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Development of High-altitude Management Guidelines for Basketball Clubs in Xining City, the People's Republic of China

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Abstract

Background and Aims: The development of basketball athletes in high-altitude areas of Qinghai Province remains constrained by the absence of a systematic and context-specific training management system. Inappropriate training approaches increase the risk of injury and limit athletes' performance development, particularly among adolescents. Moreover, deficiencies in performance monitoring, resource integration, and stakeholder collaboration further hinder sustainable athlete development. This research aimed to develop a high-altitude management guideline for basketball clubs in Xining city, the People's Republic of China.

Methodology: This study employed a mixed-methods design, integrating quantitative and qualitative approaches. To study the current situation and problems of high-altitude management for basketball clubs in Xining city, the researcher used 345 questionnaires (IOC = 0.89) and interviewed 30 stakeholders. Interview 5 experts to consult about the draft of the high-altitude management guidelines for basketball clubs in Xining city. Then, the focus group method was used with 9 experts. Finally, the Connoisseurship method was used with 7 experts to confirm the high-altitude management guidelines for basketball clubs in Xining city. Descriptive analysis was used to analyze the questionnaire data, and the content analysis method was used to analyze interview data, focus group data, and Connoisseurship data.

Results: The research results found that: 1. The overall analysis across the eight components of the POLC and 4M frameworks demonstrates a generally strong management foundation among basketball clubs in Xining City. The mean value of the eight components was more than 3.41 (Moderate level). 2. The POLC framework, with four components: Planning, Organizing, Leading, and Controlling, was each consolidated into 10 focused guidelines, yielding 40 guidelines in total. The 4M framework, comprising Man, Money, Materials, and Management, was refined into 10 guidelines per component, creating another 40 practical guidelines.

Conclusion: The experts agreed that the refined guidelines effectively address the key challenges associated with high-altitude basketball environments, including athlete adaptation, safety, facility standards, interdisciplinary coordination, and long-term development.

Keywords: High-altitude Management Guideline; Basketball Clubs; Xining City

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Introduction

China was one of the first countries to organize the YMCA, and basketball was introduced to China. Its development includes five stages: the first is the initial stage of basketball from 1890 to 1920; the second is the stage of improvement and promotion of basketball from 1930 to 1940; the third is the stage of popularization and development of basketball from 1950 to 1960; the fourth is the stage of comprehensive improvement of basketball from 1970 to 1980; and the last is the stage of innovation and climbing from 1990 to the present. Before 1974, due to the domestic political turmoil, China did not participate in any international basketball competitions, except for friendly matches with friendly countries (Wang Guanghua, 1998). The development of basketball in New China was therefore hindered to a certain extent. In 1974, Chinese basketball was allowed to participate in international basketball competitions. Since then, China's basketball career has been further popularized and developed, and the level of basketball has gradually improved. However, we must be aware of the gap between the level of Chinese basketball and the world's strong teams, especially in terms of physical fitness. Chinese players have always been at a disadvantage, which has become a stumbling block to the current development of Chinese basketball.

High-Altitude training has a history of more than 50 years, but experts and scholars still have disagreements about the effect of plateau training (Liu Xingzheng, 2006). The following issues may be the main reasons for the controversy: 1. During the training process of athletes in high-altitude areas, their exercise load is lower than that in the plains. The reduction in load is likely to cause a decrease in the working capacity of skeletal muscles. Only an appropriate load can stimulate the improvement of the body's exercise capacity. 2. Relevant studies have shown that with the increase in altitude, the protein content of skeletal muscle tends to decrease. 3. On the plateau, the gravity of the Earth will be relatively reduced. Therefore, for projects with high technical requirements, high-altitude training will have adverse effects on them. 4. Athletes may experience a decrease in immunity due to the dual stimulation of exercise load and the physiological load of a hypoxic environment. To solve these problems existing in the plateau itself, relevant research experts have proposed a training method that simulates the plateau environment - hypoxic training- which not only takes advantage of the benefits of plateau training, but also avoids the adverse effects of plateau training on athletic ability (Wang Ran, 2013). High-altitude basketball training is a crucial issue in both sports science and management, especially in the context of Qinghai Province, which lies on the Qinghai–Tibet Plateau at an average elevation of over 3,000 meters above sea level. Such an environment directly affects athletes' physical performance, particularly in terms of cardiovascular function, adaptation to hypoxia, and endurance capacity (Chapman et al., 2014).

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In Qinghai, the development of basketball athletes in high-altitude areas requires an effective management system, which includes training planning (Planning), resource and team organization (Organizing), team leadership and motivation (Leading), and continuous performance monitoring (Controlling), in accordance with the POLC framework (Robbins & Coulter, 2016). Research has shown that without training programs tailored to high-altitude environments, athletes are at increased risk of injury, performance declines, and failure to reach full potential (Foster & Lundby, 2010). This is particularly critical for adolescents aged 12–16, who are in a key stage of physical and neuromuscular development (Bompa & Haff, 2009).

In this study, integrating the POLC framework, Planning, Organizing, Leading, Controlling, with the 4M perspective of Man, Material, Management, and Money, yields a management roadmap that is both process-driven and resource-focused for high-altitude basketball training in Qinghai Province.

Objectives

1. To develop the high-altitude management guidelines for basketball clubs in Xining city, the People's Republic of China.

2. To verify the high-altitude management guidelines for basketball clubs in Xining City, the People's Republic of China.

Literature Review

1. High-Altitude Basketball Training

With the rapid development of science and technology, various sports competitions have developed rapidly; the athletic ability of participants has continued to improve, and training measures to help athletes improve their performance have also been developed. Among them, one training method that has been continuously studied by sports teams and scientific researchers in various countries is plateau training. Plateau training refers to a method of organizing athletes into areas with suitable altitudes in a purposeful and planned manner for regular special sports training (Feng Lianshi, 1994)

The 1968 Olympic Games held in Mexico were held on a plateau at an altitude of more than 2,200 meters. Coaches from some countries believed that when athletes went from low altitudes to high altitudes to participate in competitions, their bodies would inevitably be restricted by low oxygen conditions, which would in turn affect their athletic ability. Therefore, before these Olympic Games, many athletes from low-altitude countries were taken to high altitudes for training. Before participating in the Olympic Games, some countries even wanted to go to Mexico City for pre-match training. In the 1960s, there was a period of enthusiasm for training at high altitudes. At that time, this phenomenon attracted worldwide attention. The

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practical experience and theoretical basis of training at high altitudes were rapidly improved, laying a certain theoretical level and practical experience foundation for plateau training.

Since the 1990s, high-altitude training has ushered in great development. The Flagstaff Plateau is a training base where most of the swimming champions at the Barcelona Olympics practiced. Before the 1996 Atlanta Olympics, the top eight countries on the Olympic gold medal list had basically trained at high altitudes. In summary, high-altitude training can be divided into several stages: germination (1951-1960), climax (1961-1970), exploration (1971-1990), and rapid development (after 1991).

In the mid-1950s, Soviet athletes achieved satisfactory results in the Melbourne Olympics after 20 days of plateau training. In the subsequent Olympics, athletes from Ethiopia and Kenya, which are located on the plateau, won the championship in the long-distance running event. Until the 1968 Mexico Olympics, plateau training, due to its good training effect, set off a wave of athletes from various countries participating in plateau training. With the in-depth study of plateau training, endurance events other than middle- and long-distance running events have gradually introduced plateau training and have achieved good results. Plateau training has a history of more than 50 years, but experts and scholars still have disagreements about the effect of plateau training. The following issues may be the main reasons for the controversy:

1. During the training process of athletes in high-altitude areas, their exercise load is lower than that in the plains. The reduction of load is likely to cause a decrease in the working capacity of skeletal muscles. Only appropriate loads can stimulate the improvement of the body's exercise capacity.

2. Relevant studies have shown that with the increase in altitude, the protein content of skeletal muscle tends to decrease. Therefore, during plateau training, athletes may suffer from decreased skeletal muscle mass, which may lead to decreased athletic ability.

3. At high altitudes, the Earth's gravity is relatively reduced. Therefore, for projects with high technical requirements, plateau training will have adverse effects on them. 4. Athletes may suffer from decreased immunity due to the dual stimulation of exercise load and the physiological load of a hypoxic environment. To solve these problems existing in the plateau itself, relevant research experts have proposed a training method that simulates the plateau environment - hypoxic training. This not only takes advantage of the benefits of plateau training but also avoids the adverse effects of plateau training on athletic ability.

Hypoxic training is essentially a training method that uses a natural or artificial hypoxic environment to train athletes to improve their athletic ability. In a broad sense, hypoxic training should include various methods such as plateau training, high-living high-training, high-living low-training, high-living high-training low-training, low-living high-training, and intermittent hypoxic training (Hu Yang, 2006). As a new training method simulating altitude training, hypoxic

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training can not only improve the body's ability to utilize and transport oxygen through hypoxic exposure, but also improve the cardiopulmonary function of athletes through exercise in a hypoxic environment.

Studies have shown that long-term training in a hypoxic environment will not only reduce the secretion of testosterone in the body but may also lead to excessive fatigue due to difficulty in recovering from fatigue. The body obtains favorable physiological adaptation changes through multiple transitions between hypoxic and non-hypoxic environments, rather than long-term hypoxic exposure. Therefore, we can say that multiple hypoxic exposures lasting 1 to 2 hours can better improve the body's endurance than long-term hypoxic exposure (Wang Ran, 2013).

Basketball is a sport that consists of running, jumping, sliding, and other movements accompanied by short breaks, where the short breaks are composed of timeouts, substitutions, free throws, fouls, and other factors. However, accurately answering the percentage of each form of movement, the duration of various forms of movement, the duration of the breaks, and the proportion of different intensities is of great value to the physical training of basketball athletes. In recent studies on the characteristics of movement patterns of collective ball players during games, most domestic and foreign researchers have chosen Time-motion analysis software for analysis. The indicators reflecting movement characteristics include the number of changes in movement methods, the average duration and distance of various movement methods, and the ratio of exercise to rest time. McInnes SE et al. (1995) used the Time-motion analysis method to study and analyze the movement characteristics of 8 elite basketball players during the game.

From the above research, it is concluded that basketball-specific speed endurance quality has become an important factor in determining the outcome of the game. Therefore, we must fundamentally understand basketball-specific speed endurance, find out the test method for basketball speed endurance, and develop an effective basketball speed endurance training method to provide coaches with a scientific training basis and theoretical support.

2. Qinghai Province Basketball Clubs

Altitude refers to the vertical distance of a place above sea level. There are differences in geography, climate, humanities, and other environments in areas with different altitudes, which lead to differences in the physical development of people at different altitudes. A plateau generally refers to areas above 500m above sea level. The four largest plateaus in China are the Qinghai-Tibet Plateau (average altitude above 4000m), the Inner Mongolia Plateau (average altitude 1000- 1200 m), the Loess Plateau (average altitude 800- 3000 m), and the Yunnan-Guizhou Plateau (average altitude 1000- 2000 m).

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Based on the theoretical research and practical application of plateau medicine, plateau exercise physiology, and plateau training at home and abroad, the altitude of 1200~2000 m is defined as the lower altitude for plateau training; the altitude of 2000~2500m is defined as the medium altitude for plateau training; and the altitude of 2500~3000m and above is defined as the higher altitude for plateau training. It is internationally recognized that the altitude of 2000~2500m is the most suitable altitude for plateau training (Ma & Fan, 2015).

Qinghai Province is named after Qinghai Lake, the largest inland saltwater lake in my country. It is located between 89°35'-103°04' east longitude and 31°9'-39°19' north latitude in western China. It is in the northeast of the Qinghai-Tibet Plateau, which is known as the "Roof of the World", and borders Gansu Province, Sichuan Province, Tibet Autonomous Region, and Xinjiang Uygur Autonomous Region. The total area is 722,300 square kilometers, ranking fourth in the country. Qinghai is known as the "Source of Three Rivers" and "China's Water Tower" because it is the source of the Yangtze River, the Yellow River, and the Lancang River.

Qinghai Province is divided into basins, mountains, and valleys, with towering mountains, crisscrossing rivers, lakes, and vast and fertile grasslands. The terrain of the province slopes from west to east, with a huge altitude difference, with the highest and lowest points differing by more than 5,100 meters. With Qinghai Lake as the intersection, there are three major natural zones in the province: the northwest arid zone (Qaidam Basin), the eastern monsoon zone (Hehuang Valley), and the Qinghai-Tibet Plateau zone (Southern Qinghai). The climate is mainly a plateau continental climate, including plateau temperate arid and semi-arid climate zones, and plateau subarctic humid and semi-humid climate zones. Most places have long, cold winters and short, cool summers, with the characteristics of high-altitude hypoxia, large temperature differences between day and night, little and concentrated precipitation, long sunshine, and strong solar radiation.

Due to the severe cold climate, the distribution area of forests in Qinghai Province is very limited, while the area of grassland is large. It is the habitat and growing place of many plateau creatures, such as rare precious animals: brown bears, snow leopards, wild yaks, wild donkeys, Tibetan antelopes, etc., and precious wild plants: snow lotus, cordyceps sinensis, licorice, Qinjiao, etc. Qinghai is located on the active continental margin. The region has a complex geological structure and diverse mineral resource generation mechanisms, which have a significant impact on the country's energy supply, especially in terms of reserves of oil, natural gas, potassium salt, asbestos, and various non-ferrous metals (Edited by Flora of China Editorial Committee, 1978).

3. Management theory

3.1 POLC Management Theory

Louis A. Allen's POLC management principle is considered a modern management theory that is still popular today. It is a management principle that emphasizes the process

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from start to finish, that is, from planning, preparation, operation, to evaluation, with an emphasis on leadership in managing work efficiently and effectively. POLC stands for planning, organizing, leading, and controlling, which covers the entire process from start to finish. It emphasizes organizational management, including personnel, planning for efficiency, and evaluation to analyze, improve, and correct work to achieve the set goals (HR NOTE, 2019).

Planning is a scheme or method of acting, doing, proceeding, making, etc., that is developed in advance. Coming up with a plan is the function of management. It involves setting objectives and determining a course of action for achieving them. Planning requires that managers be aware of the environmental conditions facing their organizations, for which they must be able to forecast future conditions for their institutions. As such, it is a requirement that managers be good decision makers.

Koontz & O'Donnell (1968) described planning as deciding in advance what to do, how to do it, when to do it, and who will do it. Therefore, planning is about connecting what is happening in the present to the desired future.

Organizing management is the determination of the position structure, roles, duties, and work of all sectors to be consistent, smooth, and without overlapping. Organizing management also includes organizing work to make work without interruption. Allocate the right people to the job. Systematically manage work. to achieve the greatest work efficiency. Northcraft and Neal (1994). An organization is when an organization has a plan. The organization must then prepare the material, equipment, and personnel resources needed to carry out the plan as planned.

Leading Conditions to control work to be accomplished. It must be able to motivate everyone to want to work together. Must manage personnel well. Must understand their own work and that of their subordinates, including having good problem-solving skills and making careful, quick, and good decisions, and be able to lead everyone to achieve their goals successfully.

Robbins and Coulter (2005) state that leading means using management's leadership together with motivation to make members of the organization do their best. For the organization to achieve success as determined

Controlling is taking care of personnel as well as performing various tasks. In accordance with the planned work plan, as well as following up and evaluating whether the performance is as planned or not. Achieving objectives or not, and how much success? Controlling also means dealing with problems effectively. Efficiency has the least impact on work as well.

Dessler (2004). Control is the act of ensuring that the plan has already been laid out. It is carried out correctly and is effective in practice. And if necessary, the plan must be revised and reviewed to achieve the desired results.

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3.2 The Management 4M Theory

The Management 4 M theory (Man, Money, Material, and Management) comes from the theory of economics with production management theory (Bangmoo, 2002; Drucker, 2008; Drucker, 2011; Drucker, 2012). If the Ancient Chinese Chak-ngaew community market is well managed following the 4m theory, it can achieve the purpose of the Ancient Chinese Chak-ngaew community market, that is, tourists will visit, people in the community will earn revenue, and careers will be sustainable.

Man is a worker, employee, or personnel from both inside and outside. is the most important factor. The management policy is set so that each employee must go through a process of training their skills before entering the job. Then, they will be assigned tasks that are appropriate to each person's skills, following the concept of Max Weber (1864-1920).

Money or capital is used in business operations from both internal and external funds. In business, capital is the most important factor. Not every business can run well if there is a loss in the operation of management theory. There is a guideline for managing the spending of money or production costs in an economical and worthwhile manner to produce results greater than the specified costs. Financial management is an important element of management according to the concept of Wirachnipawan (2005).

Material is materials, things, raw materials, spare parts, products, services, or other equipment. Contribution to the production of goods or services is the next most important thing. Every business must rely on what is obtained in this group to be used as a resource in production. By setting guidelines for the use of tools and equipment that are an important part of production to produce quality and within the specified time frame, it is therefore determined that all employees must have the knowledge and ability to use various tools well, with training and understanding, including various techniques that will be used to maintain and prevent danger or damage that may occur during work.

Management is a group of people in the organization who work together. To achieve common objectives of the organization, which include planning, organization management, recruitment, leading, or ordering and controlling the organization, or attempting to achieve common human resource management objectives.

In this study, integrating the POLC framework, Planning, Organizing, Leading, and Controlling, with the 4M perspective of Man, Material (or Machine), Method, and Money, yields a management roadmap that is both process-driven and resource-focused for high-altitude basketball training in Qinghai Province.

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Conceptual Framework

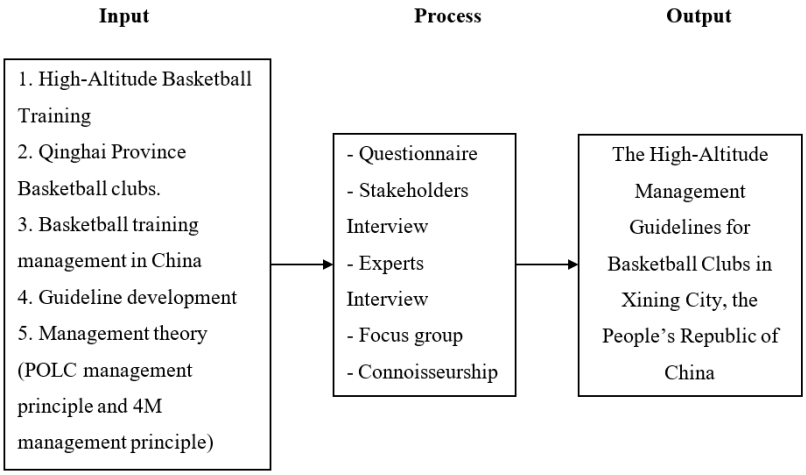


Figure 1 Conceptual Framework

Methodology

Population specification and size

A total of 10 basketball clubs in Xining City, with a total of 2,093 basketball players. The selection criteria for basketball clubs are as follows: 1. It is a basketball club located in Xining City. 2. It has a total of at least 100 basketball players. 3. It has a provincial-level or higher basketball coach and a total of at least 10 coaches. 4. It has been registered and operated as a basketball club for at least 7 years. 5. It has worked with relevant sports clubs or organizations at the provincial level for at least 3 years.

In order to provide a more detailed survey of the current situation and problems of high-altitude management in basketball clubs in Xining, the researcher would conduct interviews with 30 basketball coaches and basketball managers from 10 basketball clubs, divided into interviews with 2 basketball coaches and 1 basketball manager from each club. For the population interviews, the researcher would use all population units.

Samples

According to Taro Yamane's schedule, the researcher would use a total sample size of 345 people, the sample would select form each basketball club as table below.

No.	Club name	Population (people)	Sample (people)
1.	Qinghai CM Basketball Club	231	38
2.	Qinghai Yingcai Basketball Club	221	39
3.	Qinghai Chengyi Education Basketball Club	150	25
4.	Qinghai Huilong Basketball Club	234	38
5.	Qinghai Longxiang Basketball Club	202	33

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No.	Club name	Population (people)	Sample (people)
6.	Qinghai Meika Tianling Basketball Club	155	26
7.	Qinghai Quanren Construction Basketball Club	230	38
8.	Qinghai Snow Eagle Basketball Club	248	40
9.	Qinghai Normal University Basketball Team	205	33
10.	Qinghai Nationalities University Basketball Team	217	35
	Total	**2,093**	**345**

Research participants

Using the purposive sampling method as follows:

1. 3 experts were used to determine the quality of the questionnaire and interview questionnaire (IOC); they are a basketball club manager and a basketball coach.

2. 5 experts were used to interview experts to consult about the draft of the high-altitude management guidelines for basketball clubs in Xining city, the People's Republic of China, from the database on the current situation, including 2 basketball team managers, 2 basketball coaches, and 1 club director.

3. The focus group method would involve a total of 9 experts, including 3 basketball team managers, 2 basketball coaches, 2 club directors, and 2 sports scientists.

4. Connoisseurship method using 7 experts, including 2 basketball team managers, 2 basketball coaches, 1 sports scientist, and 2 basketball club directors.

Research Instrument

1. Questionnaire for collecting the data. The questionnaire used to survey the current situation and problems of the high-altitude management for basketball clubs in Xining city, the People's Republic of China, would be designed under the application and integration of the POLC (Planning, Organizing, Leading, Controlling) management framework and 4M (Man, Money, Material, and Management) management function. The questionnaire would consist of 2 parts: Part 1: Information on the status of the respondents. Part 2: The current situation and problems of the high-altitude management for basketball clubs in Xining city, the People's Republic of China. This part was a 5-point scale question. Before using the questionnaire, it was tested for validity by 3 experts (IOC = 0.893).

2. In-depth Interviewing questionnaire for basketball coaches and basketball managers. The interview form provides a more detailed survey of the current situation and problems of the high-altitude management for basketball clubs in Xining city, the People's Republic of China. The interview form was open-ended. Before using the interview form, it was tested for validity by 3 experts (IOC = 0.886).

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3. In-depth Interviewing questionnaire to collect the data from experts. The interview form was used to consult on the draft of the high-altitude management guidelines for basketball clubs in Xining city, the People's Republic of China. The interview form was an open-ended question under the question of "What should be the guidelines for high-altitude training management on basketball clubs in Qinghai Province?" Before using the interview form, it would be tested for validity by 3 experts, and the IOC value must be more than 0.60.

4. Focus group outline. In the focus group method, the researcher would take the draft of the high-altitude management guidelines for basketball clubs in Xining city, the People's Republic of China, which has been created based on the data from the questionnaire survey and the expert interviews.

5. Evaluation form for connoisseurship. The researcher would use the final draft of the high-altitude management guidelines for basketball clubs in Xining City, the People's Republic of China, as an instrument to request advice and evaluation results from 7 experts in the connoisseurship method, and the experts would provide written evaluation content.

Data Collection

1. The 345 questionnaires would be sent to 10 basketball clubs in Xining City. The number of questionnaires sent to each club would be equal to the number of randomly selected samples in each club. The questionnaires would address the current situation and problems of high-altitude management for basketball clubs in Xining City, the People's Republic of China.

2. Interview 30 basketball coaches and basketball managers from 10 basketball clubs to provide a more detailed survey of the current situation and problems of high-altitude management for basketball clubs in Xining City, the People's Republic of China.

3. Interview 5 experts used to consult on the draft of the high-altitude management guidelines for basketball clubs in Xining City, the People's Republic of China, by using an online method.

4. The focus group with 9 experts will provide additional comments on the researcher's developed guideline to gain more information to improve the guideline created by the researcher.

5. Connoisseurship by 7 experts to verify the high-altitude management guidelines for basketball clubs in Xining city, the People's Republic of China; each element of the guidelines must have the agreement of no less than 5 experts.

Data Analysis

1. Evaluate the content validity of the questionnaire and interview form employing the Index of Objective Congruence (IOC ≥ 0.6).

2. Use computer analysis software to collect and organize the data obtained from the questionnaire. ($\bar{X}$, SD, Percentage). The criteria for the 5-level evaluation scale (Likert Rating Scale) of Part 2 are as follows:

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- An average score of 4.51 to 5.00 indicates the highest
- An average score of 3.51 to 4.50 indicates a High
- An average score of 2.51 to 3.50 indicates a Moderate
- An average score of 1.51 to 2.50 indicates a Low
- An average score of 1.00 to 1.50 indicates a Lowest

3. Content analysis for interviews, focus groups, and the Connoisseurship method

Results

Results of the survey of the current situation and problems of the high-altitude management for basketball clubs in Xining City, the People's Republic of China

Summary of questionnaire survey: the overall analysis across the eight components of the POLC and 4M frameworks demonstrates a generally strong management foundation among basketball clubs in Xining City. Seven components Planning (Mean = 3.92, SD = 0.63), Organizing (Mean = 3.85, SD = 0.67), Leading (Mean = 3.78, SD = 0.70), Controlling (Mean = 3.69, SD = 0.72), Man (Mean = 3.88, SD = 0.64), Materials (Mean = 3.57, SD = 0.68), and Methods (Mean = 3.73, SD = 0.66) were rated at a high level. These consistently high scores indicate that clubs have established effective structures, leadership, personnel competence, and operational methods suitable for high-altitude training environments.

In contrast, the Money component received the lowest evaluation, positioned at a Moderate level (Mean = 3.41, SD = 0.75). The relatively higher variability in responses (as shown by the larger SD) highlights disparities in financial stability and resource allocation among clubs. This suggests that financial constraints remain the most substantial barrier affecting several other components, including infrastructure improvement, acquisition of specialized high-altitude equipment, and provision of athlete support services.

Across components, the recurring high-mean items point to strong leadership behavior, clear organizational roles, and well-structured planning processes. However, the lowest-mean items, such as limited athlete participation in decision-making, insufficient availability of specialized monitoring tools, low engagement in funding acquisition, and inconsistent long-term evaluation practices, indicate systemic weaknesses that require strategic attention.

Overall, the combination of high mean values in most managerial aspects and moderate performance in financial management suggests that basketball clubs in Xining City possess solid administrative capabilities but face financial and resource-based limitations. These insights provide an essential foundation for strengthening and contextualizing high-altitude basketball management guidelines, ensuring that both operational strengths and critical constraints are addressed in future strategic planning.

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Result of the final draft of the high-altitude management guidelines for basketball clubs in Xining city, the People's Republic of China, by a researcher.

In this step, the researcher would draft the final high-altitude management guidelines for basketball clubs in Xining city, the People's Republic of China, based on the results of the focus group method under the POLC management principles and 4M management principles. The final draft of the high-altitude management guidelines for basketball clubs in Xining city could be summarized as follows:

Table 1 Final draft of high-altitude management guidelines for basketball clubs in Xining city, the People's Republic of China, under POLC management principles.

No.	Guidelines
Planning	
1	Develop a scientifically grounded high-altitude acclimatization program with clear progression steps.
2	Conduct mandatory pre-training health and altitude-risk screenings for all athletes.
3	Set measurable performance indicators (e.g., SaO_2 thresholds, HR recovery) for planning training cycles.
4	Design training periodization specifically for hypoxic conditions and environmental variability.
5	Allocate time for extended warm-up, recovery, and psychological adaptation sessions.
6	Integrate altitude-specific nutritional planning into seasonal training schedules.
7	Develop annual strategic plans that include medical readiness and emergency preparedness.
8	Prioritize budgeting for altitude-essential equipment and monitoring technologies.
9	Create long-term athlete development plans tailored to high-altitude physiology.
10	Establish planning coordination among coaches, medical teams, and managers to unify training objectives.
Organizing	
1	Establish an integrated management structure combining coaches, medical staff, and data specialists.
2	Define clear roles for altitude monitoring personnel and emergency response teams.
3	Organize routine interdisciplinary meetings to synchronize training and medical planning.
4	Ensure all staff possess minimum qualifications related to altitude physiology and first aid.

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No.	Guidelines
5	Organize athlete training groups based on acclimatization status and physiological readiness.
6	Maintain digital systems for centralized monitoring of training load and health data.
7	Provide structured communication channels for internal and inter-club coordination.
8	Manage facility resources to guarantee ventilation, temperature control, and safety.
9	Allocate organizational support for psychological services and recovery resources.
10	Form partnerships with universities or sports science institutes for ongoing expertise.
Leading	
1	Provide leadership that emphasizes safety, health, and scientific training at high altitude.
2	Communicate adaptation expectations clearly to reduce athlete stress and uncertainty.
3	Lead training sessions using evidence-based altitude training principles.
4	Encourage athletes to report symptoms early and foster a culture of safety.
5	Strengthen athlete motivation through psychological resilience methods.
6	Demonstrate proper breathing and recovery techniques during coaching.
7	Provide emotional support to athletes managing altitude-related mental strain.
8	Ensure leadership decisions are coordinated with medical and performance data.
9	Promote transparency and teamwork in all high-altitude training processes.
10	Engage in continuous professional development regarding altitude training science.
Controlling	
1	Monitor SaO_2, HR, RR, and other key physiological responses using digital tools.
2	Conduct daily readiness assessments before training sessions.
3	Track recovery indicators and adjust training intensity accordingly.
4	Implement standardized early-warning criteria for altitude sickness symptoms.
5	Evaluate environmental conditions (temperature, wind, humidity) before training.
6	Maintain an injury surveillance and reporting system across all teams.
7	Record nutrition, hydration, and sleep data as part of daily monitoring.
8	Ensure follow-up evaluations after high-intensity or high-altitude exposure.
9	Utilize technology (GPS, HRV, wearable sensors) for performance evaluation.
10	Conduct seasonal evaluations to refine guidelines and update practices.

Table 1 summarizes that the POLC framework, with its four components: Planning, Organizing, Leading, and Controlling, was consolidated into 10 focused guidelines, yielding 40 guidelines in total. The Planning component emphasizes altitude-specific physiological

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adaptation, measurable performance indicators, strategic periodization, and coordinated planning mechanisms. The Organizing component includes refined structural arrangements, defined staff roles, interdisciplinary coordination, and optimized facility and data systems. The Leading component highlights safety-centered leadership, communication clarity, psychological support, and evidence-based decision-making. Meanwhile, the Controlling component focuses on digital physiological monitoring, environmental assessment, injury surveillance, daily readiness evaluations, and seasonal review processes.

Table 2 Final draft of high-altitude management guidelines for basketball clubs in Xining city, the People's Republic of China, under 4M management principles.

No.	Guidelines
Man	
1	Require all coaches and staff to receive training on altitude physiology and emergency care.
2	Employ medical professionals trained in altitude illnesses and sport-specific injuries.
3	Provide psychologists or counselors for stress management related to hypoxia.
4	Assign data specialists to manage monitoring systems and performance logs.
5	Conduct regular workshops on altitude-training techniques for staff and athletes.
6	Increase staff availability during high-load or adaptation phases.
7	Evaluate staff performance based on their adherence to altitude guidelines.
8	Provide continuous communication between athletes and staff regarding symptoms.
9	Educate athletes on self-monitoring and recognizing risk signs.
10	Build a multidisciplinary support team for comprehensive athlete care.
Money	
1	Allocate budget specifically for altitude-monitoring technologies and medical devices.
2	Invest in ventilation, climate control, and facility upgrades for altitude safety.
3	Support costs for staff training and professional certification.
4	Provide funding for psychological support and nutrition programs.
5	Maintain financial transparency in resource allocation related to altitude training.
6	Seek sponsorships or partnerships to support high-altitude programs.
7	Prioritize high-impact purchases such as oxygen monitors and recovery tools.
8	Budget for annual evaluation and updating of monitoring equipment.
9	Secure funding for high-altitude training camps and competitions.
10	Allocate emergency medical funds specific to altitude-related incidents.

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No.	Guidelines
Material	
1	Ensure availability of altitude-appropriate equipment (O_2 sensors, pulse oximeters, HR monitors).
2	Upgrade ventilation and climate control systems in training facilities.
3	Provide respiratory training devices and emergency oxygen supplies.
4	Maintain safe and high-quality court conditions for high-altitude demands.
5	Supply hydration stations and electrolyte support materials.
6	Maintain recovery tools such as cold therapy equipment and physiotherapy devices.
7	Use altitude simulation masks or chambers if available.
8	Install air quality control systems to reduce breathing strain.
9	Ensure digital systems can support data collection from all wearable devices.
10	Inspect and maintain all equipment regularly to ensure safety.
Management	
1	Apply scientifically validated altitude-specific training methods.
2	Use structured periodization that incorporates adaptation phases.
3	Integrate breathing and respiratory muscle training into regular sessions.
4	Adopt psychological training methods such as relaxation and resilience techniques.
5	Apply individualized plans based on monitoring data and athlete adaptation rates.
6	Use technology for real-time performance analysis.
7	Incorporate cross-training to reduce excessive altitude strain.
8	Provide nutrition counseling linked with each training phase.
9	Adjust training based on environmental changes such as humidity or wind.
10	Review and revise methods annually based on new evidence.

Table 2 could be summarized that the 4M framework comprising Man, Money, Materials, and Management was refined into 10 guidelines per component, creating another 40 practical guidelines. The Man component addresses staff qualifications, multidisciplinary coordination, athlete education, and medical-psychological support. The Money component focuses on financial prioritization for altitude-specific technologies, facility improvement, staff development, and sustainable funding. The Materials component outlines altitude-appropriate equipment standards, environmental control, recovery resources, and technology integration. Finally, the Methods component emphasizes scientifically validated altitude training methods, individualization of training loads, psychological resilience strategies, nutritional integration, and annual evidence-based refinement.

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The result of verifying the high-altitude management guidelines for basketball clubs in Xining city, the People's Republic of China.

In this step, the researcher would use the final draft of high-altitude management guidelines for basketball clubs in Xining city, the People's Republic of China, as an instrument to request advice and evaluation results from 7 experts, including 2 basketball team managers, 2 basketball coaches, 1 sports scientist, and 2 basketball club directors. The experts must have more than 7 years of experience. The result of this step could be summarized as:

Across all expert groups, the guidelines were recognized as comprehensive, scientifically grounded, and well aligned with the operational realities of training and managing athletes in hypoxic environments. Managers and club directors emphasized that the guidelines offer a clear and structured management framework that can be readily integrated into existing administrative systems, with financial and organizational recommendations considered practical even for clubs with limited resources. Coaches highlighted the actionable nature of the training and monitoring guidelines, noting that the scientifically validated methods, individualized load adjustments, and step-by-step acclimatization procedures provide immediate utility in daily coaching practice. The sports scientist affirmed the scientific validity and coherence of the guidelines, particularly praising the inclusion of measurable physiological indicators and digital monitoring systems.

Overall, the experts agreed that the refined guidelines effectively address the key challenges associated with high-altitude basketball environments, including athlete adaptation, safety, facility standards, interdisciplinary coordination, and long-term development. While acknowledging that some clubs may require phased implementation, especially in areas involving technology or facility upgrades, the experts unanimously concluded that the guidelines are realistic, evidence-informed, and capable of significantly improving athlete safety, training quality, and management efficiency. Consequently, the guidelines were validated as both feasible and suitable for adoption by basketball clubs across Xining City.

Discussion

The use of the POLC framework ensures that the guidelines follow a process-oriented logic. In the Planning component, the inclusion of altitude-specific acclimatization programs, measurable physiological indicators (such as SaO_2 and heart rate recovery), and long-term athlete development pathways reflects the literature on plateau and hypoxic training, which indicates that intermittent hypoxic exposure combined with appropriate load and duration can enhance endurance and muscle oxidative capacity (Hoppeler & Vogt, 2001; Terrados et al., 1988; Geiser et al., 2001). By embedding these scientific principles into planning, the

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guidelines move beyond generic basketball training and explicitly align with the body of evidence on low-living high-training and simulated altitude training.

The Organizing and Leading components address the organizational and human dimensions that are frequently weak in Chinese club settings. Prior studies have noted that Chinese clubs often suffer from unclear structures, multi-layered control, and insufficient separation of ownership and management, leading to inefficiencies (Zhang Yu, 2010; Ma Chunlin, 2009). In contrast, the present guidelines specify integrated structures linking coaches, medical staff, data specialists, and administrators, together with clear role definitions, interdisciplinary meetings, and data-driven leadership. This is in line with Northcraft and Neal's (1994) view that organizing involves preparing and aligning resources to implement plans, and Robbins and Coulter's (2005) notion of leadership as motivating members to achieve collective goals.

The Controlling component operationalizes Dessler's (2004) concept of control as ensuring that plans are executed effectively and adjusted when necessary. By specifying daily readiness checks, continuous monitoring of key physiological indicators, injury surveillance, and seasonal evaluation of practices, the guidelines institutionalize an evidence-based feedback loop. This is particularly relevant in high-altitude contexts, where overtraining, immune suppression, and maladaptation are known risks if control mechanisms are weak.

The integration of the 4M perspective (Man, Money, Materials, Methods) complements the POLC process orientation with a resource-focused lens, consistent with Drucker's (2008, 2011, 2012) and Bangmoo's (2002) emphasis on production and resource management. The Man component emphasizes qualified personnel, including coaches trained in altitude physiology, medical staff, psychologists, and data specialists, echoing Liu Yu's (2012) call for standardized staffing and improved teaching and management in youth sports clubs. The Money component directly addresses the financial constraints identified in the survey and interviews by prioritizing expenditure on monitoring devices, facility upgrades, staff development, and essential medical and nutrition support, which aligns with Wirachnipawan's (2005) emphasis on prudent and effective financial management.

The Materials and Methods components translate the science of hypoxic training into concrete requirements for equipment and training methodology. They incorporate the principles from research on low-living high-training and intermittent hypoxia—that training in simulated or real hypoxic conditions combined with appropriate intensity and duration can enhance capillary density, mitochondrial content, and oxygen transport capacity into practical protocols for drills, periodization, monitoring tools, and recovery strategies. This responds directly to previous Chinese research indicating that traditional, monotonous training systems and insufficient scientific methods have limited the development of high-level basketball players (Chen Jun, 2001; Chen Yingchuan, 2006; Liu Huiyun, 2000).

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Recommendation

Application of the research

1. Adoption of the Guidelines: Xining basketball clubs should implement the POLC + 4M high-altitude management guidelines to improve training efficiency, safety, and organizational performance.

2. Integration into Club Policies: Clubs can convert the guidelines into operational manuals and standard procedures to ensure consistent and systematic management.

3. Professional Development: The guidelines should be used in training programs for coaches, medical staff, and support personnel to enhance altitude-specific expertise.

For further research

1. Evaluate Guideline Effectiveness: Future studies should test the guidelines' impact on performance, injury rates, and management outcomes in real club settings.

2. Longitudinal Adaptation Studies: Research is needed to examine long-term physiological and performance adaptations under structured altitude management.

3. Regional Comparisons: Comparative studies across different altitudes and climates can refine altitude-specific training recommendations.

4. Economic Feasibility Analysis: Further research should explore the cost-effectiveness and financial sustainability of implementing the guidelines.

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