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The examination of the stage-discontinuity of health action process approach in college student's physical exercise behavior

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ABSTRACT

The study examines the characteristics of health action process approach (HAPA model), the behavioral stage discontinuity, social cognitive variable's stage difference and path coefficient's difference between variables, reflected in college student's physical exercise. After having investigated 582 students for four months, by issuing questionnaires and applying the longitudinal method this study investigates their physical exercise behavior and relative social cognitive variables and uses structural equation model, confirmatory factor analysis and multi-group structural model to analyze the applicability of HAPA model in student's physical exercise, the stage difference of social cognitive variables and the path coefficient's difference between variables. The final results shows that HAPA model applies for the exercise and though three stage groups are measured equally, the potential average of social cognitive variable and the path coefficient of these variables in non-intention stage 1, intention stage 2 and action stage 3 are obvious different.

KEYWORDS

: HAPA model; College student's physical exercise; Structural equation model; Social cognitive variable; Path coefficients between variables

INTRODUCTION

A healthy body is a cornerstone of all work. However, contemporary college students have weakened in physical quality, the main reason of which is that they lack correct physical exercise idea and pay little attention to it.

Health action process approach (HAPA model), first put forward by a German scholar in 1992, has attracted attention of many scholars in exercise psychology and health psychology. It mainly studies human healthy behavior's processes that involve motivation and behavior. Motivation process refers to the personal behavior intention process, during which individual develops intention to propel heath action while behavior process refers to the process that once an health intention developed, the behavior must be planned, initiated and maintained. The maintained time of volition and the reached degree of behavior depend on self-efficacy and external factors while planning is a medium to propel health action to transform from motivation to action. Therefore, according to planning, the behavior form process can be divided into three stages that involve before-intention stage, intention stage and action stage.

By researching the behavior change theory and model of college student, the study aims to help them to realize the importance of physical exercise and encourage them to take part in it positively. 582 students are studied longitudinally to examine the characteristics of health action process approach (HAPA model), the behavioral stage discontinuity, social cognitive variable's stage difference and path coefficients difference between variables, reflected in college student's physical exercise[1-3].

STUDY OBJECTS AND APPROACHES

Study objects

It studied the college students that majored in other subjects except physical training from Wuhan Institute of Physical Education. By applying stratified cluster random sampling, it issued questionnaires continuously for three times to the students in the grade of 2010, 2011 and 2012. At the first time it issued 1200 questionnaires in total and finally returned 1150, of which it has 1045 valid questionnaires (501 from boys and 544 from girls), the second time 1220 issued, 1156 returned, 1088 valid (526 from boys and 562 from girls) and the third time, 1245 issued, 1160 returned, 1092 valid (528 from boys and 564 from girls). During three surveys, the valid cases include 582 students, of which it has 255 boys and 326 girls with age ranging from 18 to 25(M＝21.38，SD=2.189) and BMI ranging from 15.61 to 30.69(M＝20.51，SD=2.41).

Study process

According to the behavior process and HAPA model structure, it studied longitudinally and set three time measurement points, successively dividing into before-intention stage (T1), intention stage (T2) and action stage (T3). At the first week after the term starting it went on the first measurement to measure consciousness, outcome expectation, risk perception and action self-efficacy of these students from Wuhan Institute of Physical Education. After one month from the first survey, it began to measure their maintaining self-efficacy and planning, then the following next month it would measure the recovery self-efficacy and exercise level as the third measurement result[4].

Questionnaire design

It studied 10 questionnaires, of which 6 questionnaires in T1 stage, 2 in T2 and 2 in T3.

(a) To Number the Questionnaires in T1 Stage as Q1-Q6

Q1 is the demographic questionnaire, mainly investigating student's gender, age, height, weight and number, grade, major.

Q2 is the physical exercise stage judgment questionnaire and is issued every three days to measure reliability (r=0.90, P=0.05).

Q3 is the health risk perception questionnaire, measured by means of risk perception scale, also called five grade scoring method (α=0.87) put forward by Lippke.

Q4 is the outcome expectation scale that revised by Schwarzer and Lippke. It includes two sub-scales and 10 items, of which 5 items are positive expectation and 5 are negative expectation. In addition, it applies five grade scoring method (α=0.827) to score.

Q5 is exercise self-efficacy scale put forward by Motl, which includes 8 items and scored by five grade scoring method (α=0.849).

Q6 is physical exercise intention scale, comprised by 3 items and scored by five grade scoring method (α=0.849).

(b)To Number the Questionnaires in T2 Stage as Q7-Q8

Q7 is the maintain self-efficacy scale and includes 13 items scored by five grade scoring method (α=0.901).

Q8 is physical exercise plan scale (α=0.888) designed by Sniehotta. It includes 8 items and 2 sub-scales that involve action plan and response plan.

(c)To Number the Questionnaires in T2 Stage as Q9-Q10 Q9 is the recovery self-efficacy scale comprised by 3 items and scored by five grade scoring (α=0.848).

Q10 is the physical exercise standard scale that adopted international standards. By surveying the exercise time and frequency and transform them into the exercise intensity and finally transform the low, medium and high intensity into heat consumption at a certain heat proportion.

Study statistics

(a) How to Judge the Invalid Questionnaires and Deal with the Missing Values in Valid Questionnaires

Generally speaking, it is common that there are some invalid questionnaires in survey. In this study we take the questionnaires without continuous variables as invalid questionnaires, in which the data can not be used, including the missing of demographic variables and such sub-scales as physical exercise stage measurement and health and risk perception. To the questionnaire with continuous variables, once the missing items reach above 6, it will be regarded as invalid questionnaire. If the missing number less than 6, the questionnaire can be corrected by the software of SPSS18.0, that is, the estimation and replacement of multiple imputation missing values[5].

(b)Data Analysis

It mainly applies SPSS18.0 software to analyze data and uses structural equation model, confirmatory factor analysis and multi-group structural model to analyze the applicability of HAPA model in student's physical exercise, the stage difference of social cognitive variables and the path coefficients different between variables.

STUDY RESULTS AND ANALYSIS

Behavior stage distribution of measured sample

Of 582 surveyed students, 97 students stay in intention stage, occupied 16.6%, and they do not do physical exercise even have no plan to do; 170 students stay in intention stage, about 29.3% and they have considered to do or decided to do exercise; 315 students stay in action stage, about 54.1% and they have done exercise. See Figure 1.

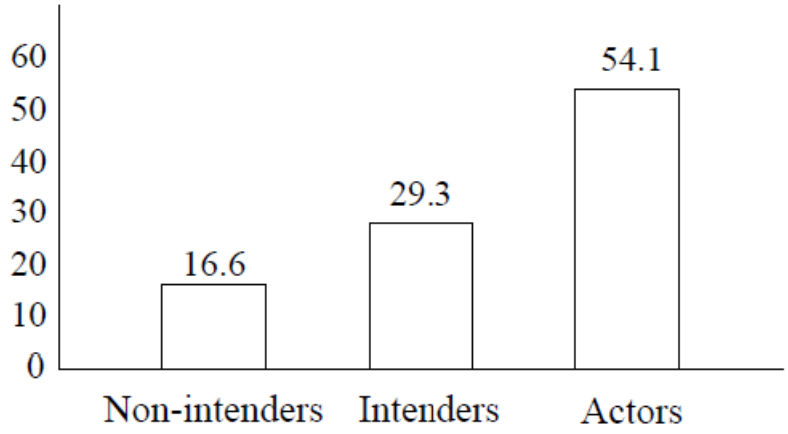


Figure 1:The Stage Distribution of HAPA Model

The prerequisite to examine the stage discontinuity of HAPA model

Firstly, to examine the applicability of HAPA model to college student's physical exercise behavior, we apply the structural equation model to examine the fit indices (See TABLE 1). In the fit indices of the whole sample and three sub-samples in stage T1, T2 and T3, the larger the chi-square, the more obvious in statistics. In this study, the number of sample we selected is 582, which is a little larger that we need to take the ratio of chi-square and degree of freedom as a reference. Observing from TABLE 1, we find that the ratio of chi-square and degree of freedom of the whole and three sub-samples is less than 2, which shows that HAPA model has good applicability. Furthermore, the results of CFI, TLI and RMSEA (CFI>0.85, TLI>0.85 and RMSEA<0.05) and other fit indices explain that HAPA model applies well. All of these above entirely reflects that HAPA model is suitable for college student's physical exercise behavior[6-7].

TABLE 1: Goodness Of Fit Indices For Whole Sample And Three Stage Subsamples

------	n	Chi-square	freedom	Chi-square/ freedom	P value	TLI	CFI	RMSEA
Whole sample	580	570.453	332	1.718	<0.01	0.954	0.959	0.035
Non-intenders	96	404.309	332	1.218	<0.01	0.928	0.937	0.048
intenders	170	472.053	332	1.422	<0.01	0.881	0.896	0.050
Actors	314	453.819	332	1.367	<0.01	0.949	0.955	0.034

Secondly, to examine the group's measurement equivalence of HAPA model in three stages. Applying confirmatory factor analysis to examine whether the items of a specific measurement tool can be understood by groups from different stages in the same way, that is, whether the measurement tool factor structure of different groups is same. In addition,

confirmatory factor analysis applied here is mainly used to examine this model's immutability of structure and other parameters. Here we make 6 hypothesis as described in the following.

Model1 Supposing all parameters can not restrict model.

Model2 Supposing the measurement parameter is equal.

Model3 Supposing the measurement parameter is equal and so is structural co-variance.

Model4 Supposing the measurement parameter is equal and structural co-variance and structural variance are equal.

Model5 Supposing the measurement parameter is equal, structural co-variance and structural variance are equal and structural coefficient is equal.

Model6 Supposing the measurement parameter is equal, structural co-variance and structural variance are equal, structural coefficient is equal and the structural residual variable variance is equal.

From TABLE 2, we get that the indices of model 2 and model 3 fit well, P value is more than 0.05 and the chi-square increased value of them has no obvious difference with model 1, which shows that model 2 and model 3 are applicable and the factor structure of HAPA model's measurement tool is invariable in three stages[8].

TABLE 2: Three group nested models and X^2 differences with increased constrains

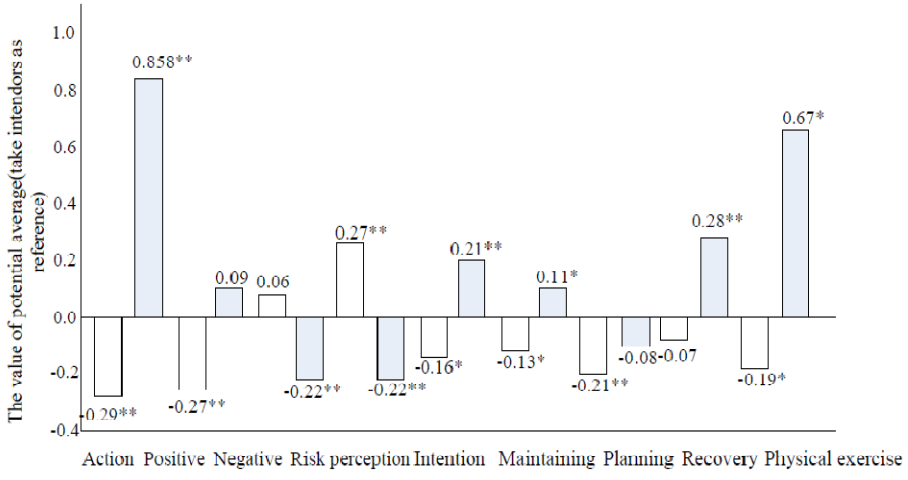
Model	Chi-square	freedom	P	Chi-square/ freedom	TLI	CFI	RMSEA	Model 1 delta x2	Model 1 P
Model 1	1331.756	996	<0.01	1.337	0.947	0.956	0.024		
Model 2	1382.928	1034	<0.01	1.350	0.944	0.951	0.025	51.172	0.075
Model 3	1408.221	1054	<0.01	1.356	0.943	0.958	0.025	76.465	0.053
Model 4	1437.354	1070	<0.01	1.352	0.944	0.948	0.025	105.598	0.009
Model 5	1464.638	1078	<0.01	1.359	0.942	0.946	0.025	132.882	0.000
Model 6	1622.313	1134	<0.01	1.431	0.926	0.926	0.027	290.557	0.000

The examination of stage discontinuity in HAPA model on college student's physical exercise

(a)The Potential Average's Difference Examination of Social Cognitive Variables in Three Stages

We have known HAPA model is applicable for exercise and it has measurement equivalence in stage T1, T2 and T3, then we need to examine the potential average's difference of social cognitive variables in three stages T1, T2 and T3. In this study, the potential average of T2 is set as 0 and the parameters of T2 and T3 as freedom to examine the structural average in three stages.

In action self-efficacy (M=-0.29, P<0.01), positive outcome expectation (M=-0.27, P<0.01), risk perception (M=0.27, P<0.01), intention (M=-0.16, P<0.05), maintaining self-efficacy (M=-0.13, P<0.05), planning (M=-0.21, P<0.01) and physical exercise (M=-0.19, P<0.05), T1 is obvious different from T2, which is different from T3 in action self-efficacy (M=0.85, P<0.01), negative outcome expectation (M=-0.22, P<0.01), risk perception (M=-0.22, P<0.01), intention (M=0.21, P<0.01), maintaining self-efficacy (M=0.11, P<0.05), recovery self-efficacy (M=0.28, P<0.01) and physical exercise (M=-0.29, P<0.01).



Note: * represents P<0.05, **represents P<0.01, ***represents P<0.001, SE represents self-efficacy, OE represents outcome expectation

Figure 2: Potential Average's Difference of Groups in Three Stages

(b)The Difference Examination of Path Coefficient between Social Cognitive Variables in Different Stages

It could make a further study to examine the path coefficient's difference between social cognitive variables in three stages T1, T2 and T3. From the perspective of statistics, we find that in chi-square increment model 3 and model 1 have no obvious difference with model 1. And in fact model 3 is the most ideal model. Therefore, the study mainly applies model 3 to study and analyze the path coefficient in three stages T1, T2 and T3(See Figure 3).

In stage T1, the obvious path coefficients are coefficients between action self-efficacy and intention but still lower than that in stage T2 and T3 while those among outcome expectation, risk perception and intention are not obvious. In stage T2, the obvious are coefficients between maintaining self-efficacy and planning but still lower than that in stage T1 and T3 while those among outcome expectation, risk perception and intention are not obvious. In stage T3, the obvious are coefficients between recovery self-efficacy and behavior and higher than that in stage T2, which has no obvious difference with T1 while those among outcome expectation, risk perception and intention are not obvious. However, the path coefficients between maintaining self-efficacy and behavior are not obvious and decrease gradually from T1 to T2 then to T3.

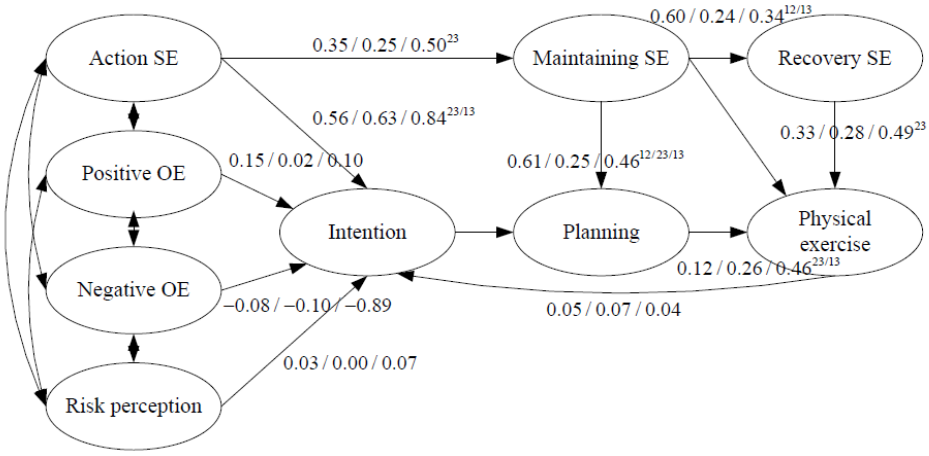


Figure 3: Path Coefficients of HAPA Model in Different Stages

DISCUSSION

In this study, it mainly examines the structure of HAPA model, taking the college students that majored in other subjects except physical training from Wuhan Institute of Physical Education as example. In the hypothetical model of HAPA, the internal potential variables contain intention, planning, maintaining self-efficacy and recovery self-efficacy while risk perception, positive outcome expectation and action self-efficacy belong to the external potential variables.

The potential average's difference examination of social cognitive variables in three stages

To HAPA model, the potential average of social cognitive variables has obvious difference in stage T1, T2 and T3. The concrete conclusion is as follows, the potential average of maintaining self-efficacy and action self-efficacy in stage T1 is lower than that in T2 and T3.

The innovative idea focuses on the study on the difference of maintaining self-efficacy, action self-efficacy and recovery self-efficacy in three stages T1, T2 and T3, the results of which shows that these three kinds of self-efficacy increase positively. That is to say, the students who have not attended physical exercise and have no consideration to attend have the worst self-efficacy while those have planned and done exercise have the best self-efficacy. However, these self-efficacy have different function, of which the recovery self-efficacy plays a role in stage T3, illustrating it has obvious stage characteristic and providing data support for its intervention in the future while maintaining self-efficacy and action self-efficacy have influence on stage T1, T2 and T3 and increase positively.

The difference of path coefficient between social cognitive variables in different stages

To HAPA model, the path coefficients between social cognitive variables in stage T1, T2 and T3 are obvious different. The concrete conclusion is as follows, the path coefficient between action self-efficacy and intention in stage T1 is obvious but still lower than that in T2 and T3 while the path coefficients of outcome expectation, risk perception and intention have no obvious difference in stage T1, T2 and T3. In stage T2, the path coefficient between maintaining self-efficacy and plan is obvious but still lower than that in stage T2 and T3 while that between recovery self-efficacy and

physical exercise has obvious different in T3 and similarly that between plan and physical exercise has obvious difference in stage T2 and T3.

The prospect and assumption of this study

The questionnaire is designed as self-statement questionnaire, which has great influence on the reliability of sample we collected. So in further study, we should make some improvement and do more open surveys.

In this study, data miss severely, especially producing lots of invalid questionnaires, which devotes to the data can not represent well. And when dealing with sample data, we take the subjective reports of students as the only standard to judge the stage of HAPA model, thus it lacks the effective evaluation to the validity of stage algorithm. Therefore, in the further study we should strengthen the validity evaluation for it.

This study also lacks intervention experimental design. To investigate the predication effect of social cognitive variable in HAPA model on physical exercise behavior, we should increase the intervention behavior.

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