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Health Belief Model Variables as Predictors of Light, Moderate and Vigorous Physical Activity Among Young Adults

Abstract

The aim of the study was to measure the association among Health Belief Model (HBM) variables and self-reported physical activity of young adults. A survey research protocol was employed. Participants were 391 university students (245 females), 19–22 years old ($\bar{x}$ = 21.41±3.49). Analyses revealed that the strongest predictor of physical activity is self-efficacy, followed by perceived benefits and the perceived barriers. Other HBM variables, such as the perceived susceptibility or perceived severity, were not associated with physical activity. On the basis of the obtained results it may be concluded that the HBM as a model of avoiding diseases is not adequate to explain and predict physical activity of young adults.

Keywords: *Health Belief Model*, *physical activity, young adults*

Introduction

Despite the numerous and well-documented benefits of physical activity (PA), many people are not active on a regular basis (Mazur, Woynarowska & Koło, 2007). Therefore, promotion of PA is an important challenge within healt education, which is nevertheless difficult due to the fact that it is complex behaviour determined by many factors of various types (demographic, psychological, social, biological and behavioural) (Buckworth & Dishman, 2002). To better understand this kind of health behaviours, several theoretical models were suggested (Biddle & Mutrie, 2001; Buckworth & Dishman, 2002; Motl, 2007). The essence of such models is to

"provide assumptions about behaviour and determine relations between key variables that are necessary to explain and predict behaviour" (Buckworth & Dishman, 2002, p. 211). One of the oldest models of health behaviour is the Health Beliefs Model (HBM) established in the 1950s to explain why certain people take actions which aim at preventing diseases while others avoid such actions.

To put it simply, the HBM assumes that the likelihood of taking specific health behaviour will depend on the extent to which the person is convinced to be threatened with certain diseases, how far he/she evaluates its severity and how much the target health behaviour allows for averting the risk of developing these diseases. Therefore, in the original version of the model, the following were considered to be the key variables: perceived susceptibility (i.e. perceived likelihood of experiencing a condition that would adversely affect one's health), perceived severity (i.e. the severity of physical, psychological and/or social consequences of the condition), perceived benefits (i.e. the belief of the individual that the target behaviour will reduce the severity of the condition or the risk of suffering from it), perceived barriers (i.e. costs or obstacles to the target behaviour perceived by the individual), cues to action (e.g. media campaigns, illness of a loved one), and the category of intermediate variables in the form of demographic variables, personality traits, etc. Later, the model was expanded to include self-efficacy, defined as "beliefs in one's own abilities regarding organising and taking the course of action required to obtain specific results" (Bandura 1997, p. 3).

The HBM has gained a great popularity and has been successfully used to explain a number of health behaviours, such as performing prophylactic examinations, weight control, mammography, wearing bicycle helmets, sunbathing, nutrition, prophylactic vaccination and many others (Janz & Becker, 1984; Hanson & Benedict, 2002; Greene & Brinn, 2003; Von Ah et al., 2004; Heszen & Sęk, 2007; Daddario, 2007; Deshpande,, Basil & Basil, 2009; Ross et al., 2011). This poses the obvious question about the usefulness of this model to predict PA. If so, in order to undertake regular PA, the individual is expected to be convinced that: 1 he/she is at risk from diseases associated with the sedentary lifestyle (ischemic heart disease, non-insulin-dependent diabetes mellitus, etc.), 2/ these diseases may have very serious effects on one's physical, social and psychological functioning, 3/ PA may reduce the risk of developing and/or lessen the negative effects of the above-mentioned diseases, 4/ the perceived benefits of PA outweigh the barriers to taking it, 5/ he/she is confident in one's own ability to overcome barriers to PA. Although some of the constructs of the HBM were frequently evaluated in the context of PA – especially the perceived barriers and, to a lesser extent, the perceived benefits – on the whole, however, this model has been rarely the subject of empirical research in

the context of PA. The same the question about the accuracy of the assumptions of the model to predict PA is left open. Some authors claim that the HBM is a typical model of avoiding disease, so its assumptions may be accurate for those who are directly at risk or already affected by hypokinetic diseases, but will not be helpful in understanding the behaiours of healthy people (Biddle & Mutrie, 2001; Buckworth & Dishman, 2002).

The purpose of this study was to determine if variables suggested by the HBM are predictors of three categories of young adults' PA: light (LPA), moderate (MPA) and vigorous (VPA). As the construct of self-efficacy is usually operationalized in terms of the perceived effectiveness in dealing with situations that hinder adopting the behaviour, we have also incorporated into our model the construct of perceived physical competence (by some identified with task self-efficacy) (Stevens et al, 2001; Annesi, 2006).

Material and methods

Participants in the study were 391 university students (245 women and 146 men) of the Faculty of Management, Tourism and Recreation at the Academy of Physical Education in Katowice. Their mean age was 21.41 (SD 3.49, range 19–22). In accordance with the principles of ethical research in social sciences, the subjects had been assured of complete anonymity and voluntary of participation.

PA was assessed with the use of the Leisure-Time Exercise Questionnaire (LTEQ) (Godin, 2011). The subjects' task was to specify how many times and for how long in the week preceding the study they had undertaken VPA, MPA and LPA. Each category was described in a way allowing for defining it by the subject with examples of activity forms that are representative of a given category (e.g., walking, swimming, running, etc.). Self-assessment of one's general health was evaluated with the use of one entry provided with a five-point scale from very bad to very good.

Perceived benefits of PA were assessed using a scale consisting of 12 statements relating to its effects on physical and mental health. The subjects' task was to assess their accuracy on a scale of 1 (definitely false) to 4 (definitely true). Barriers to PA were assessed by means of a scale consisting of 13 statements that would illustrate the impediments to taking up this behaviour. The subjects were to assess each of the presented situations on a scale of 1 (it is never a barrier) to 5 (it is very often a barrier). The perceived severity of diseases associated with the sedentary lifestyle was assessed using a scale consisting of eight conditions (e.g. atherosclerosis and

coronary heart disease, non-insulin dependent diabetes, colon cancer, depression), whose severity the subjects assessed on a scale of 1 (not at all serious) to 5 (they are a mortal threat), and then evaluated the risk of each disease within them on a scale of 1 (very low risk) to 5 (very high risk). Perceived physical competence was measured with a subscale of the perceived competence of the Intrinsic Motivation Inventory (IMI) (McAuley, Duncan & Tammen, 1987).

The reliability of the measurements was assessed by a method of internal consistency using the formula of Cronbach's alpha, assuming according to A. Sokołowski and A. Sagan (1999), that the level of alpha = 0.60 is the limit of the accepted reliability of the tool. The alpha values obtained for particular tools ranged from α=0.84 (self-efficacy) to α=0.90 (perceived physical competence), thus in all the cases meeting the aforementioned criterion.

Statistical analysis

Descriptive statistics were used to describe the study variables, and Pearson's correlation coefficients were calculated for the relationship between them. The t-test was used to evaluate the significance of differences between the participants of both sexes. In situations where it revealed statistical significance between the means, the effect size was also estimated with the use of Cohen's *d* for this purpose. To determine which variables predict VPA, MPA and LPA, multiple regression analyses in the stepwise version were used. At the initial stage of analysis, the progressive stepwise regression was used, which is based on introducing into the regression equation subsequent variables explaining the level of the explained variable until the "best fitted" model is obtained. Since there were variables with statistically insignificant directional coefficients, at the next stage the stepwise regression analysis was performed in the "backward" version. It involves eliminating from the output model, constructed out of all the potential predictors of the dependent variable, those independent variables which in a given step have the least significant influence on the dependent variable.

Results

Descriptive statistics for the whole study sample, as well as separately for the female and male subjects, together with the comparison between the sexes, are presented in Table 1. Diagnosis of the level of PA indicates that the participants spent an average about 2 hours a week doing VPA, less than 1.5 hours doing MPA and slightly more than 1 hour doing LPA. However, some significant differences between the level of VPA and LPA of the females and males were observed. The

weekly amount of VPA turned out more than twice as high among the men (the value of Cohen's *d* suggests that the degree of difference may be considered as high), whereas LPA was lower in the males. The subjects of both sexes evaluate their health as good, with a slightly higher self-assessment of the men (the difference between the means is statistically significant, but – as suggested by the effect size – rather small: Cohen's $d = 0.21$). It should be noted that the self-assessment of health is significantly, though moderately strongly, associated with VPA.

Among the psycho-social variables, the highest mean was found in the case of the perceived physical competence ($\bar{x} = 3.71$), with a significantly higher assessment of the male subjects (3.82 vs 3.64 in the females), although as indicated by the *d* coefficient, the amount of this difference is not large. The subjects evaluated self-efficacy in dealing with the barriers to activity more critically (again, with higher assessment in the males), but at the same time said that they did not experience rather too many and too serious barriers to activity ($\bar{x} = 2.39$).

In general, the subjects assess the severity of illnesses related to the sedentary lifestyle as moderately high ($\bar{x} = 3.65$), with the females significantly higher than the males (3.73 compared to 3.51; $p = 0.009$, $d = 0.28$), although the risk of experiencing them personally is perceived as very low ($\bar{x} = 2.10$). Evaluation of benefits resulting from PA was close to neutral ($\bar{x} = 3.30$).

Table 1. Descriptive statistics and the comparison between sexes (statistically significant differences are in bold)

	All		Women		Men		t	p	Effect size Cohen's d
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD			
VPA	122.49	183.45	**77.18**	**144.24**	**199.90**	**215.08**	**-6.73**	**<0.001**	**-0.70**
MPA	83.84	135.62	82.94	133.69	85.94	139.54	-0.21	0.833	
LPA	78.86	121.02	**89.38**	**132.05**	**61.31**	**98.03**	**2.22**	**0.027**	**0.17**
Perceived benefits	3.30	0.38	3.28	0.38	3.34	0.36	-1.53	0.127	
Perceived barriers	2.39	0.79	**2.49**	**0.81**	**2.20**	**0.73**	**3.54**	**<0.001**	**0.37**
Perceived severity	3.65	0.78	**3.73**	**0.74**	**3.51**	**0.83**	**2.61**	**0.009**	**0.28**
Perceived susceptibility	2.10	0.75	2.11	0.72	2.09	0.79	0.16	0.870	
Health self-assessment	4.08	0.79	**4.03**	**0.76**	**4.19**	**0.79**	**-1.98**	**0.049**	**-0.21**

	All		Women		Men		t	p	Effect size Cohen's d
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD			
Perceived physical competence	3.71	0.86	**3.64**	**0.84**	**3.82**	**0.90**	**-2.00**	**0.046**	**-0.21**
Self-efficacy	3.64	0.78	**3.57**	**0.76**	**3.75**	**0.78**	**-2.25**	**0.025**	**-0.23**

Legend: VPA – vigorous physical activity, MPA – moderate physical activity, LPA – light physical activity

Table 2. The matrix of correlation coefficients (Pearson's r) for variables (statistically significant correlations are in bold)

	1	2	3	4	5	6	7	8	9
1. VPA									
2. MPA	0.02								
3. LPA	-0.09*	0.08							
4. Perceived benefits	**0.33**	0.05	0.03						
5. Perceived barriers	**-0.34**	**-0.13**	0.01	**-0.24**					
6. Perceived severity	-0.07	-0.08	0.01	**0.10**	**0.16**				
7. Perceived susceptibility	**-0.17**	-0.04	0.02	-0.09*	**0.29**	**0.31**			
8. Health self-assessment	**0.30**	0.10*	-0.02	**0.18**	**-0.32**	-0.03	**-0.28**		
9. Perceived physical competence	**0.33**	**0.18**	0.00	**0.31**	**-0.34**	-0.01	**-0.20**	**0.43**	
10. Self-efficacy	**0.40**	**0.20**	-0.10*	**0.32**	**-0.37**	-0.04	**-0.19**	**0.22**	**0.45**

Legend: VPA – vigorous physical activity, MPA – moderate physical activity, LPA – light physical activity, * correlations with a tendency towards significance (2–8: p=0.054; 3–10: p=0.053; 3–1: p=0.080; 7–4 p=0.080

The most relationships between the HBM variables and PA were found in reference to VPA, with which statistically insignificant was only the correlation with the perceived severity resulting from the lack of PA (Table 2). Two variables, i.e. the perceived risk of becoming ill and the perceived barriers to activity, correlated negatively, which means that with an increase in observations concerning the barriers to activity and perceptions of the risk of developing an illness, the amount of VPA decreases. The strongest correlation was found in reference to self-efficacy (r=0.40). However, it should be noted that in no case the strength of the correlation

between VPA and HMB variables exceeded the values regarded as average. MPA correlated with four variables: the perceived barriers to activity (negative correlation), self-efficacy, and the perceived competence. In each of these cases, however, the correlation was weak. None of the cognitive variables significantly correlated with LPA, which suggests that activities like walking or recreational swimming are not demanding cognitively.

"Backward" stepwise regression analysis allowed for the determination of models explaining 24% of the variability of VPA and 4% of MPA. The model for LPA was statistically insignificant and none of the variables was incorporated into the model. With regard to VPA from the group of input (potential) predictors the following were included in the model: self-efficacy, perceived benefits and perceived barriers. The greatest value of the standardised directional coefficient was observed for self-efficacy (0.27), whereas the latter proved to have a negative influence.

In the case of MPA, the only variable included in the model was self-efficacy, however, as has already been mentioned, the coefficient of determination was just 0.04, and therefore the adopted model only marginally explains the influence of the above-mentioned cognitive variable on MPA.

Table 3. Results of backward stepwise regression analyses

PA level	Final models of the stepwise regression			
VPA	R=0.49; R2= 0.24; F(3.372) = 39.37; p<0.001; Standard error of the estimate: 161.74			
	Variables included	ß	t	p
	Self-efficacy	0.27	5.30	<0.001
	Perceived benefits	0.20	4.17	<0.001
	Perceived barriers	-0.20	-3.99	0.049
MPA	R=0.20;R2= 0.04; F(1.374)=15.01; p<0.001; standard error of the estimate: 132.93			
	Variables included	ß	t	p
	Self-efficacy	0.20	3.87	<0.001
LPA	Model insignificant; none of the variables included			

Legend: VPA – vigorous physical activity, MPA – moderate physical activity, LPA – light physical activity

Discussion

Health Belief Model was developed in the 1950s to predict, explain and then promote health behaviors. Predictive values of the model were confirmed to a greater or lesser extent with reference to many types of behaviour (Janz & Becker, 1984). However, the usefulness of the HBM in explaining PA is disputable, in part because of the limited number of studies and ambiguous results obtained (Biddle & Mutrie, 2001). Partial support for the hypothesis that the HBM may help to explain physical activity was provided by the study of Juniper et al. (2004), in which the authors stated that the perception of barriers was significantly higher, whereas the perceived severity, cues to action and self-efficacy were significantly lower in the group of physically inactive individuals. On the other hand, Biddle and Ashford (1988) found that although those who are active and those who do not differ significantly in relation to their beliefs on health and PA, it is the perception of susceptibility to disease that was associated with sedentary behaviour. The same variable did not differentiate active and inactive individuals in the study of Slenker et al. (1984). According to Buckworth and Dishman (2002), lack of correlation between physical activity and perceived susceptibility (or negative correlations) observed in some studies can prove that PA is not perceived as a health behaviour, but rather a behaviour allowing weight reduction, maintaining physical attractiveness, etc. Given the existing concerns, the objective of our study was to investigate the predictiveness of the HBM in reference to PA of healthy, young adults. We also asked ourselves the question whether the relations between the variables of the model and PA – if they exist – vary depending on the intensity of physical activity.

The results indicate that the strongest predictor of VPA and MPA is self-efficacy, which was incorporated into the HBM from the social-cognitive theory and which proves consequently in numerous studies to be an important correlate of many health behaviours (Heszen & Sęk 2007). Predictors of VPA were also the perceived benefits of physical activity and the perceived barriers. These variables turned out to be correlates of PA in a number of studies, provided, however, that they were evaluated either independently of other variables of the model (especially the perceived barriers), or in the context of other theoretical approaches (like the Transtheoretical Model and the social-cognitive theory).

Other variables suggested by the HBM – and in a way the most specific for it, such as the perception of susceptibility and its severity for the subject – were not predictors of LPA, MPA, or VPA.

Conclusion

The study has shown limited applicability of the model to explain the PA of healthy, young adults. While the importance of the self-efficacy and the perceived benefits for the adoption of PA were confirmed, as well as the negative influence of the perceived barriers, a threat of diseases whose etiology is rooted in the sedentary lifestyle turned out not to be a factor that determines PA of young adults. These findings can be important for the health education process, especially with reference to the promotion of PA.

Generalisation of the findings is limited mainly by their cross-sectional nature. Moreover, it is difficult to compare the obtained results with the findings of other studies, against the inadequate operationalization of the key variables of the HBM, especially measurement tools of proven psychometric properties. Nevertheless, the obtained results make, in the authors' opinion, a valuable contribution to the discourse on the HBM as one of the models on the basis of which we have been trying to comprehend PA and promote it.

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