

Frequency of exercise among undergraduate students on the basis of the model of stages and processes of change

Evangelos Bebetos¹, Athanasios Papaioannou²

¹ Department of Physical Education & Sport Science, Democritus University of Thrace, Komotini, Greece

² Department of Physical Education & Sport Science, University of Thessaly, Trikala, Greece

ABSTRACT

Introduction. The study was based on the model of stages of change, according to which people are classified into five stages: precontemplation, contemplation, preparation, action and maintenance, depending on the strategies/procedures they adopt towards exercise.

Aim of the study. The aim of this study was a preliminary investigation of the validity of this questionnaire modified for the Greek population.

Material & Methods. The sample consisted of 668 university Physical Education undergraduates. The instrument that was used was the Processes of Behavior Change Questionnaire.

Results. The results of the exploratory factor analysis supported the factorial validity of the questionnaire. In all the processes of change statistically significant differences were found between individuals who exercised with a different frequency. As the results showed, in all cases, students who scored high in the processes of change, exercised more frequently, and students who scored low exercised more seldom (personal reevaluation, social liberation, stimulus control and consciousness raising).

Conclusions. The results are supportive not only of the validity of the questionnaire, but also of the implication of the model of enhancement of exercise and physical activity in Greece.

KEY WORDS

cognitive-behaviouristic models, cognitive/empirical, behavioural/environmental.

Introduction

Sedentary life is a social phenomenon that tends to be a major problem nowadays. In most developed countries, less than one half of the adult population participates in thirty-minute physical activities of moderate intensity, while 25% do not participate in any activity at all [1, 2]. The percentage of sedentary life increases in certain population categories such as older men, women, minorities and individuals in special populations [3]. Increase in physical activity can contribute to the prevention of many illnesses. When vital body functions such as breathing, cardiac function and blood circulation are downgraded because of insufficient activity various forms of illnesses develop such as cardiac problems, numerous forms of cancer, diabetes, stress, or depression [4, 5].

Social programs aiming at the prevention of serious illnesses should take into consideration changes in the behavior of individuals in order to attain the desirable results. A lot of efforts to change unhealthy behaviors (smoking, obesity, lack of exercise) have been focused so far only on individuals who already had decided to change their behav-

iors. Therefore, the use of cognitive-behavioristic theoretical models is very important for the comprehension of different behaviors such as engagement in physical activity.

An important aspect of these cognitive-behavioristic models constitutes crucial factors in the decision to exercise. For example, cognitive factors which facilitate the understanding of problems deriving from sedentary life may increase motivation to exercise [6]. The use of "Model of Stages" attempts to change people's unhealthy behavior(s) [6].

The "Model of Stages" [7, 8] has contributed considerably to the comprehension of "when", "why" and "how" a person can change unhealthy behaviors. This model indicates that the change in behavior is not simple [9]. Each stage is based on intentions related to the particular behavior to be changed.

There are six stages of change: (1) Precontemplation: individuals do not intend to take action in the near future, i.e. in the next six months. (2) Contemplation: individuals intend to change their behavior in the next six months. (3) Preparation: individuals intend to take action in the immediate future, usually the next month. (4) Action: individuals

have made specific modifications in their life-styles within the past six months. (5) Maintenance: individuals work on the gains of the Action stage and try to prevent relapse. (6) Termination: the period where the risk of reversion is eliminated.

The objective of this model is to explain how these stages lead towards a healthy behavior. Ten processes including strategies and techniques which one can use to change behavior can be distinguished [10]: (a) Consciousness Raising: increased awareness of causes and effects for a particular problem behavior; (b) Dramatic Relief: an increased emotional arousal followed by a reduced effect if appropriate action can be taken; (c) Environmental Reevaluation: a combination of affective and cognitive assessments of how the presence or absence of a personal habit affects one's social environment; (d) Self-Reevaluation: cognitive and affective assessments of one's self image with and without a particular unhealthy behavior; (e) Social Liberation: an increase in social opportunities; (f) Counter Conditioning: healthier substitutes for problematic behavior(s); (g) Helping Relationships: trusting, accepting and utilizing others' support while attempting to change one's problematic behavior; (h) Reinforcement Management: change of conditions which control or maintain the problematic behavior; (i) Self-Liberation: individuals' commitment towards change; and, finally; (j) Stimulus Control: removing cues for unhealthy behavior(s) and adding prompts for a healthier lifestyle.

As researchers indicate, these processes can be categorized in two dimensions: (1) Cognitive/Empirical (consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, social liberation); and (2) Behavioral/Environmental (counter conditioning, helping relationships, reinforcement management, self-liberation, stimulus control) [11].

Studies in Greece indicated low percentages of individuals/students involved in health behavior strategies from a young age [12, 13, 14]. After a circumstantial review of these studies, which included body mass index, task and ego orientation towards children's motivation patterns, and children's attitudes towards nutritional behaviors, the researchers decided that the use of yet another "instrument" could also provide additional contribution towards the solution of this problem.

Aim of Study

The aim of this study was twofold: (a) to test the psychometric properties of the questionnaire of Processes of Change in Exercise translated into Greek; and (b) to contribute with the Processes of Change to the classification of Greek students at different stages of change, according to their frequency of exercise.

Material and Methods

Subjects and procedure

The sample included 668 undergraduate Physical Education students. More specifically, they were 340 men and 328 women. Their mean age was 19.3 years ($SD = 1.53$).

Processes of Change

The instrument that was used was the "Processes of Behavior Change" questionnaire [11]. The scale was translated into Greek using a back to back translation procedure from an earlier study [15]. More specifically, the questionnaire included the following factors: (1) consciousness raising, (2) dramatic relief, (3) environmental reevaluation, (4) counterconditioning, (5) social liberation, (6) self-liberation, (7) reinforcement management, (8) helping relationships, (9) self-reevaluation, and (10) stimulus control. Participants were supposed to give answers to 30 items, i.e. 3 for each factor. The researchers informed all subjects that their participation was completely voluntary and the individual responses would be held in strict confidence. The answers were given on a five-point Likert type scale from 1 (Absolutely Disagree) to 5 (Absolutely Agree).

Stages of Change

Initially the following definition was given to the subjects: "Regular exercise is every physical activity planned in advance (jogging, aerobic exercise, relaxed run, bicycle, swimming, rowing, etc.) to improve physical fitness. Such activities can be taken up 3 up to 5 times per week, for 20 up to 60 minutes each. The physical activity does not need to be painful to be effective, but it should be done on a level that increases the frequency of breathing and produces sweat". Then, in their answers to the question "Do you practice often, according to the definition?" the respondents selected one from the following answers: ("Yes, I have been doing it for a period longer than 6 months", "Yes, I have been doing it for a period shorter than 6 months", "No, but I have the intention to begin within the next 30 days", "No, but I have the intention to begin within the next 6 months", "No, and I do not have the intention to begin within the next 6 months").

Frequency of Exercise

Answers to two items were used to assess the frequency of exercise: "During the last month, how many times have you exercised intensely outside school curriculum (university courses), for at least one hour each time?" (More than 20, 15 to 20, 10 to 15, 5 to 10, 1 to 5, None); and "During the past 3 months, how many times have you exercised intensely outside school curriculum (university courses), for at least an hour each time?" (More than 40, 30 to 40, 20 to 30, 10 to 20, 1 to 10, None). The cut-off point was indicated in an earlier study [15].

Results

Principal Component Analysis of processes of change

The principal component analysis of answers in the questionnaire of processes of change yielded six factors with eigenvalues higher than 1 that interpreted 63% of total variance (Table I). These six factors also emerged with on the screen plot. Because of the positive relation between the factors, direct oblimin rotation was used. Table I shows the pattern matrix results with the use of PASW 18.0 software package.

The first factor comprised "self-reevaluation" (Items 10, 11, 12), "social liberation" (Items 13, 14, 15) and "stimulus

Table I. Principal Component Analysis of Stages of Change Questionnaire

Item	Loadings						.h ²
	1	2	3	4	5	6	
1						0.65	0.67
2						0.60	0.66
3						0.67	0.51
4			0.41			0.30	0.50
5			0.56				0.66
6			0.33				0.41
7			0.88				0.79
8			0.81				0.71
9			0.70				0.65
10	0.76						0.71
11	0.83						0.75
12	0.75						0.81
13	0.50						0.44
14	0.33				0.59		0.58
15	0.77						0.46
16		0.39			0.55		0.61
17		0.27			0.42		0.64
18					0.59		0.62
19				0.89			0.82
20				0.83			0.80
21				0.80			0.68
22	0.70						0.61
23	0.56						0.58
24	0.75						0.60
25	0.63						0.59
26		0.35			0.34		0.55
27		0.43					0.72
28		0.70					0.60
29		0.75					0.67
30		0.65					0.60
Eigenvalue	10.33	10.60	11.3	11	12.16	7.61	
% variance explained	10.33	10.60	11.3	11	12.16	7.61	
Cronbach's Alpha	0.93	0.79	0.82	0.81	0.76	0.74	

Note: Factor loadings below 0.30 were excluded

control" (Items 22, 23, 24, 25). The second factor comprised items suggesting "reinforcement management" (Items 28, 29, 30) and "self-liberation" (Items 26, 27). The third factor included the items of "dramatic relief" (Items 4, 5, 6) and "environmental reevaluation" (Items 7, 8, 9). The fourth factor declared "helping relationships" (Items 19, 20, 21). The fifth factor indicated "counterconditioning" (Items 16, 17, 18). Finally, the sixth factor was named "consciousness raising" (Items 1, 2, 3).

The reliability analysis showed that the internal consistency of the six factors was at an acceptable level. Cronbach's alpha for each scale amounted to (1) 0.93, (2) 0.79, (3) 0.82, (4) 0.81, (5) 0.76 and (6) 0.74, respectively (Table I). Based on these results six new variables were computed from the mean of the items of each factor. The means and standard deviations for these scales are presented in Table II.

Discrimination of teams at different stages of change

The analysis showed that 58% of the participants were at the "Maintenance", 15% at "Action", 13% at "Preparation", 6% at "Contemplation" and 7% at "Precontemplation" stages.

Discriminant analysis was used to examine the contribution of the six scales of processes of change in the discrimination of individuals that were at different stages of change. From the four resulting discriminant functions, the first was statistically significant (Wilks' $\Lambda = 0.73$, $\chi^2 = 101.00$, $p < 0.01$), while the rest were not. For the first discriminant function the differences among the five groups which corresponded to various stages of change satisfied the theoretical expectations. The centroid was -1.06 for the Precontemplation group, -0.85 for the Contemplation group, -0.37 for the Preparation group, 0.11 for the Action group and 0.31 for the Maintenance group. In other words, the processes of change discriminated between the two groups that exercised (Action, Maintenance) and the two groups who did not exercise (Precontemplation, Contemplation), while the Preparation group, who were ready to exercise, was in between.

From the six scales, the first scale (self-reevaluation, social liberation and stimulus control) and the sixth (consciousness raising) contributed to the discrimination. These scales had loadings of 0.86 and 0.71, while the loadings for the remaining four scales were less than 0.31. As it can be seen in Table III, the highest score of the scales was achieved by the individuals that were at the stage of Maintenance, followed by the individuals that were at the stages of Action and Preparation. Lower were the scores achieved by individuals at the Contemplation stage, and the lowest scores were attained by the individuals at the Precontemplation stage.

Table II. Means and standard deviations for every factor and factor correlations

Factor	M	SD	1	2	3	4	5
1. Self-reevaluation, social liberation, stimulus control	4	0.8	-				
2. Reinforcement management, self-liberation	3.2	1.0	0.31	-			
3. Dramatic relief, environmental reevaluation	3.6	0.9	0.46	0.30	-		
4. Helping relationships	3	1.1	0.41	0.38	0.39	-	
5. Counterconditioning	3.3	0.9	0.11	0.15	0.15	0.17	-
6. Consciousness raising	3.8	0.9	0.39	0.21	0.28	0.27	0.13

Table III. Means and standard deviations for every factor according to stage of change

Factor	Maintenance		Action		Preparation		Contemplation		Precontemplation	
	M	SD	M	SD	M	SD	M	SD	M	SD
Self-reevaluation, social liberation, stimulus control	4.3	0.6	4.2	0.6	4	0.7	4	0.6	4	0.9
Reinforcement management, self-liberation	3.2	0.9	3.1	0.7	3	1.1	3	0.75	3	0.9
Dramatic relief, environmental reevaluation	4	0.8	3.7	0.6	4	0.7	3.4	0.63	3.4	1.1
Helping relationships	3.3	1.03	3.3	1.00	3	0.9	3.3	0.83	3.2	1.1
Counterconditioning	3.4	0.8	3.3	0.6	3	0.7	3	0.73	3.2	1.1
Consciousness raising	4	0.7	3.9	0.7	4	0.7	3.4	0.83	3.3	1.2

Differences among individuals with different frequency of exercise

The sample was divided into three groups based on the individuals' monthly frequency of exercise as follows: a) individuals who did not exercise at all; b) individuals who exercised up to 15 times per month and; c) individuals who exercised more than 15 times per month [15, 16]. Multivariate analysis of variance assumed possible differences in the processes of change among these three groups. Differences were statistically significant (Wilks' $\Lambda = 0.80$, $F_{(13,436)} = 7.82$, $p < 0.01$). The results of separate analyses of variance and Duncan post-hoc tests are summarized in Table IV.

Discussion

The year 2005 was declared by the UN as the Year of Physical Education and Sports. For 3-4 years the World Health Organization designated specific days of exercise and physical activity. To comprehend exercise-promoting factors various socio-economic and psychological models of exercise are used. The present psychological model has been used widely in the last years internationally, [11] but not in Greece.

The central objective of this study was the preliminary assessment of validity of the questionnaire processes of change for exercise. Two approaches were used: the control of internal structural validity with the use of principal component analysis; and the control of exterior structural validity with the simultaneous use of exterior criteria such as the questionnaire of stages of change and frequency of exercise.

The results of principal component analysis were encouraging as for the internal structural validity of the question-

naire. For reasons of manageability, in the present research the questionnaire that was selected contained three items per factor and no other bodies were used that contained four items per factor [11]. Similar results were found in an earlier study [15].

In order to check the exterior structural validity, the questionnaire was examined in relation to the frequency of exercise and to the stages of change. The results revealed in all processes of change statistically significant differences between individuals with different exercise frequency. Individuals who exercised regularly had higher scores than individuals who exercised seldom or did not exercise at all [6].

Our results supported the discrimination of individuals at different stages of change (Self-Reevaluation, Social Liberation, Stimulus Control and Consciousness Raising) as indicated in earlier studies [7, 8].

Despite the extensive bibliography on the subject, it is not clear if all the processes contribute to the classification of individuals at specific stages of change [17]. More specifically, an earlier meta-analysis of 12 studies based on exercise shows that such processes as dramatic relief, environmental reevaluation and social liberation contributed rather little to the discrimination of individuals at different stages of change [18]. Similar indications were found in the present study.

As indicated in earlier studies [7, 8], a positive element of the validity of all processes of change examined in the present research is their relation with the frequency of exercise. In all of the processes of change, statistically significant differences existed between individuals that exercised with a different frequency. In all cases individuals who scored high in the processes of change exercised more frequently

Table IV. Differences in the process of changes between individuals exercising with different frequency

Factor	Frequency of exercise					
	Very often		Rarely - intermediate		Never	
	M	SD	M	SD	M	SD
Self-reevaluation, social liberation, stimulus control	4.3	0.5	4.1	0.6	4	0.7
Reinforcement management, self-liberation	3.3	0.7	3.1	0.8	3	0.7
Dramatic relief, environmental reevaluation	3.7	0.8	3.7	0.7	3.4	0.7
Helping relationships	3.4	1.0	3.3	0.6	3.1	1.0
Counterconditioning	3.5	0.7	3.3	0.7	3	0.8
Consciousness raising	4.1	0.6	3.7	0.7	4	0.8

in comparison with individuals who scored low and exercised more seldom. The results of earlier research support these findings [15].

Conclusions

The present study stresses the importance of processes of change for exercise and the role of psychological support of education on this subject. Both students and adults should learn strategies on how to regulate their exercise behavior. The results of the study support the importance of the use of exercise as a daily component of a healthier lifestyle. Additionally, the study shows that confidence toward behaviors such as exercise, determines the actual and future choices of individuals. Earlier studies [15, 17, 18] also stressed the idea of close relationship between these strategies and exercise frequency.

References

1. US Department of Health and Human Services. Physical activity and health: a report of Surgeon General. Atlanta, GA: Department of Health and Human Services, Centers of Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion. The President's Council on Physical Fitness and Sport; 1996.
2. Bijnen FC, Feskens FJ & Caspersen CJ. Physical activity and cardiovascular risk factors among elderly men in Finland, Italy and the Netherlands. *Am J of Epid.* 1996; 143: 553-561.
3. Booth ML, Bauman A, Owen N & Gore CJ. Physical activity preferences, preferred sources of assistance and perceived barriers to increased activity among physically inactive Australians. *Prev Med.* 1997; 26: 131-137.
4. Blair SN. Physical inactivity and cardiovascular disease risk in women. *Med Sci in Spt and Ex.* 1996; 28: 9-10.
5. Blair SN, Kohl HW, Barlow CE, Paffenbarger RS, Gibbons LW & Macera CA. Changes in physical fitness and all-cause mortality. A prospective study of healthy and unhealthy men. *J of Am Med Ass.* 1995; 273: 1093-1098.
6. McCauley E & Courneya KS. Adherence to exercise and physical activity as health-promoting behaviors: attitudinal and self-efficacy influences. *Ap Prev Psych.* 1993; 2: 65-77.
7. Prochaska JO & DiClemente CC. The transtheoretical approach: Crossing traditional boundaries of therapy. Pacific Grove, CA: Brooks/Cole; 1984.
8. Prochaska JO & Velicer WF. The transtheoretical model of health behavior change. *Am J of Hth Prom.* 1997; 12: 38-48.
9. Prochaska JO & DiClemente CC. Stages and processes of self-change of smoking: Toward an integrative model of change. *J of Cons and Cl Psych.* 1983; 51: 390-395.
10. Prochaska JO, Velicer WF, DiClemente CC & Fave JS. Stages theories of health behavior: Conceptual and methodological issues. *Hth Psych.* 1988; 17: 290-299.
11. Marcus BH, Rossi JS, Selby VC, Niaura RS & Abrams DB. The stages and processes of exercise adoption and maintenance in worksite sample. *Hth Psych.* 1992; 11: 386-395.
12. Krassas GE, Tzotzas T, Tsametiis C & Konstantinidis T. Determinants of body mass index in Greek children and adolescents. *J of Pedi & Met.* 2001; 14 (5): 1327-1333.
13. Tzetzis G, Kakamoukas C, Goudas M & Tsoarbatzoudis Ch. A Comparison of Physical Activity Patterns and Physical Self-Perception in Obese and non-Obese Children. *Inq in Spt & Phy Ed.* 2005; 3 (1): 29-39.
14. Digelidis N, Kamtsios S & Theodorakis Y. Physical Activity Levels, Exercise Attitudes, Self-Perceptions, Nutritional Behaviors and BMI Type of 12-Years Children. *Inq in Spt & Phy Ed.* 2007; 5 (1): 27-40.
15. Papaioannou A, Bebetsos E, Kafetzi S & Sagovitch A. Preliminary Investigation of a Questionnaire, Based On the Model of Stages and Processes of Change towards Exercise – Physical Activity. *Inq in Spt & Phy Ed.* 2006; 4 (1): 78-86.
16. American College of Sports Medicine. The recommended quantity of exercise for developing and maintaining cardiorespiratory and muscular fitness in healthy adults. *Med and Sci in Spt and Ex.* 1990; 22: 265-274.
17. Marshall MA & Biddle SJH. The transtheoretical model of behaviour change: A meta-analysis of applications to physical activity and exercise. *Ann of Beh Med.* 2001; 23: 229-246.
18. Rosen CS. Is the sequencing of change processes by stage consistent across health problems? A meta-analysis. *Hth Psych.* 2000; 19: 593-604.

Correspondence should be addressed to: Evangelos Bebetsos, Department of Physical Education & Sport Science, Komotini 69100, Greece, tel. +30531 039712, e-mail: empempet@phyed.duth.gr