ORGINAL PAPERS

TRENDS in
Sport Sciences
2013; **4**(20): 197-203.
ISSN 2299-9590

Perceived control variables and leisure-time physical activity of adults

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Aim of Study. **To determine whether and to what extent self-efficacy, perceived fitness competence and perceived behavioral control are related to leisure time moderate-to-vigorous physical activity in adults.** Material and Methods. **The study involved 532 adults (including 379 women) aged 18 to 26 years. Physical activity (PA) was measured by means of a short self-report questionnaire, being a modified version of the very popular Godin Leisure-Time Exercise Questionnaire (GLTQ). Each level of PA was described in a manner which enabled defining it by the participants with examples of activities representative for a given category, with 9 MET criteria for vigorous activity and 5 MET criteria for moderate intensity. Perceived physical competencies were measured by a relevant subscale of the Intrinsic Motivation Inventory (IMI).** Results. **On average, respondents undertook 2.5 hours of MVPA. Males were more active than females, and younger persons more active than older persons. For the whole sample, self-efficacy and perceived behavioral control were the two significant predictors of MVPA. However, in the case of the latter the effect size was small. In self-efficacy a nearly linear increase from sedentary to the most active group was observed. Relationships between perceived competencies, self-efficacy and perceived behavioral control and physical activity were age dependent. The comparison between younger and older adults revealed that in the younger age group all three control variables were related to physical activity, while in the older group only self-efficacy and perceived behavioral control were significant; however, in both cases the effect sizes were weak.**
Conclusions. **The most promising interventions to increase PA are teaching strategies to cope with barriers of physical activity and convincing people that regardless of their levels their physical fitness and motor abilities enable them to be physically active. However, while it seems true for young adults, the factors determining the physical activity of older adults and reinforcement strategies look different.**

KEY WORDS: moderate-to-vigorous physical activity (MVPA), adults, behavioral control, leisure-time.

Received: 15 August 2013
Accepted: 12 November 2013

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Introduction

Despite the multiple well-documented advantages of regular physical activity (PA), its level remains often unsatisfactory [1]. Thus, promoting PA is one of the most important public health tasks. However, it is also a very complex task, taking into consideration the numerous demographic, psychological, social, biological and behavioural factors that determine physical activity. While some of them are unchangeable (e.g. biological factors – sex, genetics or age), others can be changed intentionally (via education, social marketing and other strategies) and unintentionally (via socialization in families and local communities). The challenge to PA sciences is to identify those factors in ourselves and in our environment that are related to PA, especially if they can be changed by interventions. The factors in ourselves are those that originate with the person and they can be organized into categories of demographics (age, sex, socioeconomic status), biomedical (genetics, health status), behavioral (lifestyle, dietary habits) and psychological (cognitive and emotional). According to Buckworth and Dishman: "Identifying determinants that reside in the person is of practical importance because this allows us to distinguish population segments that are responsive or resistant to physical interventions" (p. 192) [2].

In a review of PA correlates of children and adolescents, Sallis et al. identified over thirty psychological factors that can be related to physical activity – some overlapping in meaning – and only in few cases the revealed associations with PA were consistently positive [3]. In a similar review of correlates of PA in adults, Buckworth and Dishman reported nine psychological factors that were positively or negatively correlated with physical activity in adults [2]. Among psychological factors, there is one category of variables that can aspire to the most significant associations with PA: factors that can be termed as control beliefs or (perceived) control variables.

Perceived control refers to one's perception of abilities or resources to influence the environment and oneself as well. The latter refers, among others, to health status and health behaviors, for example, physical activity. When a person believes that he or she has control over his/her behaviors in PA, such behaviors are more likely to be undertaken. In numerous theories of motivation, e.g. socio-cognitive theory, theory of planned behavior, perceived competence theory, or the trans-theoretical model to name but a few, different perceived control constructs can be found: self-efficacy, perceived competence, and perceived behavioral control. Although varying in operationalization, all of them assume that perceptions of control are nearly as important in determining behaviors as real or actual control.

Self-efficacy is a construct proposed by Bandura who defined it as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3) [4]. It can refer to various aspects of human activity and, thus a number of self-efficacy types can be distinguished such as *task self-efficacy* (close to the construct of perceived competencies, and even treated simultaneously with it), *collective self-efficacy*, or – most commonly assessed in physical activity research – *barrier self-efficacy*. Most measures of self-efficacy in physical activity sciences are based on operationalization of the construct as barrier self-efficacy. According to Bandura self-efficacy has a decisive influence on one's behavior: whether we perform a behavior at all; how much effort we will put to it, or how long we will continue it in the face of obstacles. Self-efficacy not only can directly influence our behavior, but also indirectly via other determinants and, therefore, it "occupies a pivotal regulative role in the sociocognitive causal structure" (p. 282) [4]. The predictive role of self-efficacy in physical activity was consequently confirmed in numerous studies [5, 6, 7, 8, 9, 10, 11, 12, 13].

Perceived athletic competence is another construct of control which is considered a determinant of physical activity behaviors. It is defined as "perceptions of ability in sport and athletic endeavors" (p. 432) [14]. Beginning with Robert W. White's seminal theory of *effectance motivation* developed in the 1950s, human desire to demonstrate competence in actions has been regarded as an inherited psychological need [2]. As it was vividly stated by Conroy et al., "achievement motives are, in essence, the phenotypic expressions of the genotypic need for competence" (p. 182) [15]. To satisfy this need one has to successfully perform activities. If not, the feeling of incompetence will cause lack of motivation to engage in physical activity. Therefore, according to Czabański, "even those, who are fully convinced about the importance of physical activity for health, are inactive when they regard themselves as physically incompetent" (p. 4) [16]. Positive correlations between perceived athletic competencies and physical activity were found mostly in children and adolescents [17, 18, 19, 20, 21, 22]. However, in some research, the strength of these correlations was rather weak. The reason for this observed inconsistency in findings may be due to different contexts of physical activity – while the relationship could be stronger in relation to participation in sports, it may be weaker for recreational/health-related physical activity.

The third construct is perceived behavioral control introduced by Ajzen in his Theory of Planned Behavior as one of three determinants of behavioral intention (along with attitude and subjective norms) and a direct determinant of behavior as well [23]. Perceived behavioral control was defined by Ajzen as "the perceived ease or difficulty of performing a behavior, assumed to reflect past experience as well as anticipated impediments and obstacles" (p. 132) [23]. Perceived behavioral control in its meaning is close to self-efficacy and sometimes even regarded as identical with this construct, although the latter is not justified [24, 25].

According to Ajzen, perceived behavioral control may be regarded as a hierarchical cognitive structure comprised of perceptions of one's self-efficacy and *perceived controllability* on the behavior, i.e. the degree to which behavior is perceived as dependent on the individual [23]. Therefore, although both self-efficacy and perceived behavioral control refer to the person's beliefs that he/she can control the behavior in question, they are differently operationalized. The former is defined and measured as confidence in being able to undertake the behavior in the face of impediments to it, while the latter – as how the individual assesses the ease or difficulty in performing the behavior, which can reflect perceived internal or external impediments such as dependence on another person, availability of time and resources, etc.

The aim of the study was to assess whether and to what extent self-efficacy, perceived athletic competence and perceived behavioral control are related to leisure time moderate-to-vigorous physical activity in adults.

Material and Methods

The study sample consisted of 532 adults (including 379 women) aged 18 to 75 years (mean 34.60 ± 19.32). PA was measured by means of a short self-report questionnaire being a modified version of the very popular Godin Leisure-Time Exercise Questionnaire (GLTQ). In the original version of GLTQ participants were asked about how many times they participated in 15-minute blocks of PA; in the modified version participants were asked how many times per week and how long each time (hours, minutes) they engaged in moderate and vigorous physical activity (MVPA). Each level of PA was described in a manner which enabled defining it by the participants with examples of activities representative for a given category, with 9 MET criteria for vigorous activity and 5 MET criteria for moderate intensity.

Perceived physical competencies were measured with a relevant subscale of the Intrinsic Motivation Inventory (IMI) [26], measuring self-assessment of one's physical abilities. Each item was assessed on a scale from 1 to 7. Cronbach's alpha reliability value for the scale was acceptable (0.89). Self-efficacy for physical activity was assessed using an eight-item scale that measured the extent to which participants were confident in their ability to perform leisure-time physical activity in the face of potential barriers or constraints to it [27]. Cronbach's alpha reliability of this scale was acceptable (0.83). Perceived control over participation in physical activity was measured in accordance with Ajzen's conceptualization, with three bipolar items assessing controllability and ease of performing leisure-time physical activity [23]. The Cronbach Alpha reliability coefficient of the scale was 0.71, which is an acceptable value.

Normality of the data was assessed with the K-S and Shapiro-Wilk tests, and homogeneity of variance was assessed with Levene's test. As the distributions of the data were close to normal (with the exception of MVPA with skewness 1.2, the skewness and curtosis of all the remaining data were within the range –1 to +1) and their variances were homogenous, parametric tests were used. All statistical analyses were performed with the STATISTICA v. 10 software package (Statsoft Inc., USA).

Results

The respondents reported undertaking ca. 2.5 hours of MVPA per week (137.2 minutes). However, a considerable dispersion of data was observed – the number of hours of MVPA ranged from 0-6 h per week. There was a significant effect of age on the amount of MVPA, with a decrease in the amount of MVPA with advancing age: $F_{(1.530)} = 57.21$; $p < 0.001$; $R^2 = 0.10$; $ß = –0.31$). Also, in general, males reported nearly two times more hours of MVPA than females. However, there were no differences in males and females within cognitive variables. Descriptive statistics of study variables for males and females with comparisons between both sexes are presented in Table 1.

The influence of predictor variables on PA was determined by comparing each of them between groups of physical activity on the basis of quartiles cut-off points (1st quartile – sedentary group, no physical activity; 2nd quartile – low activity group, to 90 minutes of MVPA; 3rd quartile – moderately active group, to 240 minutes of MVPA; 4th quartile – highly active group, over 240 minutes of MVPA). The results of these comparisons are shown in Table 2. In the case of two variables – self-efficacy and perceived behavioral control – the ANOVA results

Table 1. Descriptive statistics of study variables for total sample and separately for males and females

	Females		Males		Female/male difference	
	mean	SD	mean	SD	t	p
MVPA	108.2	137.1	208.9	179.6	–6.2	<0.001
Competence	3.8	2.7	3.7	0.9	0.1	0.912
Self-efficacy	3.6	0.7	3.6	0.8	–1.2	0.242
PBC	4.0	0.8	3.9	0.87	1.2	0.244

Table 2. Means, one-way ANOVA and post-hoc comparisons for control variables in physical activity groups

Variable	Physical activity groups (mean, standard deviation)				ANOVA; post hoc	ES partial eta^2
	Sedentary a	Low PA b	Moderate PA c	High PA d		
Perceived competencies	3.6 (3.9)	3.6 (0.8)	3.8 (0.7)	4.0 (0.8)	$F_{(3.528)} = 0.88$ $p = 0.450$	–
Self-efficacy	3.2 (0.8)	3.6 (0.7)	3.7 (0.6)	4.0 (0.7)	$F_{(3.518)} = 26.71$ $p < 0.001$ a < b; a, b < d	0.13
Perceived behavioral control	3.8 (0.8)	3.8 (0.8)	4.1 (0.8)	4.2 (0.8)	$F_{(3.502)} = 7.24$ $p < 0.001$ a, b < d	0.04

a, b, c, d – groups of physical activity, respectively: sedentary, low PA, moderate PA, high PA

revealed statistically significant differences between MVPA groups. However, in the case of the latter the effect size was small and post hoc Tukey's comparison found a statistically significant correlation between groups of the first two quartiles and the highly active group. When a less conservative test of the Least Significant Differences was used, an additional difference between the sedentary/low active group and the moderately active group appeared. In the case of self-efficacy, it nearly increased linearly from the sedentary group, achieving the highest mean in a highly active group. However, it should be noted that in the post hoc comparison the difference between the lowly active and moderately active respondents was non-significant. Surprisingly, perceived athletic competencies were similar in all four groups.

The relationship between perceived competencies, self-efficacy and perceived behavioral control and physical activity turned out to be age dependent. When ANOVAs were performed separately for two age groups: younger and older adults (below 40 years of age and over 40 years), they revealed that in the younger age group all three control variables were related to physical activity. The highest effect size was found for self-efficacy (0.19), followed by perceived competencies (0.12), and perceived behavioral control (0.9). In the older group the result of ANOVA was not significant for perceived competencies. For the remaining variables, the results were significant but weak (ES 0.06 for self-efficacy and 0.003 for perceived behavioral control). ANOVA results for the older group revealed significant differences

Table 3. Comparison of young adults (below 40 years) and adults (over 40 years) – ANOVA, post hoc, effect size

	Young adults					Adults				
	Means, post hoc and ANOVA				Effect size	Means, post hoc and ANOVA				Effect size
	a	b	c	d		a	b	c	d	
Perceived competencies	3.3	3.4	3.8	4.0	0.12	3.9	3.8	3.5	4.2	0.00
	$F_{(3.351)} = 15.58$; $p < 0.001$; a, b < c, d					$F_{(3.166)} = 0.15$; $p = 0.927$				
Self-efficacy	3.1	3.5	3.6	4.0	0.19	3.4	3.6	3.6	3.9	0.06
	$F_{(3.352)} = 27.88$; $p < 0.001$; a < b, c < d					$F_{(3.155)} = 3.32$; $p < 0.021$ a,b,c < d				
Perceived behavioral control	3.6	3.7	3.9	4.2	0.09	4.1	4.0	4.3	4.4	0.03
	$F_{(3.336)} = 11.44$; $p < 0.001$; a < c,d; b < d					$F_{(3.155)} = 1.60$; $p < 0.191$				

a, b, c, d – groups of physical activity, respectively: sedentary, low PA, moderate PA, high PA for self-efficacy ($F_{(3.155)} = 3.32$; $p < 0.021$), but not for perceived behavioral control ($F_{(3.155)} = 1.60$; $p < 0.191$) and perceived competencies ($F_{(3.166)} = 0.15$; $p = 0.927$). Even for the former variable the effect size value was weak. Table 3 shows ANOVA, Tukey post hoc comparisons and eta squared values for control variables across physical activity for both age groups.

Discussion

The aim of this study was to examine relationships between the level of leisure-time PA and personal control variables in a sample of adults within a broad age range – from 18 to 75 years. First of all, in line with previous studies, a trend toward decreasing PA with age as well as toward a higher PA level in males than in females was observed.

From the personal control variables, the highest effect size was observed for self-efficacy, which for the whole sample amounted to 0.13, usually verbalized as medium strength of association. As could be expected, those with the lowest sense of efficacy with dealing with constraints to PA were more likely to be sedentary. This finding is in line with previous research in this area, in younger as well as in older participants [5, 6, 7, 13, 25, 28]. The strength of association between PA and self-efficacy was age dependent. While in younger adults (from 18 to 40 years) the effect size was medium-to-large, in older participants it was small, so while in both age groups the stronger self-efficacy, the higher level of physical activity there was, in young adults this relationship was more pronounced. Of course, it should be remembered that self-efficacy could be both a predictor and an effect of PA, i.e. the higher self-efficacy the more likely are physical activity behaviors, and successfully performing such behaviors increases a person's self-efficacy [2].

When calculated for the entire study sample, another statistically significant correlate of physical activity was perceived behavioral control (PBC), operationalized as a sense of controllability over the physical activity behaviors. However, its effect size was very small, and in ANOVA differences merged only using the so-called "least significant differences" post hoc comparison, only between both inactive groups and groups of moderate and high level of physical activity. While self-efficacy is one of the most studied variables of perceived control, both within the original theoretical background and within many theoretical approaches (health belief model, transtheoretical model, health action process approach to name but a few), perceived behavioral control was studied mainly, if not exclusively, within its original background, i.e. Ajzen's theory of planned behavior. As mentioned before, this construct reflects personal and environmental factors that influence people's behavior (for example, subjective as well as objective obstacles) and may directly and indirectly (via behavioral intentions) affect behaviors. The direct influence on the behavior exists especially when perceived control is very close to actual control (or lack thereof) [23]. Although regarded as similar to self-efficacy, studies comparing both above-mentioned constructs showed that they were independent predictors of health behaviors [29, 30]. On the basis of studies of sunscreen and sunbed behaviors, Pertl et al. suggested that "different control beliefs play different roles, depending on the specific behavior to which they are applied. Self-efficacy may play a greater role in a health-protective behaviour and controllability in health 'risk' behaviours" [30]. In the present study PBC was weakly correlated with self-efficacy, and was significantly but weakly correlated with physical activity behaviors. It means that to be physically active it is more important for a person to believe to be in a position to deal with common barriers to physical activity (like lack of time, bad weather, etc.), than to have a strong sense that one's physical activity is easily controlled by oneself. So while convincing people that whether they do or do not undertake physical activity is easy and entirely under their control, much more important is to teach them strategies to overcome barriers to physical activity, organize mastery experiences and show proper role models.

Surprisingly, there were no relationship between the level of PA and scores of athletic competence. However, when respondents' age was taken into account, the situation changed. In younger adults, ANOVA showed a statistical significance between physical activity groups, with almost a linear increase of perceived athletic competence from sedentary to highly active individuals, and with the strength of association between variables nearly moderate. Only the mean of the low active group, although higher than the mean of the sedentary group, was statistically non-significant in Tukey's post hoc test. For the older adults, the results of ANOVA were pointless and eta squared was zero, showing no association between the perceived athletic competencies and PA.

Our findings support the idea that self-efficacy is one of the most influential correlates of physical activity, but at the same time they raise the question about the changing nature of determinants of physical activity of people of different ages. It seems that interventions to increase physical activity should focus on helping people to manage with barriers of physical activity and to convince them that regardless of their levels their physical fitness and motor abilities always enable them to be physically active. However, while it seems true for young adults, the factors determining older adults' physical activity and strategies of its reinforcement look different.

There are three limitations to this study that should be mentioned. Because all participants were students (intramural, extramural, as well as third age students), the findings may apply especially to people of intellectual aspirations, and not necessarily to people of different psycho-social status. The second limitation is the fact that the data were collected through self-report measures and therefore may be biased. Thirdly, because this study was cross-sectional, causal implications between study variables should be treated with caution.

References

1. Drygas W, Kwaśniewska M, Kaleta D, et al. Epidemiology of physical inactivity in Poland: Prevalence and determinants in a former communist country in socioeconomic transition. Public Health. 2009; 123: 592-597.
2. Buckworth J, Dishman RK. Exercise psychology. Champaign: Human Kinetics Publishers. 2002.
3. Sallis JF, Prochaska JJ, Taylor WC. A review of correlates of physical activity of children and adolescents. Med Sci Sport Exer. 2000; 32(5): 963-975.
4. Bandura A. Self-efficacy. The exercise of self-control. W.H. Freeman and Company. 1997.
5. Rudolph DL, McAuley E. Self-efficacy and perceptions of effort: A reciprocal relationship. J Sport Exercise Psychol. 1996; 18(2): 216-223.
6. Oman RF, Kinga AC. Predicting the adoption and maintenance of exercise participation using self-efficacy and previous exercise participation rates. Am J Health Promot. 1998; 12(3): 154-161.
7. Mc Auley E, Peňa MM, Jerome GJ. Self-efficacy as a determinant and an outcome of exercise. In: Roberts GC, eds., Advances in motivation in sport and exercise. Champaign: Human Kinetics Publishers. 2001: 235-262.
8. Winters ER, Petosa RL, Charlton TE. Using social cognitive theory to explain discretionary, "Leisure-time" physical exercise among high school students. J Adolesc Health. 2003; 32: 436-442.
9. Petosa RL, Suminski R, Hortz B. Predicting vigorous physical activity using social cognitive theory. Am J of Health Behav. 2003; 27(4): 301-310.
10. Feltz DL, Payment CA. Self-efficacy beliefs related to movement and mobility. Quest. 2005; 57: 2-36.
11. Beets M, Pitetti K, Forlaw L. The role of self-efficacy and referent specific social support in rural adolescent girls' physical activity. Am J Health Behav. 2007; 31(3): 227-236.
12. Bray SR. Self-efficacy for coping with barriers helps students stay physically active during transition to their first year at a University. Res Q Exercise Sport. 2007; 78(1): 61-70.
13. Duncan SC, Duncan TE, Strycker LA, et al. A cohort-sequential latent growth model of physical activity from ages 12 to 17 years. Ann Behav Med. 2007; 33(1): 80-89.
14. Craft LL, Pfeiffer KA, Pivarnik JM. Predictors of physical competence in adolescent girls. J Youth Adolescence. 2003; 32(6): 431-438.
15. Conroy DE, Elliot AJ, Coatsworth JD. Competence motivation in sport and exercise. The hierarchical model of achievement motivation and self-determination theory. In: Hagger MS, Chatzisarantis NL, eds., Intrinsic motivation and self-determination in exercise and sport. Champaign: Human Kinetics. 2007: 181-192.
16. Czabański B. Model of teaching and learning of motor sports activities. Wrocław: AWF; 1980.
17. Roberts GC, Kleiber DA, Duda JL. An analysis of motivation in children's sport: The role of perceived competence in participation. J Sport Psychology. 1981; 3: 206-216.
18. Klint KA, Weiss MR. Perceived competence and motives for participating in youth sports: A test of Harter's competence motivation theory. J Sport Psychology. 1987; 9: 55-65.
19. William L, Gill DM. The role of perceived competence in the motivation of physical activity. J Sport Exercise Psychol. 1995; 17: 363-378.
20. Mullan E, Albison J, Markland D. Children's perceived physical competence at different categories of physical activity. Pediatr Exerc Sci. 1997; 9: 237-242.
21. Hulya AF, Nazan KS, Ayse KI. The relationship of self-concept and perceived athletic competence to physical activity level and gender among Turkish early adolescents. Adolescence. 2001; 36(143): 499-507.
22. Carroll B, Loumidis J. Children's perceived competence and enjoyment in physical education and physical activity outside school. Eur Phys Educ Rev. 2001; 7(1): 24-44.
23. Ajzen I. Attitudes, personality, and behavior. Chicago: The Dorsey Press; 1988.
24. Dawson KA, et al. Perceived control: A construct that bridges theories of motivated behavior. In: Roberts GC, eds., Advances in motivation in sport and exercise. Human Kinetics Publishers. Champaign. 2001: 321-356.

25. Hagger MS, Chatzisarantis N, Biddle SJH. The influence of self-efficacy and past behaviour on the physical activity intentions of young people. J Sport Sci. 2001; 19(9): 711-725.
26. McAuley E, Duncan T, Tammen VV. Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: A confirmatory factor analysis. Res Q Exerc Sport. 1987; 60: 48-58.
27. Plotnikoff RC, Blanchard C, Hotz SB, et al. Validation of the decisional balance scales in the exercise domain from the transtheoretical model: A longitudinal test. Meas Phys Educ Exerc Sci. 2001; 5(4): 191-206.
28. Neupert SD, Lachman ME, Whitbourne SB. Exercise self-efficacy and control beliefs: Effects on exercise behavior after an exercise intervention for older adults. J Aging Phys Activ. 2009; 16: 1-16.
29. Motl RW, Dishman RK, Ward DS, et al. Comparison of barriers self-efficacy and perceived behavioral control for explaining physical activity across 1 year among adolescent girls. Health Psychol. 2005; 24(1): 106-111.
30. Pertl M, Hevey D, Thomas K, et al. Differential effects of self-efficacy and perceived control on intention to perform skin cancer-related health behaviours. Health Educ Res. 2010; 25(5): 769-779.