Research Article

Reliability Analysis of Sports Training Evaluation Index Based on Random Matrix

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1. Introduction

The goodness of the assessment index system is directly related to the success or failure of education and the quality of assessment. A good assessment index system for higher education sports can effectively guide and coordinate assessment activities and can guide and promote the healthy development of higher education sports, while a low-quality assessment index system can hardly achieve the purpose of assessment and even produce negative effects [1]. The traditional assessment system can no longer fully meet the requirements of sports development due to the backward guiding ideology and insufficient consideration of new developments and changes in college sports work and to a certain extent inhibits the improvement of the quality of college physical education. At the same time, the research on the evaluation index system of college physical education has not been able to keep up with the new orientation of education evaluation and the new changes in college physical education [2]. For example, there are more elemental, fragmented, and partial discussions about the evaluation index system, which are not comprehensive and in-depth
enough and lack systematic thinking, especially the lack of research on the evaluation of the guiding ideology of college physical education work, which is difficult to truly reflect the current situation, quality, and its development law of college physical education work. A scientific evaluation system can reflect the development of sports and the effect of the implementation of relevant policies so that people can keep track of the development process of sports. A scientific evaluation system is also an important basis for measuring the development level of youth sports [3]. The situation where the variance is known actually corresponds to the one-sample case, which is simulated in our method with the largest eigenroot of the sample covariance matrix. The situation with unknown variance actually corresponds to the two-sample situation, which is simulated in our method using the largest eigenroot of the matrix. The current evaluation of youth weightlifting athletes mostly relies on the subjective feelings of coaches and lacks unified and clear evaluation standards for youth weightlifting athletes, and the development of a scientific and objective evaluation index system for youth weightlifting athletes can analyze various contents of current youth weightlifting athletes and then guide youth weightlifting. The development of a scientific and objective evaluation index system for youth weightlifting athletes can analyze the various components of current youth weightlifting athletes and then guide the scientific training of youth weightlifters, which will help the long-term development of youth weightlifters.

While people are enjoying the fruits of technological progress, they are also suffering from a series of health problems caused by physical inactivity. Chronic diseases such as obesity and diabetes caused by physical inactivity are causing medical expenses to rise year after year in countries around the world. Today more than ever, urgent action is needed to integrate physical activity into our lifestyles [4]. It is not that people are unaware of the importance of health, but simply being healthy does not motivate people to exercise, and “fitness for all” and “lifelong sports” should not be just slogans. People need sports, and it is necessary for sports to become a way of life, especially today when people are seriously lacking in physical activity, and the deeper reason is that people need a new concept of active life. Physical training is a broad understanding of an individual’s pursuit of an active, healthy lifestyle [5]. Therefore, sports in the new era play an irreplaceable and important role in the realization of the strategic goal of a healthy China. To achieve national physical health promotion, physical education is necessary to enhance people’s knowledge of sports and health, motivate them to exercise, perform the scientific physical exercise as much as possible, and achieve the goal of a healthy China in the process of improving national physical training.

Further clarifying the characteristics of specialization teaching can make more people know and contact specialization teaching and form a joint effort to promote specialization teaching; it can also further specify the content and requirements of specialization teaching evaluation and become the theoretical basis for the construction of specialization teaching effect evaluation index system [6]. In addition, the construction of the evaluation system of specialization teaching effect can not only fill some gaps in the theory of specialization teaching and make the theoretical system of specialization teaching more perfect but also guide specialization teaching to a certain extent and promote specialization teaching to carry out better. Exploring the connotation characteristics of specialization teaching in high school physical education is the key to carrying out specialization teaching and the basis for evaluating its effectiveness. This study focuses on the core training issues such as the cultivation of high school students’ physical education consciousness, the mastery of physical education knowledge, the formation of physical education skills, the development of healthy physical education behaviors, and the cultivation of good physical education morals, and further explores the theoretical connotation of high school physical education specialization teaching based on the previous studies, to lay the foundation for the subsequent studies [7].

In this paper, the algorithm of random matrix is introduced into the feasibility analysis of sports training evaluation index, which is a new breakthrough, which can easily obtain the randomness of the data and the overall correlation characteristics of the data. It provides a reliable theoretical basis for the specialization of sports teaching. In sports specialization teaching, relying only on the measurement results of individual indicators may result in one-sided evaluation. In this study, the evaluation index system of sports specialization teaching effect was constructed by random matrix algorithm. Based on the evaluation index system, the corresponding scale is developed, hoping to provide a new way for the evaluation of the effect of sports specialization teaching.

1.1. Related Works. Keating and others summarized the basic mode of weekly training for elite female weightlifters, which usually adopts the combination of clean and jerk and snatch, and the combination of main training and auxiliary training [8]. The test results of the exercise load of pretournament training showed an inverted “U.” The test results of the pretournament training exercise load showed an inverted “U”-type change trend, and the pretournament stage needs to reduce the training load, change to weight control training, actively use sports rehabilitation means, timely treatment of injuries and diseases that occur during the training process, supplement the body necessary nutrients, and promote the recovery of the body. Liu et al. conducted biomechanical tests on the snatching action of female weightlifters, and the study concluded that each muscle group of the human body under different load intensities showed several points of better average amplitude in different stages of the snatching action, the results of the nonparametric test showed the average amplitude of the gluteus maximus and sacrospinous muscle situation, there were significant differences in different exercise intensities, and there were no significant differences in other cases [9]. Soize summarized the relevant literature and systematically sorted out the sports injuries in Olympic weightlifting, the
main parts of the weightlifting sports were mainly in the spine, shoulders, and knees, and the frequency of injuries in athletes was summarized and sorted out [10]. However, only one study analyzed the risk factors in weightlifting, and this research still needs to be further explored. The design of injury prevention programs remains to be explained in the future. Use the energy of the subvector to replace the eigenvalues of the signal subspace in the WSF weighting algorithm, and the random matrix singular value-based weighted subspace (RMT_E) algorithm in the relevant signal source and low spatial spectrogram at signal-to-noise ratio and small snapshot numbers.

Kar proposed the multiple signal classification (MUSIC) algorithm, and since then, the research focus on array signal processing has shifted to subspace-based algorithms [11]. Since multipath effects lead to signal coherence, signal coherence has a significant impact on the performance of MUSIC algorithms. Various spatially smoothed MUSIC algorithms have emerged, which preprocess the signal to do decoherence. Spatially smoothed MUSIC algorithms reduce the dimensionality of the sample covariance matrix and therefore belong to the dimensionality reduction algorithms, which lead to the loss of array aperture and require uniform linear alignment of the array. Nondimensional reduction processing algorithms are also heavily used in de-correlation processing, and there is no loss of array aperture in the nondimensional reduction processing algorithms compared to the dimensionality reduction algorithms, but the nondimensional reduction processing algorithms are only used in specific array models [12]. This study argues that the above three understandings of educational assessment are interpenetrating and complementary, and the connotation of educational assessment is continuously enriched from focusing only on the objective developmental effects of assessment objects to providing a basis for educational decision-making according to different stages of social development and realistic requirements, reflecting the adaptability and developmental nature of educational assessment. Based on the above understanding of the connotation of educational assessment, this study believes that the assessment of college physical education work also contains the general attributes of educational assessment, so it is combined with the concept and characteristics of college physical education work.

Precision processing not performed is that the extracted peak and valley data will be insufficient after precision processing, resulting in insufficient data volume to form a matrix of the same size for calculation. Therefore, precision preprocessing is not performed in this method. The assessment work is a process of value judgment led by certain objectives. However, due to the abstractness and generality of the overall assessment objectives, it is difficult to be used as the basis for assessment directly [13]. Therefore, to build an operable assessment plan, it is necessary to make a concrete and practical decomposition of macroscopic assessment objectives according to the internal structure and laws of university sports work, to form different levels of objective systems. This objective system constitutes the assessment index system of university sports work, which is made up of indicator groups decomposed and transformed from the general objectives and the collection of weight coefficients of each indicator. As the basic elements of the index system, the content and interrelationship of indicators determine the inner structure and value orientation of the whole index system. Therefore, a correct understanding of the connotation of indicators is the basis for our research on the indicator system.

2. Random Matrix Analysis of Training Metrics

The Stieltjes transform is like the Fourier transform in classical probability theory and signal processing, where the Fourier transform allows for a simpler analysis in the frequency domain than in the time domain; usually, spectral analysis of large dimensional random matrices is achieved by the Stieltjes transform, where the spectrum is the distribution of the eigenvalues of the matrix. F is the probability density distribution function of a random variable X in the real number domain; then, the F Stieltjes transformation can be expressed as

$$S_F(t) = \int dF(t) + \int \frac{1}{t + z}.$$  \hspace{1cm} (1)

However, in practice, this formula is rarely used. For a random matrix X, the eigenvalue distribution of X can be obtained if the Stieltjes transform of X is known, but obtaining the eigenvalue distribution of X in the frequency domain is more difficult to achieve than in the Stieltjes transform domain. Since we have been dealing with matrices of the form, which can also be called decomposable matrices of X, the analysis of random matrices is based on the use of the classical matrix inverse formula.

$$u^T(t) = F_t(t) + 2,$$ \hspace{1cm} (2)

$$\text{det}(AB) = \text{det}(A)^2 + 2 \text{det}(A)\text{det}(B) + \text{det}(B)^2.$$ \hspace{1cm} (3)

In some cases, the means of many independent random variables converge to a normal distribution after appropriate normalization. This theorem is a key concept in probability theory because it shows that the probability and statistical methods applicable to the normal distribution can be applied to many problems with other distribution types. For nonidentical distributions or nonindependent observations, they will also converge to the normal distribution if they meet certain conditions. The earliest version of the theorem is that the normal distribution can be used as an approximation to the binomial distribution and is called the De Moivre–Laplace theorem.

$$\lim_{n \to \infty} p(x) = \frac{1}{\sqrt{2\pi}} \sum_{n} e^{x^2/2}.$$ \hspace{1cm} (4)

In this experiment, the interception method is used to remove the head 500 data points, then remove the tail 1500 data points, use the covered function in MATLAB to specify the initial value and the cutoff value, and then import the
source data, to obtain the original pulse data with 10,000 data points after the interception, as shown in Figure 1.

The essential outlier eigenroots of the matrix are also those that fall into the increasing interval, while the non-essential outlier eigenroots fall into the decreasing interval. Next, we will give the central limit theorem for the sample eigenroots corresponding to the essential outlier eigenroots of the matrix. For indicators that cannot be quantified, they can only be reflected and described through their properties. If it cannot be quantified and the data cannot be displayed, the qualitative evaluation shall be carried out by means of grading standards.

\[ v_4 = \sum |z_{ij}|^2 = \sum |w_{i,j}|^4. \]  

(5)

Linear hypothesis testing plays a very important role in multivariate statistical analysis, and the classical examples involved include multiple linear regression models, principal component analysis, and typical correlation analysis, among other multivariate components. And the abovementioned theories are widely applied to signal detection, social sciences, and many other related fields [14]. To be consistent with the two cases in signal processing, we also divide the simulation into two cases with known variance and unknown variance for the simulation. The case with known variance corresponds to the single-sample case, which is simulated in our method using the maximum characteristic root of the sample covariance matrix. The case with unknown variance corresponds to the two-sample case, which is simulated in our method using the matrix maximum eigenroots.

The sports skills module refers to the individual technical movements, combined techniques, the overall technical system of the project to be mastered by the special, as well as the tactical knowledge and the ability to use them, and the ability to use a combination of techniques and tactics. Combined with the knowledge of the project and the knowledge of the judges, it forms the structured knowledge and skills of the project. The learning of sports skills
module should grasp the hierarchy and progressiveness, do well in the learning of individual sports skills and combined sports skills, so that the learning of sports skills has a certain breadth, and do well in the articulation between different sports techniques and tactics, with a certain depth.

Most controllers are designed based on the complete observability of the system, but in practice, it is difficult to obtain the system state completely as desired, so the system state must be estimated first. However, for the present, little research has been reported on incorporating such uncertain time lag partially unknown transfer probability Markov jump systems into observer-based fault-tolerant control ideas [15]. In addition, real systems inevitably have time lags and different degrees of nonlinearity. Therefore, the problem of observer-based robust H∞ fault-tolerant controller design for nonlinear variable time lag uncertain bounded transfer probability Markov hopping systems, where the system state is unmeasurable and needs to be estimated, has broadened the research area in this direction for fault-tolerant controller design. The construction process of the evaluation index system is shown in Figure 2.

Physical education specialization teaching is a new attempt at the high school level, and the indicators are selected accurately and scientifically to ensure the correlation among the indicators, to make the selected indicators point clearly and not repeat as much as possible, and to ensure that the evaluation objectives can reflect the teaching effects comprehensively and accurately [16]. The initial screening of indicators is the starting link of creating the specialization teaching effect index system, which is the aggregation of numerous selected indicators related to specialization teaching effect and learning effect, etc. The method of preliminary screening is mainly through reading relevant literature, journals, master’s theses, books, and previous related research results, especially the collection and collation of previous related research results about specialization teaching in high school physical education, based on which indicators reflecting the effect of specialization teaching are generally included and collated. To compare the differences between each other and distinguish the degree of difference in the same index level, it is necessary to use the variance to express the variation range and discrete degree of difference of each index. The divergence degree of expert opinions can be well described as an important indicator of the degree of data dispersion.

It is required that the establishment of the assessment content must adhere to the principles of technicality, rehabilitation and diversity, and multiple choices from the perspective of each aspect of physical education curriculum teaching. Aiming at sports skills, physical quality, and social adaptability, we should highlight the role of sports medicine in the classroom and combine the principles of sports rehabilitation to significantly improve the physical function of

\[ p_A(\theta) = Q(\theta), Q^H(\theta) = I_M - I_K, \]  

Figure 2: Flowchart of evaluation index system construction.
students in special education schools. The evaluation and assessment methods are the organic combination of process evaluation, skill evaluation, comprehensive evaluation, teacher-student mutual evaluation, writing evaluation, and follow-up evaluation, which can finally realize the comprehensive improvement of social adaptation ability and autonomy of special education school students.

In the process of distributing the questionnaires of multiple rounds of expert consultation, experts and researched people were asked to give guidance and answer questions on the listed problems and evaluation issues, and effective materials and information were harvested through records to provide help for the construction of the evaluation index system.

3. Reliability Design of Sports Training Evaluation Index

The hierarchical analysis method belongs to a kind of system method analysis, which mainly establishes indicators according to the Delphi method and establishes the weight of each level indicator and the weight of each specific indicator through the method of hierarchical analysis [17]. The hierarchical analysis method applies the principle of system stratification, divides the evaluation subjects into systematic indicators in a hierarchical manner according to the evaluation objectives, decomposes the total objectives in a continuous reduction, obtains the objectives and guidelines of each hierarchical evaluation indicator, applies the evaluation index comprehensive score, and determines the corresponding evaluation level of the evaluation object from large to small, from high to low hierarchy. This research mainly adopts the survey method, forms the evaluation index system from the obtained questionnaire data, scores according to the expert opinions, and finally determines the weight of each index in the evaluation index system through the arithmetic formula and analytic hierarchy process.

In the process of constructing the evaluation index system of physical education work in special education schools, this study makes comprehensive use of the logical argument method, logically processes the system analysis method and the relevant principles of physical education evaluation, and composes and justifies the findings and important theories of relevant literature [18]. All the above-related evaluation index systems are designed and selected from the perspectives of conditions and guarantee, work process, and work effect of college sports work, which can cover the relevant elements of college sports work in terms of content, and the selection of evaluation indexes is relatively concise, focused, and highly operable

\[(\lambda E + A^2)x \geq 0.\]  \hspace{1cm} (7)

The content of the assessment indexes is a specific description of the phenomenon of college sports work, so when researching the assessment index system, it is necessary to take into account the reality of college sports work in Jiangsu Province, position the assessment work as an assessment of the overall situation of college sports work in Jiangsu Province, and pay attention to whether the constructed assessment indexes can describe the whole picture and core elements of college sports work. The existing assessment index system mainly includes three aspects of college sports work: conditions and guarantee, work process, and work effect forming a more complete logical process that can accurately reflect the actual operation process of college sports work.

When researching the construction of the index system, attention should be paid to streamlining the composition of specific indicators in the index system and considering the operability of the actual assessment work. To accurately describe its various aspects, theoretically, it should be described by as many detailed indicators as possible, but more indicators mean more difficult to collect and analyze data, more complicated to calculate the whole assessment index system, and more procedural and mechanical time to spend, which makes the lag of assessment more obvious. Nothing is too small, and we should fully explore the development rules of college sports work, clarify the core elements, grasp the core links in a completely logical framework, and promote the overall quality improvement of college sports work with points, as shown in Figure 3, when constructing the assessment index system.

Evaluation indexes are the basic elements of the systematic evaluation scheme. Analyzing the problem of the evaluation index system of coaching training for coaches with the system theory, operating the evaluation indexes, weights, and evaluation methods of this system following the method of system optimization plays an important role in improving the quality of evaluation. The construction of the evaluation index system should conform to the basic characteristics of the system such as target, organization, aggregation, and correlation. The selected evaluation indexes should be subordinated to the general goal of the coaching system; the constructed evaluation index system consists of multilevel indexes, and the upper indexes and the lower indexes should be relatively independent and have their unique meanings; the indexes at the same level should have clear boundaries between each other; that is, there is no duplication of meanings between the system and indexes at the same level.

\[K_{MSR} = N\sum_{i=1}^{\sqrt{\lambda}}|\lambda_i|\]  \hspace{1cm} (8)

There should be a relationship between several indicators contained in the system of coaching and training of coaches that are both different from each other and related to each other. The evaluation of coaches in amateur sports schools according to the system optimization principle of system evaluation theory is an aggregate that exists to solve the same problem or achieve the same goal. The displayed result should not be only for a certain aspect or part, but the evaluation made for the whole coaching level of the coach, which requires the establishment of the best combination of all elements and a comprehensive and integrated evaluation. Obesity, diabetes, and other chronic diseases caused by lack of physical activity have caused medical expenditures in
countries around the world to increase year by year. Insufficient physical activity not only causes shocking losses to the economy and human health of various countries, but also forms an intergenerational vicious circle that weakens human beings.

Complex and complicated indicators will make the collection of statistical data more difficult and costly, and may even become meaningless and interrupt and hinder the assessment activities. Therefore, implementing the principle of operability when constructing the indicator system is a prerequisite and guarantee for the smooth and meaningful implementation of assessment activities. The designed indicators should be clear in meaning, reliable in source, easy to collect, and as simple and meaningful as possible based on ensuring the objectivity and comprehensiveness of the assessment results, and can be obtained through observation or measurement, and indicators that are difficult to quantify can also be indirectly reflected through other relevant indicators, as shown in Figure 4.

It can be seen in Figure 4 that the average of each indicator option in the first-level indicators is all greater than 3, and the full score ratio is all greater than 20%. The scores of unimportance percentages for basic conditions, organization and management, publicity and reporting, work effectiveness, activity development, staffing, financial and fund management, and material provision are all 0, indicating that the above eight first-level indicators have a high degree of importance [19]. Through a previous review of the literature, one of the relevant studies pointed out that the obtained coefficient of variation is less than 0.5, while the coordination coefficient is smaller than 0.05 and reaches a significant level, and the index entry can be considered a qualified index. After the statistical analysis and the coefficient of variation, the coefficient of variation values of the eight primary indicators is all less than 0.5, which indicates that the consistency of the opinions given by the experts is good.

In summary, the 6 primary indicators selected in this study were all approved by the experts, and although the degree of coordination of the experts’ opinions was relatively low after statistical analysis, it was still significant, indicating that the results were still desirable, so all 6 primary indicators were retained. This will make the whole questionnaire relatively clear and organized.

Control systems are becoming increasingly complex, and reliability and safety are receiving increased attention. As a strategy to improve the reliability of complex systems, fault-tolerant control techniques have attracted much attention. Uncertainty and nonlinearity of the system are unavoidable, so it is of great practical importance to discuss robust fault-tolerant control of generalized uncertain time lag stochastic systems. It is worth mentioning that most of the results are based on an implicit assumption that the complete transfer probability is available. However, in most cases, the transfer probabilities of Markovian jump systems are not completely known, or it is difficult to obtain exact transfer probabilities. It is worth pointing out, however, that few studies have been reported so far considering fault-tolerant control of Markov jumps generalized nonlinear systems containing partially unknown transfer probabilities. Therefore, the study of
Markov jump systems for uncertain nonlinear generalized bounded transfer probabilities is of great importance.

4. Performance Analysis of the Random Matrix of Training Metrics

The simulation uses correlated signal sources, where the correlation coefficient of the first source and the second source is 0.6, the third source is independent of the first two sources with a fixed SNR of −3 dB, the number of snapshots varies from 4 to 18, and the RMS error of the three algorithms varies with the number of snapshots as shown in Figure 5. The estimation error of the RMT_E algorithm is lower than that of the MUSIC algorithm and WSF algorithm, and the estimation errors of the three algorithms tend to be the same when the number of snapshots is very low, but as the number of snapshots increases, the error of RMT_E algorithm is significantly lower than that of MUSIC algorithm and WSF algorithm.

Figure 5 shows the variation curves of the probability of flying points with the number of snapshots for the three algorithms. The flying point probability of the three algorithms decreases as the number of snapshots increases, while the flying point probability of the RMT_E algorithm is lower than that of the MUSIC algorithm and WSF algorithm, and it can also be seen from the flying point probability that the error of the estimated angle of the RMT_E algorithm and the WSF algorithm still falls more within the estimation error of 0.5, while the MUSIC algorithm has more flying points. Therefore, the accuracy of the RMT_E algorithm estimation is significantly higher than that of the MUSIC and WSF algorithms.

The weighted subspace algorithm based on the singular value of the random matrix is proposed to replace the eigenvalues of the signal subspace in the WSF weighted matrix with the energy of the subvector, and the spatial spectra of the MUSIC algorithm, the weighted subspace (WSF) algorithm, and the weighted subspace based on the singular value of the random matrix (RMT_E) algorithm are drawn for the relevant signal sources and low signal-to-noise ratio and a small number of fast beats. The results show that all three algorithms can show peaks near the true body angle, but the MUSIC algorithm also has peaks near other angles, and the WSF and RMT_E algorithms have approximately the same trend, but the magnitude of the RMT_E algorithm is slightly higher than that of the WSF algorithm. The simulation of the above three algorithms is carried out under the condition of correlated signal source with the variation of S/N ratio at fixed small snapshot number and fixed low S/N ratio, and under the condition of uncorrelated signal source with the variation of S/N ratio at fixed small snapshot number, respectively [20]. The simulation results show that the estimation error and the fly point probability of the RMT_E algorithm are lower than those of the MUSIC algorithm and the WSF algorithm, and the estimation performance of the RMT_E algorithm is better than that of the classical MUSIC algorithm and the WSF algorithm.

By combining the results of active and passive tests, it is possible to estimate the physical and mental health status of the test taker; when the results of active and passive measurements match, the results are more credible; and when they do not match, a specific analysis of the active and passive status is then performed. In this way, it gives the inspiration to establish a mechanism for detecting physical and mental health status. According to the random matrix single-loop theorem and the mean spectral radius analysis index, as well as the way of processing pulse data in Chapters 3 and 4 to establish the pulse data processing model, the results of processing pulse data of 23 university student volunteers were obtained after model calculation as shown in Figure 6.

The average spectral radius value obtained from the experiment has five valid digits after the decimal point, and the value of the next three digits may have slight jitter, but it does not affect the results of the subsequent experimental analysis of the classification accuracy [21]. The null value in the sixth column is because the number of peaks and troughs does not meet the sufficient size at the same time, resulting in the inability to form a matrix, which can be handled by filling in zero if only one of the peaks and troughs is insufficient.
The results are all dimensionless calculations, and the results
in each column are derived under the same criteria.

The experiments compared the processing effects of
several experimental schemes and showed that the pulse data
were better processed by cutting the matrix by wave crest
and trough than by cutting the matrix directly by timeline;
according to the coincidence of the active and passive test
results of the third state, and the partial coincidence of the
active and passive test results of the first state, it is possible to
achieve the recognition of physical and mental health using
the method of this paper based on random matrix theory.
The results of the first state active-passive test are consistent
with each other. The experiment has a certain inspirational
meaning, especially in the discovery of the third state, which
can be used to identify the physical and mental health states
of college students; active measurement combined with
passive testing can improve the identification of the state and
provide corresponding psychological intervention or guid-
ance to college students who have physical and mental health
problems. A good evaluation index system of sports work in
colleges and universities can effectively guide and coordinate
evaluation activities, and can guide and promote the healthy
development of sports work in colleges and universities,
while a low-quality evaluation index system is difficult to
achieve the purpose of evaluation and even has a negative
effect.

5. Reliability Results of Sports Training
Evaluation Index

Operability requires that evaluation indicators must be
observable and measurable in practice and that the
designed indicators should be simple, meaningful, and easy
to collect [11]. The evaluation of physical education in
special education schools, no matter in the construction of
the theoretical system or the practice of evaluation and
assessment work, should pay attention to specific opera-
tional principles, implement the principle of simplicity
rather than difficulty, guarantee the premise of obtaining
objective and fair evaluation results, reduce trivial work
links, unnecessary labor costs, and time and energy, seize
the main contradictions in the evaluation of physical ed-
ucation in special education schools in the practical work of
evaluation, and pursue objective and effective evaluation
results so that the evaluation system can be popularized and
applied.

Independence is a requirement for indicators at the same
level, and indicators at the same level cannot overlap and
cross, and cannot have cause-effect relationships; in short,
they are consistent in the same direction and mutually
exclusive. If the indicators are not designed properly and
overlap, it will lead to the weakening of the corresponding
indicators and weaken their status, which will affect the
accuracy and evaluation effect of the whole evaluation
system. Therefore, when decomposing the overall indicators,
it is necessary to analyze and decompose them layer by layer
to find out the key essence and arrive at independent and
specific evaluation indicators.

The quantitative evaluation mainly requires that the
subject of evaluation must have certain quality character-
istics that can effectively reflect intuitive quantitative criteria
such as the quantity of data. Qualitative evaluation, on the
other hand, requires things to have certain characteristics
and nature features, and the characteristics and features of
the evaluation object can be effectively and accurately de-
scribed in the evaluation. Specifically, in education school
sports, the design of specific indicators is complex, and some
of them can be quantified and described by quantitative data,
while some of them cannot be quantified and cannot be
only be reacted to and described by their natural characteristics [22].
These qualitative indicators cannot be discarded, and in
response to the fuzzy judgment of qualitative evaluation and
the shortcomings of quantitative evaluation, it is required to
combine the specific situation of special education school
sports work, and quantitative evaluation is carried out if the
survey indicators can be processed with data; on the con-
trary, the qualitative evaluation is carried out in the way of
grade standard classification if they cannot be quantified and
data cannot be displayed, as shown in Figure 7.

The variance (S2) is a measure of the degree of dispersion
of a random variable or data in mathematics and statistics.
The variance of a data sample is the average of the mean of
the difference between the individual sample data and the
average of all sample data. The variance is used to express the
range of variation of each indicator and the degree of dis-
crete difference in the same indicator level for the com-
parison of differences between each other and the differentia-
tion of the degree of difference. By calculating the
expert scoring of evaluation indicators, the degree of dis-
agreement of expert opinions can be objectively seen, and it
can well describe the important indicator of the degree of
dispersion of data.

The coefficient of variation is an important statistical
indicator reflecting the dispersion and fluctuation of data, it
is mainly for the comparison of data that cannot be me-
ured uniformly using variance and standard deviation and
whose units or means are different, the coefficient of vari-
ation is the ratio of the standard deviation and the arithmetic
mean of the data, and it is a normalized measure of the degree of dispersion and facilitates the comparison of data [23]. By definition, it can be seen that the value of the coefficient of variation is influenced by the mean value and standard deviation. Therefore, in this study, the three will be analyzed together, and in the expert scores it reflects the smaller the data the more concentrated the expert opinion. Next, the scores of the secondary indicators were obtained by multiplying the scores of the tertiary indicators by the weight of that indicator, and the specific scores are shown in Figure 8.

The Delphi method was used to determine the evaluation index system of Shandong youth weightlifting athletes after two rounds of the expert survey, which contains 34 index entries in total, including 4 primary indexes, 10 secondary indexes, and 20 tertiary indexes. Among them, the primary indexes include physical quality, psychological quality, study training, and sports competition, the secondary indexes include 10 items such as physical form, physical function, and professional psychology, and the tertiary indexes include 20 items such as well-proportioned sturdy body, well-proportioned flexible body, well-developed body system organs, and obvious muscle lines.

The current youth weightlifting athletes are developing faster, the level of sports training is gradually improving, and the index system currently established should be revised periodically to be used to detect the development of current youth weightlifters in Shandong Province. It is recommended to evaluate youth weightlifters in groups for different sports groups and different sports periods to better evaluate youth athletes.

Using the index system to evaluate the youth weightlifting athletes in Shandong Province, the evaluation scores of the two indicators of sports competition and study training are low. In the future development process of the youth athletes of the Shandong Province weightlifting team, coaches should focus on the athletes’ sports competition and study training, based on the foundation in the daily process, improve the athletes’ cultural training, and achieve the thick and thin when participating in sports competition in the future, and the coaches should focus on both the athletes’ athletic competition and academic training.

6. Conclusion

This paper analyzes the sports training index signs based on the random matrix theory, which can be applied to big data processing applications and has produced many results, and this paper enriches the application of random matrix theory to pulse applications by analogy with the application of random matrix theory to EEG and power grid anomaly detection and gives the means of processing pulse data in the context of random matrix theory, including baseline drift preprocessing, precision preprocessing, and anomaly removal using kurtosis. It also includes several ways of forming matrices of pulse data, including cutting by timeline and cutting by crest and trough, and gives a comparative analysis, which shows that cutting by crest and trough has better results. The paper also implements the transformation of the matrix so that it can be applied to the single-loop theorem of the random matrix, and gives the quantitative analysis index by combining the concept of the average spectral radius so that it can be quantitatively analyzed. A physical training measurement scale for physical education students was designed and developed, consisting of four subscales of physical knowledge, physical emotion, physical skill, and physical behavior, containing 48 entries, with a high level of reliability and validity. The scale provides a valid reference basis for general physical training evaluation tools and for evaluating the physical training level of our physical education students.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.
Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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