



## PHYSICAL ACTIVITY AND FITNESS OF ADULTS AGED 20–59 YEARS

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### ABSTRACT

**Purpose.** The aim of the study was to check whether and to what extent leisure-time physical activity and commuting activity constitute a factor differentiating physical fitness in a selected group of females and males aged 20–59 years. **Methods.** The study was performed in the Świętokrzyskie region of Poland in the spring of 2010. The sample included 1032 adults (517 females and 515 males) employed and at the same time completing extramural education or attending vocational improvement programs. Four age groups were delineated (20–29, 30–39, 40–49 and 50–59). A self-report questionnaire assessed physical activity level whereas physical fitness was determined by tests assessing handgrip strength, upper (dynamic) and lower (explosive) extremity strength, agility, hand movement speed, and endurance. **Results.** A significant relationship was found between leisure-time physical activity and all the performance-based measures in both females and males. With regard to commuting activity, statistically significant relationships were observed only in the females with regard to handgrip strength, lower extremity strength and endurance. **Conclusions.** A significant positive relationship between leisure-time physical activity and physical fitness was demonstrated in both females and males aged 20–59 years while commuting activity should significant correlations only in females.

**Key words:** health, leisure-time, motor abilities, commuting activity

### Introduction

Physical activity, physical fitness and physical capacity are considered to have positive outcomes on health. It is clearly assumed that an optimal physical activity level (PAL) has a direct impact on physical fitness and capacity providing the possibility for a satisfying existence at each stage of life. Moreover, individuals who are characterised by a higher PAL were found to have more positive body image in comparison with those not involved in any physical activity [1].

With regard to adults, one very important aspect is that after reaching the age of optimal individual development (around the age of 30–40 years), a number of regressive and senescent processes begin to occur affecting various physical characteristics and vital functions [2–3]. These processes advance with age and bring about many changes that reduce physical fitness [4]. The magnitude of these changes, particularly within the context of motor skill performance, was found to depend not only on biological ageing but to a greater extent on motor skill development during earlier life stages, lifestyle and PAL [2, 3, 5].

The PAL of adults depends on many factors, among which the most relevant are education, available leisure time, motor skill level, economic status, education level, job type and social status [6]. Besides the amount

of physical activity, the practiced intensity is also relevant as studies indicate it should be adapted to age, where a given exercise intensity for young individuals was found to be incompatible in adults and older people [7]. Excessively intensive physical activity in older adults may cause various negative health effects as opposed to younger-aged individuals [8], with the literature indicating that systematic, moderate physical activity better enhances health in this population [9–11].

The goals of administering fitness tests to children, adolescent and adult populations are related to determining health and physical ability but can also serve as a source of motivation to achieve not only better fitness, which includes increased physical activity, but also change current and future lifestyle habits [12–14]. Physical activity interventions using performance-based measures should also develop positive attitudes and habits, teach self-assessment and self-control, and encourage an active lifestyle. Studies indicate that physical activity undertaken by middle- and older-aged adults should focus primarily on the improvement of circulatory and respiratory fitness, strength and flexibility (agility) [15].

Any assessment of physical activity must consider the scope and intensity of physical activity performed by the target population, which can be assessed with the use of objective assessment methods and validated questionnaires. The aim of this study was to confirm whether and to what extent the self-reported level of leisure-time physical activity as well as commuting activity constitute a factor differentiating physical fitness in females and males aged 20–59 years.

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## Material and methods

The study was performed in the Świętokrzyskie region of Poland in the spring of 2010. The sample was drawn from a target population of individuals employed and at the same time completing extramural education or attending vocational improvement programs in the city of Kielce, Poland. In total, 1032 individuals (517 females and 515 males) aged 20–59 years representing various socioeconomic backgrounds were selected. All provided their consent to participate in the study. The participants were divided into four age groups of 20–29, 30–39, 40–49 and 50–59 years with a mean age of 22.6, 34.9, 44.8 and 54.4, respectively (Table 1).

Physical activity level was assessed by administering a self-report questionnaire prepared by the Department of Auxology of the Jan Kochanowski University in Kielce. The questions covered leisure-time physical activity as well as commuting activity. Construct validity of the questionnaire for cross-sectional analysis was confirmed with a Cronbach's alpha of 0.81. The questionnaire assessed the amount of physical activity performed per day (minimum 30 min) over the week (7 days). The results were stratified as:

- high PAL (5–7 days per week),
- moderate PAL (3–4 days per week),
- low PAL (0–2 days per week).

Commuting activity was also taken into account in which the participant covered the entire distance to and from work on foot or by bicycle (minimum 60 min) over the week (7 days). Based on the results, the participations were categorised as having:

- high level of commuting activity (4–7 days per week),
- moderate level of commuting activity (1–3 days per week),
- lack of any commuting activity.

Physical fitness was examined by administering a simple test battery that assessed motor function by indirect means. All tests were performed in adequately prepared closed rooms, usually on Saturdays in mid-morning hours, with the participants dressed in sportswear sans footwear. The battery measured:

- handgrip strength [16], where one had to squeeze a Collin-style dynamometer (1 kg accuracy) using maximum strength with the arm free of support,

- upper extremity dynamic strength [16], determined by the amount of incline push-ups performed in 30 s; males performed this test with the legs extended and the palms resting on a bench at shoulder height, females performed the test in a similar manner except they kneeled with the legs bent at a right angle and feet suspended in the air and kept them slightly bent at a right angle at the knee joints,

- lower extremity explosive strength [17], by the standing long jump,

- agility [17], assessed with the zig-zag run test (500 × 300 cm),

- hand movement speed [17], based on the plate tapping test in which the participant touched two points on a table separated by a distance of 50 cm using the preferred hand as fast as possible; the result was the number of taps (cycles) completed in 20 s,

- endurance [16], which required the participant to step on and off a 30 cm step for 5 min at a minimum frequency of 30 steps/min; the number of heart beats at the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> min were counted to determine a Fitness Index (FI) based on the equation:  $FI = \text{test duration (s)} \times 100 / 2 \times \text{the sum of the three heart beat counts}$ .

All measures were standardised for males and females to eliminate the effect of age. Spearman's rank correlation coefficients were used to determine the relationships and correlations between the variables. Statistical analyses were performed with the use of Statistica 8.0 (Statsoft, USA) and significant differences were determined at the level of  $p \leq 0.05$ .

## Results

When taking into account the number of days per week in which the participants performed at least 30 min of leisure-time physical activity, it was found that a:

- high PAL was found in only 4.5% of females and 9.3% of males,

- moderate PAL was observed among 15.9% of females and 28.7% of males,

- low PAL characterised 79.1% of females and 61.9% of males (Figure 1).

The females were characterised by a lower PAL in comparison with the males. Age was not a factor differentiating the amount of physical activity among females, as the percentage of females with different levels of leisure-time physical activity was at a similar across the age groups (Figure 2).

The level of leisure-time physical activity in males, compared with the females, declined steadily with age (Figure 3). Here, we observed a:

- high PAL in 16.9% of the youngest age group, dropping to 3% in the oldest age group,

- moderate PAL in 36.8% of the youngest age group, with a linear decrease to 14.8% in the oldest,

- the percentage of the males characterised by a low PAL (62.1% of the sample) increased with age (from 46.3% in the youngest age group to 82% in the oldest).

Table 1. Quantitative characteristics of the study population (%)

Age range	Females		Males		Mean age
	<i>n</i>	%	<i>n</i>	%	
20–29	165	54.8	136	45.2	22.6
30–39	122	51.0	117	49.0	34.9
40–49	116	45.9	139	44.1	44.8
50–59	114	48.3	122	51.7	54.4
20–59	517	50.1	515	49.9	39.2

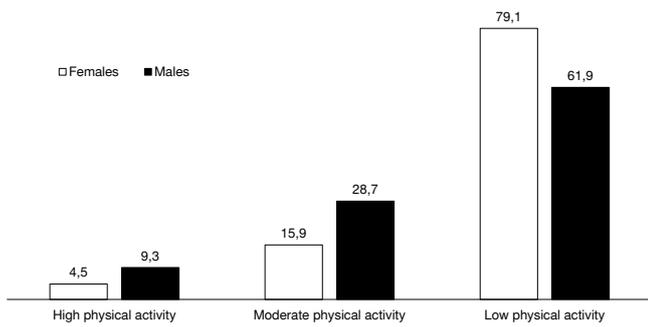


Figure 1. Level of physical activity in females and males aged 20-59 years (%)

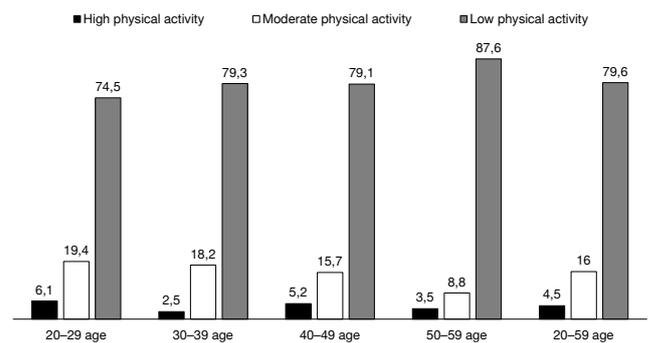


Figure 2. Level of leisure-time physical activity across female age groups (%)

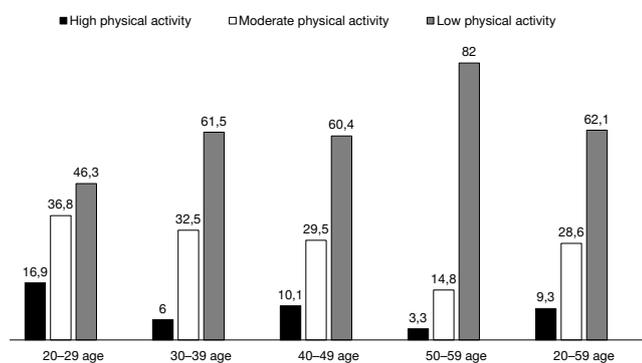


Figure 3. Level of leisure-time physical activity across male age groups (%)

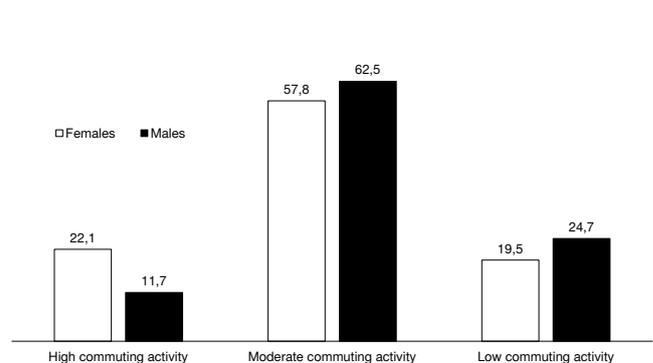


Figure 4. Level of commuting activity in females and males aged 20-59 years (%)

Taking into account the number of days per week in which the participants covered the entire distance to and from work on foot or by bicycle per day (minimum 60 min), it was found that a (Figure 4):

- high level of commuting activity characterised 22.1% of females and 11.7% of males,
- moderate level of commuting activity was presented by 57.8% of females and 62.5% of males,
- lack of commuting activity was found in 19.5% of females and 24.7% of males.

Spearman's rank correlation coefficients indicated significant relationships between leisure-time activity and all of the physical fitness-based measures in both the male and female participants (Table 2). With regard

to commuting activity, significant relationships were found between grip strength, lower extremity strength and endurance in the females. Commuting activity was not a differentiating factor in any of the analysed components of physical fitness.

### Discussion

The associations between physical activity and fitness in different populations as well as the interactions between determining and differentiating factors are very difficult to establish. This is due to not only conceptual and terminological differences but also the diverse guidelines and recommendations on physical activity [18].

Table 2. Spearman's rank correlation coefficients between physical fitness and physical activity and commuting activity in males and females

Physical fitness measures	Physical activity		Commuting activity	
	Females	Males	Females	Males
Agility	0.1029*	0.2417*	0.0002	-0.0006
Handgrip strength	-0.1310*	-0.2977*	0.1302*	0.0553
Hand movement speed	-0.1318*	-0.2524*	0.0397	0.0615
Upper extremity dynamic strength	-0.1557*	-0.3586*	-0.0407	-0.0458
Lower extremity explosive strength	-0.1684*	-0.3109*	0.1326*	0.0651
Endurance	-0.1172*	-0.1191*	-0.0881*	0.0030

\*  $p < 0.05$

Generally, regular moderate-intensity physical activity is known to significantly affect the maintenance and improvement of physical fitness [19–21]. Moreover, as was already mentioned, the period of early adulthood and particularly later adulthood give rise to a number of regressive and senescent processes that affect motor function.

The present findings indicate that leisure-time physical activity was a factor positively influencing the level of physical fitness in males and females and that these observations coincide to a great extent with the results obtained by other authors [18, 22–25]. No correlations were revealed between commuting activity and the level of the physical fitness-based measures in males. However, commuting activity was a factor that significantly differentiated handgrip strength, lower extremity strength and endurance in females. This finding is promising in regards to males, as it can be surmised that the effects of at least 60 min of walking or bicycling to and from work may result in beneficial changes.

The males in all age groups were characterised by slightly higher PAL than the women, although there was clear trend in which physical activity diminished with age. The fact that 70.5% of the entire sample presented a low PAL indicates the ascendancy of a sedentary lifestyle. On the other hand, more optimistic results were discovered in terms of commuting activity, where 16.9% self-reported commuting actively for > 1 h four and more times per week. In comparison with the findings presented Drygas et al. [26] this constituted a notable difference.

Despite the fact that physical activity plays a significant role in preventive healthcare [20, 21, 26], our results indicate that participation in leisure-time physical activity is apparently uncommon in Polish society, with one of the main reasons given by the participants was a lack of time. This is most unfortunate, as physical activity is an important factor influencing health, life quality, life expectancy and well-being. The lack of physical activity is one of the main reasons for morbidity attributed to lifestyle diseases including cardiovascular diseases, obesity, diabetes and cancer [20, 21, 26].

The literature is clear that even a minimal amount of physical activity aimed at improving various motor skills reduces the progression of disability in the elderly and concomitantly extends functional independence [27]. Even a walking-based intervention (over a period of 14 years) showed a correlation with current functional status in females over 70 years of age. Other studies have confirmed that physical activity plays a significant role in maintaining functional ability in older age [28, 29].

### Conclusions

1. Leisure-time physical activity is a factor that enhances various physical fitness components in females and males aged 20–59 years, principally in regard to static and dynamic extremity strength, agility, hand movement speed and endurance.

2. Commuting activity is not associated with the performance level of different motor skills in males, whereas in females it is a factor that positively affects the level of handgrip strength, lower extremity strength and endurance.

3. Both leisure-time physical activity combined with commuting activity are factors that significantly stimulate the performance level of various motor skills in adults.

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