Environmental factors are variables, covering adverse weather conditions, disturbances from the surrounding environment of the campus, and the macro atmosphere of insufficient attention paid by society as a whole to sports safety culture. These causes are often not independent of each other. Oversight in management are usually the ultimate catalyst that magnifies other risks

and leads to accidents.

2.3 School Sports Safety Risk Assessment Model

Building a scientific risk assessment model is the core tool for achieving precise risk management and proactive intervention. Modern risk assessment models should break through the limitations of subjective empirical judgment and shift towards a comprehensive assessment that combines quantitative and qualitative methods. This model first needs to systematically identify risk sources and establish a risk list covering aspects such as facilities and equipment, teaching organization, student conditions, and the natural environment. Secondly, tools such as the Analytic Hierarchy Process (AHP) are introduced to grade, assign values and quantitatively assess the identified risks from two dimensions: the likelihood of occurrence (probability) and the severity of consequences (loss). The risk values are calculated and the risk levels (such as high, medium and low) are determined. The core innovation of the model lies in its dynamic and data-driven nature, which can integrate historical accident data, real-time physical examination information, facility inspection records, and take into account the specificity of different seasons, different projects, and different student groups. Through the operation of the model, schools can achieve dynamic monitoring, early warning and hierarchical management of risks, prioritize the allocation of limited safety resources to high-risk areas, thereby enhancing the scientificity and efficiency of prevention and control work.

3. Construction of a School Sports Safety Risk Prevention and Control System

3.1 Prevention Mechanism and System Construction

Prevention is the cornerstone of risk control in school sports safety, and its core lies in building a systematic and regular institutional defense line. The primary task is to establish and strictly implement a school-based safety management system within the framework of national and industry standards, covering the full-process norms for the procurement, acceptance, inspection and maintenance of sports facilities, as well as the organization and management regulations for classroom teaching, after-school

training, sports competitions and large break activities. Key measures include mandating health inquiries and moderate screening before physical activities, establishing personalized activity files for students with special physical conditions, and formulating alternative plans. At the same time, safety responsibilities must be clearly assigned to school leaders, department heads, physical education teachers, class advisors, and even the students themselves. Pressure transmission can be achieved through forms such as signing responsibility agreements. In addition, the construction of systems should incorporate elements of safety education, making safety knowledge and skills training a compulsory part of teachers' continuing education and students' physical education courses. This will enhance the risk awareness and prevention capabilities of the subjects from the source, and form a rigid prevention pattern where "institutional constraints" and "self-awareness" complement each other.

3.2 Monitoring, Early Warning and Information Management

Dynamic monitoring and intelligent early warning are key links in enhancing the initiative and response speed of risk prevention and control. This requires the construction of an integrated management platform that combines information collection, transmission, analysis and early warning. The information collection end should be widely covered: Utilize Internet of Things sensors to monitor the safety conditions such as stress and displacement of key sports facilities; Collect physiological data such as heart rate and body temperature of students during exercise through wearable devices; Combine manual inspection and reporting (using a mobile terminal APP) to record the site conditions and potential equipment hazards. All data is aggregated in real time to the central management platform and automatically analyzed through the preset risk algorithm model. Once the monitoring data exceeds the safety threshold or dangerous behavior patterns are detected through video analysis, the system immediately and automatically triggers hierarchical warnings (such as blue, yellow, and red), and precisely notifies the relevant responsible persons through text messages, application push notifications, and other means. This platform also serves as a safety information database,

enabling the electronic archiving of accident reports, handling records, and case analyses, providing continuous data support for risk assessment, responsibility traceability, and strategy optimization.

3.3 Emergency Response and Handling Procedures

Efficient and standardized emergency response is the last line of defense for controlling accident damage and avoiding secondary injuries. Schools must establish an emergency response mechanism with clear rights and responsibilities, well-defined procedures and constant preparedness. The foundation lies in formulating and regularly rehearsing detailed emergency response plans for sports safety incidents. The plans need to design differentiated handling procedures for different risk types (such as cardiac arrest, severe trauma, and mass accidents), and clearly define the responsibilities and collaboration methods of each group, including on-site command, medical first aid, communication and liaison, and logistical support. The key links include ensuring the unobstructed emergency channels, the designated storage and good condition of emergency equipment (such as AEDs) and medicines, as well as the effective connection of green channels with nearby medical institutions. The core of the process is the first response within the "golden time": Teachers or on-site personnel must receive standardized training, master basic first aid skills such as cardiopulmonary resuscitation (CPR), hemostasis and bandaging, and fracture immobilization, and be able to carry out scientific rescue before professional medical staff arrive. Afterwards, it is necessary to activate the accident investigation and review mechanism, analyze the causes, improve the contingency plan, and form a management closed loop.

4. Innovative Research on School Sports Safety Response Strategies

4.1 Technology Application and Intelligent Prevention and Control

The innovation of coping strategies is highly dependent on the integrated application of modern technology. Intelligent prevention and control is becoming a cutting-edge direction. At the individual level, the promotion and use of

smart wearable devices (such as fitness trackers and smart clothing) should be carried out to monitor students' physical load, heart rate variability, posture balance and other physiological and biomechanical indicators in real time. When the data is abnormal, an alarm should be issued immediately to prevent excessive fatigue and sports injuries. At the environmental and facility level, video image recognition technology is applied to automatically detect the density of people, activity intensity and dangerous behaviors (such as the illegal use of equipment) in sports fields. Use drones for rapid inspection of large outdoor venues or facilities; Long-term safety assessment of large fixed facilities is conducted through structural health monitoring technology^[1]. In addition, a virtual reality (VR) simulation training system is developed to enable students to experience high-risk sports scenarios in a safe environment and learn response skills, effectively enhancing their risk perception and emergency response capabilities^[2]. These technological applications have brought about a profound transformation in risk prevention and control from passive response to active prediction, and from fuzzy management to precise intervention.

4.2 Management Innovation and Multi-party Collaboration

Breaking down the barriers of campus management and building a collaborative network of multi-party governance is an important path for strategic innovation. On campus, strengthen the horizontal coordination among the physical education teaching and research group, the school inpatient, the moral education office, the logistics department and the class teachers, establish a regular safety joint meeting system, share information, and jointly identify and handle risks. At the vertical level, the education administrative department should take the lead and join hands with the sports, health and wellness, market supervision and other departments to jointly formulate more complete school sports safety standards and guidelines, and carry out joint supervision and inspection. The key to innovation lies in introducing professional social forces: by purchasing services, hire third-party professional institutions to conduct regular safety inspections and risk assessments of campus sports facilities. Cooperate with

insurance companies to develop more incentivizing sports safety-specific insurance products, linking premiums to the risk management level of schools. Invite first aid experts and sports medicine experts to provide regular training at the school^[3]. This collaborative governance model, characterized by "government leadership, school responsibility, departmental collaboration, professional support, and social participation", can effectively integrate resources and make up for the shortcomings of the school's own professional capabilities.

4.3 Education Reinforcement and Capacity Enhancement

Internalizing safety as the core quality and ability of teachers and students is the most fundamental and sustainable strategy for risk prevention and control. Education reinforcement needs to be curriculum-based, scenario-based and regularized. Systematically incorporate sports safety knowledge, sports injury prevention and first aid skills into the school health education and physical education curriculum system, compile school-based teaching materials or reading materials suitable for each educational stage, and ensure necessary class hours. Reform the training of teachers and make the ability of safety risk management a compulsory core module in the pre-service and post-service training of physical education teachers. The content must cover the formulation of safety regulations, risk assessment methods, practical operation of first aid skills (especially AED and CPR), as well as psychological counseling for students. Through various scenario-based methods such as creating safety-themed activities (like the Safety Sports Month), organizing emergency evacuation and first aid simulation drills, and holding safety skills competitions, teachers and students can consolidate their knowledge and skills in practice^[4]. The ultimate goal is to cultivate every teacher and student to become the main body responsible for their own safety and the guardian of others' safety, creating a campus sports culture where "everyone talks about safety and everyone understands emergency response", thereby achieving an overall and endogenous improvement in risk prevention and control capabilities.

5. Summary

This study conducts an in-depth discussion on the systematic prevention and control as well as strategic innovation of school sports safety risks. Research suggests that effective prevention and control of school sports safety risks must be based on precise risk identification and scientific assessment. It is necessary to build a full-chain, institutionalized prevention and control system integrating "prevention - monitoring - emergency response", and take technological, management and educational innovation as the core driving force. By introducing a dynamic risk assessment model, quantitative management and precise intervention of risks can be achieved. By building an intelligent monitoring and early warning platform, the acuity of risk perception and the timeliness of response can be enhanced. By building a multi-party collaborative governance network and deepening safety literacy education, a campus safety culture can be fundamentally cultivated, and the endogenous capabilities and shared responsibilities of the prevention and control subjects can be achieved. Future practices should focus on promoting the implementation and application of the above-mentioned systems and strategies, and continuously iterate and optimize them during the application process. At the same time, interdisciplinary research should be strengthened to constantly adapt to new risk forms, ultimately forming a resilient

and sustainable school sports safety ecosystem, laying a solid safety foundation for the all-round development of students.

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