

Research on the characteristics of athletes' physical ability and special physical ability based on Association Rules Mining

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Abstract: Physical fitness is characterized by physical competitive ability, which is one of the most important structures in the overall structure of athletes' competitive ability. Regarding the athlete's physical fitness as a system, its structure refers to a fixed and inevitable connection among the various elements that constitute the athlete's physical fitness. Athletes' physical system is composed of many factors, such as body shape, physiological function and sports quality, which are intertwined and interacted with each other. It is very important to improve the scientific physical training level of our athletes. Good physical fitness can enable them to fully develop their abilities and reach a higher competitive level as soon as possible. Association rules are used to mine the association between test items and further optimize physical fitness test indexes. The comprehensive evaluation of athletes based on physical fitness data is transformed into a classification problem. Using the computer's association rule data processing and database management functions can solve the management problems of athletes' physical fitness test indexes and help coaches to manage athletes.

1. Introduction

"Physical fitness" is a vocabulary that began to appear in various sports newspapers and documents in China in the mid and late 1980s. It is also a concept that has been widely used in sports training circles in China [1]. Physical fitness test is indispensable in the training of various competitive sports. By analyzing the data of athletes' physical fitness test, we can find some rules and important information [2]. The ultimate goal of sports training is to create excellent sports results. Physical fitness plays an important role in the composition of athletes' competitive ability. It is the key factor for athletes to achieve excellent sports results in special sports competitions. Athletes' physical fitness is the most basic and controllable factor to improve their competitive ability [3]. Physical fitness test is the basic way for coaches to understand athletes' physical fitness. Physical fitness in competitive sports means that under the load of special training and competition, the maximum physical fitness plays an important role in the composition of athletes' competitive ability and is the key factor for athletes to achieve excellent sports results in special competitive sports competitions [4]. The physical fitness characteristic structure of athletes involves three major components: shape, function and quality, and each component contains a large number of specific indicators, which reflect the state level of athletes in a certain aspect, and their overall organic synthesis completely constitutes the physical fitness level of athletes [5]. Coaches should regularly carry out physical fitness tests on athletes, convert the results of each athlete's physical fitness tests according to different test standards, and then evaluate the special physical fitness training that athletes' physical fitness state affects athletes' bodies according to their own experience, which is of great significance for improving the abilities of various organs and functional systems [6]. In order to improve the level of sports system, it has become more and more difficult to manage and analyze these data by traditional manual processing methods. Therefore, it has become an important problem to manage and analyze these physical fitness test data by using advanced computer technology. Under association rules, the discrete probability distribution of feature data extracted from signals is balanced to avoid over-concentration or dispersion of data [7]. In order to evaluate the discretization of the performance data, the new standard is called entropy of interval grade information. Next, discrete features of the array of data matrices and defect labels are used to

generate relationships between features represented in association rules. In each subsequent cycle, the item set of the seed set is found with the previous large object. This seed set is used to generate a potentially large number of new item sets, called candidate item sets [8]. Support will actually count the data passed in the process of these candidate sets. At the end, the candidates are integrated into of the actual large seed [9]. This process continues until there are no new frequent itemsets. Association rules improve computing efficiency in generating transaction database of candidate item sets. In this paper, the characteristics of athletes' physical fitness and special physical fitness mined by association rules are studied [10].

2. Research status of the concept of physical ability

2.1. Analysis on the characteristics of athletes' special physical ability

Athletes'special physical fitness mainly refers to the close connection with special training and special competition tasks,physical strength refers to the body's ability to resist fatigue, which is one of the components of physical fitness. Physical strength mainly includes the quality of endurance (aerobic endurance and anaerobic endurance). Athletes'observation, judgment, reaction and movement speed need to be more rapid and agile in the competition. The application of techniques and tactics needs to be more rapid and compact. For example, movement speed, movement speed, adjustment of center of gravity, and the connection between techniques to accelerate the strength and speed quality are the main components of body's fatigue resilience. The maximum physical exertion of athletes in special competitions indicates the level of anaerobic training and aerobic training as well as the energy metabolism level of athletes. Whether it is active or passive exercise, they are trained by increasing the range of motion, that is, by using the principle of promoting the elongation of muscles and ligaments.

Good physical fitness is the premise of improving athletes'technical, tactical level and performance, and also the basis of enduring heavy training, high-frequency competition and maintaining a good and stable psychological state, and can reduce sports injury and prolong their sports career. "Physical fitness", in fact, is the abbreviation of the body's adaptability. This includes two aspects: the internal ability of the body and the adaptability to the outside world. Data is an important historical data of every athlete's physical condition. Through these historical data analysis, can we find out the law of development and change of athletes'physical fitness state, and predict athletes' physical fitness state in a certain period? In those extremely competitive and fierce competitions, athletes have abundant physical ability, which can not only keep them in good competitive condition for a long time, but also give full play to the technical and tactical level of the whole team. Association rule pattern is an important one. Association rule is a knowledge pattern that describes the rules that occur simultaneously between events in a transaction. Matrix data that need to be transformed leads to the selection of features that take away the actual physical meaning. Among the relevant features, the proposed method can be directly used to analyze the cause of the fault, and each interval is mapped as a Boolean attribute. Therefore, data discretization becomes a basic association rule mining step, and the data is converted into quantitative attributes in Boolean attributes. The heuristic symbolic aggregation approximation symbolically represents the time series data to avoid impact on irrelevant features under the premise of passing through the original state. Therefore, the optimization analysis of physical fitness index can be transformed into the mining of association rules.

2.2. Characteristics and Analysis of Special Endurance

Endurance refers to the ability of the body to persist in long-term exercise. We generally call the endurance which is closely related to the performance of special sports as special endurance. Specifically speaking, it means the endurance which continuously completes special movements or approaches competition movements. Correctly understand the special physical characteristics of athletes and grasp the physical training macroscopically. Physical fitness is the extension and development of physical fitness in a certain range. They coexist in the human body and influence

and promote each other. Without good physique, there will be no outstanding physical fitness and excellent physical fork can promote the development and improvement of physique. Among the two factors of speed and strength, the improvement of any factor will improve the speed and strength. In training practice, it is much easier to improve the strength of athletes than to improve the speed of athletes. Improving the strength is an effective way to improve the speed of athletes. Distinguish athletes' special physical characteristics. Must have good endurance and speed, can have strong anti-fatigue ability, can it be possible to complete many defensive and offensive techniques in a fast pace of competition, can it be in a long time and high intensity of competition for fierce confrontation.

3. Relevance and result analysis

3.1. Process of generating candidate project set and frequent set

The extension of physical fitness is different from that of physical fitness. The extension of physical fitness is greater than that of physical fitness. Physical fitness is one of the foundations of physical fitness. Compared with other human qualities, such as cultural and moral qualities, physical qualities have obvious innate characteristics and adapt to the external environment. The process of adaptation includes the influence of subjective and objective factors such as human emotion, will, motivation, experience, attention, judgment, thinking and so on. The important factor of high quality investment in competition. Therefore, in physical training, we should pay enough attention to these two qualities and use scientific training methods to train them. In other words, if the basic sprinting ability of athletes is better, the results of these four physical fitness tests will be higher. Fields such as physical fitness test items, each record is a percentage of an athlete's physical fitness test results. The results of association rule mining are shown in Table 1 and Figure 1. For a given minimum support degree, if a set of items satisfying project support is set, it is called frequent item set and frequent item set. The association between a display set and other projects, scan the database, calculate the support degree of each candidate project set, and finally determine which candidate project set really becomes the frequent project set of the scan. Repeat the above process until no new frequent set is generated. The passivity exercise is based on the function of ability. Classification mining in data mining is to find a reasonable description or model for each class when the characteristics and classification results of training data are known, and then use these classification descriptions or models to classify the unknown new data. Call the frequent itemset Association of this set. In the data preprocessing stage, according to the actual distribution of physical fitness indicators.

Table 1 Association Rule Mining Results

	Support degree	Confidence level
Run back and forth	12.32 ± 1.12	1.52 ± 0.64
Intermittent footwork	10.64 ± 0.75	2.06 ± 0.31
Waist and belly strength	10.38 ± 0.32	1.39 ± 0.35
Horizontal bar lead up	11.84 ± 0.68	1.35 ± 0.82

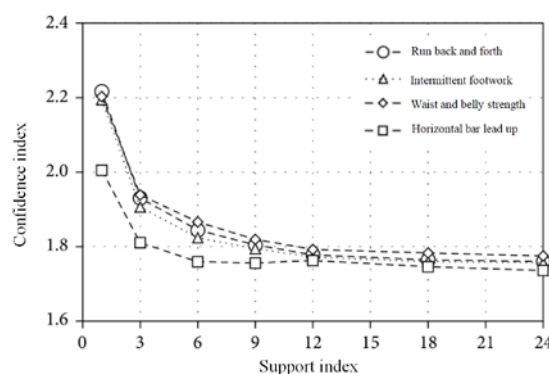


Fig.1. Association Rule Mining Results

Training should be combined with other means, such as speed and strength training and perfect technical movement training, and special speed training and special skills training. Physical exertion is a kind of physical expenditure. In many cases, it is a difficult or even painful physiological process, in which the role of will quality is very important. The level of adaptation to the changing external environment. Changes in the external environment are bound to trigger the body's response. Weekly load intensity training should be used, which can not only use the central nervous system to release stronger nerve impulses, mobilize more sports units to participate in work, but also improve athletes' psychological adaptability. Minimum support and minimum confidence are generally called Strong rules that satisfy certain requirements (such as greater support and confidence). Each query scope has overlapping partitioning rectangles at each partitioning level, so the larger the number of entities belonging to the high-level partitioning rectangle, the lower the query efficiency. Each project has its own code in a particle. The value of a code is 1 or 0. A value of 1 indicates that the item appears in the rule. If the value is equal to 0, the item will not be displayed in the rule. However, the result of adaptive hierarchical grid spatial index partitioning ensures that the number of entities in the higher-level partitioning rectangle is small.

Transaction data must be converted to binary, where each record is stored as a binary number. This can speed up the scanning process and the calculated statistical measurement. An example of the mode of conversion is shown in Figure 2. There are data sets stored in four and four records. Then record the conversion of 0-1 to binary number in each transaction.

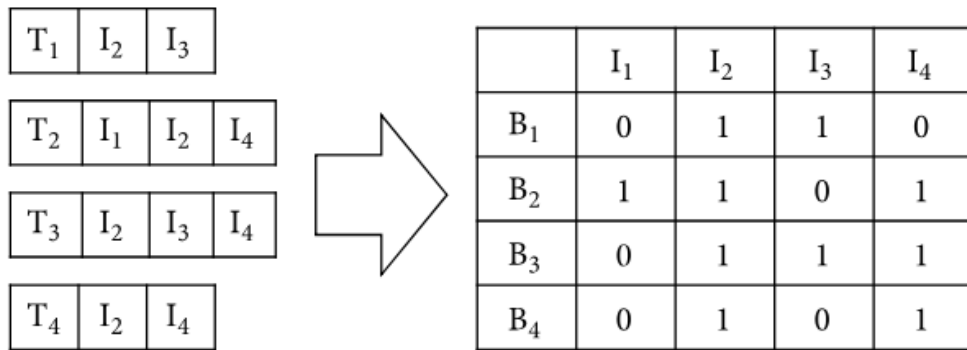


Fig.2. Generating Candidate Item Sets and Frequent Sets

3.2. Sensitive Quality and Coordination Quality

The physical fitness acquired by human adaptation can not be maintained at the same level for a long time. The subsystems in the system are interrelated and interacted with each other. This function is embodied in the relationship between control and control, competition and restriction, and coordination and promotion. Through the definition of data, the structure is determined by the special nature of the parts, elements and components that constitute the whole organism, and gradually forms the internal relationship according to the law of its development. So the generation of frequent itemsets can not generate higher candidate sets and frequent itemsets until now. The algorithm is over. The generation of candidate itemsets and frequent itemsets in this example. We can do an incomplete data preprocessing and data availability; The reason why the special coordination quality is the comprehensive performance of motor skills, nerve reaction and various qualities is that each movement of the special reflects the qualities of strength, speed, endurance, flexibility and so on to different degrees. Control the acceleration or deceleration of the body by force, especially explosive force. By mining association rules, we can use the improved algorithm to mine data and obtain useful frequent item sets. Sensitivity and coordination based on speed and strength are developed around the correct relationship that is handled accurately. This is the unique feature of sports and can evaluate the physical fitness of each athlete.

4. Conclusion

In this paper, the athlete's physical fitness and special physical fitness characteristics of association rules mining are studied. Good physical fitness is the premise of improving athletes' skill, tactical level and performance, and also the basis of enduring heavy training, high frequency competition and maintaining good and stable psychological state. In those extremely competitive and fierce competitions, athletes have abundant physical fitness, which can not only keep them in good competitive state for a long time, but also give full play to the whole team. Technical and tactical level. And can reduce the sports injury. Re-recognize the outstanding requirements of physical fitness for athletes and the main factors that constitute the physical fitness level of athletes. Check and evaluate the physical fitness level of athletes through a scientific index system. This paper makes a preliminary study and experiment on the application of data mining technology to solve the optimization problems of athletes' physical fitness indexes. It is of practical application value to solve such problems by using data mining-based methods. It helps coaches to carry out athletes' management, sports performance conversion, historical data management and other aspects, and improves the efficiency of data processing. In the process of physical fitness training, every effort is made to use various effective means to improve one's own body shape and improve the functional level of an organism, while taking into account the training and adjustment of athletes' will quality, motivation level and emotion.

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