

Research Article

Analysis on Survey Data of Special Physical Training for Skiers in Summer Training Based on Big Data

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Due to the geographical and natural conditions, the development of skiing events is more resistant in China, and the training venues, methods, and concepts are insufficient, making it difficult for Chinese skiers to make some progress and aspire to the highest peak in this field. The purpose of this study is to explore and analyze the survey data of the professional physical training of skiers in summer training based on big data. Big data is employed to investigate and analyze the special physical training of skiers in summer training. Based on the data of professional physical training of skiers in summer training under big data, the current situation of skiers in summer training is examined, and the limitations are compared to improve the traditional physical training of skiers. Results show that the special physical training of skiers based on big data is more feasible in summer training, and the improvement of training effect is more obvious than traditional physical training. The training effect of the proposed method can more effectively solve the difficulties in summer training for skiers and understand the essentials of the action.

1. Introduction

Long-term endurance training will ideally lead to better performance and physiological indices. These changes in physiological indices are measured by scientists and coaches to provide valuable analytic information about the effects of training [1]. However, presently there is inadequate information on how these physiological indices change in elite endurance athletes during months and years of training and how these changes affect performance. This information is vital to comprehend training schemes to increase performance in already extremely well-trained endurance individuals [2].

In summer training, the design of the training plan should follow the characteristics of local conditions. The

training plan of each event is a structured training system established for different training periods and different sports characteristics of each athlete [3]. In the complete set of skiing on snow, athletes pursue both speed and difficulty in the process. This requires very high strength, flexibility, agility, and coordination of athletes. Therefore, simple basic physical training is not enough for athletes in this event. However, there is no physical training theory system specifically for this project [4].

Yueliang and Pidek [5] mentioned that physical fitness is the result of training through the use of special methods, and physical fitness has a certain directionality, which is the result of adaptation to specific items. Alpine ski racing needs physical, technical, and social skills. Gilgien et al. [6] described the method of how athletes manage the multistep

nature of the obligatory training. Special importance is given to the specific aspects of sports, such as the group of stimulus that affect training, training with acute and chronic injury, training in cold regions at altitude, and the effectiveness and success of ski training and testing. Kearlson et al. [7] described the endurance training and frequency of illnesses described by a group of trained cross-country (XC) skiers using their evolution from junior to senior level. Variations in the training and performance of thirty-one well-trained XC skiers were examined using linear mixed-effects models. Moreover, the changes in the occurrence of self-reported disorder episodes were investigated using incidence rate ratios, and the relationship between self-reported illness and training capacities was analyzed using linear hybrid-effects models in a subgroup of twenty-three skiers. It was reported that the group of trained XC skiers linearly improved their endurance training volume yearly. This was primarily accomplished via an increase in low-intensity and sport-specific training. In addition, higher training volumes were related to a lower number of self-reported illness days.

Neumayr et al. [8] described the physical and physiological properties of the world cup skiers. A total of forty-eight skiers including twenty females and twenty-eight males of the Austrian ski team were investigated before and after the training. Physical characteristics such as age, height, body mass index, and body fat and thigh circumference were recorded from each player. They validated that the practical experience that provides success in professional skiing is dependent on multiple physiological variables.

The authors in [9] compared the training load volume distribution of elite Norwegian and Russian cross-country skiers in a one-year macrocycle. A pyramidal model of intensity ratio was used during the entire macrocycle, and the volume of moderate-intensity endurance training in competition periods was kept constant. A comparative analysis of training load volume distributions among the Norwegian and Russian cross-country skiers revealed substantial similarities.

Losenegard et al. [10] observed variations in aerobic and anaerobic volumes and performance in a group of elite cross-country skiers throughout a full sports session. Thirteen players were tested during the initial, middle, and final preparation phase. All the players obtained their training individually, and full training logs were characterized into different intensity zones and exercise methods. The full training volume was maximum during the summer and declined toward and through the winter season, whereas the capacity of high-intensity training increased. It was concluded that there was a significant main effect among testing sessions. Keeping in view the abovementioned research works, the purpose of this article is to improve the professional level of skiers. For this purpose, the survey data of skiers' summer training specific physical training are examined and analyzed. Through an overview of the basic theories of big data, the core technology of big data is derived and the research and analysis on the surveyed data are accomplished.

The rest of the manuscript is structured as follows. In Section 2, the different physical training contents big data

database is explained. Section 3 illustrates the various methods used for data collection. The results are presented in Section 4, and Section 5 is about the conclusion.

2. Physical Training of Skiers in Summer Training Based on Big Data

2.1. Specific Physical Training Content. Based on the five-week training plan and implementation of the Chinese national team, the training contents were classified according to the type of training content. The contents were categorized into special technology, aerobic endurance, balance ability, sensitive coordination, burst speed, core power, and basic power. The training contents and the proportion are shown in Figure 1. Among them, the training of various physical fitness accounts for 80% of the total contents, and the special technical training on the trampoline only accounts for 20%. In special physical training, the core power training has the largest proportion, accounting for 30% of the entire training. Aerobic endurance training accounts for the smallest proportion, accounting for only 4% of the entire training content.

2.2. Strength Training

2.2.1. Training Methods. In sports, each sports training method is distinctive and has its own merits and demerits. Certain types of training complement specific sports such as consistent training work well with athletes who compete in marathons and sports coaches, and athletes should know how to best cooperate them into their training programs. After a long time of summing up and thinking, the trainer often uses the movements such as turning and grasping after taking off on the trampoline during the land training [11]. On the land, the training methods such as turning jump, standing triple jump, and somersault are used, and then there is a high jump platform, rotation, and landing training method on the skateboard, but many methods are not easy to carry out quantitative testing, so the most commonly used method is to jump vertically in place and evaluate it by the height of the air. The athlete's specific strength level, before and after training, is shown in Figure 2. It can be seen that the height of the jump is more significant after training compared with the jump of athletes before training.

2.2.2. Auxiliary Means. In strength training, it is natural to make basic training on difficult techniques, and these techniques are complementary to each other [12]. The way of strength training refers to the way of muscle contraction. In exercise physiology, muscle contraction is divided into static and dynamic contraction. At present, the basic strength training of the Chinese national team includes only five training methods for heel-lifting which include hip-twisting, in situ lunge and leg-jumping, stepping, high-leg-jumping, and supine leg-lifting.

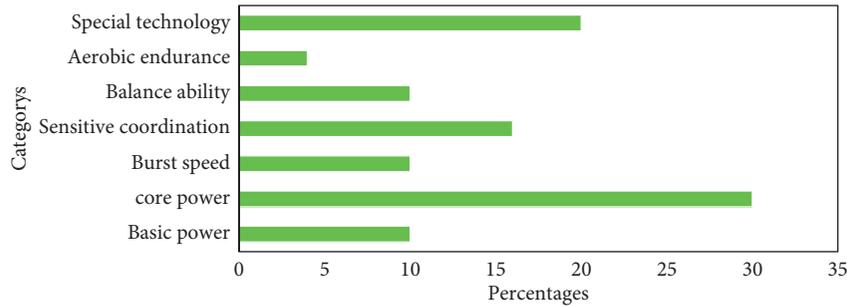


FIGURE 1: List of summer training content and percentage of snowboard athletes.

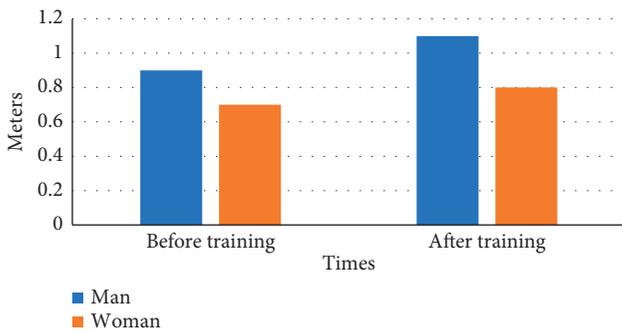


FIGURE 2: Comparison chart of the in situ vertical jump before and after the hurdle jump training.

2.2.3. Rapid Expansion and Contraction Compound Training System. The rapid expansion compound training is different from the special strength exercise in which it will allow the athletes to train the muscles to reach the maximum strength in the shortest possible training time [13]. The ultimate goal of this exercise is to train the athletes’ explosive power. Simply put, the rapid expansion and contraction compound training mainly trains the explosive power of the athletes in the skiing and snow skills event.

2.2.4. Full Body Resistance Exercise (TRX) Suspension Training System. TRX is a new workout method that uses body weight and gravity as resistance to build strength, balance, coordination, joint stability, core, and flexibility. To build strength, lose fat, and increase endurance or flexibility, the TRX Suspension Trainer can be used to achieve any fitness goal. In the application of TRX, the training methods of stable strength and explosive strength of figure skating of the same event group are used for reference, and the methods of strengthening core function training, suspension training, and super isometric training are used to train athletes [14].

2.3. Balance Training. Balance is the capability to stay in control of body movements and is a significant part of many sports. Exercises to improve balance are included in a balanced exercise program. A great way to improve balance is to work on the central muscle groups that help to maintain body posture [15]. Balance training is one of the important content of special physical training for snow skills. It runs

through all stages of the entire training cycle. In the physical training content during the preparation period, the arranged training load is second only to strength training, balance ability, and strength quality. The coordination quality and flexibility are interrelated and affect each other. Table 1 shows the arrangement of the 2013 Chinese annual periodic training plan.

2.4. Speed Training. The time for the athlete to complete the game depends on the athlete’s perfectly coordinated slewing movement to quickly pass through the snow bag area, to land smoothly after the aerial technical action is completed, to complete the established route and action, and to complete a series of action combinations in a short time [16]. Snow skills athletes spend most of their time training on land in non-snow seasons. They practice sprinting at different distances, emphasizing the rhythm and maximum speed of running at different speeds. Through short-distance speed training, the athletes’ ability to promote the athlete’s body muscle activation and movement speed production is improved. The special physical training content, owing to the special characteristics of snow skills, improves the rapid movement ability of the lower limbs. It is recommended to control the time of running for 10–30 seconds, each group performs 5–10 times, and the interval between groups is 1-2 minutes.

2.5. Special Skills Training. Special skill training emphasizes the technique of the skill and ways of applying the skill in competition. The special technical training includes skateboarding training, horse head-turning landing training, mat training, bounce net training, and balancer training. These exercises are more targeted with the aid of equipment to point the training goals to specific techniques. For example, skateboard training and balancer training are for basic sliding, balance strength, and edge-to-edge skills training. On the other hand, the training on the mat and the netting are aimed at the training of the special strength and spatial feeling required for aerial movements.

2.6. Principle of the System for Distributed Database-1 (SDD-1) Algorithm. SDD-1 is the world’s first distributed database system query [17]. The query technology of this series of distributed database systems uses the semijoin operation of

TABLE 1: The 2013 annual cycle training plan arrangement.

Content/stage	Preparation period				Prematch		Competition period		Transition period	
	General preparation period		Special preparation period		preparation period					
	Load	Strength	Load	Strength	Load	Strength	Load	Strength	Load	Strength
Balance training	D	D	D	D	D	D	D	D	D	D

Note. D (big) means more than 90%; Z (middle) means 70–90%; and X (small) means 50%–70%.

relational algebra. Given the relations R and S , the selection factor formula of the semijoin operation $R \bowtie S$ is as follows:

$$\begin{aligned} SF_{sj}(R \bowtie S) &= \frac{\text{card}(\pi_a(s))}{\text{card}(s)}, \\ SF_{sj}(R \bowtie S) &= \frac{\text{card}(\pi a(s))}{\text{card}(s)}, \end{aligned} \quad (1)$$

where $\text{card}(\pi a(S))$ is the number of tuples after the projection operation of the common attribute of R and S to S and the $\text{card}(S)$ is the number of tuples of the relation S .

The beneficial semijoin can be computed as follows: let R and S be two relations, when

$$\text{benefit}(R \bowtie S) - \text{cost}(R \bowtie S) > 0. \quad (2)$$

If the result is true, then the semiconnection $R \bowtie S$ is called a beneficial semiconnection.

The SDD-1 query algorithm obtains beneficial semiconnections with the help of loop iteration. Each time a beneficial semiconnection is obtained, the amount of network data transmission is reduced. Finally, the site with the largest amount of data is selected as the data equipment site. The SDD-1 query algorithm is mainly divided into two parts when it is executed [18, 19]. In the first part, the basic algorithm is executed and then the algorithm is optimized after execution. In the basic algorithm, the efficiency, revenue, cost, and other information of each semijoin are obtained and this statistical information is used to reduce the assembly of different semijoins, and finally the execution strategy is obtained. In the postoptimization algorithm, the basic execution strategy of the algorithm is optimized to make the final execution strategy more efficient.

3. Special Physical Training of Skiers in Summer Training Based on Big Data

3.1. Subjects. In order to make the results of this experiment more scientific and effective, this study compares the traditional special physical training of skiers in summer training with the special physical training of skiers based on big data. For this purpose, data on the feasibility of skiers' summer training-specific physical fitness were collected. A questionnaire survey method is used to obtain first-hand data by investigating its members in a ski training base in a certain place. To further investigate and analyze the special physical effect training based on big data, this experiment also conducted network interviews with relevant research experts. The gender ratio of the experts in this interview was equal to ensure the scientificity of the experimental data. The

ten-point system is used, where 1 means disapproval and 10 means approval, and the results obtained are analyzed and counted using the analytic hierarchy process (AHP). The analytic hierarchy process (AHP) is a method for analyzing and organizing difficult decisions, using mathematics and psychology.

3.2. Research Methods. Research methods are the schemes and techniques used for collecting data or evidence for analysis to expose new information or create a better understanding of a topic. In this study, the following research methods were employed for data collection.

- (i) *Questionnaire Survey Method.* This experiment sets up a targeted questionnaire based on interviews with relevant experts. The survey was conducted in a semiclosed form, the purpose of which was to facilitate the correct filling of the survey subjects.
- (ii) *Field Research Method.* This study conducted in-depth ski training bases, conducted face-to-face interviews with skiers and recorded data, and compiled the recorded data. These data not only provided theoretical support for the topic selection of this article but also provided the final research results of this article.
- (iii) *Video Observation Method.* By watching the video of the skiing skill competition at the Winter Olympics, using sports-related software, two-dimensional analysis, and event sequence analysis, the time and action combinations of each stage of the snow skill sport were obtained, and the key technical movements of the snow skill project were repeatedly watched. It provides a reference for analyzing the rationality and effectiveness of the content of the physical training on snow skills.

4. Experimental Analysis

4.1. Comparative Analysis of Special Physical Training for Skiers in Summer Training. In order to analyze the efficiency of the skiers' special physical training method based on big data, the results of the proposed method are compared with the traditional special physical training in all parts of the strength training. The comparative results are shown in Table 2 and Figure 3.

It can be seen from Figure 3 and Table 2 that compared with the traditional special physical training for

TABLE 2: Comparative analysis of special physical training for skiers in summer training.

	Aid system (%)	Compound training system (%)	TRX system (%)	Others (%)
Big data	74	80	67	69
Traditional	46	40	42	44

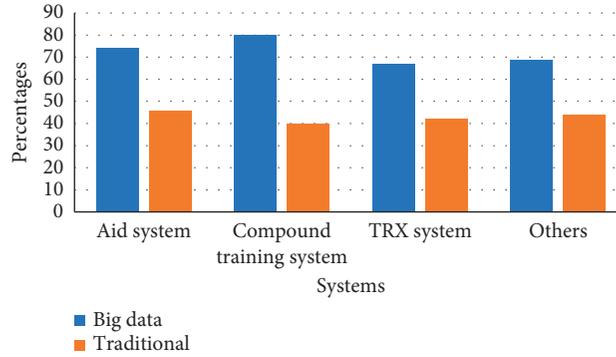


FIGURE 3: Comparative analysis of special physical training for skiers in summer training.

skiers in summer training, the special physical training for skiers based on big data in summer training is much better than traditional special physical training in all parts of the strength training. The proposed big data method reported 74%, 80%, 67%, and 69% efficiency for aid systems, compound training systems, TRX systems, and others, respectively, as compared with results obtained by the traditional physical training methods. Furthermore, it shows that the rapid expansion and contraction compound training system is 40% higher than the traditional training effect, which reflects the feasibility of the research and analysis of the summer training special physical training for skiers based on big data. The results validate that the skiers' special physical training method based on big data is more efficient than the traditional special physical training in all parts of the strength training.

4.2. *Analysis of the Performance of Skiers' Special Physical Training in Summer Training Based on Big Data.* To further investigate the special physical training of skiers in summer training based on big data, this experiment conducted network interviews with relevant experts and recorded the data obtained, as shown in Table 3 and Figure 4, respectively.

It can be seen from Figure 4 that most experts are satisfied with the special physical training for skiers based on big data in summer training. In the case of balance training, a total of thirteen experts are satisfied with using big data techniques. Likewise, fifteen experts are satisfied with the use of big data techniques for speed training. Similarly, thirteen and eleven experts are in favor of using big data techniques for special skills training and others, respectively. Especially for speed training, the training effect is better than other training methods, which fully reflects the skiers based on big data and the extensive use and effectiveness of summer training special physical training.

TABLE 3: Analysis of the performance of skiers' special physical training in summer training.

	Balance training	Speed training	Special skills training	Others
Man	7	8	7	6
Woman	6	7	6	5
Total	13	15	13	11



FIGURE 4: Analysis of the performance of skiers' special physical training in summer training.

5. Conclusion

The purpose of skier's training is to develop specific physiological abilities and maximum efficiency of the movement system. This enables the athletes to reach competitive speeds at the main races. In addition to training exercises and ideal methods, the most significant conditions for obtaining the highest performance level in due time are the selection of a particular training method.

In this article, big data techniques were used to analyze the survey data of the professional physical training of skiers in summer training. The big data techniques were employed to investigate the current situation of skiers in summer

training, and the shortcomings were compared to improve the traditional physical training of skiers. Analysis results showed that the special physical training of skiers based on big data is more efficient in summer training, and the improvement of training effect is more evident than traditional physical training of skiers. The training results of the proposed special physical training method can more effectively solve the difficulties in summer training for skiers and understand the essentials of the actions.

Data Availability

The data underlying the results presented in the study are included within the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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