



Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Curve fitting factor analysis-based school sports and educational system reformation research

Yabiao Meng

Institute of Physical Education, Inner Mongolia Normal University, Huhhot, Inner Mongolia, China

ABSTRACT

School education and educational system reformation have close relations, research on school physical education can better serve to Chinese educational system reformation some time in future. School education development has impacts on students' physical quality as well as healthy body and psychological growth. Go in for basketball, tennis, volleyball, football, gymnastics, aerobics, cheerleading and swimming as well as other sports activities have important effects on students' psychological health. The paper uses curve fitting and factor analysis method, combines with developmental concepts, by introducing sports educational investment and total educational investment percentage, as well as present Chinese students' states in taking physical education courses, starts from sports and health course combinative aspect, researches Chinese physical education existing problems and future development direction. So that further put forward Chinese school sports should reference foreign physical education power ideology, it should focus on lifelong education mode, improve students' healthy body and psychological development, and finally put individualization, specialization and socialization thought throughout students' school life.

Key words: curve fitting, factor analysis, individualization, educational system, physiology and biochemistry

INTRODUCTION

School sports position in educational reformation is very important, research on school education development rules and its performances play a crucial role in a country educational system reformation. Research on school sports can help us to better understand educational system, make clear which effects that school sports have in modern social life, and use these functions to serve our life. In addition, school sports also have certain promotions to students' physical quality and healthy physical and psychological growth.

With national economy constantly rapid development, people's living quality is clearly raised, masses demands on spiritual cultures have increased, sports service industry has already become an indispensable industry in country economic advancement. Therefore, the paper analyzes Chinese school sports status by researching on school sports and educational system reformation development, and provides feasible suggestions for future school physical education development.

Present world is a world that knowledge economy takes leading role in international economy, therefore, all countries in the world adjust and reform their education to cultivate useful talents that can more adapt to knowledge economy era social development demand. We should take sports as an indispensable part in daily life. In workout time, take physical exercises as a kind of leisure and entertainment ways, so that improve physical quality and living quality.

The paper through horizontal and vertical analysis, combines with developmental concepts, makes researches on

school sports and educational system reformation. In virtue of curve fitting and factor analysis mathematical analysis, it provides theoretical basis for school sports researches, so that further proposes ideology that Chinese sports should reference foreign physical education power, highlights that physical education development trend is lifelong education mode, Chinese education should put school sports in the important place, focus on students' health physical and psychological development so that ensure that students can healthy and happily grow.

Model establishments

Current society is a school education-based environment. Completely school education system is jointly composed of school sports and school moral education as well as intellectual education. However, school sports affiliate education range, social politics, economy and culture will have certain effects on school education. School sports affect students' health and development; it plays a crucial role in students' physical quality improvement and physical and psychological growth, as Figure 1.



Figure 1: School sports

2.1 Curve fitting-based physical education investment status

School investment in basketball, tennis, volleyball, football, gymnastics, aerobics, cheerleading, swimming and other sports events affect physical education development. To a country, education investment proportion in GDP is an evidence to judge whether a country takes primary strategic position in the whole world or not, meanwhile is also the fundamental basis to judge whether its leader focuses on education or not. While physical education also plays extremely important roles in students' education, physical education investment proportions in education investment concerns whether students can healthy and comprehensive develop or not.

Below Table 1 is recently years' Chinese physical education investment amount, and its percentage in total education investment in current year, data is from "Chinese education comprehensive statistical yearbook".

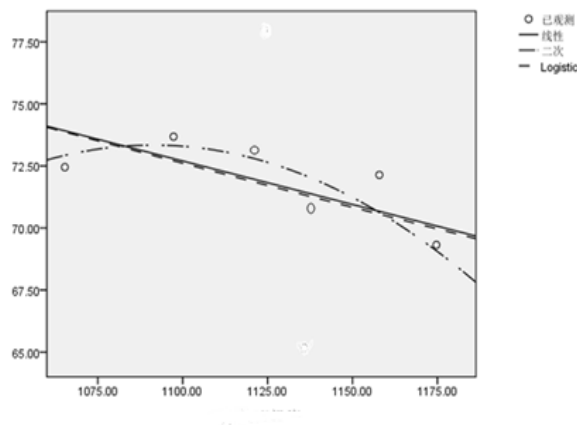
Table 1: Physical education investment status

Year	2007	2008	2009	2010	2011	2012
Physical education investment/ Ten thousand Yuan	69.32	72.45	65.17	73.68	78	72.14
Total education investment/ Hundred million Yuan	1174.7	1065.3	1135.8	1097.3	1124.1	1157.9
Proportion in total education investment%	2.59	2.68	2.55	2.79	2.87	3.19

Curve fitting refers to that, "Known a group of data (two dimensions), that plane n pieces of points $(x_i, y_i), i = 1, 2, 3, \dots, n, x_i$ are different from each other, assume there is a curve function $y = f(x)$, let $f(x)$ to get closer to known all original data's data figure points positions in one relation criterion, so that it can get curve fitting goodness. In general, we use polynomial function by least square method to solve the fitting function."^[2]

Take total education investment as independent variable, sports education investment as dependent variable, process with original data by using SPSS software, so that get physical education investment and total education investment linear function relationship is: $y = 0.106x + 111.227$

According to SPSS analysis data, it can get following function Figure 2:



(Observed, linear, quadric, logistic)
 Figure 2: Changes in physical education investment

From Figure 2, it is clear that current Chinese school physical education trend is stuck in physical education investment. Physical education position in people’s heart is still not optimistic, traditional cultural education still takes leading position.

Though education investment is further increasing, school investment in basketball, tennis, volleyball, football, gymnastics, aerobics, and cheerleading, swimming and other sports events still occupies little part by comparing to cultural courses’ investment. In future, our development target is increasing school physical education investment, positively advertising school physical education; encouraging students to positive participate in sports activities, so that impelling school physical education development.

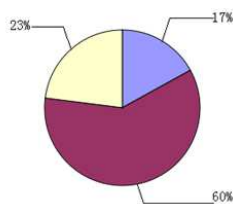
2.2 Physical education position in students’ ideas

In modern teaching, due to every universities excessive pursuit cultural education, partial pursuit high enrolment rate, so that ignores physical education. Physical education course, extracurricular athletics are often diverted and occupied, basketball, tennis, volleyball, football, gymnastics, aerobics, and cheerleading, swimming and other sports events often make way for cultural courses, so that cause contemporary students universally existing “high intelligence, low physical ability” such status. According to one investigation, it indicates that 300 enrolled new students’ physical education course teaching state investigation Table 2.

Table 2: Students’ physical course state condition table

	Maintain state	Shepherd type	No in the mood	Total
Number of people	51	171	70	300
Percentage%	17	60	23	100%

Among them, there are 51 people can maintain state in physical education course that occupy 17%, and 179 people are in “Shepherd type” teaching state that occupy 60%, other 70 people are not in the mood that occupy 23%, thereupon school physical education hasn’t yet occupied primary position. To clearly observe 300 enrolled new students’ physical education course teaching state, and better analyze physical education position in students’ ideals, it draws following pie Figure 3.



(Maintain state, shepherd type, not in the mood)
 Figure 3: PE teaching state diagram

Investigation indicates that students’ states during sports course teaching have great differences; most of them are not in the mood. Physical education position in students’ ideas is to be improved.

China is still cultural education-based, basketball, tennis, volleyball, football, gymnastics, aerobics, and cheerleading, swimming and other sports events organization is not widely. The more important is physical education concept position in students and teachers' hearts is still quite low, they haven't yet recognized physical education importance.

2.3 School sports and adjacent disciplines relations

School sports can fully absorb its correlated disciplines advantages for its own using, meanwhile it can also enrich other disciplines contents, and teaching forms. It has multifarious relations with sports science, education science multiple disciplines. That is to say, in a sense, school sports is branch of above two disciplines groups, is their sub discipline.

School sports included main theoretical knowledge is extremely broad that are sports teaching theory, physical education curriculum theory, exercise training theory, students in sports training theory and school sports management, they have relative independent development trend, research objects and research ranges, and mutual connect with each other, as Figure 4.

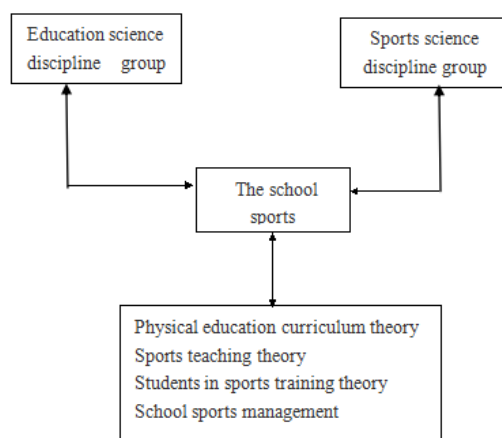


Figure 4: School sports figure relationship with neighboring disciplines

2.4 Factor analysis-based sports activities impacts on students' psychological health

School physical education is one of key part in current higher education. Its widely spread is helpful for cultivating "morals, intelligence, physical fitness, aesthetics" comprehensive developed "four have" new persons, and it plays indispensable roles in maintaining higher education talents cultivation aspect.

Go in for sports activities, such as basketball, tennis, volleyball, football, gymnastics, aerobics, cheerleading, swimming and other sports, they have important impacts on students' psychological health. Sports activities not only have significant effects on a people physical quality as lung capacity, heartbeat frequency and others, but also affect a people's emotion.

In the following, use factor analysis to make comparative analysis of sports activities and chemical medicines treatment effects on some common psychological diseases, so that research on sports activities influence on students' psychological health.

Factor analysis also calls element distraction method, is developed and established on the basis of psychology, it provides a kind of effective mathematical model to explain things relationships. Meanwhile, factor analysis method also is a kind of dimensions reduction statistical method in multiple analyses that integrates variables with intricate relations into factors with fewer amount.

Factor analysis method basic thought is "try to use least amount of unobservable variables (common factors) to explain correlation models appear in observable variables. By variables (or samples) correlation coefficient matrix (approximate coefficient matrix) internal structure research, find out fewer some (unobservable) variable s that control all variables (or samples) to describe numerous original variables (or approximate) relationships."^[8]

Factor analysis mathematical model: set $x_i = (i = 1, 2, \dots, p)$ pieces of variables, if it is expressed as:

$$\begin{cases} X_1 = a_{11}f_1 + a_{12}f_2 + \dots + a_{1m}f_m + e_1 \\ X_2 = a_{21}f_1 + a_{22}f_2 + \dots + a_{2m}f_m + e_2 \\ \dots \\ X_k = a_{k1}f_1 + a_{k2}f_2 + \dots + a_{km}f_m + e_k \end{cases}$$

That $X = Af + e, f_1, f_2, \dots, f_m$ is called common factors, is unobservable variables, $A = (a_{ij})_{k \times m}$ is called sub load, a_{ij} represents the i variable in the j factor load, e_k is special factor, is the part that cannot be contained by previous m pieces of common factors and can meet $Cov(f, e) = 0, f, e$ is uncorrelated.

Following Table 3 is chemical medicines and sports activities treatment effects on depression, anxiety, phobia and obsession four kinds of main psychological diseases, data is from psychologist Dishman findings.

Table 3: Psychological diseases curative effects comparison

Influence factors	Depression	Anxiety	Phobia	Obsession
Diseases types				
Sports activities	86%	60%	78%	83%
Chemical medicines	74%	57%	69%	79%

Common factor and indicator variables correlation coefficient is factor load, "The load gets bigger, and it shows indicator variables and common factors get closer. When defining common factors number, firstly select same factors number as initial variables number, then calculate factor total variance."^[3]

Analyze data by SPSS; results can refer to following Table. Take factors that initial feature values are above 1 as common factors. By following Table 4, it is clear that one feature value conforms to conditions, accumulative variance contribution rate arrives at 97.604%, it covers most of variables information. Therefore select the first factor as common factor.

Table 4: Explanatory total variance

Component	Initial feature value			Extract squares sum and load		
	Total	Variance %	Accumulation %	Total	Variance %	Accumulation %
1	1.952	97.604	97.604	1.952	97.604	97.604
2	8.695E-17	2.174E-15	100.000			
3	5.367E-17	1.342E-15	100.000			
4	-2.526E-33	-6.316E-32	100.000			

Extract method: Principal component analysis.

And extracted principal component indicator variable function is as following:

$$y = 0.506 * x_1 + 0.481 * x_2 + 0.250 * x_3 + 0.248 * x_4$$

It further can get principal component comprehensive evaluation model:

$$Z = \frac{1.952 * y}{0.97604}$$

Below Table 5 is comprehensive score obtained by computing:

Table 5: Two influence factors comprehensive scores status

Influence factor	Factor score	Comprehensive score
	y	Z
Sports activity	112.46	224.91
Chemical medicine	101.703	203.39

By above Table 5, it can analyze that sports activity comprehensive score is the highest, and further know sports activity has important effects on students' psychological health improvements.

School sports is passing on sports and sports theoretical knowledge basis to students, basketball, tennis, volleyball, football, gymnastics, aerobics, cheerleading, swimming and other sports play crucial roles in cultivating students' sports habits and willing. No doubt that school education will play a role in improving university students' psychology, physical health level and sports attainments that cannot be ignored, and it has certain promotion to educational system reformation.

Factor analysis model is not accepting or rejecting original variables but making combination according to original variables information, and finding out variables influence common factors, simplifying data. It adopts least square method, introduce independent variables by rotation has more interpretability, and high clarity. By factor analysis method, it analyzes basketball, tennis, volleyball, football, gymnastics, aerobics, cheerleading, swimming and other sports curative effects on some kinds of common psychological diseases, and compare it with chemical medicines, so that research on sports activity impacts on students' psychology health.

2.5 Some suggestions on school sports

- 1) When organize teaching materials and select teaching contents, it is required to on the basis of not ignoring sports body aspect values to people, put more and more emphasis on cultural connotation that is involved in sports.
- 2) Focus on combination of lecturing teaching and students extracurricular activities, pay attention to students' mutual effects. In addition, diversify teaching forms so as to impel students' thinking ability cultivation, and then form into humanistic sports, natural type sports trend again under new social conditions and environments.
- 3) School physical education course should make some developmental adjustment; combine with happy sports, lifelong sports concepts into classroom. Focus on students' physical quality and physical and psychological health, encourage students to positively participate in basketball, tennis, volleyball, football, gymnastics, aerobics, cheerleading, swimming and other sports, cultivate their physical exercises interests.
- 4) Based on school sports development, according to future sports development and educational system reformation features, make better combination between school sports and educational system. We also need to cultivate students' sports social awareness, on a whole, strengthen sports theoretical knowledge learning, and better fuse sports knowledge and physical exercises into students' ideology.
- 5) Students in school should establish strong sports idea, focus on sports learning guiding ability cultivation, take sports and exercise as a fun. In addition, it should strengthen in-service teachers especially for sports teachers' continuing learning, only teachers focus on physical education importance then they can encourage students to participate in sports activities, so that improve school physical education position in students thoughts, and better serve to educational system reformation.

CONCLUSION

Reformation research on school sports and education system reformation has very important effects on Chinese educational system reformation some time in future. Research on school sports can help us to better understand education system, make clear which effects school sports can have in modern social life, and use these functions to serve our life.

Nowadays, Chinese social economy and political position have changed dramatically, we also should extract more beneficial thoughts from developed countries' physical education modes, and combine with Chinese school physical education, put forward that the key to physical education is students' physical and psychological health development, and finally put individualization, specialization and socialization thought throughout students' school life.

The paper applies curve fitting and factor analysis method, makes a general survey of school sports development and existing problems, and further gets conclusions. It is thought that school sports should more focus on basketball, tennis, volleyball, football, gymnastics, aerobics, cheerleading, swimming and other sports activities organization, guide students to positively participate in physical exercises. So that impel to students' physical quality and physical as well as psychological healthy growing development.

REFERENCES

- [1] CHEN Po, QIN Zhong-Mei, YIN Ying, XIA Chong-De. *Journal of Beijing Sport University*, **2007**, 30(12):1610-1613.
- [2] GUO Hong. *China Sport Science and Technology*, **2007**, 43(3):36-40
- [3] LI Hong, XUE Hai-hong, FENG Wu-long. *Journal of Xi'an Institute of Physical Education*, **2007**, 24(4):25-28..

- [4] LI Lin, YANG Jie, YANG Tian, XU Lie-hui. *Journal of Beijing Sport University*, **2010**(9).
- [5] MIAO Zhi-wen, QIN Chun-lin. *Journal of Physical Education*, **2006**, 13(1):119-121.
- [6] XIAO Huan-yu, FANG Li. *Sports Science Research*, **2005**, 26(1):7-10.
- [7] XIAO Huan-yu, WENG Zhi-qiang, CHEN Yu-zhong. *Journal of Shanghai Physical Education Institute*, **2005**, 29(2):10-14.
- [8] XUE Jin-xia, WANG Jing-tong. *Bulletin of Sport Science & Technology*, **2011**, 19(4):57-59.
- [9] YAN De-yi. *Journal of Wuhan Institute of Physical Education*, **2006**, 40(1):15-19.