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Physical activity, body composition and general health status of physically active students of the University of the Third Age (U3A)

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ABSTRACT

Objective: To evaluate general health status of a group of older adults, physically active students of the University of the Third Age (U3A), based on results of biochemical analyses of blood, assessment of their physical activity (PA) level, body composition and cognitive function with respect to age and sex.
Methods: A total of 104 students (85 women and 19 men, aged 63.7 ± 6.6 y) of the U3A's located in the Upper Silesia region of Poland volunteered to participate in this study. A habitual PA level and body composition were objectively assessed by using ActiGraph GT1M and InBody 720, respectively. Serum lipid profile and glucose metabolism markers were measured for assessment of cardiovascular disease risk factors. Moreover, subjects' cognitive functions were tested.
Results: Most of the study participants reached the daily step goal of 10,000 steps and thus fulfilled the ACSM recommendations for the quantity and quality of cardiorespiratory exercise. Highly negative correlations between the number of steps per day and body adiposity markers, serum insulin and HOMA-IR confirmed that vigorous physical activity at the recommended level was associated with better body composition and lower levels of risk markers of coronary heart disease and diabetes. Most of the U3A students were characterized by a favorable lipid profile, prevalence of normal blood pressure, low rates of HOMA-estimated insulin resistance and normal cognitive function.
Conclusion: Adherence to ACSM recommendations is associated with beneficial changes in risk factors related to cardiovascular disease.

1. Introduction

Demographic perspectives show that the population of older adults is growing much more rapidly than any other age group. Population projection for Poland 2014–2050 (Demographic Survey and Labour Market Department, 2014) elaborated by the Polish Central Statistical Office (CSO) in 2014, predicts that life expectancy of males and females will grow from 73.1 and 81.1 y in 2013 to 83.0 and 88.4 y respectively, in 2050. It is estimated that within the same time frame, the forecast percentage of population aged 65 y and over will be steadily increasing from 14.7 to 32.7%, although it will be slightly higher in urban than in rural areas (34.7 vs. 30.2%). The fastest growing segment of the senior population aged 80 y and over is projected to more than double from 3.9 to 10.4% (Demographic Survey and Labour Market Department, 2014).

There is a scientific consensus that normal aging is a universal and irreversible process caused by a gradual and lifelong accumulation of a wide variety of molecular and cellular damage that leads to gradual functional and physiological decline, deterioration of cognitive functioning, and higher susceptibility to frailty and diseases (de Magalhães, 2012, 2013; Knight, McMahon, Green, & Skeaff, 2006). Human aging is typically associated with changes in body composition, such as gain in body weight and body fat and a loss of muscle and bone mass, even without changes in body weight (Beaufrère & Morio, 2000; Gába & Přidalová, 2014). Regardless of general obesity, abdominal obesity and excess visceral fat have been identified as independent risk

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factors for cardiovascular diseases (CVD) (Van Gaal, Mertens, & De Block, 2006; Beaufrère & Morio, 2000; De Lorenzo et al., 2007; Hamdy, 2005; Wisse, 2004). Most of the studies on cardiovascular disease risk factors in older individuals put special emphasis on the associations between the CVD risk and blood lipid profile measures (Boullart, de Graaf, & Stalenhoef, 2012). In older adults, LDL-C and lipoprotein(a) are considered major independent risk factors for human carotid atherosclerosis and stroke (Go et al., 2014). Other risk factors such as hypertension, tobacco smoking and low levels of physical activity (PA) are also taken into account. On the other hand, there is strong scientific evidence that lifestyle intervention, such as involvement in a range of health behaviors (including consumption of a balanced diet and involvement in the recreational, intellectual and social activities), may provide substantial health benefits extending over the lifespan (Chodzko-Zajko et al., 2009; Després et al., 2008; Garber et al., 2011; Kanning & Schlicht, 2008; Levy & Myers, 2004).

A high priority for older people is to maintain functional independence, physical and mental fitness, financial well-being, family ties and social contacts with friends, as well as use the opportunity for self-education and self-realization (Reichstadt, Sengupta, Depp, Palinkas, & Jeste, 2010). Since similar changes in the age structure of the population are observed worldwide, a debate on "successful aging", the concept focused at adopting health-promoting behaviors to ensure good physical and mental health in later life, is conducted (Hsu & Jones, 2012; Kanning & Schlicht, 2008). It is worth noting that the international initiative adopted in several countries worldwide, including Poland, known as the University of the Third Age (U3A), has substantially contributed to the implementation of the model of "successful aging" among older adults (Formosa, 2014; Zielińska-Więczkowska, Kędziora-Kornatowska, & Ciemnoczołowski, 2011; Zielińska-Więczkowska, Muszalik, & Kędziora-Kornatowska, 2012). There are currently about 400 U3A's in Poland, the main aim of which is to improve the quality of life of retired members of the community, through a range of educational activities focused on improvement in a variety of physical and social measures, by giving them opportunity to enhance their life satisfaction. However, there are also several barriers deterring older people from participating in life-long education, as most third age learners have limited income and U3A services are available for senior citizens only in middle-sized or large cities. Only few reports on the impact of participation in U3A activities on quality of life of Polish citizens are found in the literature (Zielińska-Więczkowska et al., 2011, 2012), while only little attention was paid to the evaluation of health-promoting effects of their habitual physical activity based on self-reported questionnaire surveys (Rowinski, Dabrowski, & Kostka, 2015). Therefore, the aim of this study was to evaluate general health status of a group of older adults, physically active students of the University of the Third Age (U3A) living in three selected cities located in the southern part of the country (Upper Silesia region), based on results of biochemical analyses of blood, objective assessment of their physical activity (PA) level, body composition and cognitive function with respect to age (<65 *vs.* ≥65 y only in females) and sex. Moreover, by comparison of the metabolic profiles of the U3A students with those recorded in a local, community dwelling cohort of individuals of the same age, selected from the nationwide PolSenior survey, we attempted to assess whether and how a regular leisure time PA affected cardiometabolic risk factors in older adults.

2. Material and methods

2.1. Participants

A total of 104 adults (85 women and 19 men) aged 47–82 y (mean age 63.7 ± 6.6 y), all being active students of the U3A since one year at least, volunteered to participate in this study. Beyond normal daily activities, all participants were involved in the PA program realized at the local U3A's offering the opportunity to attend gymnastics classes targeted at enhancement of overall mobility, building muscular strength, flexibility, agility, coordination, and balance, or to participate in other forms of physical activity, such as Nordic walking. Female participants were subdivided into two groups aged below 65 years (<65 y, $N = 57$) and those aged 65 y and over (≥65 y, $N = 28$), while given the low

Table 1
Summary characteristics of the study participants.

Measurements	Normal values	Women <65 y ($n = 57$)		Women ≥65 y ($n = 28$)		All women ($n = 85$)		Men ($n = 19$)	
		Mean (SD)	Median	Mean (SD)	Median	Mean (SD)	Median	Mean (SD)	Median
Age [y]	n/a	59.5 (3.5)	60.0	69.4 (4.1)	69.0	62.8 (5.9)	62.0	68.0† (8.0)	68.0
Height [cm]	n/a	158.4 (5.0)	158.0	158.7 (5.5)	159.0	158.5 (5.2)	158.0	171.5††(7.3)	173.0
Weight [kg]	n/a	67.6 (11.1)	66.9	72.4 (12.0)	77.1	69.2(11.6)	67.9	81.5† (16.1)	82.6
BMI [kg/m^2]	<25	27.0 (4.4)	26.3	28.7 (4.4)	27.9	27.6 (4.5)	27.2	27.7 (4.8)	26.7
VFA [cm^2]	<100	129.7 (32.3)	129.8	156.6** (26.7)	158.2	137.7 (32.7)	135.6	141.8 (39.5)	149.6
WC [cm]	Female ≤88 Male ≤102	83.8 (12.2)	83.0	88.4* (9.6)	88.5	85.3 (11.5)	85.0	94.0† (12.6)	93.0
WHR	Female <0.85 Male <0.90	0.83 (0.07)	0.83	0.84 (0.05)	0.84	0.83 (0.07)	0.83	0.93†† (0.07)	0.94
PBF [%]	Female <28 Male <20	37.1 (7.6)	37.4	39.4 (5.4)	40.1	37.8 (7.0)	37.7	26.3†† (8.9)	27.5
BFM [kg]	n/a	25.8 (8.9)	24.8	29.0 (8.5)	28.0	26.8 (8.8)	26.3	22.3 (10.8)	19.6
BFMI [kg/m^2]	3.9–8.2	10.3 (3.7)	9.7	11.5 (3.3)	11.2	10.7 (3.6)	10.3	7.6† (3.6)	7.4
FFM [kg]	n/a	41.9 (3.9)	41.2	43.4 (4.7)	42.9	42.4 (4.2)	42.1	59.2†† (8.0)	58.9
FFMI [kg/m^2]	14.6–16.8	16.7 (1.2)	16.5	17.2 (1.4)	17.0	16.9 (1.3)	16.8	20.0†† (1.7)	19.6
BMR [kcal]	n/a	1274.3 (83.7)	1259.6	1 307.9 (101.8)	1 296.2	1285.4 (90.8)	1279.7	1648.1†† (173.6)	1642.4
PA [steps/day]	≥10 000	11 376 (3278)	11 451	9774* (2697)	9360	10848 (3174)	10413	11561 (4625)	11400
PA (3–6 MET) [min/week]	≥150	307.4 (191.2)	308.0	303.9 (165.9)	288.0	306.2 (181.8)	298.0	381.1 (179.1)	368.0

Notes: n/a: not available; BMI: body mass index; VFA: visceral fat area; WC: waist circumference; WHR: waist-to-hip ratio; BMR: basal metabolic rate; PBF: percent body fat; BFM: body fat mass; BFMI: body fat mass index; FFM: fat-free mass; FFMI: fat-free mass index; PA: physical activity (number of steps/day); PA (3–6 MET): time of moderate physical activity.
* Mann–Whitney U test: $p < 0.05$.
** Mann–Whitney U test: $p < 0.001$ ≥65 y *vs.* <65 y (separately for women).
† Mann–Whitney U test: $p < 0.05$.
†† Mann–Whitney U test: $p < 0.001$ men *vs.* women.