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Original Article

Prediction of physical activity factors in Macedonian adolescents

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Abstract:
Background: the aim of this paperwork is to determine the relationship of the demographic, psychological, social and environmental factors with physical activity and to determine whether the indicators of physical activity differ in gender for 847 Macedonian adolescents at the age of 14 to 18 years (N= 847). Methods: Students completed a questionnaire which examined their level of participation in Physical activity and sedentary behaviours along with a number of potential correlates. Hierarchical regression was used to explore the relationship between hypothesized factors and Physical activity. Results: on the basis of the obtained results it can be concluded that boys compared to girls showed significantly higher level of physical activity. Respondents of both genders who have a greater level of self-efficacy, perceive greater benefit from physical activity, have greater confidence in their abilities, enjoy more physical activities, perceive greater social support from friends and parents and have higher level of physical activity. Conclusions: research results suggest the importance of preparing a national plan and a program to promote physical activity in order to help young people to change unhealthy habits and increase physical activity, which can enhance their health.
Key Words*:* - adolescent, physical activity, sedentary, perception, barriers, benefits, self-efficacy, social support

Introduction

Regular physical activity (PA) provides adolescents with important physical, mental, and social health benefits (Department of Health, Physical Activity, Health Improvement and Prevention, 2004). Despite these advantages there has been a rapid decline in physical activity during adolescence. If in early adolescence habits are forms for engaging in physical activity the adolescents are more likely to be physically active in adulthood (Telama & Yang, 1997; Vanreusel et al., 1997; Yang et al., 1999).

Physical activity is a complex behavior being affected by multiple internal and external factors, such as socio-cultural, psychological-cognitive and physical-social environment surrounding the individual. The explanation how the factors affect behavioral change is crucial for preparation of interventions, strategies and educational programs that will contribute to increasing the physical activity level in adolescents (Sallis et al., 2000; Trost et al., 1997). In the Republic of Macedonia there is not a great number of studies that researched the factors which influence the physical activity of Macedonian adolescents, due to which in this study we used data from the literature in English language.

This research has been realized in order (a) to determine the relation of demographic, psychological, social and environmental factors with physical activity, (b) to determine whether the indicators of physical activity differ by gender and (c) to make recommendations for interventions to promote active and healthy lifestyle for this population group.

Material & methods

Participants – Subjects

The research was realized on a sample of 847 Macedonian adolescents at the age from 14 to 18 years. The sample is divided into two subsamples according to gender out of whom 407 are male respondents and 440 are female respondents. The average age of the respondents from both genders was 16,4 years.

The sample included students whose parents had given consent for their son/daughter to participate in the research, and who were psychologically and physically healthy and who regularly attended classes of physical and health education. The respondents were treated in accordance with the Helsinki Declaration. Measurements were conducted in March, April and May 2007, in standard school conditions at regular classes of physical and health education.

Measures

A questionnaire was used to identify (i) demographic factors (ii) the physical activity, (iii) the sedentary behaviour, (iv) the factors associated with physical activity and (v) environmental factors. Demographic factors: The following demographic data and participant characteristics were collected to describe the study sample: Sex,

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Education of the father, Education of the mother, Whether the father is dealing with sport, Whether the mother is dealing with sport, residence place, number of family members.

Physical Activity: Moderate-to-vigorous physical activity (MVPA) was measured using an item modified from the Health-Behaviour in School-aged Children (HBSC) study, which was found to have acceptable reliability and validity (Booth, Okely, Chey, & Bauman, 2001). The respondents were asked to answer how many times per week were involved in physical activity lasting 20 minutes or longer. The students received the following definition for MVPA; 'activity that makes you breathe heavily and increases your heart rate'.

Sedentary behaviours: The respondents were asked to answer a question, how long they spend in sedentary activity such as: watching TV (including watching video or DVDs), computer work (playing computer games, chatting or surfing on the internet). The questions firstly refer to the working days (Monday – Friday), and then to the non-working days. The respondent answers to each item that is fixed at fourteen degree scale, "never", "15 minutes or less", "30 minutes", "1 hour", "1.5 hour", "2 hours","2.30 hour","3 hours", "3.30 hour","4 hours", "4.30 hour", "5 hours", "5.30 hour" and "6 hours and more" (Robinson at. al 1999).

Perceived Benefits. Perceived benefits are assessed by means of a 22-item scale, stating the reasons why some people are physically active. It is of the Likert type of 5 degrees, ranked from 1 (completely disagree) to 5 (totally agree). The result is obtained as an sum value of the responds to all items (Sallis at. al. 1989; Rovniak at. al 2002).

Perceived Barriers. Perceived barriers are assessed by means of a 22-item scale, stating the reasons why some people are not physically active. It is of the Likert type of 5 degrees, ranked from 1 (never) to 5 (very often). The result is obtained as a sum value of the responses to all items (Sallis at. al. 1989; Cheng at. al. 2003; Kenneth at al. 2005).

Exercise Self-Efficacy. Perceived exercise self-efficacy was assessed using the Adolescent's Physical Activity Self-Efficacy Survey, an 8-item scale developed by Marcus et al. (Marcus, Selby, Niaura and Rossi, 1992). Responses ranged from 'very true' to 'not at all true' and a mean score, ranging from 1–5, was computed by sum responses to the eight items.

Perceived Sports Competence. The scale assessing how great the respondents' confidence in their abilities is was constructed by Sallis and the associates (Sallis at. al. 1999). In the scale the respondent compares his capabilities with other persons with the same age and gender. It is one item, graphic scale, consisting of 7 degrees ranging from 1 (much smaller) to 7 (much larger).

Exercise Enjoyment Scale. The scale assessing how much the respondents enjoy physical activity was constructed by Salis and the associates (Sallis at.al. 1999). It is the same of the Likert type, 5 degrees and it is consisted of 6 particles-items. The result is obtained from the average value of all particles. Two variables are received from the scale: enjoying the exercise and enjoyment in the physical education lesson.

Parent Support Scale. The scale assessing the social support from parents was constructed by Prochaska and the associates (Prochaska, Rodgers and Sallis, 2002). The scale is of Likert type, 5 degrees, ranked from 1 (never) to 5 (very often) (example: „in the last year members of my close family verbally encouraged me to participate in sports activities") and it is consisted of 8 particles-items. The result is obtained by summing up the responses of all particles.

Peer Support Scale. The scale assessing the social support from friends was constructed by Prochaska and the associates (Prochaska, Rodgers and Sallis, 2002). The scale is of Likert type, 5 degrees, ranked from 1 (never) to 5 (very often and it is consisted of 4 particles-items. The result is obtained by summing up the responses of all particles.

Environmental factors (South Carolina instrument). This instrument assesses the quality of the settlement, number, condition and proximity of the sports facilities in the vicinity in which the respondent lives and the number of sports tools and items that the respondents have in their home or yard (for example: „is the settlement a nice place for sports, is it safe, number and proximity of the sports facilities, if the people in the settlement in which the respondent lives is physically active, etc."). The instrument was constructed by Answorth and the associates (Answorth et al. 2000), it is combined, some of the questions are Likert type, ranging from 1 to 4, while a part of the questions is answered by the respondents with yes or no.

Statistical Analysis

The data was processed using the statistical package SPSS for Windows Version 20.0. The normality of distribution of public variables is tested with the Kolmogorov-Smirnov method and log transformations were made when possible. The variables that satisfy the criteria of normality were analyzed by using parametric statistical procedures, while the variables that do not meet the criteria of normality are analyzed by using statistical procedures if nonparametric statistical procedures. Independent samples t-tests and Mann-Whitney U tests were used to compare differences in PA for gender. Comparison of means used a two-tailed hypothesis with the alpha levels set at $p < .05$. Spearman's Rho correlation was used to analyze the relationship between PA and potential correlates. Factors associated with PA were entered into hierarchical regression models.

Results

In order to determine whether there are differences in physical activity, sedentary habits, psychological factors, settlement safety, number, proximity and access to sports facilities among male and female respondents, the

Mann-Whitney U test is applied. From the review of the Table 1 in which are the results of the applied analysis it can be seen that between male and female students statistically significant differences are established in the variables: Physical activity (p=.000), Television viewing (p=.003), Computer use (p=.000), time spent in a café (p=.000), Homework (p=.000), self-efficacy (p=.009), confidence in their own abilities (p=.000), Perceived barriers to physical activity (p=,000), enjoying the physical education lesson (p=.000), enjoying the physical activity (p=.000), Parents support (p=.000), Peer support (p=.000) and a number of friends who exercise (p=.000).

Table 1. Means and standard deviations for study variables grouped by gender and Mann-Whitney U tests

	Males		Females		P
	Mean	SD	Mean	SD	
PA	3.52	1.27	2.83	1.15	0.000
Television	158.83	90.64	184.31	95.22	0.003
Computers	131.32	98.39	78.25	82.99	0.000
Cafes	152.78	100.19	198.72	106.17	0.000
Studying	91.38	74.49	144.53	81.28	0.000
Self-confidence	28.27	6.85	26.89	5.88	0.009
Conf - abilities	4.91	1.35	4.01	1.32	0.000
Benefits	89.83	11.24	89.39	9.61	0.480
Barriers	42.81	12.32	49.71	12.72	0.000
Enjoy-lesson	3.96	0.92	3.35	0.96	0.000
Enjoy - pa	4.28	0.71	3.90	0.80	0.000
Support-parents	17.94	5.25	16.11	4.30	0.000
Support-friends	13.88	3.76	10.79	3.34	0.000
Friends-exercises	2.77	1.38	1.71	1.30	0.000
Objects	4.11	2.13	4.25	2.08	0.429
Tools-home	3.55	1.75	3.24	1.43	0.051
Active-people	2.95	0.78	2.90	0.74	0.428
Aesthetic	2.82	0.96	2.86	0.86	0.852
Traffic	2.04	0.87	2.18	0.81	0.026
Paths	2.19	0.86	2.26	0.83	0.295
Light	2.78	0.75	2.81	0.77	0.631
Safety	2.85	0.76	2.70	0.66	0.020
Sotj- objects	2.56	0.79	2.62	0.69	0.379

Table 2. Correlations between Physical Activity and various factors using Spearman's Rho

Variable	Males	Females
Town/village	-.008	-.035
Education-father	.114	.047
Education-mother	.112	.058
Father-sport	.254**	.138**
Mother-sport	.057	.191**
Number-members	.064	-.043
Self-confidence	.549**	.561**
Confidence-abilities	.637**	.535**
Benefits	.475**	.318**
Barriers	-.580**	-.501**
Enjoy-lesson	.241**	.382**
Enjoy-pa	.488**	.519**
Support-parents	.203**	.287**
Support-friends	.257**	.318**
Friends-exercise	.376**	.318**
Objects	.220**	.078
Tools-home	.233**	.237**
Active-people	.147	.077
Aesthetic	.229**	.116*
Traffic	-.129	.080
Paths	.168*	.034
Lightning	.100	.040
Safety	.230**	.078
Soto-objects	.266**	.105*
Television	-.165*	-.043
Computers	-.207**	.054
Café	-.036	-.072
Studying	-.003	.056

Table 2 presents the coefficients of correlation between physical activity and demographic, social, psychological variables, variables assessing the physical environment and sedentary habits among respondents of

both genders. From the review of the table it can be seen that for male respondents it is determined low statistically significant positive correlation (ranging from. 220 to . 266) between physical activity and the variables, if the father did sports, enjoying the physical education lesson, social support from parents and friends, number of sports facilities in the settlement, the aesthetic appearance of the settlement, settlement safety and situation of the facilities in the settlement. Low statistically significant negative correlation is established between physical activity and the time spent on computer. Moderately positive statistically significant correlation (ranging from .475 to .637) for male respondents is determined in the variables self-efficacy, confidence in their own abilities, Perceived benefits from physical activity and Perceived barriers to physical activity and enjoying the physical activity and number of friends who exercise. For female respondents it is determined a low statistically significant positive correlation (ranging from .138 to . 287) between physical activity variables, if the father did sports, if the mather did sports, Parents support, number of tools at home.

Moderately positive statistically significant correlation (ranging from . 318 to .561) for female respondents is defined in the variables self-efficacy, confidence In their own abilities, Perceived benefits from physical activity and Perceived barriers to physical activity and ejyoning the physical activity and physical education lesson, Peer support, and number of friends who excerise.

In order to determine how the multi-variant affect the demographic, social and psychological factors on physical activity the hierarchical regression analysis is applied. The results from the regression analysis are shown in the Table 3. The first regression equation explains 11.6% ($p<0.001$) of the total variability of the criteria variable, with statistically significant impact on the predictory variables gender, age, if the father did sport and if the mother did sports. With the inclusion of the three variables for estimation the social support in the second step the amount of the explained variance incerased to 23.9% ($p<0.001$), and coefficients of the linear relation in the equation for this system of 3 predictors with the level of physical activity is $R=0.489$ ($p<0.001$). social support form parents ($\beta=.123$, $p<0.01$), social support from friends ($\beta=.161$, $p<0.001$) and the number of friends who excerise ($\beta=.259$, $p<0.001$) are important determinants which have statistically significant influence on the criterion variable physical education. With the inclusion of psychological variables in the third block the amount of explained variance increased to 54.8% ($p<0.001$). From the overall predictory system statistically significant influence have variables self-efficacy ($\beta=.218$, $p<0.001$), confidence in their own abilities ($\beta=.242$, $p<0.001$), Perceived barriers to physical activity ($\beta=-.178$, $p<0.001$) and enjoying the physical activity ($\beta=.126$, $p<0.01$).

Table 3. Hierarchical regression analyses explaining PA

Variable	ß	Partial r	$ß_1$
Demographics	**R = .341 R^2 = .116*** **		
Gender	-,217***	-,220	-,005
Group	-,087*	-,091	,001
Town/village	,016	,016	,002
Education-father	,031	,028	,030
Education-mother	,041	,036	,003
Father-sport	,157***	,162	,054
Mother-sport	,122**	,124	,029
Number-members	,026	,028	-,004
Social	**R = .489 R^2 = .239*** **		
Support-parents	,123**	,127	,031
Supports-friends	,161***	,156	,059
Friends-exersice	,259***	,257	,105**
Psychological	**R = .740 R^2 = .548*** **		
Self-confidence	,218***	,562	,218***
Confidence-abilities	,242***	,594	,242***
Benefits	,052	,390	,052
Barriers	-,178***	-,544	-,178***
Enjoy-lesson	,023	,390	,023
Enjoy-pa	,126**	,548	,126**

Note. Partial r – partial correlation coefficient; ß – standardized partial regression coefficient; $ß_1$- value of ß-coefficient in the last equation analysis; R – Multiple correlation coefficient; R^2 – change the coefficient of determination; Significance. * p < .05. ** p < .01. *** p < .001.

After inclusion of the third block of the psychological variables, demographic variables gender, age, if the father did sport, if the mother did sport and the variables for social support from friends and parents in the final regression equation become statistically insignificant. This suggests that there is co-linearity between the social support from parents and friends and psychological determinants, approval self-efficacy and confidence in

their own abilities. At this age, the adolescents who perceive greater social support from friends and parents have higher self-efficacy and confidence in their own abilities, two variables that have the highest beta coefficients of partial correlation with physical activity.

Discussion

The explanation how the factors affect on behavioral change is crucial in the preparation of interventions, strategies and educational programs that will contribute to increasing of the levels of physical activity for high school population (Sallis et al., 2000; Trost et al., 1997). In this study are researched the demographic, social, psychological and the variables for assessing the physical environment in order to understand their influence on the change in physical activity for high school population in the region.

Although in the world on this topic is realized a number of studies in many countries (different geographic areas), the question arises whether the results of these researches can be generalized to the population of Macedonian adolescents have their own unique cultural, social, religious and other specifics. The results obtained in our research to some extent overlap with the results obtained from the international research.

Most of the previous researches suggest that the level of the physical activity for girls is lower compared to the boys (Macera et al. 2005; Muntner et al. 2005; Dominguez-Berjon et al., 1998; Ammouri et al., 2007; Higgins, Gaul, Gibbons, & Van Gyn, 2003; Kristjansdottir & Vilhjalmsson, 2001; Loucaides et al., 2007; Raudsepp, 2006; Sherrick-Escamilla, 2007; Shi et al., 2006; Vilhjalmsson & Thorlindsson, 1998; Wu & Jwo, 2005). Also, boys perceive greater degree of self-efficacy, they believe more in their abilities, perceive greater degree of barriers to physical activity, enjoy more physical activity and physical education lesson, perceive greater social support from friends and parents, have more friends exercising and more time spent on computer. Girls unlike boys spend more time in studying, in café and watching television. The social environment in which physical activity is carried out has crucial impact on young people. Family members, friends, teachers and coaches can play an important role in promoting physical activity among adolescents. The social impact can function through various mechanisms, including encouragement, modeling of activity, joint activity and practical support. The results of our research have shown that parents can influence the physical activity for adolescents of both genders. The previous research suggests that the role of parents in promoting physical activity for their children can take various forms, such as the transfer of positive attitudes and values (Iannotti et al., 2005), participation in joint activities (Stucky-Ropp & DiLorenzo, 1993), organizing the activities (Stucky-Ropp & DiLorenzo, 1993; Anderssen & Wold, 1992) and providing transportation to places where they can be physical active (Sallis, et al., 1992). The research has shown that boys perceive greater social support from parents unlike the girls, while the social support from parents is more important determinant of which depends on “if” and “how many” girls will be physically active.

Other characteristics of the family, such as gender, age, place of residence, socio-economic status, education of parents can influence the physical activity among adolescents. The results of our research indicate that gender and age affect the physical activity. The male respondents are physically more active, but the age is in inverse relation to the physical activity. This is demonstrated in a number of previous researches (Ammouri et al., 2007; Kristjansdottir & Vilhjalmsson, 2001; Neumark-Sztainer et al., 2003). As adolescents became older, the level of PA decreased. One study (Shi, Lien, Kumar, & Holmboe- Ottesen, 2006) found that age was not significantly correlated with PA.

The sporting tradition in the family (parent as a model, especially father) influences the physical activity among respondents of both genders. The results from the Framingham Heart Study suggest that children of active parents have almost 6 times more probability to be physically active compared to children of inactive parents (Moore L.L. et al. 1991).

The social support from their friends and especially the activity of the group (number of friends who exercise) is important determinant that can help increase physical activity among young people. This is confirmed in several previous researches realized in children, pre-adolescents and adolescents (Anderssen and Wold 1992; Zakarian et al. 1994).

The self-efficacy is the belief in your own abilities in trying to fulfill a task. Self-efficacy is based on the idea of the importance of the subjective experience of personal competence in realizing in different ways, and not the actual knowledge, skills and abilities. Self-efficacy is not estimated as personality trait, but as a belief in your own abilities to coordinate the knowledge and skills to achieve the desired goal. The personal factors (cognitive, emotional and biological), environmental factors and behavior have an interactive impact in the model of mutual determinism (Bandura 1997). The results of this research show that the self-efficacy and confidence in your own abilities which are the construct of the socio-cognitive theory are the most important determinants that influence the physical activity among adolescents of both genders. The results of other researches have shown that the self-efficacy directly and immediately affect the physical activity in children and adolescents (Chang, 2004; DiLorenzo et al., 1998; Dowda et al., 2007; Jago et al., 2007; Loucaides et al, 2007; Motl, et al., 2007; Neumark-Sztainer et al., 2003; Petosa, et al., 2005; Pis, 2006; Sherrick-Escamilla, 2007; Wu, 1999; Wu & Jwo, 2005; Wu & Pender, 2003)

There are two cognitive variables that can determine the level of physical activity, perceived barriers and perceived benefits. Perceived benefits can impact positively while perceived barriers negatively on the level

of physical activity (Buckworth i Dishman 1999). The research results suggest that the degree of perceived barriers is in negative relation to physical activity for respondents of both genders. The same is confirmed by researches of Stucky, DiLorenzo, Tappe, Duda, Menges, Zakarian (Stucky-Ropp and DiLorenzo 1993; Tappe, Duda, Menges-Ehrnwald 1990; Zakarian et al. 1994).

Indulging in physical activity is also a strong predictor of physical activity in adolescents of both genders. The concept of pleasure is defined as a multidimensional construct that is consisted of factors associated with affect, competence, attitude, and cognition (Crocker, Bouffard & Gessaroli 1995; Wankel, 1997). According to Scanlan and Simons (1992) indulging is an important factor for physical activity and sports activity and may contribute to increased participation in the activity. Research has also shown that enjoyment is an antecedent of physical activity. Rowland and Freedson (1994) state that providing an enjoyable experience is potential strategy to increase the level of physical activity in youth. Wallhead and Buckworth (2004) found that the enjoyment in the physical education lesson is in relation to the motivational factors that are related to the formation of the habit of an active life outside the school. Besides, the enjoyment is associated with physical engagement at physical education lessons (Kremer, Trew & Ogle 1997; Wallhead & Buckworth 2004). Soini (2006) stated statistically significant gender differences in the enjoyment of the physical activity among adolescents between the 15 years old adolescents. According to the research results of Soini, the boys enjoy more in the physical activity compared to the girls.

This research does not confirm the statistically significant relation between the sedentary habits (watching TV, computer use, time spent in a cafe) and physical activity. The fact that students of both genders much of their free time spent on watching TV or using a computer, on average 4.5 hours per day is concerning. The World Health Organization and the Health Organization by the Commonwealth (Commonwealth Department of Health and Ageing, 2004), recommended that „children and young people should not spend more than two hours per day on watching television or using a computer (surfing, chatting or playing computer games)". The research results show that 82% of the respondents of both genders on a daily basis on the weekdays spend more than two hours working on electronic media which is a worrying fact. The researches also suggest that the chances of adolescents to have metabolic syndrome, risk factor for future cardiovascular disease or diabetes 2 type increases proportionally with each additional hour on watching TV, independently of physical activity (Mark A.E., et al. 2008).

The research results provide indications that the Macedonian adolescents certain variables for assessing the physical environment influence on the physical activity, especially for male gender. Low positive correlation for both genders is established between physical activity and the number of sports tools and items to the respondent. For the male respondents the low positive correlation is established between physical activity and the number and proximity to sports objects in the settlement, the aesthetic appearance of the settlement, the safety, and the condition of the sports facilities in the settlement. Greater relation between the physical environment and the physical activity for male respondents is probably due to the fact that the most of the girls at this age if they exercise want to participate in a sports or fitness club compared to boys that have spontaneous physical activity outdoors and they more use the external fields. The impact of the physical environment on physical activity has been demonstrated in several pervious researches conducted for adolescents and pre-adolescents by Butcher, Strucky and DiLorenzo (Butcher 1983; Stucky-Ropp and DiLorenzo 1993).

Based on the all above stated it can be concluded that it is necessary to develop a national plan and a program to promote the physical activity in order to help young people to change unhealthy habits and increase physical activity, and thus improve their health. These strategies, plans and programs should take into account the specifics of the environment, customs and cultural characteristics of the region.

Changes can be achieved through a wide change in policy and practice, in particular through increased cross-sectoral cooperation and the adoption of new roles of the various entities that are already well established and respected in their fields of competence. Basically it takes small changes in policy and practice in order to promote and increase the physical activity for young people.

Conclusions

On the basis of the obtained results it can be concluded that the boys unlike girls perceive greater degree of self-efficacy, they believe more in their abilities, perceive a greater degree of barriers to physical activity, enjoy more physical activity and physical education lesson, perceive greater social support from friends and parents, have more friends who exercise and more time spent on computer. Girls unlike boys spend more time on studying, in a café and watching television.

Respondents of both genders who have higher self-efficacy, confidence in their abilities, have a lower level of perceived barriers, enjoy more physical activity, perceive greater social support from parents and friends and have more friends who exercise, have higher level of physical activity. The residence place and education of parent for both gender is correlated with physical activity. Sporting tradition in the family, especially the father as a model have influence on physical activity for respondents of both gender. The number of sports tools and items is correlated with low physical activity and the condition of sports facilities and the aesthetis appearance of the settlement is in low correlation with physical activity for male gender. In both gender it is not determined a

significant association between the sedentary habits (watching TV, computer use, studying) and physical activity.

The research results suggest the importance of preparing a national plan and a program to promote the physical activity in order to help students to change the unhealthy habits and increase the physical activity and thus can enhance their health

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