Research on comprehensive evaluation model-based sports activities intervention effects on university students common mental diseases

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ABSTRACT

Sports not only has competition functions, but also is the best choice to build one's body. And meanwhile, sports activities have certain curative effects on mental diseases, which have very important impacts on psychological health. The paper utilized correlations analysis, establishes correlation analysis model between physical exercises and students psychological health, and analyzes current stage students understanding on sports health, and gets conclusion: physical exercises have important impacts on students psychological health, Chinese physical education course contents are relative traditional, their understanding on physiological health knowledge, psychological health are not deepen enough, students rarely participate in physical exercises. Secondly, based on correlation analysis, analyze physical exercises and chemical medicine curative effects on common depression, anxiety, terror, obsession these four mental diseases, utilize fuzzy comprehensive evaluation methods to make comprehensive evaluation, compare physical exercises and chemical medicine curative effects, and get that physical exercises effects are better.

KEYWORDS

Sports activities; Psychological health; Correlation analysis; Comprehensive evaluation; Mental intervention.

INTRODUCTION

Sports psychological health is the base of physical health. Usually, sports activities are crucial to psychological health impacts, medically diseases that are hard to cure generally can be cured by sports activities.

Zhang Xiao-Ning in the article "Briefly discuss on physical exercises impacts on technical school students psychological health", by introducing physical exercises and psychological health relations, took technical school students as research objects, briefly stated physical exercises important effects, and utilized multiple kinds of algorithms, finally got the conclusion that physical exercises impacts on technical school students were not only building their body, improving their physical health, but also had very important impacts on their psychological health, students that often took physical exercises their psychological disorder also had problems, while students rarely took physical exercises, their psychological health was not good.

Zhao Yun-Shu in the article "Contemporary middle school students sports psychological quality development features", took contemporary middle school students as research objects, started from their sports psychological quality, studied on contemporary middle school students sports psychological quality development process existing features, so that analyzed their advantages and disadvantages, put forward that contemporary middle school students sports psychological quality was lower, many middle school students still quite understood sports psychological health knowledge, physical exercise awareness was not strong enough.

Shen Liang in the article "University students sports psychological quality model exploration and construction", from the perspective of university students sports psychological quality, explored university students existing problems during physical exercising process, and further proposed that sports psychological quality was one of essential qualities of contemporary students in all-around development process, to improve contemporary university students sports psychological health and strengthen their physical quality, it should construct sports psychological quality model to fit for contemporary students development, and promote their development.

The paper combines with formers research experiences, on this basis, utilizes correlation analysis and fuzzy comprehensive evaluation method, makes quantitative analysis of sports activities curative effects on some common mental diseases, and puts forward that physical exercises have very important impacts on psychological health.

MODEL ESTABLISHMENT

University students physical education course contents and class hours comparative analysis

Sports is a kind of recreational entertainment event, physical exercises not only are competitive activities that are active in each main competition, but also can fortify one's health, and have obvious curative effects on some medically diseases that are hard to cure.

For university student physical course contents, generally they are mainly physiological health knowledge, sports psychological health knowledge, social sports knowledge and physical exercises knowledge. Below Figure 1 is comparison between university students physical education course curriculum standard class hours and actual class hours, data is from general administration of sport of China, national students physique and health investigation result announcement.
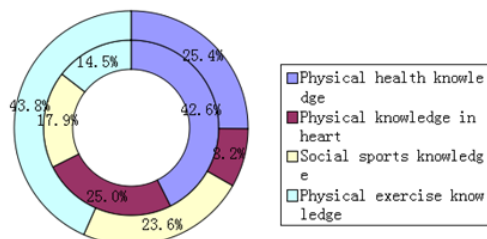

Figure 1 : Physical education content and comparative analysis

Above ring statistical Figure 1 indicates that for students' physical education, it sets up physiological health knowledge, sports psychological health knowledge, social sports knowledge and physical exercises knowledge four kinds of contents, but actual class hours don't conform to standard ass hour, especially for physiological health knowledge course, class hours are fewer. Students' sports health criterion regulates that physiological health knowledge is key point in sports teaching, but in realistic implementation, it is replaced by physical exercises. Analyze the causes; it mainly suffers impacts of traditional sports concept, awareness on physiological health care and sports psychology are not enough.

Students understanding on sports psychological health

Psychological health is an important part of evaluating whether a student is sound developing or not, however for psychological health problems, many students don't understand, below TABLE 1 is statistical table of Chinese students understanding on psychological health, data is from national students physique and health investigation result announcement.

TABLE 1 : Chinese students understanding on psychological health

	Comprehend	Digest	Misunderstand
Percentage%	72.6%	19.4%	8.0%

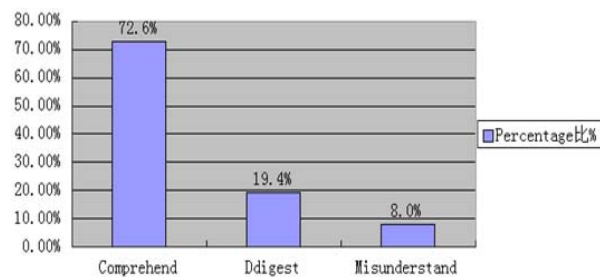Draw above TABLE 1 into following statistical chart, and analyze conclusion:

Figure 2 : To understand the mental health of students in China

Above bar Figure 2 indicates that Chinese students understanding on psychological health are better, there are 72.6% students comprehend psychological health effects, but still 8% students misunderstand, for the part student, it should strengthen sports psychological health education and publicity, so that let more students to understand psychological health important effects.

Though most of students comprehend sports psychological health, for sports and health courses, their main motivations are different. Below Figure 3 is Chinese students' main motivations statistics about sports and health course.
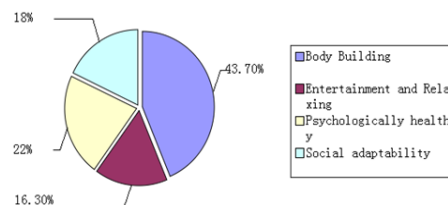

Figure 3 : The motivation of physical education and health class

From above pie Figure 3, it gets conclusion that for sports health course, most students are for body building, improving physical quality, only 22% take psychologically health as motivation.

Therefore, it is clear that students understanding on sports health course are not enough; especially for psychological health emphasis is not deep enough.

Correlation analysis-based students' physical exercise and psychological health

Physical exercise is a kind of good habits, however presently it bears academic performance pressures, and many students don't have time to participate in physical exercise. And, to schoolboys and schoolgirls, physical exercises habits are different. Below TABLE 2 is Chinese students' physical exercise habits statistical table, data is from national students' physique and health investigation result announcement and general administration of sport of China.

TABLE 2 : Physical exercise habits statistical table

	Sum total	Number of schoolboys	Number of schoolgirls
Exercise regularly	36.67%	62.20%	37.80%
Don't exercise regularly	53.51%	43.61%	56.39%
Don't exercise	9.82%	35.71%	64.29%

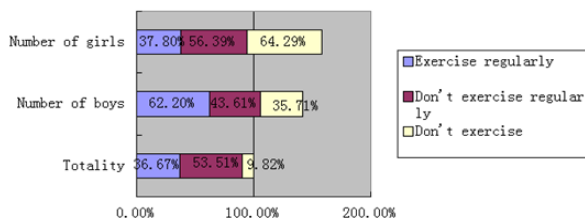Draw above TABLE 2 into statistical chart, and analyze conclusion:

Figure 4 : Physical exercise habits

Above bar statistical Figure 4 shows Chinese students physical exercises participation status is not good, and especially for schoolgirls. Most students don't exercise regularly, and there are students that don't exercise.

Implementation of correlation analysis must require that each factor have certain connections or comparability, it covered range almost covers all aspects of our life.

Pearson correlation coefficient is one kind of correlation analysis, its computational formula is as following:

$$\rho(X,Y) = \frac{\text{cov}(X,Y)}{\sigma_x \sigma_y} = \frac{E\big((X-\mu_x)(Y-\mu_y)\big)}{\sigma_x \sigma_y}$$

And $\mu_x = E(X), \sigma_x{}^2 = E(X-\mu_x)^2 = E(X^2) - E^2(X)$

So, Pearson correlation coefficient can also be written as:

$$\rho(X,Y) = \frac{E(XY) - E(X)E(Y)}{\sqrt{E(X^2) - E^2(X)}\sqrt{E(Y^2) - E^2(Y)}}$$

When two variables Pearson correlation coefficient gets closer to 1or -1, it shows the two correlation is big or has close relations. Get closer to 1 shows the two are in positive correlation, on the contrary get closer to -1 shows the two are in negative correlation.

Below TABLE 3 is statistical table of different exercise habits influence status on psychological health, data is from national students' physique and health investigation result announcement and general administration of sport of China relative investigation report.

TABLE 3 : Different exercises habits impacts status on psychological health

	Health	Slight psychological Disorder	Moderate psychological disorder	Serious psychological disorder
Exercise regularly	82.3%	10.53%	5.74%	1.43%
Don't exercise regularly	72.58%	16.07%	9.14%	2.22%

When study on different exercise habits impacts on psychological health, take above TABLE 3 data as observable variable, establish physical exercise habits and psychological health status correlation coefficient formula, utilize SPSS software to handle with above TABLE 3 data, it can get following result TABLE 4:

TABLE 4 : Correlation

		Health	Slight psychological disorder	Moderate psychological disorder	Serious psychological disorder
Exercise frequency	Pearson correlation	.953*	.759	-.43	-.878
	Significance(bilateral)	.012	.137	.469	.050

**. Significant correlated in .01 level (bilateral)

By above data TABLE 4, it can get conclusion that physical exercise habits have significant correlations with students psychological health, therefore, it is necessary to make further analysis of relations between physical exercises and psychological health.

FUZZY COMPREHENSIVE EVALUATION-BASED SPORTS IMPACTS ON UNIVERSITY STUDENTS' PSYCHOLOGICAL HEALTH

University students physical education is beneficial to cultivate university students with "morality, intelligence, physical fitness and aesthetics" all-around development, take sports activities have important impacts on students psychological health. Sports activities not only affect a person lung capacity, heart beat frequency and so on, but also have very important impacts on people emotions.

Above correlation analysis gets conclusion that physical exercises have important impacts on students' psychological health. Below TABLE 5 is sports activities and chemical medicine curative effect on university students' common mental diseases, data is from psychologist Dishman investigation materials.

TABLE 5 : Mental disease curative effects comparison

Influence factors Kinds of diseases	Depression	Anxiety	Terror	Obsession
Sports activities exercises	86%	60%	78%	83%
Chemical medicine curing	74%	57%	69%	79%

According to lots of literature, it is clear present common mental diseases that affect university students' psychological health are as following 4 kinds: depression, anxiety, terror, and obsession. And presently for these kinds of mental diseases, it mainly have sports activities exercises and chemical medicine curing two paths, now make comprehensive evaluation on the two curative effects one by one.

Define evaluation indicator set
According to :

$$U = \{u_1, u_2, \cdots, u_m\}, m = 1,2,3,4$$

Evaluation indicator set is={depression, anxiety, terror, obsession}.

Define evaluation grade set

For system evaluation grade, main defining method is experts' evaluation method. In sports activities exercise curative effects on some common mental diseases, its evaluation grade set is as following, according to:

$$V = \{v_1, v_2, \cdots, v_n\}, n = 1,2,3,4$$

Curative effects evaluation grade set is={Very good,good,general,bad}.

Define each evaluation indicator weight

Weight main expression method is:

$$w = \{\mu_1, \mu_2, \cdots, \mu_m\}, m = 1,2,3,4$$

Among them: $\sum_{m=1}^{6} \mu_m = 1$

Define evaluation indicator weight method mainly has analytic hierarchy process and normalization method, from which normalization formula is as following:

$$w_i = \frac{\dfrac{C_i}{\overline{S_i}}}{\sum_{i=1}^{n} \dfrac{C_i}{\overline{S_i}}}, (i = 1,2,\cdots,m)$$

Among them, w_i is evaluation parameter i monitoring value; $\overline{S_i}$ is evaluation parameter i grade m criterion arithmetic average value, then weight set is:

$$w = \{w_1, w_2, \cdots, w_m\}$$

Here, apply normalization method to calculate weight, result is:

$$w_1 = \{0.35, \quad 0.11, \quad 0.21, \quad 0.33\}$$

Defining evaluation matrix

Comprehensive evaluation matrix R evaluation methods mainly have expert evaluation method, analytic hierarchy process, and membership function method.
Here use membership function method, define fuzzy relation matrix R, from which:

$$R = (R_1, \quad R_2, \quad R_3, R_4)^T$$

First design membership function
For first grade evaluation grade:

$$\mu_{i1(u_i)} = \begin{cases} 0 & u_i \geq v_{i2} \\ -\dfrac{u_i - v_{i2}}{v_{i2} - v_{i1}} & v_{i1} < u_i < v_{i2} \\ 1 & u_i \leq v_{i1} \end{cases}$$

For the j grade evaluation grade:

$$\mu_{ij(u_i)} = \begin{cases} 0 & u_i \le v_{ij-1} \text{ or } u_i \ge v_{ij+1} \\ \dfrac{u_i - v_{ij-1}}{v_{ij} - v_{ij-1}} & v_{ij-1} < u_i < v_{ij} \\ -\dfrac{u_i - v_{ij+1}}{v_{ij+1} - v_{ij}} & v_{ij} \le u_i < v_{ij+1} \end{cases}$$

For the n grade evaluation grade:

$$\mu_{in(u_i)} = \begin{cases} 0 & u_i \le v_{in-1} \\ \dfrac{u_i - v_{in-1}}{v_{in} - v_{in-1}} & v_{in-1} < u_i < v_{in} \\ 1 & u_i \ge v_{in} \end{cases}$$

Input data into above each parameter to each grade standard membership function formula, it can solve each evaluation parameter to each evaluation grade membership, so that construct fuzzy relation matrix R.

By calculating, it can solve:

$$R_1 = \begin{pmatrix} 0.5 \\ 0.1 \\ 0.1 \\ 0.3 \end{pmatrix}; \quad R_2 = \begin{pmatrix} 0.4 \\ 0.1 \\ 0.2 \\ 0.3 \end{pmatrix}; \quad R_3 = \begin{pmatrix} 0.5 \\ 0.05 \\ 0.2 \\ 0.25 \end{pmatrix}; \quad R_4 = \begin{pmatrix} 0.45 \\ 0.05 \\ 0.1 \\ 0.4 \end{pmatrix};$$

And then by $R = (R_1, \ R_2, \ R_3, \ R_4, \ R_5, \ R_6)^T$, it can get comprehensive evaluation matrix as following :

$$R_1^{'} = \begin{pmatrix} 0.5 & 0.4 & 0.5 & 0.45 \\ 0.1 & 0.1 & 0.05 & 0.05 \\ 0.1 & 0.2 & 0.2 & 0.1 \\ 0.3 & 0.3 & 0.25 & 0.4 \end{pmatrix}$$

Carry out comprehensive evaluation

Known $W = (\mu_j)_{1 \times m}$, $R = (r_{ji})_{m \times n}$, by:

$$S = w \circ R = (\mu_1, \mu_2, \cdots, \mu_m) \circ \begin{pmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{pmatrix} = (s_1, s_2, \cdots, s_n)$$

It can get fuzzy evaluation set S, from which "$\circ$" is fuzzy compound operator. For fuzzy operator, mainly is as following several kings TABLE 6:

TABLE 6 : Fuzzy operator

Feature	Operator			
	$M(\wedge, \vee)$	$M(\cdot, \vee)$	$M(\wedge, \oplus)$	$M(\cdot, \oplus)$
Reflect weight effect	Not remarkable	Remarkable	Not remarkable	Remarkable
Comprehensive extent	Weak	Weak	Strong	Strong
Utilize R information	Insufficient	Insufficient	Relative sufficient	Sufficient
Type	Main factor highlight type	Main factor highlight type	Weighted average type	Weighted average type

Here take fuzzy operator as $M(\cdot,\oplus)$ operator, that:

$$s_k = \min\left(1,\sum_{j=1}^{m}\mu_j r_{jk}\right), k=1,2,\cdots,n$$

Input above calculation result into above formula and can get:

$$S_1^{'} = (0.431,\quad 0.136,\quad 0.298,\quad 0.321)$$

Get results

By analyzing fuzzy evaluation vector S, it makes comprehensive conclusion. Generally, it can adopt maximum membership principle, weighted average principle, fuzzy vector uniformization, and here apply maximum membership principle.

For maximum membership principle, if given fuzzy evaluation set $S = (S_1,S_2,\cdots,S_n)$, (from which S_i is grade v_i to fuzzy evaluation set membership), $M = \max(S_1,S_2,\cdots,S_n)$, M corresponding element is comprehensive evaluation result of evaluation.

By $S_1^{'} = (0.431,\quad 0.136,\quad 0.298,\quad 0.321)$, it is clear:

$$M_1 = \max(S_1,S_2,\cdots,S_n) = 0.431$$

Evaluation on Chemical medicine curative effects on some kinds of mental diseases

Follow above analysis process, it can get:

Each evaluation indicator weight is:

$$w_2 = \{0.33,\quad 0.12,\quad 0.24,\quad 0.31\}$$

By calculating, it can solve:

$$R_1 = \begin{pmatrix} 0.45 \\ 0.1 \\ 0.15 \\ 0.3 \end{pmatrix}; R_2 = \begin{pmatrix} 0.35 \\ 0.15 \\ 0.2 \\ 0.3 \end{pmatrix}; R_3 = \begin{pmatrix} 0.45 \\ 0.1 \\ 0.2 \\ 0.25 \end{pmatrix}; R_4 = \begin{pmatrix} 0.45 \\ 0.1 \\ 0.1 \\ 0.35 \end{pmatrix};$$

And by $R = (R_1,\quad R_2,\quad R_3,\quad R_4,\quad R_5,\quad R_6)^T$, it can get comprehensive evaluation matrix as following:

$$R_2^{'} = \begin{pmatrix} 0.45 & 0.35 & 0.45 & 0.45 \\ 0.1 & 0.15 & 0.1 & 0.1 \\ 0.15 & 0.2 & 0.2 & 0.1 \\ 0.3 & 0.3 & 0.25 & 0.35 \end{pmatrix}$$

Fuzzy evaluation vector $S_2^{'} = (0.413,\quad 0.105,\quad 0.172,\quad 0.221)$, and it has:

$$M_2 = \max(S_1,S_2,\cdots,S_n) = 0.413$$

Carry out statistical analysis of above sports activities exercises and chemical medicine treatment obtained evaluation result, it gets as following statistical Figure 5:
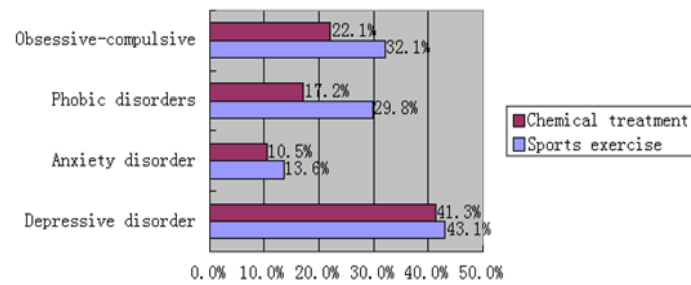
Figure 5 : Comparison of results

From above statistical Figure 5, it is clear that on a whole, for depression, anxiety, terror, obsession four kinds of common mental diseases, sports activities exercises curative effects are better than chemical medicine. Make specific analysis of four kinds of mental diseases, no matter is physical exercise or chemical medicine, both have better curative effects on depression, and poor curative effects on anxiety, terror and obsession curative effects are relative better. The conclusion conforms to psychologist Dishman investigation material, so that proves the conclusion accuracy.

CONCLUSION

The paper firstly studies on physical education physical education course curriculum contents, and further analyzes current stage students understanding on physical health, and physical exercises correlation on students psychological health, and gets that presently Chinese physical education course contents are relative traditional, their understanding on physiological health knowledge, psychological health are not deepen enough, students rarely participate in physical exercises. And on this basis, utilize correlation analysis, establish physical exercise and psychological health correlation model get that physical exercise has important impacts on students' psychological health.

And based on correlation analysis, utilize fuzzy comprehensive evaluation method, analyze physical exercises and chemical medicine curative effects on common depression, anxiety, terror, obsession these four mental diseases, by comparing the two fuzzy evaluation vector, compare physical exercises and chemical medicine curative effects, and get that physical exercises have better effects on the four kinds of common mental diseases.

ACKNOWLEDGMENT

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