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Sports dance to female college students' physical and psychological health level influences' factor analysis

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ABSTRACT

In recent years, sports dance has become one of favorite sports events among numerous female college students. It has extremely high entertainment, fitness, and appreciation. It has impacts on female college students' physical and psychological in multiple aspects. The paper selects female college students as research objects, divides them into research group and control group. Targeted at basic information, body shape indicator, cardio-pulmonary function indicator, and body balance indicator, psychological indicator these six influence orientations, carry out investigation and research on 40 more kinds of influence factors. Utilize factor analysis method, it provides factor analysis screen plot. Thereupon, it defines every influential orientation's main influence factors, simplifies the above 40 kinds of influence factors into six influence factors, and combines with practice, it defines five main influence factors. Those are weight, lung capacity, single leg standing with eyes closed, deep squat and summarization. The simplified result provides powerful evidence for the kind of problems subsequent researching, is easy to subsequent research.

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KEYWORDS

Sports dance;
Female college students;
Factor analysis method;
Influence factor;
Lung capacity;
Physiological indicator;
Physical and psychological health.

INTRODUCTION

Sports dance is a branch in sports events; it has effects as fitness, heart building, and appreciation so on. By far more and more college students love the event; universities of every place are also positive organizing it. Sports dance includes Latin dance, international style of ballroom dancing and others dozens of items, which have broad influence ranges to college students.

In 2003, Zhao Li in the article "Chinese sports dance organization status and counter measure research", made analysis that targeted at Chinese partial provinces

and cities' athletes, teachers' group and other status, and looked for Chinese sports dance event development status shortcomings. Analysis result shows that though sports dance prevailed in China, its development trend was good, some provinces still didn't organized such event. In addition, teenager athletes' education degree was not high, they ignored cultural course learning and their prospects were worrying. In 2006, Rong Li and others in the article "Analyze and research on ordinary institutions of higher learning sports dance development status", comprehensive applied multiple kinds of research methods, took fifty ordinary institutions as research objects, analyzed sports dance course

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development status, analysis result shows universities sports dance course though had gradually been organized, it was still in the preliminary exploring stage. By far, teachers' levels were important factors that restricted sports dance development. In 2012, Zhao Jing-Hui in the article "Chinese sports dance teachers' continuing education research", he took Beijing universities sports dance further educated teachers as research objects, adopted multiple kinds of research methods, according to continuing education features, got conclusion. By far, sports dance development trend in China was good, so that it put forward higher requirements on sports dance teachers, which propelled to sports dance teachers' levels improvement. In 2012,

Xia Yun-Ping in the article "Hunan province sports dance development status and counter measure research", selected the fourth middle school of Changsha, Hunan Normal College and others total thirteen organizations as research objects, utilized multiple research methods, comprehensive considered Hunan province sports dance development status, the paper pointed out each local government and administrative organizations emphasis and investment forces on sports dance event were not enough. Sports training school teaching contents were unreasonable, teaching plan was inconsistent. Meanwhile, author provided guiding opinions. In 2012, Li Ping in the article "Sports dance to female college students physical and psychological health level influence", selected 38 female college students as research objects, divided them into experimental group and control group, and tested their body shape, cardio-pulmonary function and other health indicators. Combined with universities sports dance teaching status, the paper pointed out sports dance event was beneficial to female college students' physical and psychological health.

Sports dance event has broad physical and psychological influence range in college students, indicators are various, and in order to more clearly research on the problem, the paper makes classification on these influence indicators.

MODEL ESTABLISHMENTS

Sports dance has multiple influences on female college students, and range is broad. It contains basic in-

formation that is composed of height, weight and other indicators (as TABLE 1), body shape indicator that is composed of chest circumference, hip circumference and other factors (as TABLE 2), cardio-pulmonary function indicator that is composed of lung capacity, respiratory difference and other factors (as TABLE 3), body balanced indicator that is composed of stepping experiment deflection angle, deflection distance and other factors (as TABLE 4), basic motion ability that is composed of deep squatting, hurdling and other factors (as TABLE 5), psychological indicators that is composed of depression, anxiety and other factors (as TABLE 6). The paper establishes models, targeted at every indicator factors; it utilizes factor analysis method to study them.

Original data

Data in TABLE 1-6 is from "Sports dance impacts on female college students' physical and psychological health level".

Factor analysis

Factor analysis is integrating variables with intricate relations into some factors with fewer quantities. When carry out multiple analysis, it is also a kind of statistical method to make dimensionality reduction.

Factor analysis is also called element analysis, is established and developed during research psychology process. It can be supposed that psychology unique contribution on natural science is factor analysis method. With people constant deepen researching for years; the analysis method has been gradually tended to be perfect in theory. Not only just its usage in psychology intelligent and character researching, it also applied into attitude, learning and other aspects' researching. It is

TABLE 1: Basic information compariso

Classification	Non-sports	Sports dance
	dance group	group
Age	18.95	19.16
Height (cm)	151.51	158.27
Weight (kg)	48.52	47.94
Body fat percentage (%)	14.99	16.04
Single leg standing with eyes closed (S)	19.74	17.63
Psychological assessment (score)	170.79	180.16
Physical test result (score)	75.05	69.37

TABLE 2 : Body shape indicator comparison

Classification	Non-sports dance group	Sports dance group
Weight (kg)	48.5211	46.5105
Chest circumference (cm)	82.8474	80.9789
Waist circumference (cm)	69.9947	68.6158
Hip circumference (cm)	90.7684	88.9105
Upper arm circumference (cm)	22.8105	22.0737
Thigh circumference (cm)	53.4474	51.1053
Shank circumference (cm)	32.2211	32.3421
Body fat percentage (%)	14.9895	15.1211

TABLE 3 : Cardio-pulmonary function indicator comparison

Classification	Non-sports dance group	Sports dance group
Lung capacity (ml)	2516.47	2954.95
Lung capacity index	52.0526	52.6316
Step test result	50.7368	56.4211
Endurance score	73.8421	79.1579
Respiratory difference (cm)	3.8063	5.4526

TABLE 4 : Balance indicator comparison

Classification	Non-sports dance group	Sports dance group
Single leg standing with eyes closed (S)	20.8947	44.3158
Step experiment deflection angle (°)	31.2632	20.1316
Step experiment deflection distance (cm)	44.2105	27.2947
Accurate single limb left upper limb deflection angle (°)	23.0726	21.1049
Accurate single limb left upper limb deflection distance (cm)	2.2271	1.7356
Accurate single limb right upper limb deflection angle (°)	29.2887	16.0108
Accurate single limb right upper limb deflection distance (cm)	2.1480	1.3735
Accurate single limb left lower limb deflection angle (°)	26.5655	12.9286
Accurate single limb left lower limb deflection distance (cm)	3.9318	2.1396
Accurate single limb right lower limb deflection angle (°)	22.1319	17.7416
Accurate single limb right lower limb deflection distance (cm)	3.0556	2.1475
Accurate combinative left upper limb deflection angle (°)	27.3181	19.4033
Accurate combinative left upper limb deflection distance (cm)	3.7001	2.0274
Accurate combinative right upper limb deflection angle (°)	24.0414	18.4154
Accurate combinative right upper limb deflection distance (cm)	3.3050	2.1968
Accurate combinative left lower limb deflection angle (°)	24.4269	12.5337
Accurate combinative left lower limb deflection distance (cm)	5.1907	3.2217

also promoted to non-psychology field, as geography, geology and biology as well as other researches. It is a kind of effective mathematical model to explain relations among matters.

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

$$X_i = a_{i1}F_1 + a_{i2}F_2 + \dots + a_{im}F_m + \epsilon_i \quad (m \leq p) \quad (1)$$

That $X = AF + \epsilon, F_1, F_2, \dots, F_m$ is called common factor, is unobservable variable, $A = (a_{ij})_{p \times m}$ is called factor loading matrix, a_{ij} represents the i variable loading in the j factor, ϵ_i is special factor that cannot be contained by previous m pieces of common factors and meets $Cov(F, \epsilon) = 0, F, \epsilon$ are uncorrelated.

Factor analysis analyzed and solved three basic questions: (1) Estimate factor loading matrix A ; (2) In case that factor is not easy to be explained, to get reasonable explanation, carry out orthogonal transformation on factor loading matrix; (3) Provide every vari-

able (or samples) regarding m pieces of common factors scores, generally it represents as original variable

linear combination to reasonable estimate common factors.

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Factor analysis general steps

- (1) Similar to principal component analysis, calculate \bar{x}_k and $s_k (k, j = 1, 2, \dots, m)$, establish basic equation set.
- (2) Use principal component analysis method to define factor loading matrix A .

Factor analysis basic model is as following:

$$\begin{cases} X_1 = a_{11}F_1 + a_{12}F_2 + \dots + a_{1p}F_p + \epsilon_1 \\ X_2 = a_{21}F_1 + a_{22}F_2 + \dots + a_{2p}F_p + \epsilon_2 \\ \dots \\ X_m = a_{m1}F_1 + a_{m2}F_2 + \dots + a_{mp}F_p + \epsilon_m \end{cases} \quad (2)$$

Among them, X_1, X_2, \dots, X_m are original variables,

F_1, F_2, \dots, F_p are common factors, it expresses as matrix form:

$$X_{(m \times 1)} = A_{(m \times p)} \cdot F_{(p \times 1)} + C_{(m \times m)} \cdot U_{(m \times 1)} \quad (3)$$

X is factor loading matrix, estimate factor loading matrix method includes principal component method, image factor method, weighting least square method, maximum likelihood method and others.

- (3) Variance maximum orthogonal rotation.

The purpose of establishing factor analysis mathematical model not only is to find out common factor and group variables, but also it should make clear every common factor significance so that scientific analyze practical problems. When factor loading matrix X structure is not convenient for explaining main factors, it can use an orthogonal matrix post multiplication A (that is to implement an orthogonal transformation on A). By linear algebra knowledge, make an orthogonal trans-

TABLE 5 : Basic motion ability comparison

Classification	Non-sports dance	Sports dance
	group	group
Deep squat (score)	2.0000	2.8947
Jump the high-jump bar (score)	1.7895	2.3684
Linear lunge squat (score)	1.7895	2.3158
Shoulder straps/shoulder joint activity (score)	2.1053	1.9474
Straight leg raising up (score)	2.3158	2.5789
Controlled body push-up (score)	1.2632	1.7895
Twist stability test (score)	1.5789	1.3684

TABLE 6 : Psychological indicator comparison

Classification	Non-sports dance	Sports dance
	group	group
Somatization (score)	1.4868	1.35965
Obsession symptom (score)	2.3684	2.0736
Interpersonal sensitivity (score)	2.1520	1.8480
Depression (score)	2.0243	1.7611
Anxiety (score)	1.9105	1.74211
Hostility (score)	1.6315	1.5088
Terror (score)	1.6090	1.4060
Paranoia (score)	1.8684	1.7280
Mental disorder symptom (score)	1.7895	1.5474

TABLE 7 : Variable communalities table

	Initial	Extract
VAR00001	1.000	1.000
VAR00002	1.000	1.000
VAR00003	1.000	1.000
VAR00004	1.000	1.000
VAR00005	1.000	1.000
VAR00006	1.000	1.000
VAR00007	1.000	1.000

Extract method: principal component analysis

formation on A , corresponding coordinate system has a rotation so that can make explanation on factor significances.

- (4) Get factor score function, calculate samples factor scores.

Use common factor to express cause variable linear combination, and further get factor score function. By factor score functions, it calculates and observes scores recorded in each common factor; therefore it solves common factors unobservable problems.

Analyze SPSS computational result

For TABLE 1 data (that is age, height, weight, body fat percentage, single leg standing with eyes closed, psychological assessment, physical test result), make factor analysis, it can get following result.

TABLE 7 is every variable communalities result. From the table, it is easy to see that factor analysis variable communalities are very high, which shows factor

TABLE 8 : Factor contribution rate table

Component	Initial feature value			Extract square sum and load in		
	Total	Variance %	Accumulation %	Total	Variance %	Accumulation %
1	7.000	100.000	100.000	7.000	100.000	100.000
2	3.154E-16	4.505E-15	100.000			
3	1.110E-16	1.586E-15	100.000			
4	7.980E-33	1.140E-31	100.000			
5	-1.019E-16	-1.456E-15	100.000			
6	-1.081E-16	-1.544E-15	100.000			
7	-4.396E-16	-6.280E-15	100.000			

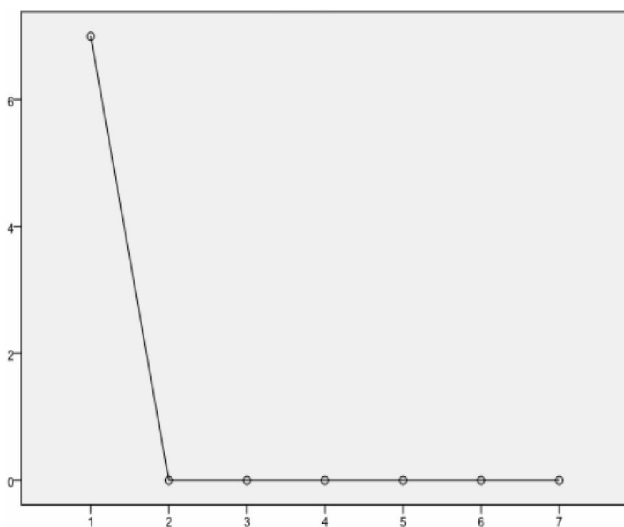


Figure 1 : Scree Plot

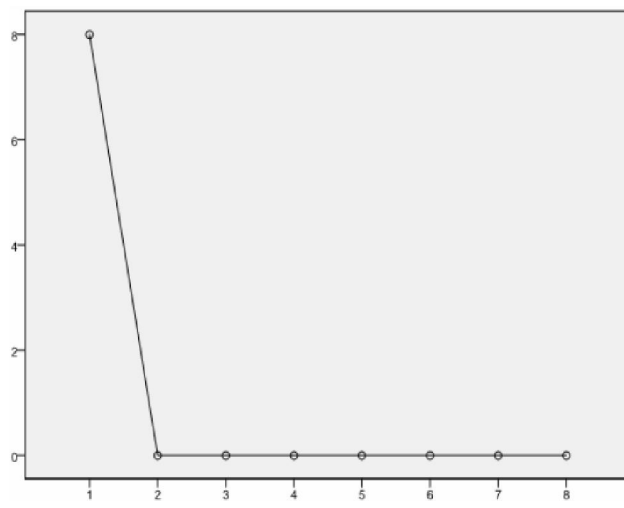


Figure 2 : Scree Plot

factor.

Figure 1 is basic status analysis scree plot. From Figure 1, we can see that slope is in gently state since the second factor, therefore age is main factor, height, weight, body fat percentage, single leg standing with eyes closed, psychological assessment, physical test result are secondary factors.

Due to body shape indicator, cardio-pulmonary function indicator, balance indicator, basic motion ability, psychological indicator these five indicators analysis is the same as analysis of basic information, so, following gives the five indicators' analysis scree plot (as Figure 2-5 shows) to explain result.

Figure 2 is factor analysis result chart targeted hip circumference, waist circumference, chest circumference, weight and others eight items. From Figure 2, we can clearly see that factors are in the slope gently position since the second factor, so we can get conclusion, weight is main factor.

Figure 3 is factor analysis result chart that targeted

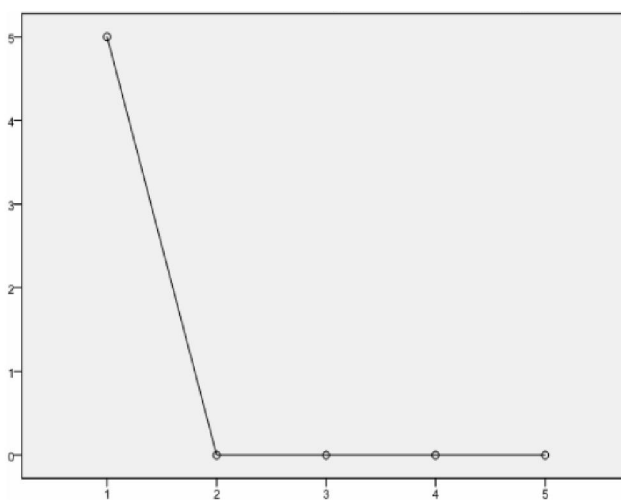


Figure 3 : Scree Plot

analysis result validness.

TABLE 8 is factor contribution rate result. From TABLE 8, it is clear that factor 1 feature value is above 1, other factors are lower and are 100%, so extract the factor 1 as main factor that age is maximum influence

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at lung capacity, lung capacity index, step test result, endurance score, and respiratory difference these five items. From Figure 3, we can clearly judge that lung capacity is the main factor.

Figure 4 is factor analysis of single leg standing with eyes closed, step experiment deflection angle, step experiment deflection distance, accurate single limb left upper limb deflection angle and others total sixteen items. From Figure 4, we can judge that single standing with eyes closed is main factor.

Figure 5 is factor analysis targeted at deep squat, jump the high-jump bar, linear lunge squat, shoulder straps/shoulder joint activity, straight leg raising up, controlled body push-up, twist stability test the seven items. From Figure 5, we can judge that deep squat is the main factor.

In psychological indicator factor analysis, we find summarization is main factor. To sum up, and consider

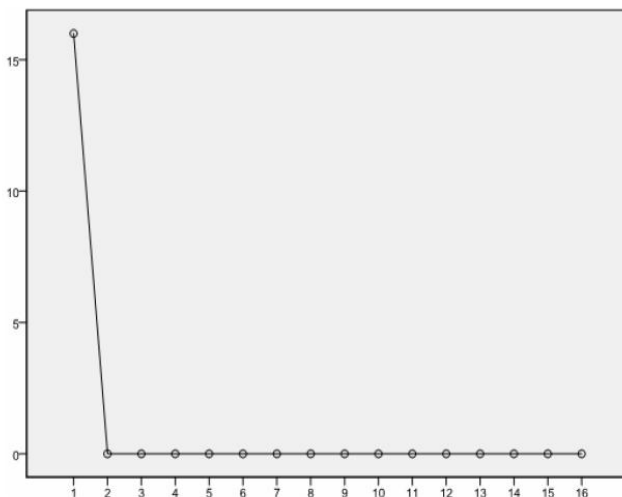


Figure 4 : Scree Plot

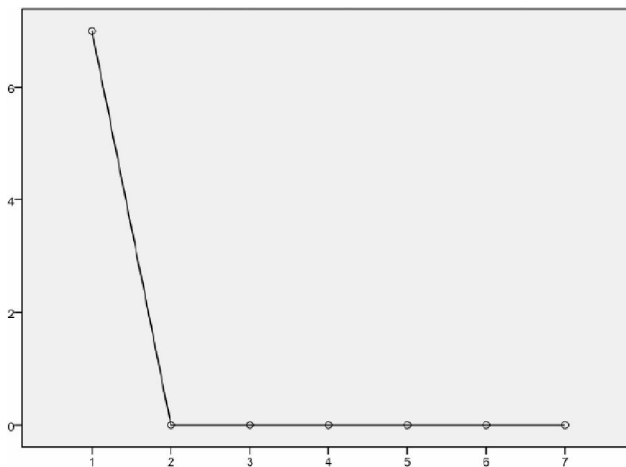


Figure 5 : Scree Plot

practice, we get conclusion, sports dance to female college students' important influential factors are weight, lung capacity, and single leg standing with eyes closed, deep squat, and summarization.

CONCLUSION

Factor analysis is a mathematical tool that looks for main factors under numerous factors influence, it can help us objective look for main factors from numerous factors. The paper applies factor analysis into researching sports dance to female college students influence such problem, extracts six aspects main influence factors, simplifies above forty items influence factors to six main influence factors, it simplifies the kind of problem to a certain degree so as to easy to the kind problem later period research. Combine with practice status, take age factor as objective factor, it will not change with external things change to a certain degree, therefore, we define that five main influence factors, they are weight, lung capacity, single leg standing with eyes closed, deep squat, and somatization.

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