Research on College Student Sports Training Decision Support System Based on Association Rule Algorithm

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Abstract

As the mass sports advance continuously, more and more people are doing physical exercises in China, enabling increasing overall physical fitness of Chinese nationals. In contrast, undergraduates, under great pressure for schoolwork, spare little time on physical exercise, resulting in a poor physical exercise ability of college students and declining overall physical quality, significantly impeding China’s future development. At present, college students mainly receive physical activities from two perspectives, namely sports classes and after-school exercises, both showing a disorderly characteristics. As physical exercises require long-term uninterrupted progress, the existing physical training model cannot meet the needs of college students to improve their physical fitness. Therefore, the traditional sports training decision-making model shall be adjusted accordingly, based on the association rule algorithm, to improve college students’ sports training mode and enhance their overall physical quality. To this end, this paper first studied the association rule algorithm, and then established the decision support system to formulate a reasonable sports training program for college students.

Keywords: Association Rule Algorithm, Sports Training, Decision Support System.

1. RESEARCH REVIEW

1.1 Research background

The decision support system originated in the seventies of last century, as recorded in some documents, but it was still in the theoretical level. Until 1980, Sprague proposed the three-part principle of the decision support system, namely the model part, data part, and dialogue part, which laid a solid theoretical foundation for the development of decision support system and effectively promoted its development. Subsequently, in the late 1980s and early 1990s, the expert system grew rapidly and integrated with the decision support system to build the initial intelligent decision support system. This integrated system can fully display the abilities of the decision support system and the expert system in the analysis and solution of quantitative problems and qualitative issues respectively, effectively solving a large number of problems that cannot be solved at that time. Subsequently, along with the development of technologies such as data warehouse, on-line analysis and processing, and data mining, the decision support system is becoming more and more powerful, mainly reflected in the ability to learn from the information and data provided in the analysis process to become a new generation of decision support system. In recent years, in the context of rapid development of the Internet, the decision support system based on the Internet architecture has taken shape, which can not only obtain and analyze information through the Internet, but also convert the conclusions obtained into shared resources, to achieve more efficient decision support and thus dramatically accelerate the improvement of traditional sports training modes.

1.2 Literature review

Sports is a highly integrated discipline. Physical exercises can not only effectively improve people’s physical fitness and health level, but also cultivate the positive mentality and competitive consciousness, which is of great significance to promote the overall development of people’s physical and mental health. And the sports training decision support system can provide more scientific and accurate sports programs for the athletes, which is highly important for the advancement of the sports training level (Ma and Xi, 2016). With the development of information technology, it has posed an important influence on the development of various traditional fields, due to its openness, convenience, and richness. In the physical training of college students, the sports training decision support system can select suitable sports training plans for college based on their own conditions, effectively improving the nonstandard and unscientific traditional physical training model of college students and advancing
their level of physical training (Deng et al., 2016). The physical training decision support system has several characteristics as follows. First, the physical training decision support system is generally used in physical training with low structural level and insufficient information. Second, the sports training decision support system combines data storage and retrieval technology with data analysis technology. Third, the sports training decision support system is so easy to operate that non-professionals can use it well. Fourth, the physical training decision support system, through the analysis of related parameters, can provide reference for college students' physical training behaviors. Fifth, the results of the decision support system are used only for reference, and do not represent the final result (Zhou et al., 2014).

2. OVERVIEW OF THE ASSOCIATION RULE ALGORITHM

2.1 Basic connotation of association rule algorithm

The association rule algorithm is essentially a rules algorithm for the user to set corresponding thresholds for the parameters of support degree and trust degree. The association refers to the relationship between two different events or things that are interdependent or parallel (Wang et al., 2014). Suppose there is a set \( i = \{i_1, i_2, ..., i_m\} \) that contains all the items of an event, and A represents a set consisting of the items, it can be called an item set, which contains an item subset T with a unique thing identifier as \( T_{id} \). If and only if \( A \subseteq T \) is contained (Zhang, 2014). Supposing that set A contains K items, it can be called a K-item set. Assuming the thing database is D, the frequency of item set A in database D is recorded as support degree in percentage. After computation, if the support degree obtained is higher than the minimum threshold of the support degree initially set, the result is a frequent item set (Zhang, 2014). The association rule refers to the explicit or implicit logic relation between X and Y. When \( X \cup Y \) are contained and \( X \cap Y = \phi \), then X represents the prerequisite necessary to achieve a result or form a rule, and Y stands for the result obtained. In such conditions, the association rule has support degree and trust degree (Cui, 2014).

The support degree is the frequency of the appearance pattern of the rule of one thing. Suppose that in a database O, \( s\% \) of the thing contain XY, it is proved that in the rule XY, D has a support degree of \( s\% \), with the probability of \( P(XY) \). The formula is shown as follows:

\[
\text{sup port}(XY) = P(XY)
\]  

The trust degree refers to the strength of a particular thing. Assuming that there is a thing D, with \( c\% \) of the thing that contain X and XY, and the support degree of X is \( \text{sup port}(X) \), then the trust degree formula is as follows:

\[
\frac{\text{sup port}(XY)}{\text{sup port}(X)}
\]

The above formula shows conditional probability in essence, namely \( \text{confidence}(XY) = P(X|Y) \).

2.2 Architecture of sports training decision support system based on association rule algorithm

The architecture of the sports training decision support system based on the association rule algorithm mainly falls into the following points:

The first is the infrastructure of the network system, which is mainly composed of various hardware and software, mainly switches, data management systems, routers, hosts, etc. (Ma, 2014). The main services provided by this function module, on the one hand, are the establishment of an advanced information management system, and on the other hand, the provision of due information service functions.

The second is the business management system, mainly for data mining and use, and automation management for various relational databases used in sports training. Through this system, the physical training programs for college students can be adjusted flexibly based on the sports training database (Zhang and Wei, 2014).

The third is the data warehouse management system. The system mainly enables in-depth utilization of the data warehouse, including the collection, exploration, integration, analysis, storage and application of information data, as well as auxiliary decision making based on the data warehouse technology (Xie and Li, 2013). The core technology of the system is the relation database management system. By building the data warehouse
management system, the business data in the upper system can be extracted and processed, mainly through the gateway and data replication.

The fourth is the on-line analysis system. Based on the analysis and statistics of relevant data from other databases and Internet and in-depth exploration of the information data, this system can realize the analysis of the development trend so that the information data can better assist in decision-making.

The fifth is the application service system, which is mainly to realize the overall function of the sports training decision support system. The system serves and guides the college students through the Internet (Xu and Mu, 2016).

The sixth is the data warehouse client, which is mainly used to serve college students, so that students can understand and learn other sports training programs through the data warehouse technology contained in the sports training decision support system. In this way, they can better understand the sports training program and utilize the program to a higher level.

The seventh is the network system management system, which is mainly to manage the sports training decision support system, with the scope covering each level, such as surveillance management, security management, data management, data recovery, etc. (You et al., 2016).

3. COLLEGE SPORTS TRAINING MODE

3.1 Select appropriate sports training programs

Sports training programs are mainly divided into water sports, ball games, track and field sports, skiing, etc. And the sports facilities in colleges and universities are mainly for ball games and track and field sports, such as venues for basketball, soccer, badminton, table tennis, and tennis, open-air stadiums, and track and field stadiums. According to the physique and interests, college students need to choose their own sports training mode combined with the suggested program by the sports training decision support system. For frail college students, a light exercise mode shall be selected together with practice step by step, instead of intense exercises, such as badminton and jogging. After a certain achievement, they can suffer relatively intense physical trainings. For some college students who are physically fit and capable of intensive training, they can choose intense sports, such as long-distance running, 100-meter racing, basketball, and soccer, to better meet their demands (Li et al., 2015).

3.2 Focus on thinking and concept cultivation

For college students, sports training has two roles. On the one hand, physical training can effectively improve their physical fitness and level of sports skills, so as to continuously advance the overall physical fitness of Chinese college students. On the other hand, competitive sports can develop the college students’ competitive spirit, which is of great significance to promote the all-round development of college students both in physical and mental health. Therefore, during the sports training of college students, they should focus on not only training their own level of sports skills, but also cultivating their own economic thinking and positive mentality. College students should have a clear vision on the importance of sports training, and develop good habits of regular physical training. Under the background of comprehensive physical fitness, this thinking and habit can support college students for independent sports training, and play an important role in promoting the life and development of college students (Li and Qu, 2014).

3.3 Improve the faculty

In essence, the sports training decision support system can only provide reference for college students' sports training activities, and students still need to choose activities based on their own understanding and preference. However, for college students, their knowledge of sports theories basically comes from PE teachers, for which the teaching level of PE teachers to some extent affects the level of college students' sports training. In this sense, teachers shall explain in detail the theoretical sports knowledge to college students before sports training, so that students can rely on the sports training decision support system based on the association rule algorithm to better carry out sports training activities, to further provide more high-quality compound talents for the society. On the other hand, colleges and universities should also prioritize perfecting the teaching staff by introducing a group of
more capable PE teachers, whose outstanding teaching quality will effectively enhance college PE teaching and accelerate the healthy and sustainable development of PE in universities (Chen and Wang, 2014).

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