SUCCESSFUL AGEING: THE ROLE OF PHYSICAL ACTIVITY AND ITS BARRIERS IN POLISH MEN OF ADVANCED AGE

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Abstract One of the most important factors of successful ageing is a sufficient level of motor independence, which is strongly associated with an appropriate level of activity. It was decided to determine the relationship between barriers to physical activity and physical activity and health self-assessment in healthy and chronically ill men, among 206 men aged 65–83 years. A relationship was found between kinesiophobia, physical activity and self-assessment of health, and the differences between health self-assessment in the healthy and chronically ill. No differences were found regarding activity. Important factors affecting the health of older men are self-awareness of being chronically sick, BMI and level of physical activity. A relationship exists between kinesiophobia, physical activity and self-assessment of health. The awareness of being chronically sick, BMI and level of physical activity are the most significant factors affecting the health self-assessment of older men.

Key words advanced age, barriers to physical activity, kinesiophobia, successful ageing

Introduction

The problem of an ageing population is increasing in many countries. This is a result of longer life expectancy and a decline in fertility. The lengthening of life expectancy in many countries appears to be relatively stable, and its dynamics in recent decades is growing. In the last 50 years, the average life expectancy in Europe has risen from 66 to 75 years, and it is forecast to reach 82 years in 2050 (Economist Intelligence Unit, 2012). In Poland, an increase in life expectancy of three years compared to 2000 along with a drastic decline in the birth rate, results in the fact that the proportion of people aged 65 years and older is more than double the seven per cent threshold adopted by the United Nations, which classifies this society as 'old' (Central Statistical Office, 2013). The effects

of this process relate to the functioning of almost the whole structure of society, in all areas, from politics and the economy to culture and education. In this context, the problem of determinants of successful ageing is important (Rowe, Kahn, 1997).

The social dimension of the problem of old age affects many areas: medical–biological, psychological, and socio-economic. On an individual level, the key appears to be the efficiency of the body, defined subjectively as the 'sense' or self-assessment of health. It is always associated with the possibility of functioning, irrespective of the area, whether self-care, functioning in the family or in society. Functional efficiency is a function of activity, and its base in old age is a sufficient level of motor independence (Clarke, Bennett, 2013). The optimal level of physical activity and health status in the light of previous studies, are mutually positive correlates (Bokovoy, Blair, 1994; Knapik et al., 2009). The need for natural activity in living beings, including humans is reduced by technology development. Increasingly, activity levels are lower than biological needs. This deficit of activity – hypokinesia – with age shows an increasing trend, representing a serious threat to health (Blair, 2009). Epidemiological data indicate the prevalence of this problem (Berk et al., 2006; Haley, Andel, 2010; Moschny, Płyt, Klaassen-Mielke, Trampisch, Hinrichs, 2011; Vašíčková, Roberson, Frömel, 2011). Studies demonstrating the possibilities for intervention in preventing hypokinesia by increasing physical activity indicate the need for an analysis of the barriers to physical activity in older people (Sebastião et al., 2013). Investigation of the relationship: activity barriers – activity – self-assessment of health, can explain many important aspects of successful ageing. It may also provide a basis for working out programmes to increase activity among the elderly. Possible gender differences could be an important problem. Although the average life expectancy of women is higher than that of men, increased life expectancy is also occurring among men. Therefore, the aim of the research presented here is an evaluation of the above-mentioned dependencies among men.

Materials and methods

The study involved 206 men aged 65–83 years (70.51 ±4.16 years). The body mass index (BMI) was 27.63 ±3.92. Selection of the test was purposeful. Selection criteria were volunteering to participate, age 65 years or more (the threshold of old age, according to the UN), a sufficient level of mental capacity to understand and complete an anonymous questionnaire used in the survey as well as motor independence in terms of movement and self-care in everyday activities.

The study was carried out using the pencil and paper method in several provinces of southern Poland. The investigator answered any doubts about the questions where necessary. The study used an anonymous questionnaire consisting of personal data and three research tools: the Kinesiophobia Causes Scale (KCS), Baecke Activity Questionnaire (BAQ) and short form 36 (SF-36) health survey questionnaire supplemented with questions about age and the occurrence of chronic diseases associated with regular visits to the doctor, and the use of medication, allowing a distinction between two groups of respondents, not suffering (NSF) and suffering (SF).

The KCS questionnaire is a tool designed to diagnose barriers to physical activity. The questionnaire includes closed questions. Answers to these questions are scored on a scale of 0 to 100 (percentage); the higher the score, the greater the severity of barriers to activity – kinesiophobia. It consists of two domains: biological (BD) and psychological (PD). Each domain contains four factors. For BD these are: morphological, individual need for stimulation, energetic substrates and power of biological drives. The PD also consists of four factors: self-acceptance,

self-assessment of motor predispositions, state of mind and susceptibility to social influence. Domain score is the average of the sum of the factors that make up the domain, while the overall rate of kinesiophobia (Kinesiophobia index [KI]) is the average of two domains (Knapik et al., 2011; Knapik et al., 2012).

BAQ is used for the subjective assessment of an individual's activity. It contains two open questions concerning occupation and sport and 14 closed questions. Closed questions relate to the frequency of activities performed and physical intensity. The answers to these questions, presented in a simple adjective form, are ranked on a scale of 1–2–3–4–5. Such questionnaire design allows grading/evaluation in points for the physical activity level of the respondent in three areas of activity: work (work indicator [WI]), sports activities (sport indicator [SI]) and leisure, excluding sport (leisure time indicator [LTI]). The sum of these areas of activity allows global, usual activity (HPA index [habitual physical activity]) to be specified (Baecke, Burema, Frijtes, 1982; Hertogh, Monninkhof, Schouten, Peeters, Schuit, 2008; Ono et al., 2007). Taking into account the age of respondents, one of the selection criteria for testing, the area of professional activity was abandoned in this study.

SF-36 is a widely used tool to measure quality of life related to health. A questionnaire containing 36 closed questions determines health status in its two components: physical (PC) and mental (MC). Scoring answers to questions from 0 to 100 allows the health status in both components to be determined, each of which contains the following four factors. PC factors are: physical functioning, role limitations due to physical health, pain and general health. MC consists of: role limitations due to emotional problems, energy/fatigue, emotional well-being and social functioning. Scoring of each component is by the average sum of the factors that make up a component (Ware, Sherbourne, 1992; Żołnierczyk-Zreda, Wrześniewski, Bugajska, Jędryka-Góral, 2009).

The study was conducted according to the provisions of the Helsinki Convention, and also the Bioethics Committee of the Medical University of Silesia Katowice expressed its approval (Decision no.: KNW/0022/KB/74/14).

Non-parametric tests were used in all the analyses. Spearman's rank correlation was used to determine the relationship between variables. U Mann-Whitney test was used to compare the group of chronically ill respondents to the healthy group. Limit values for the lower (Q1) and upper (Q2) quartiles were calculated for components of self-assessment of health, and in order to compare the designated quartile, the Kruskal-Wallis test was used as well as multiple comparisons of mean values ranked in the Kruskal-Wallis test. This type of analysis is used to explain an experimental unbalanced system and lack of homogeneity of variance, which was checked with Levene's test. The accepted level of statistical significance was $p < 0.05$.

Results

Statistical analysis showed a negative correlation between health self-assessment of respondents (questionnaire SF-36) with body weight and BMI, except for the factor general health. There was no correlation between age and body height and health self-assessment (Table 1).

Correlation analysis demonstrated that the results of the BAQ questionnaire significantly correlated with age and height of the subjects. There were no such associations in the case of body weight and BMI. Considering the sum of the scores of the KCS questionnaire, a significant relationship was observed for height, weight and BMI. The results are shown in Table 2.

Table 3 presents the results of the correlation of the physical activity barriers (KCS) with indicators of activity (BAQ), which in most cases demonstrated a significant relationship.

Table 1. SF-36 self-assessment of health and the result of correlation with age, height, body weight and BMI

Components and factors of health	Mean ± SD	R-Spearman correlation			
		Age	Height	Body mass	BMI
PC	52.8 ±24.6	–0.10	–0.10	–0.26**	–0.28**
Physical functioning	57.9 ±30.5	–0.09	0.01	–0.21**	–0.31**
Role limitations due to physical health	51.9 ±42.3	–0.12	–0.10	–0.26**	–0.26**
Pain	53.7 ±25.8	–0.12	–0.12	–0.21**	–0.18*
General health	48.1 ±19.6	–0.03	–0.05	–0.11	–0.10
MC	58.3 ±24.4	–0.08	–0.08	–0.24**	–0.26**
Role limitations due to emotional problems	59.3 ±22.2	–0.08	–0.06	–0.22**	–0.26**
Energy/fatigue	58.4 ±42.8	–0.13	–0.10	–0.20**	–0.19**
Emotional well-being	53.8 ±20.2	0.00	–0.09	–0.15**	–0.16*
Social functioning	61.5 ±27.5	–0.07	–0.06	–0.21**	–0.23**

PC – physical component; MC – mental component; *p < 0.05; **p < 0.001 (correlations statistically significant).

Table 2. Barriers to activity and physical activity and the result of correlation with age, height, body weight and BMI

	Variable	Mean ± SD	R-Spearman correlation			
			Age	Height	Body mass	BMI
	BD	40.1 ±18.5	0.09	–0.05	0.27**	0.30**
	Morphological	29.3 ±27.7	0.02	0.06	0.45**	0.44**
	Individual need for stimulation	48.8 ±22.3	0.11	–0.13	0.19*	0.26**
	Energetic substrates	36.0 ±23.2	0.15	–0.06	0.14	0.14
	Power of biological drives	46.2 ±27.1	–0.04	–0.07	0.02	0.06
KCS	PD	47.0 ±16.2	0.16*	–0.23**	0.04	0.16*
	Self-acceptance	33.6 ±22.8	0.03	–0.35**	–0.25**	–0.10
	Self-assessment of motor predispositions	46.0 ±24.3	0.06	–0.18*	0.08	0.18**
	State of mind	50.3 ±22.0	0.10	–0.15	0.01	0.08
	Susceptibility to social influence	58.3 ±26.2	0.16*	–0.00	0.15	0.16*
	KI	43.6 ±15.9	0.12	–0.17*	0.17*	0.25**
	SI	2.0 ±0.8	–0.23*	0.36**	0.05	–0.06
BAQ	LTI	2.8 ±0.8	–0.23*	0.12	–0.04	–0.04
	HPA	4.7 ±1.5	–0.24*	0.27**	–0.02	–0.10

KCS: BD – biological domain; PD – psychological domain; KI – kinesiophobia index; BAQ: SI – sport indicator; LTI – leisure time indicator; HPA – habitual physical activity.
*p < 0.05; **p < 0.001 (correlations statistically significant).

Table 3. The result of R-Spearman correlation barriers to activity (kinesiophobia) and indicators of physical activity

Kinesiophobia Causes Scale	BAQ – activity indicator		
	SI	LTI	HPA
1	2	3	4
BD	–0.48**	–0.54**	–0.58**
morphologic	–0.42**	–0.39**	–0.46**
individual need for stimulation	–0.31*	–0.24*	–0.31*
energetic substrates	–0.57**	–0.72**	–0.73**
power of biological drives	–0.05	–0.15	–0.01

1	2	3	4
PD	–0.32*	–0.52**	–0.47**
self-acceptance	–0.15	–0.12	–0.16
self-assessment of motor predispositions	–0.15	–0.32**	–0.27*
state of mind	–0.16	–0.27*	–0.24*
susceptibility to social influence	–0.35**	–0.50**	–0.48**
KI	–0.45**	–0.59**	–0.59**

BD – biological domain, PD – psychological domain, KI – kinesiophobia index; SI – sport indicator; LTI – leisure time indicator; HPA – habitual physical activity.
*p < 0.05; **p < 0.001 (correlations statistically significant).

A comparison between health self-assessment, kinesiophobia and activity factor of people reporting no chronic disease and people suffering from chronic disease is presented in Table 4.

Table 4. Mean ± SD of questionnaires for groups NSF and SF, and the result of the comparison using U Mann-Whitney test (Z)

	Dependent variables	Mean ± SD		Z
		NSF (n = 76; 36.9% total)	SF (n = 130; 63.1% total)	
SF-36	PC	62.74 ±25.5	47.12 ±22.2	4.26**
	physical functioning	70.00 ±28.2	50.81 ±29.6	4.25**
	role limitations due to physical health	63.49 ±44.2	45.10 ±39.7	2.75**
	Pain	65.47 ±25.8	46.77 ±23.2	4.69**
	general health	51.99 ±21.6	45.80 ±18.0	1.91
	MC	70.72 ±20.9	50.97 ±23.3	5.62**
	role limitations due to emotional problems	76.75 ±39.3	47.61 ±41.2	4.56**
	energy/fatigue	61.05 ±19.7	49.62 ±19.3	4.14**
	emotional well being	68.76 ±17.5	53.81 ±22.9	4.50**
	social functioning	76.32 ±22.1	52.83 ±26.6	5.86**
KCS	BD	36.66 ±18.2	41.30 ±18.6	–1.25
	morphological	22.55 ±24.9	31.74 ±28.3	–2.05*
	individual need for stimulation	42.21 ±20.8	51.19 ±22.4	–2.71**
	energetic substrates	32.70 ±24.4	37.18 ±22.7	–1.36
	power of biological drives	49.18 ±24.8	45.10 ±27.9	1.15
	PD	48.02 ±17.0	46.68 ±15.9	0.45
	self-acceptance	37.20 ±22.8	32.29 ±22.7	1.33
	self-assessment of motor predispositions	42.93 ±23.7	47.02 ±24.5	–1.10
	state of mind	52.17 ±24.1	49.62 ±21.3	0.43
	susceptibility to social influence	59.78 ±25.5	57.80 ±26.5	0.65
	KI	42.34 ±16.4	43.99 ±15.8	–0.39
BAQ	SI	2.29 ±0.98	1.79 ±0.59	2.33*
	LTI	2.81 ±0.81	2.83 ±0.74	–0.08
	HPA	5.15 ±1.68	4.62 ±1.17	1.52

SF-36: PC – physical component; MC – mental component; KCS: BD – biological domain; PD – psychological domain; KI – kinesiophobia index; BAQ: SI – sport indicator; LTI – leisure time indicator; HPA – habitual physical activity.
*p < 0.05; **p < 0.001 (differences statistically significant).

The greatest observed significant differences concerned the SF-36 questionnaire. The quartiles of health self-assessment were also calculated in accordance with the adopted methodology of the study. For PC, the lower quartile was: Q1 – 32,291; upper: Q3 – 76,042. MC quartiles were: lower Q1 – 34,875; upper Q3 – 79,000. As a result of the ANOVA rank Kruskal-Wallis analysis, both physical and mental health components showed significant intergroup differences for BD, PD, KI and HPA (each, $p < 0.01$). Multiple comparisons of the average ranks showed significantly lower (except HPA) results of people in the third quartile compared to the second quartile. Detailed results for all comparisons are shown in Table 5.

Table 5. The results of post hoc tests for kinesiophobia and physical activity

Variable		Mean value			Intergroup differences – p‡		
dependent	grouping†	Q1	Q2	Q3	Q1/Q2	Q2/Q3	Q1/Q3
BD	PC	45.2	45.1	25.9	0.88	<0.001*	<0.001*
	MC	42.9	45.6	26.6	0.37	<0.001*	<0.001*
PD	PC	49.4	49.9	39.4	0.92	<0.001*	0.07
	MC	45.3	52.4	38.8	0.001*	<0.001*	0.62
KCS	PC	47.3	47.5	32.6	0.53	<0.001*	<0.001*
	MC	44.1	49.0	32.7	0.01*	<0.001*	0.01*
HPA	PC	4.8	4.2	6.0	0.06	<0.001*	0.04*
	MC	5.0	4.4	5.8	0.09	0.01*	0.91

†Introduced quartiles (Q) for physical component (PC) and mental component (MC) of SF-36 questionnaire; KCS: BD – biological domain, PD – psychological domain; BAQ: HPA – habitual physical activity.
‡The level of significance of differences Kruskal-Wallis test; *differences statistically significant.

Discussion

The results presented on self-assessment of health indicate generally good health self-assessment of respondents, as evidenced by the average of the two components, and all factors except for the factor 'health – generally' were above 50 points. A High value for standard deviations is typical for old age, indicating high variability of the individual. These figures are lower than in previous studies, which probably resulted from a higher average age and selection criteria (Knapik et al., 2011). Also of interest is the factor 'general health' with the lowest average and the smallest standard deviation. Both the lowest average and highest homogeneity of this factor confirm earlier observations on the importance of cultural background for the perception of the relationship between age and general health (Franklin, Tate, 2009).

The observed lack of correlation between PC and MC with age and SD values of health self-assessment indicates its high individual variability, where age is not a determining category of well-being. It also highlights the role of non-biological factors in the ageing process, and thereby justifies exploring the determinants of positive ageing. Negative correlations between PC and MC and BMI and body mass (Table 1) confirm the importance of the modifiable factors of diet and physical activity which are associated with lifestyle (Franklin, Tate, 2009).

The occurrence of chronic diseases, typical for old age, was variable, highly differentiating the health self-assessment by the respondents (Table 4). This shows that the awareness of being chronically ill in elderly people is a factor strongly influencing self-assessment of health. However, this variable did not differentiate respondents in terms of activity (HPA) and its barriers (BD, PD and KI). Cohen-Mansfield et al. in their research indicated that the

feeling of being sick and low efficiency are the main hurdles to activity in the elderly (Cohen-Mansfield et al., 2003). The resultant set of results and cited studies suggest that the source of passivity in mobility of the elderly can often be the mental sphere, and not the actual limitations of disease. This is important from the point of view of preventive care. The results of multivariate analysis of Meisner et al. (2010) performed in a large population of people aged 60 years and more, support this argument. According to these authors, hypokinesia is a factor that has a stronger influence on functional limitations than the occurrence of chronic diseases (Meisner et al., 2010).

Research on barriers to physical activity in older people mention the nature of biological factors (low levels of energy resources), as well as psychological (fear of falling and personal injury) and socio-cultural (Clark, 1999; King et al., 2000). This problem is analysed using a variety of methodological approaches. The tool used in this study is based on analysis barriers to activity such as kinesiophobia, which is understood as the fear of physical and mental discomfort resulting from physical activity. The authors define it as a relatively constant psychological disposition, depending on biological and psychological factors (Knapik et al., 2011, 2012).

The results of this study indicate that psychological factors are greater barriers to activity than biological factors. Susceptibility to social influence has the greatest value among these factors (Table 2). In the light of previous studies, there is a certain repeatability independent of age, highlighting the importance of the aforementioned context of cultural and social barriers to physical activity (Clarke, Bennett, 2013; Knapik, Rottermund, Myśliwiec, Plinta, Gruca, 2012).

Strong negative correlations of barriers to activity and its indicator (HPA) confirmed their role as determinants of passivity in mobility (Table 3). The factor 'level of energy resources' shows the strongest negative correlation with HPA, which seems to confirm the observations of King (King et al., 2000). The self-assessment of health was a variable highly differentiating both physical activity and its barriers (Table 4). Men in the upper quartile (PC and MC) of health self-assessment definitely have the highest rates of HPA and the lowest value of BD, PD and KI. These differences confirm the accepted hypothesis that the barriers to physical activity, activity and health self-assessment are the correlates.

Multidimensionality of the causes of the ageing process can be analysed in terms of biology, medicine or the social sciences (Błędowski, 2012; Diener, Scollon, Lucas, 2003). Longer duration of age results in changing perceptions of this period of life. An earlier focus on the negative effects of old age gave way to the search for determinants of 'successful ageing'. Rowe and Kahn (1997) defined the three key elements of successful ageing as the absence of disease and disability, good physical and mental functioning and participation in society. In a review of studies on successful ageing factors, Depp and Jeste (2006) reported as many as 29 different factors that promote successful ageing. The ability to function independently and the lack of physical disability occurred as conditions for successful ageing in almost all the studies analysed (Depp, Jeste, 2006). Slightly different conclusions resulted from the study of Montross and co-authors conducted among people living in community care homes, which provided a full spectrum of care and participated in the activities of institutes of further education (Montross, 2006). The authors of this study noted a high percentage of people satisfied with their lives in spite of old age. For these people, existing chronic diseases and disability were not overriding. Optimism, self-efficacy and participation in community life were important for a sense of successful ageing. Recitation of the results of these two papers provides a broad spectrum of conditions for the process of successful ageing. A cultural and social context also appears to be very important (Hank, 2011). A sense of material, social and medical security can, to a certain extent, move efficiency in movement and self-care to the next level. However, motor independence is the most

important aspect for most older people. A manifestation of this independence is function-based, regardless of the context (activities of daily living, participation in family life, social life, etc.) for at least a sufficient level of physical activity. Studies on the possible barriers to this activity can be helpful in developing intervention programmes aimed at potentially successful ageing.

In conclusion, a relationship exists between kinesiophobia, physical activity and self-assessment of health. The awareness of being chronically sick, BMI and level of physical activity are the most significant factors affecting the health self-assessment of older men. Developing programmes aimed at enabling older people to be more active should take into account existing barriers to physical activity.

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