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Empirical research on the change of physical exercise based on transtheoretical model

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ABSTRACT

The transtheoretical model can help facilitate the change of physical exercise of students in colleges and universities. Thus it can correspondingly establish students' causal relationships in all stages. Theoretically speaking, there still exists gap in the degree and proportion to which higher education students take physical exercise between China and foreign countries. The phenomenon can be fully demonstrated in some document literature. While from the viewpoint of application, transtheoretical model can efficiently illustrate the internal connections among each scale, thus giving data in both scales persuasion. The authenticity of the research results can get verified through corresponding scientific computing, further exerting certain positive influence on the existent fundamental situations. The research is designed to function positively among scholars, and simultaneously to have a vigorous influence on higher education students' participation in physical exercise.

KEYWORDS

Transtheoretical model; Physical exercise; Stages of change; Empirical research.

INTRODUCTION

The research is characterized by a wide scope and a detailed process, and therefore the specific conclusion. The relations of factors among survey data become more clear-cut and definite through the efficient construction of transtheoretical model. At the same time, the targeting and authenticity in the research process can also be fully guaranteed. The research is done within the following four aspects. That is, the research purpose and research hypothesis, research method, the descriptive statistics of research results and the analysis of correlation and path within each scale and among the scales, and the analytical study on the situation and discrimination of the change of university students' physical exercise. In this way, the research process and idea become more reasonable and clear, which lays a solid foundation for the accuracy of the research conclusion.

RESEARCH PURPOSE AND RESEARCH HYPOTHESIS

Research purpose

During this research, the standard norm can be efficiently established via the related data arrangement of questionnaires. The corresponding scales of change constantly strengthen their targeting at the data, the maximization of research scope is used as a concrete means to collect data extensively and efficiently, and all these make the construction of the standard norm more scientific[1]. Thus the exploration and study made is able to objectively reflect the fundamental situations of higher education students' physical exercise, with high authenticity. However, the factor of dimension shown in different scales is more convincing. But in the corresponding research of the transtheoretical model, the change of university students' behaviors can be efficiently reached with signs of different stages, which makes more reasonable the process of the research. By means of that, dimension relationships among scales can be efficiently explored and analyzed.

Research hypothesis

Hypothesis one: the standard norm about the change of university students' physical exercise across China can be laid down according to the testing results of the scales that show the change of students' physical exercise.

Hypothesis two: obvious correlation can be found within each scale and among scales; the structure of each scale is clear and excellent structures are found among dimensions. Moreover, the scores in terms of the process of change, self-efficacy and decisional balance can remarkably predict the scores obtained in stages of change.

Hypothesis three: the number of university students in each stage of change presents a tendency with the shape of an upside-down "U". It's viable to exactly decide the stages of change[2] where testees are by the scores in the scale of stages of change of university students' physical exercise (continuous measurement).

Hypothesis four: conspicuous differences in region, gender, grade, and exercise time are found in each scale.

Hypothesis five: testees in different stages of change score differently in the psychological variable (self-efficacy and decisional balance).

Hypothesis six: the process of change of testees who are in different stages of change functions differently. Intervention can be enacted in accordance with such different processes of change.

RESEARCH METHOD

Research and investigation object

While doing this research, the author has made a questionnaire survey with the adapted scales of the universities and colleges in 17 provinces and cities in the eight large areas of China. It also includes 40 universities and colleges. The amount of questionnaires handed out has come to 9,500. However, the number of the questionnaires used for horizontal survey has added up to 9,050, and all these questionnaires are distributed at only one time. Among them, the number of the questionnaires retrieved is 7,877, but the valid of them are only 6,607. Related arrangement is made towards these questionnaires, and the data in them are further analyzed. Thus, the clear demonstration is formed in the TABLE below.

Geographical distribution of testees

The questionnaires are distributed on the basis of overall planning. The universities, cities, and provinces associated are displayed in TABLE 1:

Distribution of the number of testees

Specific distribution of students receiving the questionnaire test and the number of them is illustrated in TABLE 2:

Research tool

The main research tool used in this questionnaire survey is the scales that show the change of university students' physical exercise. The scales mainly include 4 parts, namely, the scale of periodic change of physical exercise, the subscale of the process of change of physical exercise, the subscale of self-efficacy and the subscale of decisional balance.

TABLE 1 : Instruction of testees

Eight areas of China	Provinces and municipalities	Universities
East China	Shanghai, Zhejiang, Anhui	East China Normal University, Shanghai Normal University, Shanghai Fisheries University, Zhejiang University of Media and Communications, Zhejiang Chinese Medical University, Zhejiang University, Huaibei Coal Industry Teachers College
North China	Beijing, Shandong, Hebei, Henan,	Peking University, Beijing Union University, Beijing University of Agriculture, Beijing Wuzi University, China Youth University for Political Sciences, Shandong University, Hebei University of Economics and Business, Hebei Normal University, Hebei Medical University, Hebei Engineering College, Shijiazhuang Vocational and Technical institute of Communication Engineering, Shijiazhuang University, Henan Polytechnic University
Central China	Hubei	Wuhan Engineering University, Wuhan Vocational and Technical College, China University of Geosciences
South China	Guangdong	Guangdong University of Technology, Guangdong University of Foreign Studies, Guangzhou Pharmaceutical University, South China University of Technology, South China Normal University
Southwest China	Sichuan, Jiangxi, Chongqing	Luzhou Medical College, China West Normal University, Jiangxi Normal University, Southwest University
Southeast China	Fujian	Huaqiao University
Northwest China	Xinjiang, Gansu, Shannxi	Xinjiang Changji University, Xinjiang Normal University, Tianshui Normal University, Xi'an Technological University, Xi'an University of Technology, Xi'an Shiyou University
Northeast China	Liaoning	Dalian Maritime University

TABLE 2 : Specific distribution of students receiving the questionnaire test and the number of them

universities	boys	girls	total	universities	boys	girls	total
Peking University	90	70	160	Shanghai Normal University	80	122	201
Beijing Union University	16	14	30	Shanghai Fisheries University	114	128	242
Beijing University of Agriculture	57	131	188	Shijiazhuang Vocational and Technical institute of Communication Engineering	30	77	107
Beijing Wuzi University	84	88	172	Shijiangzhuang College	8	100	108
Dalian Maritime University	250	191	441	Luzhou Medical College	62	37	99
Guangdong University of Technology	136	39	175	Tianshui Normal University	60	126	186
Guangdong University of Foreign Studies	22	48	70	Wuhan Engineering University	21	29	50
Guangzhou Pharmaceutical University	35	31	66	Wuhan Vocational and Technical College	70	57	127
Hebei Engineering College	103	170	273	Xi'an Technological University	33	2	35
Hebei University of Economics and Business	0	129	129	Xi'an University of Technology	41	2	43
Hebei Normal University	38	1	39	Xi'an Shiyou University	59	0	59
Hebei Medical University	30	55	85	China West Normal University	102	33	135
Henan Polytechnic University	232	119	351	Xinjiang Changji University	35	104	139
East China Normal University	36	206	242	Xinjiang Normal University	231	138	369
South China University of Technology	77	24	101	Zhejiang University of Media and Communications	25	110	135
South China Normal University	51	131	182	Zhejiang University	136	26	162
Huaqiao University	28	47	75	Zhejiang Chinese Medical University	2	214	216
Huaibei Coal Industry Teachers College	45	157	202	China University of Geosciences	27	12	39
Jiangxi Normal University	9	142	151	China Youth University for Political Sciences	342	459	801
Shandong University	65	66	131	Southwest University	22	68	90
				Total	2904	3703	6607

Research process and analytical method

During the questionnaire survey, the above-mentioned four scale questionnaires are integrated into a whole one. These questionnaires are orderly placed through their serial numbers. The sequential order is the stage of change, the process of change, self-efficacy and decisional-balance. But in the input and comprehensive analysis of the data, professional data statistics and analysis softwares are used. Thus efficient data analysis can be conducted on the research results. Furthermore, the cross-theory model that targets at the change of physical psychology of Chinese university students is effectively set up. Simultaneously, the conventional model of research can also be effectively built[3].

DESCRIPTIVE STATISTICS OF RESEARCH RESULTS AND ANALYSIS OF CORRELATION AND PATH WITHIN EACH SCALE AND BETWEEN SCALES

The number of those distributed questionnaires for horizontal survey is larger, which can prove the importance of the horizontal survey. The descriptive statistics made towards those valid questionnaires retrieved bring more pertinence and standardization to the build of conventional and unconventional models. Due to the limit of the writing space, the research here doesn't discuss too much about the nonstandardized model[4].

Descriptive norm

The whole nation is mainly decided into 8 areas for the purpose of the research. The subscales and total scales have fully embodied the standard values and average values of boys and girls surveyed. Two kinds of analytical methods are used in this research, correlation analysis and path analysis. With these two methods, internal connections of structure between each scale are effectively explored, so as to be more clear and definite.

The correlation within each subscale

Very close internal connections can be fully seen among all the dimensions in the analysis of scales. And the scores of each dimension in the subscales are also subtly connected to those of total scales. However, every dimension in the scales in stages of change is notably connected to each other. The concrete inner connections are shown in TABLE 3.

TABLE 3 : The correlation within each scale in stages of change

	contemplation stage	preparation phase	action phase	maintenance stage	total points
precontemplation stage	.69**	.201**	.204**	.227**	.653**
contemplation stage	1	.489**	.293**	.103**	.493**
preparation phase	.489**	1	.535**	.474**	.740**
action phase	.293**	.535**	1	.578**	.732**
maintenance stage	.103**	.474**	.578**	1	.692**
total points	.493**	.740**	.732**	.692**	1

Note: The symbol "" means that p is less than 0.01.**

Rather extensive necessary connections and high degree of tightness between each dimension can be seen as well in the analysis of the scales of the process of change. The concrete connections are fully shown in TABLE 4 in the form of date statistics.

The structure within each subscale (path analysis)

In the process of analyzing the internal structure between two scales, research method of path analysis is mainly used to effectively analyze the related internal structure. This method is also called structure equation model. The reason why this method is chosen is that it can make all predictive variables simultaneously within the linear regression model. Based on the collection of literature and data, the original model of the test can be established, and the same is true of its path coefficient diagrams[5]. In the diagrams, all causal relationships are substituted by arrows. The arrows begin from cause, and points to effects. The effects represent dependent variables, while departments independent variables. Then the conclusion that the corresponding variable is regression equation and the independent variable is zero can be drawn from the multivariate analysis theory. It helps provide valid data sources for the confirmatory factor analysis, and at the same time lay a solid foundation for structure equation model.

The research gives a specific confirmatory fact analysis to scales of stages of expect change. As shown in Figure 1, five dimensions can be clearly embodied. But each problem plays a positive role in the formation of factors.

TABLE 4 : The correlation of the process of change

	social release	mutual relationship	self-management	effects and feelings	reverse condition	consciousness raising	stimulus control	environmental revaluation	total points
self-release	.497**	.422**	.683**	.453**	.503**	.476**	.430**	.478**	.789**
social release	1	.321**	.531**	.316**	.285**	.338**	.243**	.349**	.618**
mutual relationship	.321**	1	.390**	.385**	.481**	.500**	.543**	.392**	.676**
self-management	.531**	.390**	1	.510**	.500**	.485**	.389**	.504**	.835**
effects and feelings	.316**	.385**	.510**	1	.489**	.423**	.391**	.585**	.686**
reverse condition	.285**	.481**	.500**	.489**	1	.534**	.541**	.464**	.719**
consciousness raising	.338**	.500**	.485**	.423**	.534**	1	.577**	.443**	.713**
stimulus control	.243**	.543**	.389**	.391**	.541**	.577**	1	.418**	.672**
environmental revaluation	.349**	.392**	.504**	.585**	.464**	.443**	.418**	1	.698**
total points	.618**	.676**	.835**	.686**	.719**	.713**	.672**	.698**	1

Note: The symbol "" means that p is less than 0.01.**

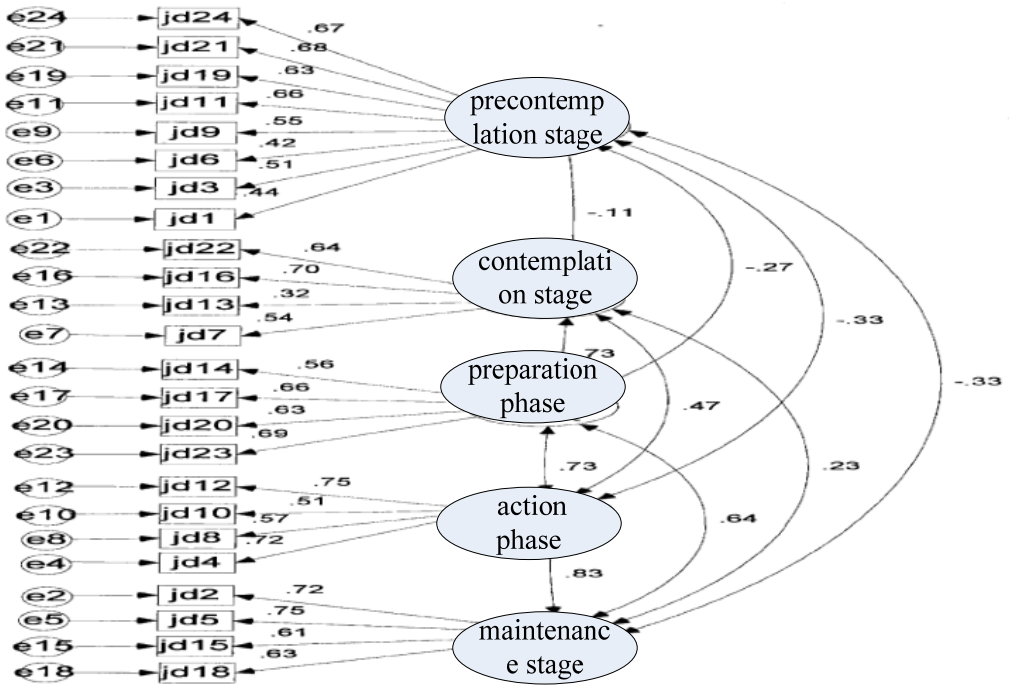

Figure 1 : Path analysis diagrams in stages of change

However, the conclusion is based on the analysis of the above-mentioned factor relations. The analytical results of both factors should keep the same as the afore-said analytical results. That suffices to prove the high validity of the scale itself. Afterwards, related confirmatory analysis is conducted on its program scales. The path analysis diagrams of pretty print programs is shown as Figure 2.

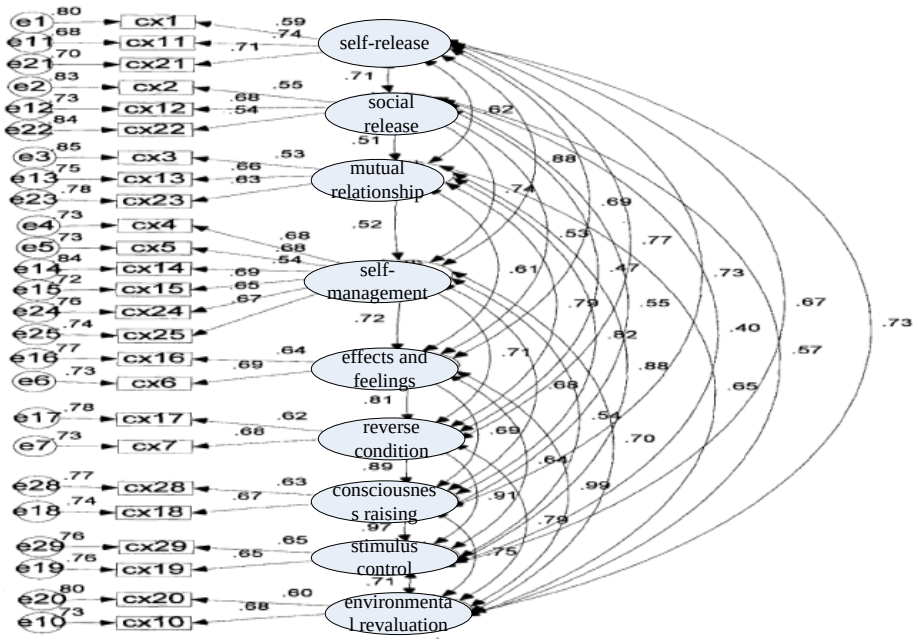

Figure 2 : Path analysis diagrams of pretty print programs

As is clearly shown in Figure 2, nine dimensions are illustrated in the program scales of the change of university students' physical exercise. Likewise, the Figure has also shown the composition, formation and effect of the pimple factor in every problem. At the same time, the analytical results of the factor are equal to those of the above-mentioned factor, and therefore, it can reflect the high validity of the scale to the full. The path analysis diagrams of the scale of self-efficacy is shown as Figure 3.

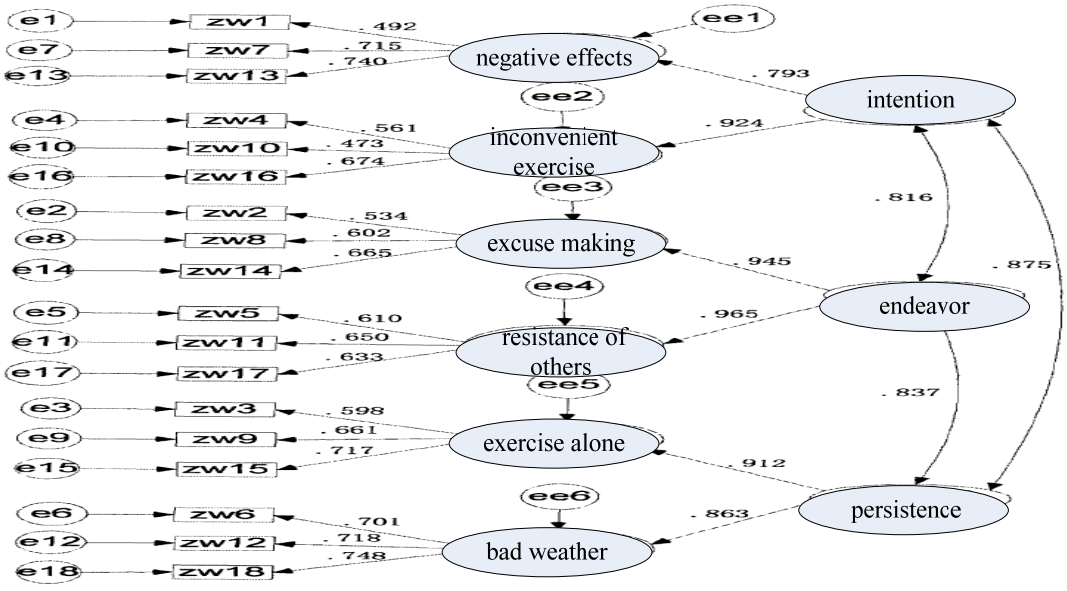

Figure 3 : Path analysis diagrams of the scale of self-efficacy

Then, in the confirmatory factor analysis of the research, it's not hard to discover such a law through Figure 3. The scale of self-efficacy shows 6 dimensions that can be integrated into 3 ones through valid summary and conclusion. The conclusion is the same as that drawn from the previous researches, which fully confirms that every problem in the scale plays a positive role in the formation of factors. And the conclusion reached from the factor analysis can keep corresponding to each other, which also proves the high validity of the scale itself[6]. The path analysis diagrams of the scale of decisional balance is shown as Figure 4.

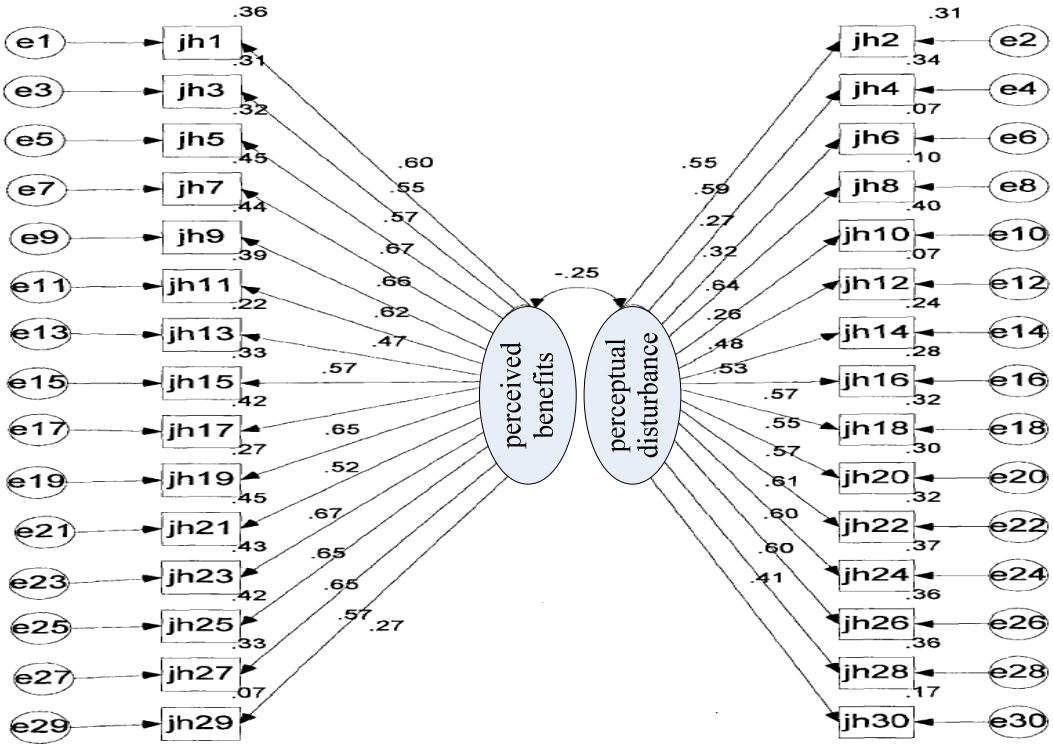

Figure 4 : Path analysis diagrams of the scale of decisional balance

Finally, the related confirmatory analysis is made on the scale of decisional balance. As is conspicuously shown in Figure 4, the scale is mainly composed of 2 dimensions. Every problem in it plays a large role in the formation of silver. It's corresponding to the results of the previous confirmatory factor analysis, thus the connections between each scale is remarkable. The conclusion is the same as the previously discussed results, which proves the high validity of the scale itself.

The correlation between each subscale

With the same idea and method, relative research and analysis are made upon the paths among scales. From the analytical results, the fact that the dimension between each scale has somewhat relevance can be concluded. The specific data can be fully embodied in TABLE 5.

TABLE 5 : The correlation between each subscale

	stages of change	the process of change	self-efficacy	decisional balance
stages of change	1	.586**	.315**	.411**
the process of change	.586.**	1	.509**	.363**
self-efficacy	.315**	.509**	1	.092**
decisional balance	.411**	.363**	.092**	1

Note: The symbol "" means that p is less than 0.01.**

Path analysis between each subscale

Path analysis is performed on the data between two TABLES through the data statistics tool. During the application of the statistics tool, two related variation diagrams can be obtained, here further explained in Figure 5 and Figure 6. Then the changing process can be clearly embodied.

In the process of path analysis, quantitative research and model ways of recognition are both the best approaches through the basic characteristics of the prototype diagram. However, effective analysis can be made upon each dimension factor in the scale of behavior change by taking advantage of the corresponding data statistics softwares. Thus the identifying relationship can be further established. While the Figure 5 and the Figure 6 require further specific analysis through the application of the cross-theory model, so as to get a clear path analysis diagram.

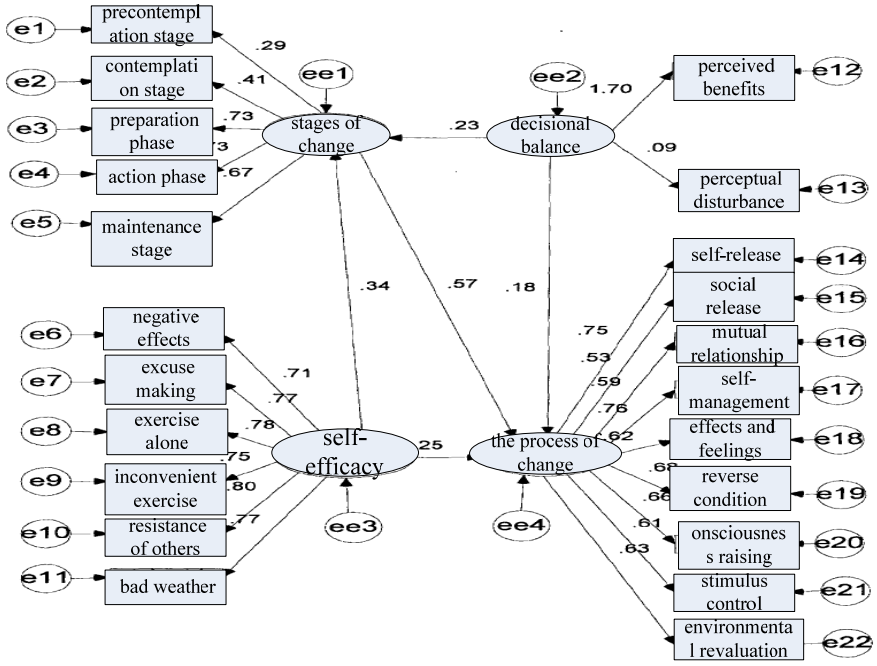

Figure 5 : Path analysis A between each scale (stages of change decide the process of change)

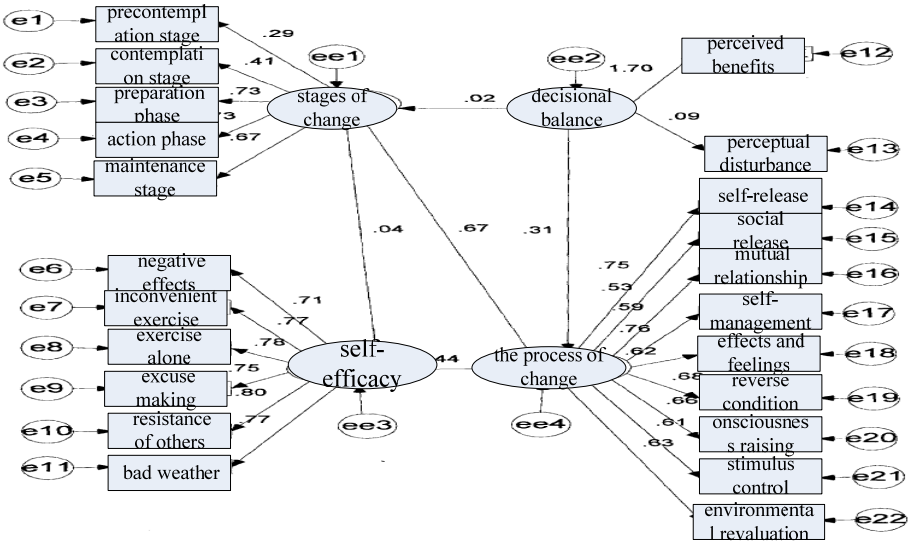

Figure 6 : Path analysis B of the relations between each scale (the process of change decides stages of change)

In the process of the path analysis, such a conclusion can be drawn that self-efficacy and decisional balance can exert relevant effects on the process of change and further plays a periodic role in the closure of the whole action through the process of change. In this process, the process of change acts as the role of intermediate variable that directly points to its stages of change. Thus it leads self-efficacy and decisional balance to directly affect the formation of the stages of change.

RESEARCH ON CURRENT SITUATIONS OF STAGES OF CHANGE AND DISCRIMINATORY ANALYSIS OF UNIVERSITY STUDENTS' PHYSICAL EXERCISE

Survey on current situations of stages of change of university students' physical exercise

In the process of related statistics and analysis of survey data, the fact that stages of change and periodic change in university students' physical exercise form together an inverted "U" curve by virtue of the results of data statistics. The curve shows that there are a larger number of students in the preparation phase. But seeing from the whole curve, you can find a smaller number of them at both ends, with their proportion gradually dwindling. While the characteristics of distribution of the change in physical exercise show that there are respectively 39% of students in the preparation phase and the intention phase. What's more, there are respectively 30% of them in the action phase and the maintenance phase, but the proportion is

relatively lower when compared with that in the foreign literature[7]. The direct cause of such a phenomenon lies in the emphasis different students lay on their school work. Many students think they should devote more time to their professional learning, instead of physical exercise. As a result, the university students' pressure to learn is increasing while their participation in extracurricular activities is decreasing. The direct effect is universities and colleges will have fewer and fewer ways to offer physical education curriculum or activities, and the students will get more and more hinders to get valid physical exercise.

Discriminatory analysis of stages of change of university students' physical exercise

In the analysis on stages of change of behaviors, the research mainly uses discriminatory analysis method. Effective judgment of predictive variables is carried out via the five dimensions in the scale, with the judgment based on continuous measurement. It in turn increases university students' basic ability of judgment in stages of change of their physical exercise, makes the research keep high systematization and lays a solid data and theoretical basis for the increasing validity.

CONCLUSIONS

The above-mentioned is just the research on the change of physical exercise based on transtheoretical model, with the model building and the specific relations of factors and dimensions in each scale as its focus. Questionnaires with corresponding data statistics and analysis make the research more reasonable. At the same time, they can fully guarantee the targeting and effectiveness of model building and model application. Finally, it's expected that the research can place a solid theoretical and practical foundation for the research in-depth in the days to come.

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