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Principal component analysis of microblog impacts on contemporary university students sports values

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ABSTRACT

Microblog is university students' inseparable information capturing way, microblog's timeliness; anywhere available attribute let it to become university students' sports values important influential tool. The paper takes university students as investigation objects, makes investigation on university students' motivation of contacting with microblog sports information as well as university students' motivation of physical exercises, and utilizes principal component analysis method to analyze investigation result. Analysis result shows that for analysis of motivation in contacting with microblog sports information, university students main motivation is increasing new knowledge of sports, passing time, and learning sports stars comments. For physical exercises motivation analysis, university students' main motivation is self-hobbies, improving sports level and performance, and grasping a kind of technology.

KEYWORDS

Contemporary university students; Sports values; Network microblog; Principal component analysis.

INTRODUCTION

Microblog, micro-letter, and micro public good have become fashionable words. University students as group of the strongest receptivity have become representative personage of fashion. However, microblog impacts on university students sports values is worthy of people's attentions.

In 2008, Sun Zhu-Bing, in the article "Discuss sports values impacts on university students socialization", pointed out that sports value is a kind of special value, it can be divided into health, education, competition, recreation, economy five kinds of values. These five kinds of values have important guiding effects on university students physical and psychological health growth. The paper comprehensive applied multiple kinds of disciplines knowledge, studied on sports values; research showed that for most university students, sports values were positive, in five sports values; sports health value was the mainstream. And meanwhile, author pointed out that sports competition value was essential quality for university students adapting to contemporary society intense competition.

In 2009, Li Huan-Yu in the article "University students sports values and physical exercises behavior relation research", took university students in school as research objects, comprehensive applied multiple kinds of methods to make investigation and research on them. Research results showed that university student sports values compared to other groups' sports values; it showed relative positive. But gender difference and health status difference would lead to university students' sports values being affected. Author pointed out sports values had certain positive correlations with physical exercises frequency, time and intensity and other aspects.

In 2008, Chen Wei in the article "University students sports values and universities sports environment relations preliminary research", selected ten universities of Jiangsu province as investigation objects, investigation results showed that university students had better overall evaluation on universities sports environment, evaluation on hardware aspect was higher than software aspect. University students sports values overall trend was good, most students paid more attentions to sports individual values. Ranked according to importance from big to small, they were respectively fitness value, entertainment value, education value, interpersonal relation value, social value. For schoolboys, they put emphasis on sports interpersonal relations values and social values. And meanwhile, author pointed out that university students sports education values suffered deepest impacts from sports education and sports system.

In 2006, Zhang En-Tai, in the article "Chinese university students sports values status preliminary research", took university students in school as investigation objects, made classification with university students sports values. The article pointed out university students' values could be divided into two kinds, one was social values, and another is individual values. Investigation result showed university students' sports values had grade difference, students' origin differences and regional difference.

The paper will take university students as research objects, targeted at microblog sports information contacting motivation and sports activities participation activities two aspects,it studies on microblog impacts on university students sports values.

MODEL ESTABLISHMENT

Data in TABLE 1, TABLE 2 is from the article "Research on microblog impacts on Xian university students sports values and sports participation behaviors".

Sports values divide into social values and individual values. University students' physical exercises participation motivation and university students' microblog sports information participation motivation affect university students' sports values. Due to motivations items are quite a lot, we adopt principal component analysis method to extract principal components in motivation items.

Main thought of principal component analysis is variable's dimension reduction. It is a statistical analysis method that transforms multiple variables into fewer main variables. It generally is used to data compression, system evaluation, regression analysis and weighted analysis so on.

TABLE 1 : Each part of university student microblog sports information contacting motivation

Motivation	Women	Men	Sports	Literature And History department	Science and engineering department	Junior grade	Senior grade
Increase new knowledge of sports	46.3	37.6	38.1	43.8	43.8	46.8	38.5
Learn each kind of sports competitions	31.9	54.9	47.6	37.1	46.3	38.2	45.3
Pursuit of entertainment	49.5	28.4	33.3	48.5	31.4	43.5	37.5
Enthusiasm for sports	11.6	28.4	31.7	9.8	26.4	12.4	25
Solve problems that one come across in sports activities	11.1	18.5	14.3	12.4	17.4	14	14.6
Pass time	31.5	16.1	23.8	27.8	20.7	30.6	19.3
Learn sports stars comments	24.5	20.4	20.6	25.3	19.8	20.4	25
Learn sports host, commentator, narrator	32.4	29.6	34.9	32.5	27.3	31.7	30.7
Personal habits	16.2	16.1	12.7	14.9	19.8	18.3	14.1
Participate in communication of each kind of sports information opinions	17.6	20.4	25.4	14.4	22.3	17.2	20.3

TABLE 2 : Each part of university student physical exercises participation motivation

Motivation	Women	Men	Sports	Literature and History department	Science and engineering department	Junior grade	Senior grade
Personal hobbies	46.7	58	68.3	43.8	55.4	51.1	52.1
Body building	70.3	72.8	71.4	75.3	65.3	74.7	68.2
A communicative way with classmates and friends	32.9	38.9	36.6	31.9	40.5	34.4	36.5
Passive participation	15.7	12.3	14.3	14.4	14.1	19.4	9.3
Improve sports level and performance	30.1	32.7	42.9	31.4	24.8	28	34.4
Lose weight and shape body	42.6	26.5	36.6	39.2	29.8	33.3	38
Temper mind, promote attainment	35.2	28.4	36.6	32.5	29.8	33.9	30.7
Master a kind of technology	23.1	32.7	46	26.3	19	25.8	28.6

Principal component analysis method

Main way of principal component analysis is reducing dimension of variables, which is recombining original many variables with correlation into a group of uncorrelated variables to replace original variables. Therefore, we can pay attention to every time observation's variables that have maximum variation, for every time observation's small changed variables that can be used as constant to process and get rid of them, so that it reduces variables number in problem that needs to be considered.

Assume that there is m pieces of original indicators to do principal component analysis, which are recorded as $x_1, x_2, \cdots, x_m$, now it has n pieces of samples, corresponding observation value is $x_{ik}(i = 1,2,\cdots,n)$,and $k = 1,2,\cdots,m$ takes standardization transformation, and then transform x_k into x_k^*, that:

$$\mathbf{x_k^* = \frac{x_k - \overline{x_k}}{s_k}, k = 1,2,\cdots,m} \quad \textbf{(1)}$$

Among them, $\overline{x_k}$ and s_k are respectively x_k average number and standard deviation, x_k^* average number is 0, standard deviation is 1.

According to each sample original indicator observation value x_{ik} or after standardization observation value x_{ik}^*,it solves coefficient b_{kj}, establish indicator x_k^* that is transformed through standardization to express comprehensive indicator z_j equation $z_j = \sum_k b_{kj} x_k^*$,which can also establish equation that uses original indicator x_k to express comprehensive indicator z_j

$$\mathbf{z_j = \sum_k \tilde{b}_{kj}\, x_k^* + a_j} \quad \textbf{(2)}$$

There are two requirements on defining b_{kj} :

(1) Comprehensive indicators are mutual independent from each other or uncorrelated.

(2) Every comprehensive indicator reflected each sample gross information content is equal to corresponding feature vector (comprehensive indicator coefficient) feature values. In general, it is required that selected comprehensive indicator feature vales contribution ratios sum to be above 80%.

Principal component analysis general steps

(1) According to observed data, calculate $\overline{x_k}$ and $s_k\left(k, j = 1,2,\cdots,m\right)$.

(2) By correlation coefficient matrix R ,it can get feature value λ_j $\left(j = 1,2,\cdots,m\right)$ and each principal component variance contribution、contribution ratio and accumulative contribution ratio, and define principal component reserved number p with accumulative contribution ratio as evidence.

(3) m pieces of basic equations are as following:

$$\begin{cases} \mathbf{r_{11}x_1^{(j)} + r_{12}x_2^{(j)} + \cdots + r_{1m}x_m^{(j)} = \lambda_j x_1^{(j)}} \\ \mathbf{r_{21}x_1^{(j)} + r_{22}x_2^{(j)} + \cdots + r_{2m}x_m^{(j)} = \lambda_j x_2^{(j)}} \\ \cdots \\ \mathbf{r_{m1}x_1^{(j)} + r_{m2}x_2^{(j)} + \cdots + r_{mm}x_m^{(j)} = \lambda_j x_m^{(j)}} \end{cases} \quad \textbf{(3)}$$

Among them, $j = 1,2,\cdots,m$.

Proceed with Schmidt orthogonalization, for every λ_i , solve its basic equations solution $x_1^{(j)}$, $x_2^{(j)}$,…, $x_m^{(j)}$ $\left(j = 1,2,\cdots,m\right)$,and then let:

$$\mathbf{b_{kj} = \frac{x_k^{(j)}}{\sqrt{\sum_k \left(x_k^{(j)}\right)^2}}} \quad \textbf{(4)}$$

It can get expressed by $x_1^*, x_2^*,\ldots, x_m^*$ principal component $z_j = \sum_k b_{kj} x_k^*$, or input $x_k^* = \frac{x_k - \overline{x_k}}{s_k}$ and then get expressed by $x_1, x_2,\ldots, x_m$ principal component $z_j = \sum_k \tilde{b}_{kj}\, x_k^* + a_j$.

(4)Input $x_1, x_2,\ldots, x_m$ observed values into principal component expressions, calculate each component value.

(5) Calculate original indicator and principal component correlation coefficient that is also factor loading that use it to explain principal component significances.

For university student microblog sports information contacting motivation and university students' physical exercises participation motivation, it makes principal component analysis, researches on two motivations principal components factors.

University students' microblog sports information contacting motivations analysis result

When analyze university students microblog sports information contacting motivations, increase new knowledge of sports, learn each kind of sports competitions, pursuit of entertainment, enthusiasm for sports, solve problems that one come across in sports activities, pass time, learn sports stars

comments, learn sports host, commentator, narrator, personal habits, participate in communication of each kind of sports information opinions,their corresponding variables 1—10(VAR00001—VAR00010).

TABLE 3 : Variables communalities table

	Initial	Extract
VAR00001	1.000	.994
VAR00002	1.000	.960
VAR00003	1.000	1.000
VAR00004	1.000	.968
VAR00005	1.000	.974
VAR00006	1.000	.999
VAR00007	1.000	.944
VAR00008	1.000	.953
VAR00009	1.000	.995
VAR00010	1.000	.881

Extract method: principal component analysis.

From TABLE 3, it is clear that increase new knowledge of sports, learn each kind of sports competitions, pursuit of entertainment, enthusiasm for sports, solve problems that one come across in sports activities, pass time, learn sports stars comments, learn sports host, commentator, narrator, personal habits, participate in communication of each kind of sports information opinions these ten factors variable communalities are higher that between 0.8—1.0, which shows most of variables can be extracted, principal component analysis is valid.

TABLE 4 : Factor contribution ratio table

Component	Initial feature value			Extract squares sum and load in			Rotate squares sum and load in		
	Total	Variance %	Accumulation %	Total	Variance %	Accumulation %	Total	Variance %	Accumulation %
1	6.265	62.647	62.647	6.265	62.647	62.647	4.914	49.138	49.138
2	2.382	23.818	86.465	2.382	23.818	86.465	2.393	23.934	73.072
3	1.023	10.227	96.692	1.023	10.227	96.692	2.362	23.620	96.692
4	.329	3.295	99.987						
5	.001	.013	100.00						
6	4.544E-6	4.544E-5	100.00						
7	1.386E-16	1.386E-15	100.00						
8	3.395E-17	3.395E-16	100.00						
9	-7.977E-17	-7.977E-16	100.00						
10	-2.974E-16	-2.974E-15	100.00						

Extract method: principal component analysis.

In TABLE 4, accumulation items' data indicates percentage of total feature values. From table,it is clear that component 1-5 occupy 100% of total feature values that are increase new knowledge of sports, learn each kind of sports competitions, pursuit of entertainment, enthusiasm for sports, solve problems that one come across in sports activities these five factors.

Figure 1 is feature values' scree plot. From Figure 1, it is clear that the factors 1, 2, 3 are in the relative steeply slope, and starts from the fourth factor, the slope turns to be gentle. Generally main factors are in the relative steeply slope position. Therefore we select three factors as main factors.

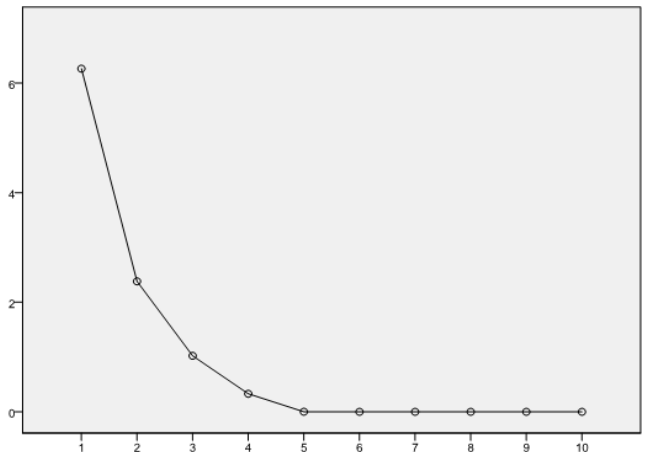

Figure 1 : Scree plot

TABLE 5 : Component scoring coefficient matrix

	Component		
	1	**2**	**3**
VAR00001	.272	-.158	.165
VAR00002	-.186	-.022	-.014
VAR00003	.099	.036	-.138
VAR00004	-.093	.105	.177
VAR00005	-.137	-.200	-.006
VAR00006	.311	.102	.270
VAR00007	-.231	.042	-.580
VAR00008	.156	.424	.266
VAR00009	.149	-.378	.128
VAR00010	.073	.189	.433

Extract method: principal component; Rotational method: Orthogonal rotation method with Kaiser standardization.

$$z_1 = 0.272x_1 - 0.186x_2 + 0.099x_3 - 0.093x_4 - 0.137x_5 + 0.311x_6 + 0.231x_7 + 0.156x_8 + 0.149x_9 + 0.073x_{10}$$

$$z_2 = -0.158x_1 - 0.022x_2 + 0.036x_3 + 0.105x_4 - 0.2x_5 + 0.102x_6 + 0.042x_7 + 0.424x_8 - 0.378x_9 + 0.189x_{10}$$

$$z_3 = 0.165x_1 - 0.014x_2 - 0.138x_3 + 0.177x_4 - 0.006x_5 + 0.270x_6 - 0.580x_7 + 0.266x_8 + 0.128x_9 + 0.433x_{10}$$

Draw TABLE 5 data into pie chart so as to be convenient for looking for calculation component maximum influence factors, as Figure 2 shows.

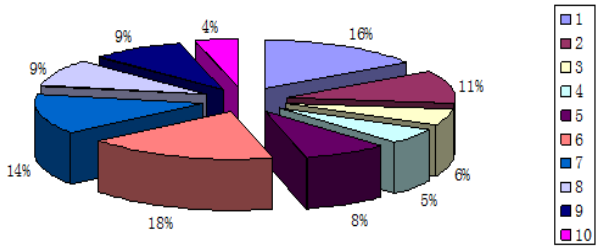

Figure 2 : Comparison chart

From Figure 2, we can see that factor 1, factor 6 and factor 7 are largest effective factors to components calculation that are increase new knowledge of sports, pass time, learn sports stars comments.

University student physical exercises participation motivation analysis result

The analysis process is similar to university students' microblog sports information contacting motivation analysis process. Personal hobbies, body building, a communicative way with classmates and friends, passive participation, improve sports level and performance, lose weight and shape body,temper mind 、promote attainment, master a kind of technology, they correspond to components 1—8(VAR00001—VAR00008).

TABLE 6 : Factor contribution ratio table

Component	Initial feature value			Extract squares sum and load in			Rotate squares sum and load in		
	Total	Variance %	Accumulation %	Total	Variance %	Accumulation %	Total	Variance %	Accumulation %
1	3.069	38.363	38.363	3.069	38.363	38.363	2.820	35.250	35.250
2	2.821	35.267	73.629	2.821	35.267	73.629	2.458	30.729	65.979
3	1.238	15.476	89.106	1.238	15.476	89.106	1.850	23.127	89.106
4	.872	10.894	99.999						
5	3.805E-5	.000	100.000						
6	1.597E-5	.000	100.000						
7	1.629E-16	2.036E-15	100.000						
8	-1.802E-16	-2.252E-15	100.000						

In TABLE 6, accumulation items' data indicates percentage of total feature values. From table, it is clear that components 1—4 occupy 100% of total feature values that are personal hobbies, body building, a communicative way with classmates and friends, passive participation the four factors.

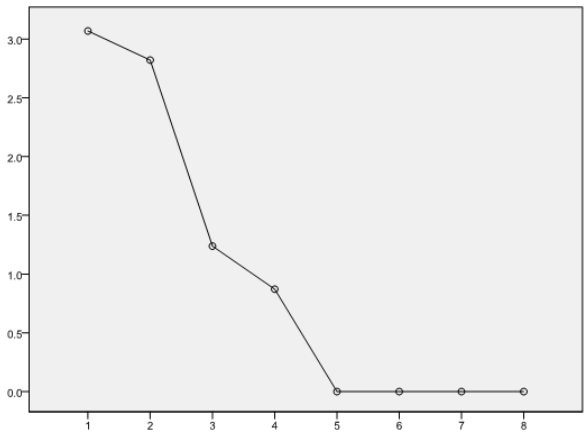

Figure 3 : Scree plot

From Figure 3, it is clear that the factors 1、2、3 are in the relative steeply slope. We select three factors as main factors.

$$z_1 = 0.297x_1 + 0.053x_2 + 0.051x_3 - 0.062x_4 + 0.334x_5 - 0.006x_6 + 0.151x_7 + 0.351x_8$$

$$z_2 = -0.221x_1 - 0.065x_2 - 0.315x_3 - 0.19x_4 + 0.14x_5 + 0.488x_6 + 0.199x_7 - 0.024x_8$$

$$z_3 = 0.056x_1 + 0.451x_2 - 0.099x_3 + 0.573x_4 - 0.111x_5 - 0.248x_6 + 0.155x_7 + 0.065x_8$$

Draw TABLE 7 data into pie chart so as to be convenient for looking for calculation component maximum influence factors, as Figure 4.

TABLE 7 : Component scoring coefficient matrix

	Component		
	1	**2**	**3**
VAR00001	.297	-.221	.056
VAR00002	.053	-.065	.451
VAR00003	.051	-.315	-.099
VAR00004	-.062	-.190	.573
VAR00005 .334	.140	-.111	
VAR00006	-.006	.488	-.248
VAR00007	.151	.199	.155
VAR00008	.351	-.024	.065

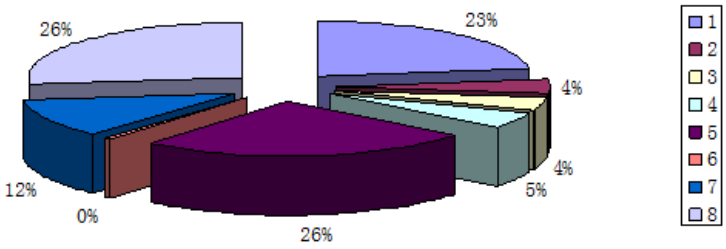

Figure 4 : Comparison chart

According to Figure 4, it is not hard for us to find that factor 1, factor 5 and factor 8 have larger proportions in calculation components that are personal hobbies, improve sports level and performance, and master a kind of technology, which are students' main purposes.

CONCLUSION

The method utilizes dimension reduction thought to use fewer variables to replace original multiple variables, these fewer variables can reflect original data most information. In addition, the model more focuses on information comprehensive evaluation. The method also has certain drawbacks, the model's principal component is composed of original factors linear combinations, so principal components actual significances are hard to define, just functions as dimension reduction. In the paper, it provides calculation component z_i so as to easy to such kind of problems research in later period, and reduce research factors numbers. It gets conclusion that for analysis of microblog sports information contacting motivation, university students' main motivations are increase new knowledge of sports, pass time, and learn sports stars comments. For physical exercises participation motivation analysis, university students' main motivations are personal hobbies, improve sports level and performance, and master a kind of technology. Therefore, on a whole, university students' sports values are good and still to be further improved.

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