

# Perceived constraints on exercise in the group of the elderly: a pilot study

Research Article

Migle Baceviciene\*, Justas Alisauskas

*Lithuanian Sports University, Laboratory of Physical Activity Epidemiology,  
Sporto str. 6, city: Kaunas, LT-44221, Lithuania*

Received 5 July 2012; Accepted 25 March 2013

**Abstract:** The aim of this study was to evaluate psychometric properties of the perceived constraints on the physical exercise scale and to indicate the most important perceived constraints that restrict the elderly from exercise. 160 persons (aged 60-89) living in Lithuania, Kaunas city were interviewed in 2011. Physical activity was assessed using a short version of International Physical Activity Questionnaire. Constraints on physical exercise were determined according to a structured list of statements consisting of five domains: poor health, fear and negative experiences, lack of knowledge, lack of time and interest, and unsuitable environment. Perceived constraints on the exercise scale demonstrated satisfactory internal consistency and good construct validity: Cronbach's alpha coefficients of internal reliability were above the standard ( $\geq 0.7$ ) with the exception of lack of knowledge domain. Exploratory factor analysis revealed a five-factor solution that accounted for 67.4% of the variance. Fear and negative experience during exercise increased the odds of insufficient physical activity by 3.3 (1.16-9.59) times whereas lack of time and interest - by 7.2 (2.98-17.31) times. Perceived constraints on the exercise scale is a suitable measure for the elderly investigations. Perceived constraints that most restrict elderly people from exercise were lack of time, interest, fear of falling and injuries.

**Keywords:** *Physical activity • Constraints on exercise • Elderly • Health*

© Versita Sp. z o.o.

## 1. Introduction

There is strong scientific evidence that regular physical activity (PA) produces major and extensive health benefits in both younger and older adults [1]. In some cases the evidence of health benefits is the strongest in older adults because the outcomes related to inactivity (obesity, chronic diseases, depression, and smaller muscle strength) are more common in older adults [2]. Regular PA plays an important role in improving and maintaining health and quality of life, especially for aging individuals [3,4]. Conclusive evidence shows that both moderate-intensity and vigorous-intensity activity provide similar health benefits. With increasing age the number of perceived constraints and barriers on PA increases as well. Reasons that restrict the elderly from an active lifestyle may be classified into internal (personal) and external (environmental) whereas the most common personal barriers for exercise are chronic health problems, obesity, pain, tiredness, lack of knowledge and skills, and psychological aspects like fear of falling, mood disorders, etc. [5-8]. Minimizing per-

sonal and environmental constraints on PA may help to increase PA participation among seniors [9].

The proportion of elderly population is increasing worldwide. The proportion of Lithuanians aged 60 and over is 21.2% and 16.2% - aged 65 and over [10]. These numbers are steadily increasing for the general Lithuanian population of elders. Population-based studies revealed high prevalence of the risk factors and chronic health conditions in Lithuanian elderly [11]. Aspects of motives and barriers on PA in the elderly have not been studied in Lithuania before. Moreover, there is no information whether perceived constraints can explain an increased odds for physical inactivity among older people. The integral part of perceived constraints analysis and interpretation is translation procedure and validity and reliability evaluation of the questionnaire. In Lithuania psychometric standards of any perceived constraints on exercise scale were not confirmed before. Thus, the aim of this study was to evaluate psychometric properties of the perceived constraints on the physical exercise scale and to indicate the most important perceived constraints that restrict the elderly from physical exercise.

\* E-mail: migle.baceviciene@lsu.lt

## 2. Materials and methods

### 2.1 Study organization

The study was conducted in 2011 August – November in Kaunas city. The information about PA, health aspects and perceived constraints on exercise was collected using the interview method for each participant. All the study participants were randomly selected from the National population registry of Kaunas city and during health examination 160 volunteers completed an additional questionnaire about perceived constraints on exercise (62 men and 98 women). The average age of the respondents was  $70.6 \pm 7.5$  years. The investigation was approved by the Kaunas Regional Biomedical Research Ethics Committee.

### 2.2 Interview

PA was assessed using a short version of the International Physical Activity Questionnaire (IPAQ) [12]. Four days a week and more of moderate and/or vigorous PA for at least 30 minutes was considered as adequate.

Constraints on physical exercise were determined according to a structured list of statements from which the participants chose “agree” or disagree” for each statement. The list was created on the basis of previous research in Finland and the advice of the panel of experts [13]. Double translation of the scale from Finnish to Lithuanian was performed and logical discrepancies were corrected. Cultural adaptation of the instrument was performed after the pre-pilot study of 10 persons.

Self-reported body weight and height were used to calculate body mass index (BMI): weight in kilograms was divided by height in meters squared. The normal body weight was defined as BMI 18.5-24.9 kg/m<sup>2</sup>; overweight – BMI 25.0-29.9 kg/m<sup>2</sup> and obesity – BMI  $\geq 30.0$  kg/m<sup>2</sup>.

The study participants were asked to rate their health and to indicate health disorders. Self-rated health was divided into five levels based on the information from the questionnaire: very good, good, average, poor and very poor.

### 2.3 Statistical analysis

Firstly, chi square tests were used to assess the association between categorical variables. Internal consistency of perceived constraints on PA scale were evaluated by Pearson’s correlation coefficients and by Cronbach’s  $\alpha$ . Secondly, to evaluate the construct validity of the scale, exploratory factor analysis with orthogonal varimax rotation was conducted and factors’ scores were calculated. The Kaiser–Meyer–Olkin (KMO) test was used to measure sample adequacy. Factor scores variables were categorized into negative and positive. Positive values of each perceived constraint factor score indicated higher importance of a particular perceived constraint

on PA. And finally, the binary logistic regression was employed to estimate the effect of different aspects of perceived constraints on inadequate PA. The Hosmer – Lemeshow goodness of fit test was conducted for both models analyzed with logistic regression [14]. A dichotomous dependent variable was constructed by dividing the study sample into two groups of inadequate (1) and adequate (0) PA. P value  $< 0.05$  was considered as statistically significant. SPSS version 19.0 was used for statistical analysis.

## 3. Results

Sample characteristics are presented in Table 1. PA in 51.9% of the responders was inadequate. 58.2 % of women and 41.9% of men were insufficiently physically active ( $\chi^2=4.0$ ,  $df=1$ ,  $p<0.05$ ). Physical inactivity was found in 65.1% of the responders aged  $\geq 70$  years and in 37.7% of the study participants aged  $< 70$  ( $\chi^2=12.0$ ,  $df=1$ ,  $p<0.01$ ). 41.9% of men and 46.9% of women were overweight, 17.7% of men and 22.4% of women were obese ( $\chi^2=1.7$ ,  $df=2$ ,  $p>0.05$ ).

**Table 1.** Characteristics of the study sample (160 urban Lithuanian adults aged 60-89 screened in 2011).

Variables	n	%	
Gender	men	62	38.8
	women	98	61.2
Age group	60-69	77	48.1
	$\geq 70$	83	51.9
Marital status	single (never married)	13	8.1
	married	78	48.8
	divorced	21	13.1
	widowed	48	30.0
Education	primary/incomplete secondary	11	6.9
	secondary	31	19.4
	vocational	36	22.4
	college	20	12.5
Social status	university	62	38.8
	pensioners	126	78.7
	employed pensioners	21	13.1
	employed	10	6.3
Self-rated health	unemployed	3	1.9
	very good/good	66	41.3
	average	73	45.6
Body mass index	poor/very poor	21	13.1
	normal weight	55	34.4
	overweight	72	45.0
Physical activity	obesity	33	20.6
	inactive	77	48.1
	active	83	51.9

The analyses presented in Table 2 show that perceived constraints such as not used to exercise (63.9%), no skills for exercising (56.6%), don't like exercising alone (55.4%), feelings of discomfort during exercise (32.5%) and insecure when exercising outdoors (30.1%) were strongly associated with insufficient PA in the elderly ( $p < 0.0001$ ).

Good internal consistency of the questionnaire satisfied the requirement for positive and significant correlation between the items inside the domains (Table 3). Cronbach's alpha coefficients of internal reliability were above the standard ( $\geq 0.7$ ) with the exception of lack of knowledge domain (0.67).

The Kaiser-Meyer-Olkin (KMO) resulted in a measure of sampling adequacy of 0.78, and the Bartlett's test of sphericity ( $\chi^2 = 2277.9$ ,  $df = 253$ ,  $p < 0.0001$ ) indicated the appropriateness to proceed with factor analysis. The five-factor solution accounted for 67.4% of the total variance, had a good structure and was meaningfully interpreted. The first factor explained 18.2% of the variance and included all items relating to fear and negative experience during physical exercise (Table 4). The second factor explained 17.9% of the variance and was defined by all items from lack of time and interest for

exercise domain. Items of no skills for exercising (lack of knowledge domain) and unsuitable weather conditions (unsuitable environment domain) were also attributed to the second factor. The third factor explained 12.1% of the variance and encompassed four items related to the unsuitable environment domain. The fourth factor explained 10.5% of the variance and comprised the items relating to physical health (pain, diseases, tiredness, poor eyesight, etc.). The fifth factor explained 8.7% of the variance and included three items from lack of knowledge domain.

**Table 3.** Psychometric evaluation of the constraints on physical activity scale (160 urban Lithuanian adults aged 60-89 screened in 2011).

Constraints to physical activity	No. of items	Cronbach's $\alpha$	r	min.	max.
Poor health	5	0.80	0.44	0.22	0.75
Fear and negative experiences	4	0.86	0.61	0.52	0.86
Lack of knowledge	4	0.67	0.34	0.21	0.72
Lack of time and interest	4	0.84	0.56	0.37	0.84
Unsuitable environment	5	0.78	0.42	0.18	0.72

*r* – mean Pearson correlations between items, *min.*, *max.* – minimal and maximal Pearson correlation values.

**Table 2.** Prevalence of constraints on physical exercise according to physical activity (160 urban Lithuanian adults aged 60-89 screened in 2011).

Constraints on physical activity	Inactive		Active		p	
	n	%	n	%		
<b>Poor health</b>	Pain	28	33.7	17	22.1	>0.05
	Diseases	23	27.7	8	10.4	<0.01
	Poor eyesight	5	6.0	6	7.8	>0.05
	Warnings not to exercise	1	1.2	2	2.6	>0.05
	Too tired	17	20.5	7	9.1	<0.05
<b>Fear and negative experiences</b>	Fear of falling	26	31.3	8	10.4	<0.01
	Fear of injury	30	36.1	10	13.0	<0.01
	Exercise feels uncomfortable	27	32.5	3	3.9	<0.0001
	Insecure when exercising outdoors	25	30.1	6	7.8	<0.0001
<b>Lack of knowledge</b>	Too old to exercise	8	9.6	3	3.9	>0.05
	Don't know why should exercise	5	6.0	2	2.6	>0.05
	Don't know where to exercise	10	12.0	3	3.9	>0.05
	No skills for exercising	47	56.6	22	28.6	<0.0001
<b>Lack of time and interest</b>	No time to exercise	20	24.1	11	14.5	>0.05
	No interest in exercising	48	57.8	17	22.1	<0.0001
	Enough other interests	32	38.6	23	29.9	>0.05
	Not used to exercise	53	63.9	21	27.3	<0.0001
<b>Lack of company</b>	Don't like exercising alone	46	55.4	20	26.0	<0.0001
<b>Unsuitable environment</b>	Unsuitable weather conditions	34	41.0	24	31.2	>0.05
	Unsuitable neighbourhood	7	8.4	5	6.5	>0.05
	Exercise facilities are too far away	6	7.2	3	3.9	>0.05
	Exercising is too expensive	8	9.6	2	2.6	>0.05
	No equipment needed for exercising	21	25.3	17	22.1	>0.05

**Table 4.** Factors and factors' loadings of constraints on physical activity (160 urban Lithuanian adults aged 60-89 screened in 2011).

Constraints on physical activity	Factors* and factors' loadings				
	fear	interest	environment	health	knowledge
<b>Poor health</b>					
Pain				0.525	
Diseases				0.590	
Poor eyesight				0.751	
Warnings not to exercise				0.736	
Too tired				0.604	
<b>Fear and negative experiences</b>					
Fear of falling	0.872				
Fear of injury	0.825				
Exercise feels uncomfortable	0.765				
Insecure when exercising outdoors	0.723				
Lack of knowledge					
Too old to exercise					0.551
Don't know why should exercise					0.893
Don't know where to exercise					0.814
No skills for exercising		0.787			
<b>Lack of time and interest</b>					
No time to exercise		0.701			
No interest in exercising		0.789			
Enough other interests		0.795			
Not used to exercise		0.855			
Don't like exercising alone		0.785			
<b>Unsuitable environment</b>					
Unsuitable weather conditions		0.485			
Unsuitable neighbourhood			0.816		
Exercise facilities are too far away			0.873		
Exercising is too expensive			0.865		
No equipment needed for exercising			0.562		

KMO = 0.78,  $p < 0.0001$ ; \* factors' loadings  $< 0.4$  are suppressed.

**Table 5.** Predictors of insufficient physical activity in elderly, multivariable analysis (160 urban Lithuanian adults aged 60-89 screened in 2011).

Constraints on physical activity	Model 1 (unadjusted)			Model 2*		
	OR	95% CI	p	OR	95% CI	p
Fear and negative experiences	<b>3.58</b>	<b>1.49-8.63</b>	<b>0.004</b>	<b>3.34</b>	<b>1.16-9.59</b>	<b>0.025</b>
Lack of time and interest	<b>3.96</b>	<b>1.92-8.16</b>	<b>&lt;0.0001</b>	<b>7.18</b>	<b>2.98-17.31</b>	<b>&lt;0.0001</b>
Unsuitable environment	0.46	0.18-1.17	0.10	0.60	0.21-1.72	0.34
Poor health	0.64	0.25-1.61	0.34	0.46	0.15-1.36	0.16
Lack of knowledge	1.43	0.54-3.83	0.47	2.91	0.91-9.32	0.07

OR – odds ratio, CI – confidence interval; \* - adjusted for age, education and body mass index.

According to the number of perceived constraints on PA, all the responders were categorized into four groups: no constraints, 1-4 constraints, 5-6 constraints and  $\geq 7$  constraints. Only 34.4% of men and 28.6% of women have not indicated any perceived constraints on exercise whereas women indicated higher number of perceived constraints on exercise as compared to men ( $\chi^2=9.4$ ,  $df=3$ ,  $p<0.05$ ). With increasing number of perceived constraints on exercise the proportion of

physically active people decreased: in the group with no constraints there were 40.8% of physically active persons whereas in the group with the largest number of perceived constraints only 11.8% of the responders were physically active ( $\chi^2=16.7$ ,  $df=3$ ,  $p<0.01$ ). In the group of poor and very poor perceived health the largest part of the responders also indicated seven and more perceived constraints on the exercise ( $\chi^2=26.0$ ,  $df=6$ ,  $p<0.0001$ ). The most common health disorders in the

group of the elderly were heart trouble (43.8%) and joint/spine dysfunctions (36.3%). Individuals who had more health complaints also indicated more perceived constraints on the exercise ( $\chi^2=15.1$ ,  $df=6$ ,  $p<0.05$ ).

Perceived constraints that most restrict elderly people from exercise were lack of time and interest and fear of falling and injuries. Unadjusted and multivariate-adjusted (age, education and BMI) odds ratios for the insufficient PA are shown in Table 5. Fear and negative experience during exercise increased the odds of insufficient PA by 3.3 times whereas lack of time and interest – by 7.2 times.

## 4. Discussion

The list of perceived constraints on exercise was created on the basis of previous research in Finland and the advice of the panel of experts [13]. The original list consisted of 24 constraints on physical exercise [15]. All different constraints listed here showed a good reliability ( $\kappa=0.417-1.00$ ) among the persons screened in Finland aged 75–81 [16]. Our data confirmed a satisfactory internal consistency and good construct validity of the scale and suitability for population-based screening purposes.

According to our data, more than half of the interviewed persons did not meet the World Health Organization (WHO) PA recommendations. Physical inactivity was strongly related to the number of perceived barriers on PA. A qualitative study by the USA focus group described physically inactive person as “probably more depressed because of not having those endorphins circulating,” and as “someone who is not very happy and complains a lot and just sits around and doesn’t do hardly any activities” [17]. Social isolation, mobility limitation due to chronic illness and difficulties in self-care were also noted as important aspects decreasing PA of seniors.

In our study only 6.7% of the responders indicated too old age as perceived barrier on exercise but still older age was associated with insufficient PA. According to South Australian Spring Health Omnibus Survey, advancing age was significantly associated ( $p<0.001$ ) with reduced PA [18]. Barriers on PA such as injury and illness were associated with being older and single. The majority of all age groups (72%) agreed that it is never too late to improve muscle strength through PA, no matter what age an individual is.

Individuals with fear of falling are more likely to report reductions in levels of PA and reduced ability to perform activities of daily living [19,20]. In the group of interviewed Lithuanian adults more than 20% of the participants as a barrier on PA noted fear of falling and injury during exercise. Multivariable logistic regression re-

vealed fear of falling and injuries increased the odds of physical inactivity by 3.34 times (95% PI 1.16-9.59). In Australia the results of population-based study of 4,312 community dwelling women aged 70 and older revealed fear of falling was present in 33% of subjects at baseline and developed in 30% of women who had been free of the symptom at baseline after 3 years of follow-up [6]. Fear of falling was independently associated with living alone status, obesity, cognitive impairment, depression, and impairments in balance and mobility. Women with decreased physical function and lack of PA were more likely to experience fear of falling.

Psychological factors, social support and health are associated with initiating and maintaining physically active lifestyle. Physical health and integrating PA within everyday activities are very important for adherence to PA [21,22]. 60.6% of our study participants indicated one or more chronic health disorders. The most common health disorders in the group of the elderly were heart trouble (43.8%) and joint/spine dysfunctions (36.3%), 16.3% suffered from diabetes. 45.6% of the responders rated their health as average, 13.1 – as poor or very poor. Both number of health disorders and perceived-health status were strongly associated with PA level and perceived barriers on exercise. Besides, chronic pain, as a barrier for any activity, was indicated by 28.1% of our responders, whereas diseases and tiredness – by 19.4% and 15.0%, respectively. Analyzing potential barriers to self-management in individuals aged 65 or older, who had coexisting diagnoses of diabetes, depression, and osteoarthritis, 50% of the responders reported fair or poor health [5]. Potential barriers to self-management significantly associated with lower levels of physical functioning were higher level of morbidity, greater financial constraints, greater number of compound effects of conditions, persistent depressive symptoms, higher level of patient-clinician communication, and lower income. In Finland, the study of community-living people aged 75–81 concluded that a higher prevalence of comorbidities, pain, tiredness, fear of falling and injury, discomfort and feelings of insecurity when exercising explained almost half of the increased risk of physical inactivity of older severely obese people [7]. Accordingly, our results confirmed the association of obesity with higher PA limitation and more perceived constraints on exercise.

In contrast to the elderly Fins study [7], the most common reason of not exercising in the Lithuanian sample was lack of time and interest and this perceived constraint increased the odds of insufficient PA by 7.18 times (95% PI 2.98-17.31). This may be also due to lack of knowledge about beneficial effects of regular exercising [23]. The study of Mexican older adults identified that 67.6% of respondents did not meet PA recommendations

of at least 150 minutes per week. Overall, the most frequently reported barriers on physical exercise included “lack of time,” “very tired,” and “lack of self-discipline”.

Problems in gaining access to facilities (dislike of going out alone or in the evening) deter some older people from going out [24,25]. Our study results revealed that 36.3% of the responders were complaining about bad weather conditions and indicated bad weather as a constraint on exercising outside but no statistically significant environmental predictors for physical inactivity were obtained. Senior Neighborhood Quality of Life Study provided some support for ecological model predicted interactions between built environment and psychosocial factors in explaining PA among older adults [26]. PA minutes were greater when both psychosocial and environmental factors were supportive of PA. Summarizing across the interactions, living in a supportive environment (vs. un-supportive) was related to 30–59 more minutes of PA per week for participants with more positive psychosocial attributes, but only 0–28 more minutes per week for participants with less positive psychosocial attributes. Walking for transportation was significantly related to multiple perceived neighborhood attributes, although walking for leisure was not [27]. Only two environmental attributes, proximity to nonresidential uses (like shops) and recreation facilities were moderately correlated with walking for transportation in the oldest groups.

## References

- [1] World Health Organization. Global recommendations on physical activity for health. World Health Organization, Geneva (Switzerland), 2010
- [2] Baumgartner R.N., Wayne S.J., Waters D.L., Janssen I., Gallagher D., Morley J.E., Sarcopenic obesity predicts instrumental activities of daily living disability in the elderly. *Obes. Res.*, 2004, 12, 1995–2004
- [3] Spirduso W.W., Cronin D.L., Exercise dose-response effects on quality of life and independent living in older adults, *Med. Sci. Sports. Exerc.*, 2001, 33, S598-S610
- [4] Lim K.C., Kayser-Jones J.S., Waters C., Yoo G., Aging, health, and physical activity in Korean Americans, *Geriatr. Nurs.*, 2007, 28, 112-119
- [5] Bayliss E.A., Ellis J.L., Steiner J.F., Barriers to self-management and quality-of-life outcomes in seniors with multimorbidities, *Ann. Fam. Med.*, 2007, 5, 395-402
- [6] Austin N., Devine A., Dick I., Prince R., Bruce D., Fear of falling in older women: a longitudinal study of incidence, persistence, and predictors, *J. Am. Geriatr. Soc.*, 2007, 55, 1598-1603
- [7] Rosqvist E., Heikkinen E., Lyyra T.M., Hirvensalo M., Kallinen M., Leinonen R., et al., Factors affecting the increased risk of physical inactivity among older people with depressive symptoms, *Scand. J. Med. Sci. Sports.*, 2009, 19, 398-405
- [8] Avlund K., Rantanen T., Schroll M., Factors underlying tiredness in older adults, *Aging Clin. Exp. Res.*, 2007, 19, 16-25
- [9] Sallinen J., Leinonen R., Hirvensalo M., Lyyra T.M., Heikkinen E., Rantanen T., Perceived constraints on physical exercise among obese and non-obese older people, *Prev. Med.*, 2009, 49, 506-510
- [10] Lithuanian Ministry of Health Information. Health Statistics of Lithuania 2010. Lithuanian Ministry of Health Information Centre of Institute of Hygiene, Vilnius (Lithuania), 2011
- [11] Daugeliene E., Tamosiunas A., Reklaitiene R., Baceviciene M., Radisauskas R., Jureniene K., Health and lifestyle of the elderly people, *Lithuanian General Practitioner* 2009, 2, 88-94
- [12] Craig C.L., Marshall A.L., Sjöström M., Bauman A.E., Booth M.L., Ainsworth B.E., et al., International physical activity questionnaire:

## 5. Conclusion

In conclusion, the Lithuanian version of perceived constraints on exercise scale demonstrated a good internal consistency and construct validity results and it is a suitable measure for investigations of the elderly. Positive and significant correlation between the items inside the domains and Cronbach's alpha coefficients (0.67-0.86) confirmed good internal reliability of the scale. Factor analysis revealed a five-factor solution that accounted for 67.4% of the total variance and approved good construct validity of the perceived constraints on exercise scale. Perceived constraints that most restrict elderly people from exercise were lack of time and interest (OR=7.2,  $p<0.0001$ ) and fear of falling and injuries (OR=3.3,  $p<0.05$ ) outlining the importance of these aspects as part of PA promotion in the elderly. Definitely, in the future population-based researches in large elderly samples are needed.

## Acknowledgment

The authors would like to thank Taina Rantanen, professor of gerontology, for sharing the experience and motives and barriers scale.

- 12-country reliability and validity, *Med. Sci. Sports Exerc.*, 2003, 35, 1381-1395
- [13] Hirvensalo M., Lampinen P., Rantanen T., Physical exercise in old age: an eight year follow-up study on involvement, motives, and obstacles among persons age 65–84, *J. Aging Phys. Act.*, 1998, 6, 157–168
- [14] Hosmer D.W., Lemeshow S., *Applied logistic regression*, Wiley, New York, 1989
- [15] Rasinaho M., Hirvensalo M., Leinonen R., Lintunen T., Rantanen T., Motives for and barriers to physical activity among older adults with mobility limitations, *J. Aging Phys. Act.* 2007, 15, 90–102
- [16] Leinonen R., Heikkinen E., Hirvensalo M., Lintunen T., Rasinaho M., Sakari-Rantala R., et al., Customer-oriented counseling for physical activity in older people: study protocol and selected baseline results of a randomized-controlled trial, *Scand. J. Med. Sci. Sports*, 2007, 17, 156–164
- [17] Costello E., Kafchinski M., Vrazel J., Sullivan P., Motivators, barriers, and beliefs regarding physical activity in an older adult population, *J. Geriatr. Phys. Ther.*, 2011, 34, 138-147
- [18] Thomas S., Halbert J., Mackintosh S., Quinn S., Crotty M., Sociodemographic factors associated with self-reported exercise and physical activity behaviors and attitudes of South Australians: results of a population-based survey, *J. Aging Health.*, 2012, 24, 287-306
- [19] Bruce D.G., Devine A., Prince R.L., Recreational physical activity levels in healthy older women: the importance of fear of falling, *J. Am. Geriatr. Soc.*, 2002, 50, 84–89
- [20] Cumming R.G., Salkeld G., Thomas M., Szonyi G., Prospective study of the impact of fear of falling on activities of daily living, SF-36 scores, and nursing home admission, *J. Gerontol. A Biol. Sci. Med. Sci.*, 2000, 55, M299–M305
- [21] Horne M., Skelton D.A., Speed S., Todd C., Attitudes and beliefs to the uptake and maintenance of physical activity among community-dwelling South Asians aged 60-70 years: a qualitative study, *Public Health*, 2012, 126, 417-423
- [22] Atlantis E., Barnes E.H., Ball K., Weight status and perception barriers to healthy physical activity and diet behavior, *Int. J. Obes. (Lond.)*, 2008, 32, 343-352
- [23] Bautista L., Reininger B., Gay J.L., Barroso C.S., McCormick J.B., Perceived barriers to exercise in Hispanic adults by level of activity, *J. Phys. Act. Health*, 2011, 8, 916-925
- [24] Crombie I.K., Irvine L., Williams B., McGinnis A.R., Slane P.W., Alder E.M., et al., Why older people do not participate in leisure time physical activity: a survey of activity levels, beliefs and deterrents, *Age Ageing*, 2004, 33, 287-292
- [25] Bjornsdottir G., Arnadottir S.A., Halldorsdottir S., Facilitators of and barriers to physical activity in retirement communities: experiences of older women in urban areas, *Phys. Ther.*, 2012, 92, 551-562
- [26] Carlson J.A., Sallis J.F., Conway T.L., Saelens B.E., Frank L.D., Kerr J., et al., Interactions between psychosocial and built environment factors in explaining older adults' physical activity, *Prev Med.* 2012, 54, 68-73
- [27] Shigematsu R., Sallis J.F., Conway T.L., Saelens B.E., Frank L.D., Cain K.L., et al., Age differences in the relation of perceived neighborhood environment to walking, *Med. Sci. Sports Exerc.*, 2009, 41, 314-321