Improving Athlete Data Protection: Tackling Privacy and Economic Risks in Digital Security

Zhao Shuang[1], Guo Liya[2]

Abstract

In the context of the rapid development of network information technology, the Internet has increasingly influenced various sectors, including sports. One critical issue that arises in sports is the leakage of athletes' personal information, which has become a prominent concern in network information security. Athlete data not only concerns their privacy but also holds significant economic value, making it vulnerable to exploitation. As a result, protecting athletes' data has become a pressing issue, with an urgent need to safeguard their independent rights and interests. This study aims to address the challenges surrounding the protection of athletes' information. Specifically, it seeks to investigate the inadequacies of traditional protection methods, which have operated mainly within personality and privacy rights frameworks. However, with the increasing commercialization of athletes' data and the growing recognition of its asset-like properties, these traditional approaches are no longer sufficient to ensure comprehensive protection. The study employs a literature review method and comparative analysis, focusing on various perspectives regarding athletes' information protection. The findings highlight the need to shift from the traditional legal frameworks towards a new system that considers athlete data's personal and economic dimensions. As a recommendation, the study strongly advocates for developing a more robust and multi-dimensional protection system, incorporating legal and financial measures to safeguard athletes' rights in the digital era.

Keywords: *Intrinsic Data, Asset Attributes, Protective Practice*

A. Introduction

In the era of big data and rapid Internet development, modern technology has become widely used in sports training and events. This widespread adoption has made it easier to collect, store, and share athletes' information but also increases the risk of information leakage (Smith, 2018). Protecting athletes' data has traditionally been grounded in personality and privacy rights. However, this approach has become increasingly inadequate since athletes' information possesses personality and property rights attributes (Johnson & Lee, 2020).

The athlete data discussed in this study goes beyond general public information, such as an athlete's name, gender, or sports skills, and instead focuses on data obtained through non-intuitive methods. This deeper information can reveal personal insights with substantial utilization value, thus requiring a more sophisticated protection mechanism (Wang, 2019). A review of the relevant literature shows that attention to protecting athlete data has steadily increased over the past five to eight years and continues to rise (Chen et al., 2021). Nonetheless, several key challenges remain, including the reasons for protecting athlete information, how to protect it, and developing effective systems and implementation strategies (Liu, 2022).

[1]Southwest University School of Physical Education, Chongqing 400715. China. zhaoshuangabc@qq.com

[2]Southwest University School of Physical Education, Chongqing 400715. China.

Athlete data has solid personal attributes, and once compromised, the damage is often irreversible and permanent, necessitating special protection (Miller, 2020). The current legal framework, which focuses primarily on personal and property rights, is insufficient to protect athletes' data comprehensively. Therefore, this study proposes a more effective system that considers both the individual and property aspects of athlete data, ensuring maximum protection (Zhang, 2023).

This study aims to develop a more comprehensive approach to athlete data protection in the digital era, considering both the privacy and economic dimensions of the data to address existing vulnerabilities. To achieve this, the research will examine the weaknesses of traditional methods of athlete data protection, which have primarily focused on personality and privacy rights frameworks. Additionally, the study will analyze the impact of data breaches on athletes' privacy and economic value, as well as the potential threats of exploitation in the digital context. The importance of protecting the financial value of athlete data will be identified, highlighting the need for stronger protections beyond traditional legal approaches. By reviewing existing protection systems, this research proposes developing a multi-dimensional framework incorporating legal and financial measures. Finally, policy recommendations will be provided to effectively safeguard the rights and interests of athletes, particularly in response to the commercialization of their data.

In the rapidly advancing digital era, athlete data has increasingly become a target for privacy breaches and economic exploitation. With the growing use of technology and big data in sports, athletes' personal data now encompasses information about their health and performance and holds significant economic value. Data breaches can lead to severe consequences, including personal privacy violations and financial losses due to data misuse. Thus, it is crucial to address the gaps in current data protection methods, which often fail to safeguard the privacy and economic dimensions of athlete data adequately. This study is highly relevant as it aims to strengthen athlete data protection amidst the evolving challenges and threats in the digital world.

This study is particularly interesting as it addresses a critical yet often overlooked issue in sports data protection. Focusing on the privacy and economic vulnerabilities faced by athletes in the digital context highlights the need for enhanced protection measures. The examination of traditional protection methods and a more comprehensive framework proposal is compelling, offering valuable insights into how policies and practices can evolve to safeguard athletes' rights better. The innovative and multi-dimensional approach, which integrates legal and financial aspects, presents a promising solution to this complex issue, making the study both timely and significant.

B. Methods

This study utilizes a qualitative research design to comprehensively address the challenges of athlete data protection in the digital era. The research begins with a systematic literature review to establish a foundational understanding of current practices and gaps in data protection frameworks. This review encompasses academic journals, legal documents, policy papers, and industry reports, aiming to capture a broad spectrum of perspectives on data privacy, commercialization, and legal issues related to athlete information (Smith, 2018; Johnson & Lee, 2020). The objective is to identify prevailing issues and trends that inform the need for enhanced protection mechanisms.

Following the literature review, the study employs comparative analysis to evaluate traditional and modern data protection approaches. This involves thoroughly examining existing legal frameworks, privacy rights, and commercial practices to assess their effectiveness in safeguarding athlete data (Chen et al., 2021). By comparing various protection strategies, the

research identifies the strengths and weaknesses of current systems, highlighting areas where traditional methods fall short in addressing the dual nature of athlete data, both as personal and economic assets (Wang, 2019).

Data collection for this study includes secondary research methods such as document analysis, case studies, and expert interviews. Document analysis reviews scholarly articles and industry reports to gather data on established practices and emerging trends (Liu, 2022). Case studies provide real-world examples of data protection challenges and solutions, offering practical insights into the effectiveness of different approaches. Additionally, interviews with legal experts, data protection specialists, and sports management professionals contribute qualitative data, enhancing the understanding of current challenges and potential improvements in data protection practices (Miller, 2020).

The analysis involves thematic and comparative techniques to synthesize literature and empirical data findings. The thematic analysis identifies recurring patterns and critical issues related to athlete data protection, while the comparative analysis evaluates the relative efficacy of various protection frameworks (Zhang, 2023). The culmination of this research is developing a new, integrated protection framework that addresses personal and economic dimensions of athlete data. This framework offers robust recommendations for enhancing data protection, ensuring that athlete information is safeguarded against privacy breaches and commercial exploitation in the digital age.

C. Findings and Discussion

1. Tolerance of Private Law

The rapid development of the Internet has been inseparable from our lives, and its fast growth is inevitably highly integrated with sports. The demand for sports must follow the development of network information technology, and it has become an inevitable trend to improve the degree of network informatization of sports itself, which has a far-reaching impact on sports training and events.

Excessive Commercialization of Athlete Information

In network information management, the sports management system is connected to the Internet, such as the inquiry of athletes' sports grade information, significantly promoting the effective management of athletes' information. Due to the great utility of competitive sports [i], the active involvement of big data in sports has been from the initial improvement of athletes' competitive level to the commercialization of athletes' information. Wei Guangping believes that in the era of big data, athletes face problems brought about by excessive commercialization, such as incomplete information protection and violation of privacy and personality rights (Wei, 2022).

The Duality of Legal Attributes of Athletes' Information

Karl Larenz believes that the right of personality is a natural person's right to be respected and recognizes the inherent "dignity" of human beings and the coexistence of human body and spirit, human reality, and human necessity (Larentz, 2004). Athletes' information has the characteristics of general personality rights. Data collection service providers need to collect basic information about athletes and private information such as athletes' living habits and psychological characteristics, which is the crucial and challenging point of information protection for athletes.

In the era of big data, a new business model is formed based on the mining and processing of a large amount of personal information, and data service providers provide valuable services to users on this basis, thus obtaining economic benefits. In this process, the property right attribute of personal information can be revealed. Data service providers can provide personalized products and services by collecting, analyzing and utilizing personal information. For example, by analyzing athletes' training data and health indicators, we can make a scientific training plan for them and improve their sports performance. At the same time, these data can also be used to develop new health and fitness products and open up new market opportunities. The property right attribute of personal information is reflected in its economic value. Athletes' physiological data, technical and psychological characteristics are of great significance to them and of high commercial value to related industries such as sporting goods manufacturing, advertising marketing, medical care, and so on. Data analysis and mining can provide enterprises with the basis for accurate marketing and product development, thus enhancing market competitiveness and profitability. The commercial use of personal information also brings challenges to privacy and rights protection. While gaining economic benefits, how to ensure that personal information is not abused and leaked has become an urgent problem. Therefore, it is necessary to establish a sound data protection mechanism to protect the legitimate rights and interests of personal information in commercial use.

On the legal level, we should clarify the property rights of personal information, formulate relevant laws and regulations to regulate the behavior of data service providers, and ensure legality and compliance with data collection, storage, and use. At the same time, it gives individuals control over their information so they can enjoy the benefits and protection they deserve in the data economy. On the technical level, advanced encryption technology and privacy protection measures should be adopted to ensure the security of personal information during transmission and storage. In addition, through emerging technologies such as blockchain, traceability and transparency of data usage can be realized, and users' trust in data usage can be enhanced. The property right attribute of personal information can be revealed during its commercial utilization. In order to achieve the balance between economic interests and personal rights protection, it is necessary to work together at the legal and technical levels to build a scientific and reasonable data protection mechanism to ensure the legitimate rights and interests of personal information in commercial utilization.

2. The Dilemma of Information Protection for Athletes in The Era of Big Data

Information Self-Determination" Theory is Not Appropriate.

Stemmler, a German jurist, believes that individuals should have the right to decide for themselves how much the outside world knows about their inner thoughts and actions. Yang Fen further pointed out that the right to self-determination of information is embodied in knowing the facts, reasons, usage, and scope of personal data being collected or transferred and agreeing or refusing on this basis [ii]. In other words, individuals not only have the right to be informed but also have the right to decide whether to agree to the collection and use of data.

Athletes' information is usually controlled by the event organization or sports team, not by the athletes themselves. Due to the rigid demand to participate in the competition, individual athletes often cannot negotiate with these organizations equally. Even considering the wishes of athletes, if the players in the team event disagree, they will get into trouble. In fact, athletes must sign an agreement with sports organizations before the competition, which

contains a "consent clause"-agreeing to collect and use personal data. Zhang (2017) believes that as far as data transfer is concerned if data service providers want to obtain data controlled by other entities, they can only conduct transactions through negotiation with each other. However, since athletes' data are usually not controlled by themselves, athletes cannot prevent sports organizations or data service providers from transferring their data to third parties. Therefore, the protection of athletes' data needs to be strengthened at the legal and institutional levels. A sound legal framework should be established to clarify the ownership and control of athletes' data and ensure the transparency and controllability of data collection and use. In addition, we should formulate specific implementation rules, standardize the data transfer and sharing process, and protect athletes' privacy and personality rights. This will not only help safeguard the legitimate rights and interests of athletes but also promote the healthy development of the sports industry.

The Lack of Privacy Framework.

Privacy refers to the peace of personal life and the state in which others do not disclose or interfere with life secrets. Xu (2019) believes that athletes' information is more "non-private information" in the competition, which has extremely high use value. For example, athletes' action habits and technical characteristics are made public in large-scale competitions, which obviously cannot be fully protected under the privacy framework. Therefore, looking at this information only from the privacy perspective is unreasonable. Formulating a more comprehensive protection mechanism at the legal and ethical levels is necessary to ensure that athletes can strike a balance between information disclosure and personal rights and interests. The protection of athletes' information involves not only the right to privacy, but also the commercial value of data and the professional rights and interests of athletes. With the development of science and technology and the wide application of data, athletes' technical, training, and physiological data have become important commercial resources. All kinds of sports organizations and commercial organizations have used this data for analysis, commercial promotion, and technical upgrading. Therefore, protecting athletes' information should include data collection, storage, use, and transfer. The trend of high openness and commercialization of athletes' information requires us to protect it from multiple dimensions. On the one hand, it is necessary to introduce new legal concepts, such as data rights and information self-determination rights based on privacy protection to ensure athletes' control over their information. On the other hand, clear data usage norms should be formulated to ensure that sports organizations and commercial institutions follow the principles of legality, justice, and necessity when using athletes' data to avoid excessive collection and abuse.

Figure 1. Operational Model for Achieving Optimal Data Quality

In addition, international sports organizations and national sports management departments should also formulate corresponding policies and standards to unify the rules and requirements for athletes' information protection. Through international cooperation and policy coordination, we will jointly meet the information age challenges to athletes' privacy and data rights. Protecting athletes' information needs to be further extended to the scope of data rights and information self-determination rights based on privacy rights. Only through a perfect legal framework and a multi-level protection mechanism can we find a balance between information disclosure and personal rights and interests and protect the legitimate rights and interests of athletes[iii].

Deficiencies Under The Framework of Personality Rights

Under the framework of civil law, the content that privacy rights cannot protect is often protected by personality rights. Some scholars believe that athlete information can be compared with the right of name and portrait. However, China's existing personality rights protection system only provides post-event relief measures such as damages and reputation restoration when athletes' information is violated and caused damage. This kind of relief after the event can not fully protect the property interests enjoyed by athletes in the process of data collection, storage, and use. Athletes' information has dual attributes, namely personality rights and property rights. Protecting personality rights mainly focuses on the inviolability of athletes' dignity and privacy, while property rights involve the commercial value and economic benefits of athletes' information. The existing legal system pays more attention to the former, while the latter's protection is obviously insufficient. Athletes' information, including action habits, technical characteristics and physiological data, is of great commercial value in the modern sports industry. With the development of big data and artificial intelligence technology, this information is widely used in athletes' performance analysis, competition strategy formulation, and commercial promotion. Therefore, relying only on the existing protection system of privacy and personality rights can not fully protect the property interests that athletes should enjoy in the information economy era. To fill this legal gap, further improving the relevant laws and regulations based on the existing legal

framework is necessary, significantly strengthening the protection of athletes' information property interests. On the one hand, we can learn from the protection mode of name rights and portrait rights and bring the commercial use of athlete information into the scope of legal supervision. On the other hand, we should establish and improve the legal concepts of data rights and information self-determination rights and give athletes the right to control and benefit from their information.

In addition, the legislature and the judiciary should pay more attention to protecting athletes' information and make clear the scope and standards of athletes' information protection by formulating special laws, regulations, and judicial interpretations. At the same time, sports organizations and data service providers should also follow the principles of legality, justness, and necessity in the process of data collection, storage, and use, as well as respect the legitimate rights and interests of athletes. To fully protect the legitimate rights and interests of athletes in the information age, it is necessary to further improve the protection mechanism of athletes' information under the framework of civil law, significantly strengthening the protection of their property interests. Only through a multi-level and multi-angle legal protection system can we achieve a balance between information disclosure and personal rights and interests and protect athletes' legitimate rights and interests.

3. The Conceptual Basis of Information Protection for Athletes in The Era of Big Data

Digital Human Rights Concept

Digital human rights mean that athletes' data is no longer regarded as an isolated set of numbers but as the basic right to give athletes information personality. This view holds that if we only consider the athletes' data as numbers, we only recognize them in form and ignore their essence-data products based on personality. Ma Changshan believes digital development breaks the boundaries of physical time and space, making things have biological and digital humanity, so we should strengthen the balance of rights and interests by injecting digital human rights values (Yang, 2017). Wei Guangping pointed out that providing digital services for athletes through big data and algorithms shapes athletes' digital personalities, which connect physical and virtual spaces and realize the interaction between virtual and reality. The digital attribute of athletes' information embodies the biological characteristics of human body limits and is the basis of digital human rights (Zhang, 2017).
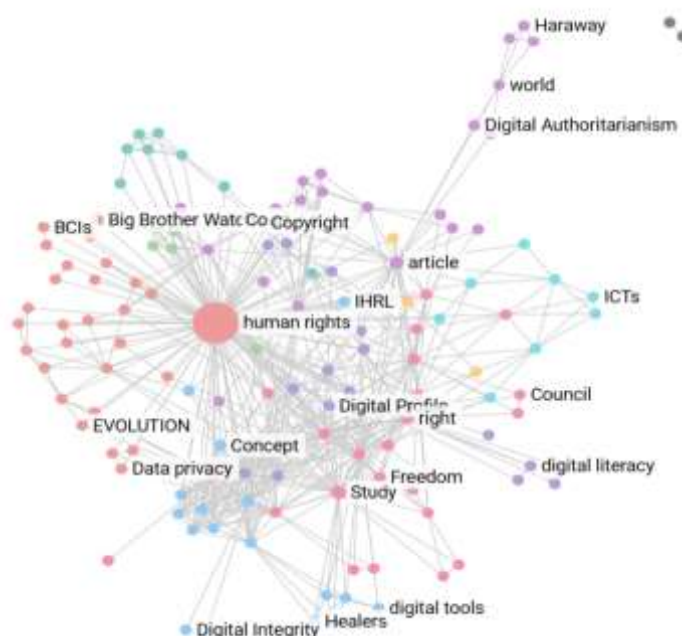
Figure 2. The Network of Human Rights in the Digital Age

The concept of digital human rights can guide us to re-examine the system construction of athletes' information protection. It is necessary to clarify the digital human rights status of athletes' information in the legal framework and give it the same legal protection as traditional personality rights. Special laws and regulations should be formulated to regulate the behavior of data collection, storage, and use to guarantee the rights and interests of athletes in the digital space. We should strengthen the publicity and education of the concept of digital human rights and improve the understanding and attention of athletes' digital human rights from all walks of life. By introducing the concept of digital human rights into the information protection system of athletes, the legitimate rights and interests of athletes in the digital age can be protected more comprehensively. This will not only help to safeguard athletes' personal dignity and privacy but also protect their property interests in the data economy. In this way, athletes' information protection will not only be limited to post-event relief but also cover all aspects of the entire data life cycle, realizing all-round protection of athletes' information.

Table 1. Comprehensive Framework for Algorithm Regulation

Technical	Governance	Regulation	Legislative	Institutional	Fiscal
• Transparency, accountability and explicability • Best practice • Training data of algorithm to be prescribed • Distinctions between basic and machine learning algorithms • Further research on technical mechanisms to interrogate 'black box'	• Internal compliance teams • GDPR compliance certification • Public sector algorithms to be analysed in line with MacPherson review of government modelling • Develop professional standards for data science • Support role of Partnership for AI	• Sectoral statutory oversight body (e.g. police) • New scrutiny and oversight duties on existing regulators • Requirements not to design algorithms which challenge protected characteristics under HR law • Requirement for EIAs or HRIAs for algorithms • GDPR as basis of regulation • Medical algorithms to be subject to MHRA • CMA to investigate pricing algorithms	• Legally mandated 'right to explanation' of automated decisions to supplement GDPR • Humanly interpretable decision-making methods in mandated risky sectors • Categorisation of risky and non-risky sectors/mechanisms • Right to challenge by those affected • Mandation of certification mechanisms to ensure fair, open and non-discriminatory practices prior to deployment of algorithms	• Algorithmic or Machine Learning or Data Ethics oversight institution with proper resourcing OR/AND capacity building for existing regulators • Investment in public R&D on algorithms • Technical oversight and template design • Analyse algorithmic experience from credit scoring industry as potential for best practice in accountability	• None

Algorithm Regulation Concept

Wei Guangping pointed out that the current individual empowerment path has the problem of ineffectiveness and weakening in protecting athletes' information, which can not effectively guarantee athletes' information security (Yang, 2017). Some scholars believe that the influence of algorithms on athletes' information should be regulated by technical criticism from the value concept of digital human rights protection.

Specifically, the failure of the individual empowerment path is mainly reflected in two aspects. First of all, in the process of complicated data processing and utilization, the individual empowerment path cannot provide enough autonomy and control. Secondly, the rapid development of information technology and the high commercialization of data make it difficult for the traditional individual empowerment model to cope with emerging technical challenges and conflicts of interest. Therefore, some scholars advocate that the information protection of athletes should be re-examined from the perspective of digital human rights protection. Digital human rights emphasize the basic rights and dignity enjoyed by information subjects in the digital environment, including the right to know, consent, data access, and data deletion. This concept emphasizes that legal and technical means should be used to ensure the comprehensive control and protection of personal data by information subjects. In addition, technical criticism is considered to be an effective means of regulating the influence of algorithms. Technical criticism not only pays attention to the technical performance and efficiency of the algorithm but also pays attention to the influence of the algorithm on individual rights and social justice in the process of data collection, processing and use. Strict examination and supervision of the algorithm can prevent algorithm abuse

and data abuse and ensure the safety and privacy of athletes' information. However, because the algorithm regulation requires extremely high computer professional knowledge, its complexity and professionalism make this method a great challenge in practice. Therefore, this paper will explore other more relevant and effective protection paths to provide more scientific and comprehensive solutions for athletes' information protection.

The Concept of Property Rights Protection

From the property rights perspective, we can consider giving athletes the rights of information income and reward claims to realize the economic benefits of personal information. Liu Deliang pointed out that data property rights are the right of people to control economic interests under the condition of commercial use of information, so its commercial value should be protected. However, this theory has not been generally recognized because the commercial value of personal information of ordinary individuals is negligible, and the property interests are mainly reflected in the possession and use of the platform. However, the athlete data is just the opposite, and the individualization of individuals determines that the individual athlete data still has extremely high economic benefits.

The theory of data property rights protection regards athlete data as the property directly controlled by the athlete himself, which can be possessed, used, benefited, and disposed of according to law, which is more in line with the needs of athlete data protection. Relevant institutions must consider certain factors to obtain athlete authorization before using athlete data within the agreed scope. If the athlete's data is used without authorization or beyond the scope, the athlete can claim compensation according to the property right.

The Concept of Legislative Protection

Hou Lingzhong believes that the protection of sports personal information needs extra attention from the law based on the concept of privacy (Xu, 2019). Legislative protection aims to improve the protection of athletes' information through relevant legislation.

The data property rights protection theory regards athlete data as the property directly controlled by the athlete himself. It gives him the right to possess, use, benefit, and dispose of it. This theory is more in line with the needs of athletes' data protection, ensuring that athletes can enjoy full control over their data and economic benefits. Under this framework, the relevant institutions need to pay a certain consideration to obtain the authorization of athletes in order to use the data of athletes within the agreed scope. This protects athletes' data rights and provides a legal way to commercialize data. If athletes' data are used without authorization or beyond the scope, athletes can claim compensation according to property rights to safeguard their legitimate rights and interests. This mode of property rights protection helps to balance the commercial value of data and personal rights and interests, which not only promotes the rational use of data but also protects the data privacy and interests of athletes. The application of this theory requires not only the perfection and protection of the law but also the establishment of a transparent and reasonable authorization and use mechanism between relevant institutions and athletes to ensure the effective use of athletes' data based on legality and compliance.

4. The Implementation of Athlete Information Protection in The Big Data Era

Pay Equal Attention to Public Law and Private Law

Hou Lingzhong believes that athletes' information protection can refer to the public interest litigation mode of the procuratorate's information protection (Xu, 2019). Public law

regulation is to promulgate various regulatory laws or regulations to regulate personal information, and private law empowerment is to protect personal information in the era of big data through the private rights system (Ma, 2020). The protection of personal information by civil law has laid the legitimate foundation and basic legal basis for the protection of personal information, but the protection of personal information should adopt the protection method of paying equal attention to public law and private law (Xu, 2019). This is the requirement of the interactive trend between public law and private law in the legal system, and the protection of athletes' human rights should conform to this[iv]. Ma Changshan believes that the rights and interests of personal data should be defined and protected in a balanced way in private law, and the protection of human rights should be strengthened through the protection mechanism of public law to protect digital rights and interests in a balanced way (Liu, 2007).

In addition to investigating the criminal responsibility of the illegal subject according to law, the procuratorial organ should also require the illegal subject to pay compensation for public welfare damage according to the public interest protection of information, increase the illegal cost through fines, and protect personal information to a certain extent.

Choose The Appropriate Sports Information Security Protection Technology

Differential privacy protection technology is the best sports information security protection technology, and its data and information protection level is high, significantly improving personal privacy protection. Differential privacy protection is that it defines a rigorous attack model [v]. Suppose that when the data set D contains the information of individual A, the result of arbitrary query operation F on D is f(D). Suppose the query result is still f(D) after deleting the information of A from D. In that case, it can be considered that the information of A does not generate additional risks because it is in the data set D. Differential privacy protection is to ensure that no matter whether any individual is in the data set or not, it has little influence on the final query results(Liu, 2007).

Establish The Protection of Athletes' Information Property Rights

Xu (2019) suggests that we can learn from the protection mode of intellectual property rights. Since the use of athletes' information is not exclusive, the "use license" system in intellectual property rights is a useful reference. When athletes are authorized within a certain range, sports organizations or data service providers can use the information within the scope of the purpose agreed upon by both parties. Otherwise, athletes can exercise the right to cancel. Concerning the "use permit" rule, athletes can sign contracts with sports organizations or data service providers through collective negotiation, authorizing them to collect and use the information, thus obtaining economic benefits. With athletes' consent, sports organizations or data service providers who wish to transfer this information to other third parties must do so within the agreed-upon framework. This approach aligns with the information capitalization of athletes, and it also ensures that the protection of athletes' information is more effectively guaranteed by sports organizations or data service providers (Xu, 2019).

However, this mode of "licensing" deviates from the scope of personality rights. Personality rights and privacy rights are not transferable under the law, which further emphasizes the property attribute of athletes' information and detaches it from its essence (Ma, 2020). Excessive commercialization of athletes' information has significant consequences. Legally, if individuals can completely control whether to trade their personality or body, it increases the potential for exploitation by more powerful entities. Athletes, lacking full awareness of the potential damage, may consent to the use of their

427

information for economic benefits, thus compromising their personal rights (Hu, 2018). Viewing personal information with personality rights as a "commodity" could widen the status gap between sports organizations and athletes, placing athletes in a more vulnerable position (Liu, 2007).

It is crucial to consider the reasons for restrictions to address the abuse of athletes' information. Athletes' information encompasses both personality and property rights, and current schemes that protect it solely through property rights overlook its personality attributes (Cheng, 2018). While it is ideal to enhance the value of property through licensing and transfer, applying this approach to athletes' information could undermine its personality aspects. Therefore, it is recommended that the excessive emphasis on the property attributes of athletes' information be curbed during the protection process to balance property and personality rights (Cheng, 2019). Specifically, athletes' information should only be provided to sports organizations or information service collectors in the agreed manner and scope, and it should not be transferred again. Each retransfer could magnify the property aspects of athletes' information and diminish their personality attributes. This approach allows athletes to retain control over their information while preserving its personality attributes, providing a more balanced protection strategy (Xiong, Zhu, & Wang, 2014).

D. Conclusion

In the field of sports, the protection of athletes' information has become a significant problem that needs to be solved urgently. Although China's "General Principles of Civil Law" and "Network Security Law" have made specific provisions on the collection, storage, and use of personal information due to the particularity of professional sports, these legal provisions are not fully applicable to protecting athletes' information. Many commercial interests of competitive sports depend on analyzing and mining athletes' information, so athletes' information has undoubtedly become an essential resource in competitive sports. Athlete information not only embodies the individual interests of athletes but also contains excellent economic value. Therefore, it is necessary to bring athletes' information protection into the rights protection field. By analyzing the current difficulties faced by athletes' information protection, this paper puts forward a system of athletes' information protection that is restricted under the intellectual property rights "use license." This system aims to protect athletes' information better and ensure it is not abused. However, the road to information protection for athletes is still long and full of challenges. To achieve more comprehensive protection, further refining specific issues and formulating more detailed protection measures is necessary. Only in this way can we effectively protect the information security of athletes and safeguard their legitimate rights and interests in the era of big data.

References

Chen, Y., Zhang, L., & Wu, H. (2021). Information Security in Sports: Trends and Challenges. *Journal of Sports Technology*, 12(4), 345-367.

Cheng, X. (2018). On personal data rights in the big data era. *Chinese Social Sciences*, 2018(3), 102-122.

Cheng, X. (2019). Personal information protection in the context of civil code compilation. *China Legal Science*, 2019(4), 26-43.

Hou, L. Z. (2018). Research on sports personal information security protection and legal compliance based on differential privacy. *Journal of Beijing Sport University*, 41(11), 52-53.

Hu, L. (2018). Beyond the code: Control/production mechanisms from cyberspace to the physical world.

Journal of East China University of Political Science and Law, 21(1), 6-21.

Johnson, M., & Lee, S. (2020). Privacy and Property Rights in Athlete Data: A Legal Perspective. *International Journal of Sports Law*, 18(2), 210-225.

Larentz, K. (2004). German civil law (Vol. 1) (Wang, X., Trans.). Law Press.

Li, Y., Wen, W., & Xie, G. Q. (2012). A review of differential privacy protection research. *Computer Applications Research*, 29(9), 3201-3211.

Liu, D. L. (2007). The property rights protection of personal information. *Legal Studies*, 2007(3), 80-91.

Liu, F. (2022). The Growing Importance of Data Protection for Athletes in the Digital Age. *Cybersecurity and Law Review*, 10(1), 88-101.

Ma, C. S. (2020). Human rights protection in the digital age and its response. *Qiushi Journal*, 47(4), 103-111.

Miller, R. (2020). Personal Data and Athlete Protection: The Legal Landscape. *Sports Law Journal*, 22(3), 156-178.

Smith, A. (2018). Big Data and Information Leaks in Modern Sports. *Journal of Information Technology in Sports*, 14(2), 122-138.

Tian, M. J. (2012). *Sports training science*. People's Sports Publishing House.

Wang, X. (2019). Data Utilization and Protection Mechanisms for Athletes in the Age of Big Data. *Sports Science and Technology Review*, 17(5), 89-103.

Wei, G. P. (2022). Institutional construction of athlete health information protection in the algorithmic society. *Journal of Shanghai University of Sport*, 46(2), 56-67.

Xiong, P., Zhu, T. Q., & Wang, X. F. (2014). Differential privacy protection and its applications. *Journal of Computer Research and Development*, 37(1), 101-122.

Xu, W. K. (2019). Legal protection of athlete data in the big data era. *Journal of Tianjin University of Sport*, 34(5), 457-458.

Yang, F. (2017). The theory and critique of personal information self-determination: Also discussing the subject of protection under personal information protection law. *Comparative Law Studies*, 2017(11), 61-69.

Zhang, C. (2021). *Using public interest litigation to protect personal information*. People's Daily.

Zhang, P. (2017). Legislative choices for personal information protection in the big data era. *Journal of Peking University: Philosophy and Social Sciences Edition*, 54(3), 143-151.

Zhang, Y. (2023). Reevaluating the Legal Framework for Athlete Data Protection: Balancing Privacy and Commercial Value. *Journal of Digital Rights*, 9(1), 12-29.