Construction Research on Sports Training Simulation System Based on Computer Modeling

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Abstract

During the process of traditional training on athletes' training mode, due to the lack of comparable training data and the calculation model with higher calculation efficiency, the feasibility of training plan cannot be assessed accurately. Therefore, the sports training simulation system is designed in this research. This system consists of the human-computer communication system, object library, model library, knowledge base, intelligent control system and analytical interpretation system. By collecting relevant training plan indicators of athletes, such as the past training performance data of athletes, the training status data of athletes, time data indicating athletes' training indicators and physical index data of athletes etc., the preferred plan for the comprehensive evaluation on training mode can be further improved, and the suggestions about optimizing the training content can be provided through simulation system, thus the data support can be provided to the decision maker of the training plan.

Keywords

Computer modeling; Sports training; Simulation system; Evaluation system; Decision-making suggestions.

1. Introduction

The sports training simulation system is to simulate relevant training data and information of athletes so as to generate the training plan in the system. The data indicated represents the expected training objective in such training plan. Therefore, after relevant data and information are collected, the data is processed through this system so as to simulate the application effect of simulation data. The processing content of data and information mainly includes a series data and information processing procedures, such as the order ranking, storage, distribution, extraction, updating, combination and check etc. Relevant sports data and training plan are combined for calculation so as to obtain the sports training scheme with the optimum training effect; the training plan is to be adjusted and arranged under the execution conditions of repeated operation, until the final generation of training mode with higher feasibility. Although individual differences exist in data samples collected, the simulation model which is closer to the real training conditions can be obtained by comparing the training scheme based on the combination and processing of relevant data content, and such simulation model is the training optimum direction obtained from system calculation. According to the comparison between the simulation result and past training content, the weakness, disadvantages and deviation can be found out so as to obtain the effective training simulation model, thus the adjustment on training content of athletes can be supported, and the data reference can be provided [1-3].

The objective of information processing flow is to distinguish the difference and specificity of relevant data and information, and such data index from different athletes can generate personalized training demands in the system. Therefore, the simulation experimental model must be deemed as the simulation model in the repeated calculation results so as to obtain the potential expected training effects. Athletes and coaches may improve the pertinence and timeliness of training plan based on expected training effect information provided in the system and the final decision training method. Therefore, the simulation experiment must be equipped with higher simulation training effect, and it also requires the function of feedback and output of simulation information, thus the expected result of simulation training model can be reflected to athletes. In case multiple feasible scheme for training plan occur in the simulation experiment, then the direct rejection of the system is nor required, all data and information provided should be merged for the comparison and decision making of athletes and coaches. However, it does not mean that this system is of poor assessment capability on training plan; this system will provide the feasibility scores for the training plan in all results items of the simulation experiment, so that the data and information with higher reference valve can be provided for athletes. Therefore, the simulation experiment is the final output results of this system, and it is also equipped with the result output function of multiple scoring mechanism [4-5].

2. Information collection procedures of sports training simulation system

During the entire operation process of sports training simulation system, the sample information should be collected firstly so as to provide data for the reference as the basic information of training indexes for the simulation system. The information collected shall include: the past training performance of athletes, the training status data of athletes, the time data indicating athletes' training indexes and the physical ability index data of athletes etc [6].

Firstly, the past training performance data information of athletes is the assessment conditions used to understand the optimum performance of the athlete; and the training plan provided based on optimum record in history is also the reliable basis with scientific training methods.

Secondly, the training status data of athletes is based on the information collecting direction with the current training effect of the athletes as the evaluation indexes. In case the past training performance is better, but the current training status is poor, then the feasibility of the training method should be subject to the comprehensive analysis; therefore, the status data and information collection of athletes are very important, which is not only the essential condition in planning the train method, but also the essential reference in providing the training direction.

What's more, the collection and reflection of time data of athletes' training indexes are also the assessment mechanism of the optimum status of athletes in a certain period of training effect. If the athletic ability peak of athletes in each training cycle is the time node, then the time series of the training plan should also refer to such time node so as to ensure the optimal configuration of athletes in normal training and pre-competition training, thus the effective performance can be achieved in the competition with the optimum training status by athletes. The conflicts on normal training and pre-competition training should be avoided [7].

Finally, the physical ability data of athletes is the objective indicators in the comprehensive evaluation on athletes' training capability. If the physical ability extreme of athletes is the training objective, although the obvious training effect can be achieved when such objective is realized, the poor status of overload training may occur in case the training plan exceeds such extreme. Therefore, the collecting items of athletes' physical ability index data are the essential conditions for constraining the upper limit of training plan [8].

3. Computer modeling scheme of sports training simulation system

The training plan based on computer modeling is applied in this system; the comprehensive comparison improvement scheme is prosed by collecting relevant information of athletes in training so as to provide decision-making support for athletes. The evaluation principle of computer modeling

is as follows: firstly, if the factor set affecting the training indexes is U=[u1,u2,…,un], and the set for evaluating the optimal training scheme is V=[v1,v2,…,vn], then the fuzzy relation of evaluation conditions between U and V is generated; and according to the generation effect of comprehensive evaluation value, the training index is set up as R, then the data matrix of which is [9]:

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} \tag{1}$$

There are n influence factors in the object to be evaluated, and in the meanwhile, there are m items of evaluation levels in each factor. In case the rij=μk(ui,vj); 0≤rij≤1 condition is met, the membership between the evaluation level and relevant evaluation indexes becomes clear, and the simulation data support for prioritizing training methods is obtained. The transformational matrix of fuzzy subset is [10]:

$$R = \left(r_{ij}\right); (i = 1,2, \dots, n; j = 1,2, \dots, m) \tag{2}$$

The calculation value is set up as M, then the operator N=M•R is obtained based on weighted average model, and the calculation model of the comprehensive mean is:

$$\mu_{M \cdot R} = \wedge \mu_R(u, v) \vee \mu_M(u); (\mu \in v) \tag{3}$$

The comprehensive mean predictive value of multiple factors is provided according to the execution effect of the simulation on relevant training schemes, thus the direct effect of data comparison can be provided to the decision makers; thus, the science and objectivity of the training plan can be supported. In the meanwhile, after the decision maker carries out the comparison analysis on several training plans, the expected result of relevant statistics in different time nodes can be referred to so as to obtain the system data support with the man-machine interaction method, and the feasibility of the final simulation training plan can be decided [11].

4. Structure framework and function set of sports training simulation system

4.1 The structure framework of sports training simulation system

The sports training simulation system designed in this research is based on the computer modeling technology, and it is the function output set up for the fuzzy boundary of athletes' training indexes. If the simulation function can be used to predict the real training result is the core function of such system. Therefore, the smart control system is the middle data-processing link in the entire structure framework of sports training simulation system. Based on the comprehensive application of object database, information database, model database and knowledge base, the feasibility of training objectives and training method is analyzed and explained. The training plan with higher feasibility is returned to the smart control system so as to be uploaded to the human-computer communication system, thus the analysis result of data and information can be provided to the end users. See the structure frame of sports training simulation system in Figure 1 [12].
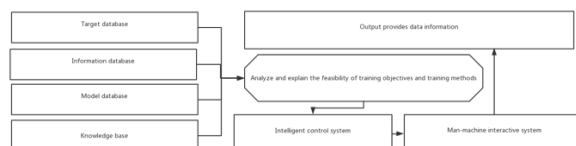

Fig.1 Structural framework of the sports training simulation system

The structure frame of sports training simulation system consists of human-computer communication system, objective library, model library, knowledge library, database, smart control system and analysis & interpretation system. Each subsystem is corresponding to each individual operation function in the actual process.

4.2 Human-computer communication system function

The subsystem of human-computer communication is the system function for coaches and athletes providing the data and information. Relevant information of training plan can be converted into the data type which can be identified by the decision maker rapidly, and it is also the key point of design in human-computer communication system function. According to the simulation data result output, the data support can be provided to the training decision maker, thus the identifiability of the data and information is the objective evaluation condition used to judge if the simulation effect can meet the training plan. Therefore, the final output effect should be deemed as the evaluation indicator fin the human-computer communication system function, and the operation effect of the subsystem can be understood [13].

4.3 Supporting function of objective library/model library/knowledge library/database

Firstly, the objective library is the information collection function of the training objective; the expected training effect is set up after the relevant information of athletes is compared in the objective library, thus the quantitative object of training can be provided to the simulation model so as to estimate current training conditions and training volume. Secondly, the model library is the subsystem function with the data model as the calculation method provided through the transformational matrix of fuzzy subset. The system evaluation of relevant sports training items can be completed in this model library, so that the balance conditions of training content and training requirements can be distinguished. What's more, relevant content stored in the knowledge library is the reference to the design of training items and training content. According to the optimized direction of training requirements and training objectives, the past training content in knowledge library is compared so as to provide data reference and plan the rationality of sports training method. Finally, many comprehensive evaluation information are recorded in the database supporting function, and the sports professional direction of athletes is deemed as the reference conditions so as to support the comparison of training objective and professional training record and to improve the timeliness of the training plan [14].

4.4 Smart control system and analysis & interpretation system

The smart control system is the central control system providing the simulation training plan; relevant information of objective library, model library, knowledge library and database can be optimized in configuration in the entire planning of smart control system; thus the standardization degree of training data can be analyzed effectively. The docking problem generated in data and information interaction can be solved with analysis & interpretation system, thus the comprehensive application conditions of various training data and information can be clarified so as to verify the rationality of training plan [15].

5. Conclusion

In conclusion, the sports training simulation system is designed based on computer modeling. The current multi-item training indexes of athletes are clarified with information collection, then the optimization conditions and direction of various indexes are evaluated through the computer modeling scheme of sports training simulation system. Finally, the optimum design of training content is completed in the structure framework of sports training simulation system, and the data information of sports training plan is provided for the decision maker based on the timeliness of predictive training plan.

Acknowledgments

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