

# Identification of demographic factors and health problems that affect the acceptance of disease and health behaviors of patients with osteoarthritis

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**INTRODUCTION:** Osteoarthritis (OA) is one of the most common causes of musculoskeletal system's ailments. In the prevention of the disease and in its comprehensive treatment, it is proper health-related behavior that becomes an extremely important factor for the maintaining of optimal health condition. **THE AIM OF THE STUDY** is to assess the relationship between the reported pain and the disability level and the health-related behaviors undertaken by OA patients as well as their tolerance of the disease. **MATERIALS / METHODS:** The study group consisted of 198 patients with diagnosed OA, according to ACR criteria (1988). The method used in the study was a Pain VAS (0-10), Health Assessment Questionnaire Disability Index (HAQ DI 0-3), Acceptance of Illness Scale (AIS 8-40) and Health and Behavior Inventory (IZZ 24-120). **RESULTS:** The average age among respondents with OA has been 59.16 years of age ( $\pm 15.87$ ), duration of disease 5.5 years ( $\pm 4.32$ ). Experienced pain, both during movement ( $r=0.319$ ,  $p<0.001$ ) and at rest ( $r=0.375$ ,  $p<0.001$ ) correlated positively with physical disability (HAQ DI). Researches indicated a positive linear correlation between the age and physical disability ( $r_s=0.200$ ,  $p=0.005$ ). Tolerance of the disease (AIS) depends mostly on age ( $r=-0.325$ ,  $p<0.001$ ), on pain in motion ( $r=-0.209$ ,  $p<0.001$ ) and at rest ( $r=-0.218$ ,  $p<0.001$ ) and on the disability levels ( $r=-0.353$ ,  $p<0.001$ ). Analysis of the health-related behaviors (IZZ) indicates the average severity of declared behavior a statistically significant with physical disability (HAQ DI) ( $p=0.029$ ). **CONCLUSIONS:** With age and progressive levels of disability as well as with the severity of pain, the acceptance of illness is reduced significantly. The progressive levels of disability and younger age of the respondents motivate them to engage in health beneficial behavior.

1 **Identification of demographic factors and health problems that affect the**  
2 **acceptance of disease and health behaviors of patients with osteoarthritis**

3  
4 **Acceptance and health behaviors in OA**

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24 Osteoarthritis - OA (*morbus degenerativus articularum*), also known as a degenerative  
25 disease, is a group of overlapping disorders that despite their different etiologies lead to similar  
26 effects within the biological, morphological and clinical results. The disease affects ligaments,  
27 joint capsules, synovium, bursitis, tendons, muscles, and it is often accompanied by the  
28 secondary damage to the nerves and veins (*Bannell, Hunter & Hinman 2012; Jordan et al.*  
29 *2003*). This applies in particular to the weight-bearing joints, for example knees, ankles, spine  
30 and upper limbs, less often hips.

31 The main physical problems of OA patients are: headache, contracture and distortion of  
32 joints as well as difficulty with moving and with performing basic tasks of self-care. The  
33 patients display behaviors resulting from the fear of losing physical mobility, such as anxiety,  
34 depressive states, despondency, and reluctance to undertake any form of physical activity. The  
35 progressive nature of the disease causes also problems within the social and professional sphere,  
36 that lead to isolation, lack of acceptance of one's inability for professional work, restrictions in  
37 movement and in limitations in performing basic activities of daily living (*Østerås et al., 2013;*  
38 *Kolanowski, 2010; Suri & Walsh, 2012*).

39 For many patients it is extremely difficult to adapt to the changes brought by the chronic,  
40 progressive disease that sometimes results even in a physical disability. The patient should be  
41 prepared for a conscious participation in the treatment and self-care; therefore, it is important  
42 that he/she obtains professional help, support and health education (*Hill, 2006; Sierakowska et*  
43 *al., 2010a*). Another key factor is laying foundation for the proper health-related behaviors as  
44 it can reduce or even prevent the progression of disability and physical dysfunctions.

45 In osteoarthritis, particular attention is paid to health behaviors that improve the  
46 function of the musculoskeletal system. Patients have to take daily physical activity, in the  
47 form of physical exercises tailored to their individual abilities, and daily walks to improve the

48 overall condition. It is important to maintain diet, in order to keep a healthy weight. Such  
49 actions help in taking the relief of the joints and reducing pain. Given the adverse effect of  
50 non-steroidal anti-inflammatory drugs, it is recommended to use them mainly locally. Also  
51 physiotherapy can be helpful in relieving pain and disability. The active patient's participation  
52 in the therapeutic process, maintaining a healthy lifestyle and starting behaviors that reduce  
53 the progression of disability will improve the patient's functioning in everyday life, and thus  
54 his/her acceptance of illness will increase (*Jordan et al., 2003; Hochberg et al., 2012;*  
55 *Bannell, Hunter & Hinman 2012*).

56 **THE AIMS OF THE STUDY:** an attempt to evaluate the degree of acceptance of the  
57 disease and pro-health behaviors, in relation to the major health problems in osteoarthritis  
58 patients, such as pain and inability to independently perform activities of daily living; to  
59 determine how selected demographic factors, such as age and sex, as well as the duration of  
60 disease, affect the acceptance of osteoarthritis and taking pro-health behaviors and, in  
61 consequence, the progression of pain and disability; an analysis of the actions undertaken by  
62 the patients that could improve their well-being and everyday functioning (patients taking  
63 analgesics, doing physical exercises on their own).

64 The authors aim to show the disease from the biomedical, but also psychological and  
65 existential perspective, having in mind the patient who suffers from a chronic, progressive  
66 rheumatic disease. It has been used a study of health psychology that enriches the paradigm  
67 with the psychological biomedical, social and behavioral dimensions. The research tools (AIS,  
68 IZZ) are based on the social-cognitive theories and refer to holistic approach to health and  
69 disease. Therefore, the evaluation of patient's behavior, that describes health, physical  
70 complaints, methods of coping with the disease and treatment, takes into account cognitive,  
71 emotional and motivational aspects. This is particularly important in the rheumatic diseases,  
72 which lead to a reduced level of performance, high severity of health problems, and dependence

73 on the environment and, consequently, lower quality of life (*Juczyński, 1999; Felton, Revenson*  
74 *& Hinrichsen, 1984a; Amir, 1987; Grohman, 1982*).

75 The researchers hypothesized that in self-care in osteoarthritis, particularly important is  
76 the attitude of patients towards disease and their practices that are conducive to health, i.e.  
77 behavior that lowers the risk of exacerbations. Such approach contributes to a better well-being  
78 stemming from the treatment compliance. An important task for health professionals is to  
79 motivate the patient to engage in health beneficial behavior. The authors have attempted to  
80 identify the factors affecting the acceptance of illness and positive lifestyle, so that educational  
81 activities and support of patients with OA would be planned deliberately and accurately.

## 82 MATERIALS AND METHODS

### 83 Participants and procedures

84  
85 The study included 198 patients diagnosed with osteoarthritis of knee, osteoarthritis of the hip  
86 and degenerative disease of the spine, within the program of inpatient and outpatient care. The  
87 study was conducted at the Department of Rheumatology and Internal Diseases, Medical  
88 University of Białystok, Poland, during patients' hospitalization and in Rheumatology  
89 Occupation in Augustow, during inspection visits to rheumatologists, from April to November  
90 2011. The patients were informed about the study and how to fill in the questionnaires  
91 independently and anonymously.

92 The inclusion criteria were: age  $\geq 40$  years, diagnosis of OA according to ACR criteria  
93 (1988) and informed consent to participate in the study. The criterion for exclusion from the  
94 study was the existence of other, overlapping diseases of bone and joint, including  
95 inflammatory joint diseases.

### 96 Ethics approval

97 The study follows the *Good Clinical Practice* guidelines and it is in accordance with the  
98 *1975 Helsinki Declaration* revised in 2000 (concerning the ethical principles for the medical

99 community and forbidding releasing the name of the patient, initials or the hospital evidence  
100 number) and with the ethical standards of the institutional committee on human  
101 experimentation (statute from the Bioethics Committee of the Medical University in Bialystok,  
102 Poland no. RI-002/572/2011).

### 103 **Study instrument**

104 The method used was a diagnostic survey, using a questionnaire, visual–analog scale  
105 assessment of pain (Pain VAS) during movement and resting (0-10), Health Assessment  
106 Questionnaire Disability Index (HAQ DI 0-3) and measurement tools used in the promotion of  
107 health and health psychology that are accessible to health professionals, such as: Acceptance of  
108 Illness Scale (AIS 8 -40) by *Felton, Revenson & Hinrichsen (1984)* adapted by *Juczyński*  
109 *(1999)*, and Health Behavior Inventory (IZZ 24-120) by *Juczyński (1999)*.

110 Acceptance of Illness Scale (AIS) contains 8 statements that describe the negative  
111 consequences of ill health, taking into account the limitations imposed by the disease, lack of  
112 self-sufficiency, a sense of dependence on others and low self-esteem. The scale is used to  
113 measure the degree of acceptance of the disease (*Juczyński, 1999*). To evaluate the level of the  
114 acceptance of the disease, the results were interpreted within the scale of 8 – 40 pts. The higher  
115 the score, the greater acceptance of disease, better adaptation and lesser the sense of  
116 psychological discomfort.

117 Health Behavior Inventory (IZZ) contains 24 statements that describe the intensity of  
118 health-related behaviors. The scale allows for the evaluation of the intensity of health-related  
119 behaviors in four areas (1-5): proper eating habits (type of food intake e.g. vegetables, fruit,  
120 whole wheat bread) preventive behavior (following doctor's recommendations, interest in  
121 knowledge about the disease), positive mental attitude (avoiding strong emotions and stress)  
122 and healthy practices (sleep, recreation, physical activity). IZZ is helpful in planning measures  
123 of prevention, behavior modification determining the direction and monitoring of changes in

124 health practices (*Sierakowska et al., 2010a*). For the overall evaluation of health-related  
125 behaviors, interpreting the results in terms of 24–120 pts. The results can be converted into raw  
126 values sten (1-10), given the temporary standards for men and women (1-4 sten scores low F  
127 24-77, M 24-71; average 5-6 F 78-91, M 72-86 7-10 92-120 high F, M 87 - 120) (*Juczyński,*  
128 *1999*).

129 The severity of pain (Pain VAS 0-10) has been interpreted in three ranges: 0–3.5 – a  
130 slight degree of pain (low), 3.6 - 6.5 – an average pain (medium), 6.6 - 10 – a strong degree of  
131 felt pain (strong) (*Wiland, Madaj & Szmyrka – Kaczmarek, 2008*).

132 The HAQ-DI is a validated generic measure of physical functioning combining eight  
133 domains (dressing and grooming, arising, eating, walking, hygiene, reach, grip and other  
134 activities). Responses to each item ranges from zero (no difficulty) to three (unable to do). The  
135 total score ranges from 0 – 3: 0 – 1 – little degree dysfunctions in any field of daily life; > 1 –  
136 2 – serious limitations or need for help in daily activities; > 2 - 3 – total inability to do daily  
137 activities without help (*Bruce & Fries, 2003; Thorsen et al., 2001*).

## 138 DATA ANALYSIS

139 All data were analyzed using PQStat v.1.4.2 software. We tested the null hypothesis of  
140 no correlation between health behavior, acceptance of disease and patient pain problem and  
141 disability. Pearson ( $r_p$ ) and Spearman ( $r_s$ ) correlation coefficient is reported together with p-  
142 values, with r of 0.10, 0.20 and 0.50 representing small, medium and large effects respectively.  
143 The effects of sex, age and disease duration were tested across all measures. Students' t-test was  
144 used to asses gender differences and One-Way ANOVA for differences across age groups and  
145 disease duration. The level of significance  $\alpha = 0.05$ .

## 146 RESULTS

### 147 General characteristics of subjects with OA

148 In a general view, what we can see in Table 1., is that the largest group (n=110) of patients  
 149 diagnosed with OA was women (55.6%). The mean age was 59.16 ( $\pm$ 15.87). The average time  
 150 of disease duration was 5.5 ( $\pm$ 4.32) years. More than half of respondents (56%) suffered more  
 151 than 10 years. As it is shown in Table 1., the largest group of patients (n=100, 50.5%) declared  
 152 primary education/vocational training and lived in the city (n=122, 61.6%). The vast majority  
 153 (n=138, 70.1%) of subjects were retired and married (n=147, 74.2%).

154 The majority of respondents (59%) were taking analgesics during the periods of the  
 155 disease's worsening. The level of physical activity was not satisfactory. More than half of  
 156 respondents (52.5%) declared that they did not practice any sport. A large percentage of  
 157 respondents (44.7%) did not use any form of rehabilitation.

158

159 **Table 1.** Patient characteristics and outcomes (numbers means (SD) except where stated  
 160 otherwise)

Variables studied (score range)	Mean ( $\pm$ SD)
Age	59.16 ( $\pm$ 15.87)
Disease duration years	5.5 ( $\pm$ 4.32)
sex - number of women (%)	110 (55.6)
Educational background	
basic/ professional - number (%)	100 (50.5)
secondary - number (%)	61 (30.8)
higher – number (%)	37 (18.7)
Place of residence	
city - number (%)	122 (61.6)
village - number (%)	76 (38.4)

7

Occupational status	
retired - number (%)	138 (70.1)
working - number (%)	55 (27.9)
unemployed - - number (%)	5 (2.5)
Family Status	
married / married - number (%)	147 (74.2)
widow / widower - number (%)	43 (21.7)
single – number (%)	8 (4.0)
Pain-VAS (0-10) in motion	5.92 ( $\pm$ 1.90)
Pain-VAS (0-10) at rest	4.95 ( $\pm$ 2.27)
HAQ-DI (0-3)	1.10 ( $\pm$ 0.92)
AIS (8-40)	25.75 ( $\pm$ 8.47)
IZZ (24-120)	88.39 ( $\pm$ 15.5)

161 VAS - visual - analogue scale; HAQ DI - Health Assessment Questionnaire Disability Index; AIS - Acceptance of Illness  
 162 Scale; IZZ - Health Behavior Inventory  
 163

#### 164 **The analysis of pain perception during motion and rest (Pain VAS)**

165 The mean of pain in motion for the test group, as presented in Table 1., was 5.92 ( $\pm$ 1.90),  
 166 and the rest 4.95 ( $\pm$ 2.27), which indicates the average level of pain. In the performing a detailed  
 167 analysis of the data on the severity of pain in motion, it was shown that more than half of all  
 168 respondents (50.5%) declared a strong degree of experienced pain, 29.8% of respondents  
 169 declared pain while resting.

170 The statistical analysis showed a statistically significant relationship between the  
 171 perception of pain during movement and taking analgesics. Patients who did not take anti-pain  
 172 drugs rated their pain on the lower level significantly more often - Pain VAS 3.94 ( $\pm$ 1.81)  
 173 ( $p < 0.001$ ). Respondents who declared average level of pain during movement - Pain VAS 6.10

174 ( $\pm 1.91$ ), more frequently pointed to the regular taking anti-pain medications. As it is shown in  
 175 Table 2., there is a statistically significant relationship between the level of pain at rest and  
 176 administered anti-pain medications ( $p < 0.001$ ). With the increase of pain at rest the frequency  
 177 of taking anti- pain drugs has been intensified.

178 The answers to the character of pain in relation to the physical exercises at home  
 179 (physiotherapy) suggest that the level of pain experienced both during movement and the rest  
 180 was slightly reduced, although it was not statistically significant, with the execution rate of the  
 181 individually performed physical exercises at home (data in Table 2).

182

183 **Table 2.** The level of pain during movement and resting (Pain VAS) in comparison to the  
 184 variables in the group with osteoarthritis.

Variables studied	Pain in motion (VAS 0-10)		Pain at rest (VAS 0-10)	
	Mean ( $\pm$ SD)	<sup>1</sup> F-statistic (p-value)	Mean ( $\pm$ SD)	<sup>1</sup> F-statistic (p-value)
<b>Sex</b>				
F	5.1 ( $\pm 2.22$ )	0.12 (0.694)	5.0 ( $\pm 2.35$ )	0.12 (0.732)
M	4.79 ( $\pm 2.14$ )		4.88 ( $\pm 2.17$ )	
<b>Age, years</b>				
40 - 60	4.62( $\pm 1.92$ )	0.74 (0.708)	4.83 ( $\pm 2.17$ )	0.22 (0.802)
61 – 76	4.96 ( $\pm 1.57$ )		5.08 ( $\pm 2.36$ )	
$\geq 77$	4.76 ( $\pm 2.54$ )		4.94 ( $\pm 2.38$ )	
<b>Disease duration, years</b>				
0-5	5.72 ( $\pm 2.05$ )	0.62 (0.539)	4.37 ( $\pm 2.30$ )	2.37 (0.096)
6-10	5.78 ( $\pm 1.71$ )		4.86 ( $\pm 2.03$ )	

9

>10	6.05 ( $\pm$ 1.90)		5.22 ( $\pm$ 2.31)	
<b>Intake of analgesics</b>				
during worsening of symptoms	6.10 ( $\pm$ 1.75)	11.01 (< <b>0.001</b> )	5.10 ( $\pm$ 2.20)	8.49 (< <b>0.001</b> )
systematically	6.10 ( $\pm$ 1.91)		5.21 ( $\pm$ 2.25)	
not taking	3.94 ( $\pm$ 1.81)		2.85 ( $\pm$ 1.88)	
<b>Physical exercises</b>				
doesn't perform physical exercises	5.87 ( $\pm$ 2.08)	0.84 (0.471)	4.89 ( $\pm$ 2.33)	1.19 (0.313)
several times a month	6.42 ( $\pm$ 1.60)		5.67 ( $\pm$ 2.07)	
2-3 times a week	5.82 ( $\pm$ 1.64)		4.76 ( $\pm$ 1.99)	
daily	5.69 ( $\pm$ 1.78)		4.66 ( $\pm$ 2.58)	

185 the univariate ANOVA for independent groups, F statistic; VAS - visual - analog scale

186

187 **The analysis of the level of physical disability in performing daily activities (HAQ**  
 188 **DI)**

189 In order to analyze the degree of physical disability of patients in everyday activities,  
 190 there has been used a HAQ DI questionnaire. In the study group, as it is indicated in Table 1.,  
 191 the average HAQ DI score was at 1.10 ( $\pm$ 0.92).

192 The average value level of disability among women was 1.25 ( $\pm$ 1.07), while in men 0.92  
 193 ( $\pm$ 0.64). The statistical analysis showed that there is a statistically significant relationship  
 194 between the level of inability in performing daily activities and sex ( $p=0.012$ ) (data in Table 3).

195 The average level of disability in the age group  $\geq 77$  years amounted to 1.22 ( $\pm$ 0.72) (it  
 196 was the highest value in all groups) ( $p=0.028$ ). The study has shown, that more than half of the  
 197 respondents (62.4%) aged  $\geq 77$  years, declared major restrictions or the need for help in

198 activities of daily living (HAQ DI>1-2). Researches indicated a positive linear correlation, what  
 199 we can see in Table 3., between the age and physical disability ( $r_s=0.200$ ,  $p=0.005$ ).

200 The evaluation of skills in everyday life, as presented in Table 3., has been positive in  
 201 patients who declared that they were not taking any anti-pain medications (HAQ DI  $0.59$   
 202  $\pm 0.43$ ). Respondents who regularly took analgesics obtained the highest level of disability  
 203 (HAQ DI  $1.31 \pm 0.73$ ). There has been observed a statistically significant relationship between  
 204 the level of disability in the performance of activities of daily life and the intake of analgesics  
 205 ( $p=0.012$ ).

206 The study indicated a statistically significant correlation between the level of pain during  
 207 movement and physical disability (HAQ DI) ( $p<0.001$ ), what we can see in Table 3. Patients  
 208 who declared strong level of pain, declared also serious limitations when performing daily life  
 209 activities (HAQ DI  $1.25 \pm 0.68$ ). There was a positive linear correlation ( $r_s=0.319$ ,  $p<0.001$ )  
 210 between the Pain VAS and HAQ DI. The average value for the level of disability among  
 211 patients who declared a strong level of pain at rest was  $1.47 (\pm 0.63)$ . It has been observed that  
 212 along with improving mobility, level of pain decreased ( $r_s=0.382$ ,  $p<0.001$ ) (Table 3).

213

214 **Table 3.** The level of physical disability (HAQ DI) in comparison to the variables in the group  
 215 with osteoarthritis.

Variables studied	HAQ DI (0-3)		
	Mean ( $\pm$ SD)	<sup>1</sup> F-statistic (p-value)	<sup>2</sup> $r_s$ (p-value)
<b>Sex</b>			
F	1.25 ( $\pm 1.07$ )	6.38 ( <b>0.012</b> )	
M	0.92 ( $\pm 0.64$ )		
<b>Age, years</b>			

40 - 60	0.98 ( $\pm 1.17$ )	1.37 ( <b>0.028</b> )	0.200 ( <b>0.005</b> )
61 - 76	1.18 ( $\pm 0.64$ )		
$\geq 77$	1.22 ( $\pm 0.72$ )		
<b>Disease duration, years</b>			
0-5	0.93 ( $\pm 1.47$ )	1.56 (0.211)	
6-10	1.03 ( $\pm 0.67$ )		
>10	1.20 ( $\pm 0.66$ )		
<b>Intake of analgesics</b>			
during worsening of symptoms	1.06 ( $\pm 1.03$ )	4.49 ( <b>0.012</b> )	
systematically	1.31 ( $\pm 0.73$ )		
not taking	0.59 ( $\pm 0.43$ )		
<b>Physical exercises</b>			
doesn't perform physical exercises	1.17 ( $\pm 1.11$ )	0.80 (0.496)	
several times a month	1.16 ( $\pm 0.60$ )		
2-3 times a week	1.03 ( $\pm 0.62$ )		
daily	0.88 ( $\pm 0.71$ )		
<b>Pain VAS in motion (0-10)</b>			
low	0.81 ( $\pm 1.90$ )	18.50 (< <b>0.001</b> )	0.319 (< <b>0.001</b> )
medium	1.01 ( $\pm 0.64$ )		
strong	1.25 ( $\pm 0.68$ )		
<b>Pain VAS at rest (0-10)</b>			
low	0.92 ( $\pm 1.28$ )	18.28 (< <b>0.001</b> )	0.382 (< <b>0.001</b> )

medium	0.97 ( $\pm 0.60$ )		
strong	1.47 ( $\pm 0.63$ )		

216 <sup>1</sup>the univariate ANOVA for independent groups, <sup>1</sup>F-statistic; <sup>2</sup> $r_s$  Spearman correlation; HAQ DI - Health Assessment  
 217 Questionnaire Disability Index  
 218

### 219 **Correlates of disease acceptance (AIS)**

220 The average value level of acceptance of the disease in the study group, as presented in  
 221 Table 1., was 25.75 ( $\pm 8.47$ ), which indicates the average level of acceptance of the disease  
 222 among patients with diagnosed OA.

223 With age the level of acceptance of the disease significantly worsened. The results of  
 224 statistical analysis showed that there was a statistically significant correlation between the level  
 225 of acceptance of the disease and the age ( $r_s = -0.325$ ,  $p < 0.001$ ).

226 In statistical analysis of the variable of disease duration and the level of acceptance of the  
 227 disease, it was observed, as shown in Table 4., that along with the duration of OA the level of  
 228 acceptance of the disease significantly decreases (>10 years - AIS 23.71 ( $\pm 7.79$ )). The analysis  
 229 indicated a statistically significant relationship between the variables ( $p < 0.001$ ).

230 The respondents who declared that they do not take any medication for pain assessed the  
 231 acceptance of the disease on a good level – AIS 30.64 ( $\pm 9.30$ ) and those who take medication  
 232 for pain systematically pointed to the average level of acceptance of the disease – AIS 24.35  
 233 ( $\pm 9.10$ ) ( $p = 0.023$ ) (data in Table 4).

234 As it is shown in Table 4., it has been observed a negative correlation ( $r_p = -0.209$ ,  
 235  $p < 0.001$ ) between the level of the acceptance of disease and the degree of pain during  
 236 movement. Along with the seriousness of pain the capacity to accept the disease decreased. A  
 237 relation between the level of acceptance of disease and the degree of pain at rest ( $r_p = -0.218$ ,  
 238  $p < 0.001$ ) has been also demonstrated.

239 It has been also proven that there is a negative linear correlation between the acceptance  
 240 of illness and the level of disability (HAQ DI) ( $r_p = -0.353$ ,  $p < 0.001$ ). The average value for the  
 241 level of acceptance of disease among those declaring a slight dysfunction in every area of  
 242 everyday life (HAQ 0-1pkt.) was 28.75 ( $\pm 8.53$ ), and among respondents reporting a total  
 243 inability in carrying out activities of daily living (HAQ > 2-3pkt.) – 21.06 ( $\pm 6.02$ ) ( $p < 0.001$ )  
 244 (data in Table 4).

245

246 **Table 4.** Correlates of disease acceptance and health behaviors in the group with osteoarthritis.

Variables studied	AIS (8-24)			IZZ (24-120)	
	Mean ( $\pm$ SD)	<sup>1</sup> F-statistic/ p-value	<sup>2</sup> $r_s$ / <sup>3</sup> $r_p$ (p-value)	Mean ( $\pm$ SD)	<sup>1</sup> F-statistic/ p-value
<b>Sex</b>					
F	30.23 ( $\pm 8.45$ )	2.51 (0.115)		92.51 ( $\pm 14.02$ )	4.67 ( <b>&lt;0.001</b> )
M	28.22 ( $\pm 7.54$ )			83.23 ( $\pm 15.44$ )	
<b>Age, years</b>					
40 - 60	28.47 ( $\pm 7.84$ )	9.46 ( <b>&lt;0.001</b> )	<sup>2</sup> -0.325 ( <b>&lt;0.001</b> )	87.25 ( $\pm 16.85$ )	3.47 ( <b>0.033</b> )
61 – 76	24.42 ( $\pm 8.27$ )			91.84 ( $\pm 12.75$ )	
$\geq 77$	22.23 ( $\pm 8.45$ )			84.43 ( $\pm 15.34$ )	

<b>Disease duration, years</b>					
0-5	30.31 ( $\pm$ 8.54)	11.11 <b>(&lt;0.001)</b>		87.46 ( $\pm$ 15.47)	1.06 (0.349)
6-10	26.05 ( $\pm$ 8.25)			85.82 ( $\pm$ 17.43)	
>10	23.71 ( $\pm$ 7.79)			89.46 ( $\pm$ 14.46)	
<b>Intake of analgesics</b>					
during worsening of symptoms	25.80 ( $\pm$ 7.76)	3.81 ( <b>0.023</b> )		87.43 ( $\pm$ 15.20)	1.56 (0.213)
systematically	24.35 ( $\pm$ 9.10)			91.01 ( $\pm$ 15.46)	
not taking	30.64 ( $\pm$ 9.30)			85.11 ( $\pm$ 15.33)	
<b>Doing physical exercises</b>					
doesn't perform physical exercises	25.26 ( $\pm$ 8.83)	0.38 (0.765)		82.67 ( $\pm$ 15.91)	13.31 <b>(&lt;0.001)</b>
several times a month	26.92 ( $\pm$ 8.22)			90.85 ( $\pm$ 10.67)	

2-3 times a week	26.38 (±8.03)			97.64 (±10.51)	
daily	25.48 (±8.17)			94.51 (±14.02)	
<b>Pain VAS in motion (0-10)</b>					
low	29.82 (±8.70)	3.38 (0.036)	<sup>3</sup> -0.209  ( <b>&lt;0.001</b> )	87.83 (±15.50)	0.28 (0.753)
medium	25.80 (±8.38)			89.46 (±15.07)	
strong	24.68 (±8.23)			87.52 (±15.96)	
<b>Pain VAS at rest (0-10)</b>					
low	27.18 (±8.66)	4.14 ( <b>0.017</b> )	<sup>3</sup> -0.218  ( <b>&lt;0.001</b> )	86.60 (±15.26)	0.73 (0.482)
medium	27.04 (±7.93)			88.86 (±15.51)	
strong	22.55 (±8.10)			89.81 (±15.30)	
<b>HAQ DI (0-3)</b>					
0-1	28.75 (±8.53)	11.53 ( <b>&lt;0.001</b> )	<sup>3</sup> -0,353 ( <b>&lt;0.001</b> )	87.81 (±15.26)	3.59 ( <b>0.029</b> )
>1-2	22.20 (±6.93)			87.12 (±15.33)	

>2-3	21.06 ( $\pm 6.02$ )			98.06	
				( $\pm 13.30$ )	

247 <sup>1</sup>the univariate ANOVA for independent groups; <sup>2</sup> $r_s$ , Spearman correlation; <sup>3</sup> $r_p$ , Pearson's correlation coefficient, where 0.10,  
 248 0.20 and 0.50 represent small, medium and large effects respectively; HAQ DI - Health Assessment Questionnaire Disability  
 249 Index; AIS - Acceptance of Illness Scale; IZZ - Health Behavior Inventory  
 250

251

## 252 **Correlates of the inventory of health-related behaviors (IZZ)**

253 In the general analysis of inventory of health-related behaviors it has been observed the  
 254 average intensity of declared behavior – IZZ 88.39 ( $\pm 15.34$ ) (Table 1).

255 As it is shown in Table 3., health behaviors in the group of women was valued 92.51  
 256 ( $\pm 14.02$ ), while men 83.23 ( $\pm 15.44$ ) ( $p < 0.001$ ). The detailed analysis showed that 61.8% of  
 257 women and 42% of men reported a high occurrence of health-related behaviors.

258 Given the age factor, mean value of inventory of health behaviors in the group  $\geq 77$  years  
 259 was the lowest, compared to other age groups, and was 84.43 ( $\pm 15.34$ ). The analysis showed a  
 260 statistically significant relationship between the declared health behavior and the age of the  
 261 respondents ( $p = 0.033$ ) (Table 4).

262 Analysis of health-related behaviors in relation to the applied physiotherapy at home,  
 263 showed that patients performing physical exercises every day, declared a high intensity of the  
 264 declared pro-health behaviors - IZZ 94.51 ( $\pm 14.02$ ), while those who have not practice any  
 265 sport pointed to medium/average occurrence of pro-health behaviors - IZZ 82.67 ( $\pm 15.91$ )  
 266 ( $p < 0.001$ ) (data in Table 4).

267 In seeking the significant relationship between health behaviors (IZZ), and the level of  
 268 disability (HAQ DI), what is presented in Table 4., there has been found that the respondents  
 269 declaring dysfunction of slight intensity in every area of everyday life (HAQ DI 0-1) pointed  
 270 to the average severity of health behaviors - 87.81 ( $\pm 15.26$ ), while patients requiring total  
 271 assistance in carrying out activities of daily living (HAQ DI > 2-3) declared a high intensity of

272 health-related behaviors - 98.06 ( $\pm 13.30$ ) ( $p=0.029$ ). The study showed no statistical significant  
273 linear correlation between health-related behaviors and the studied variables.

274 Separate calculation of the four categories of health behaviors (1-5), indicates that the  
275 average value for healthy eating habits was to 3.70 ( $\pm 0.55$ ), preventive behaviors- 4.13 ( $\pm 0.60$ ),  
276 positive mental attitude - 3.87 ( $\pm 0.60$ ), and health practices - 3.76 ( $\pm 0.60$ ). The study has shown  
277 that the patients received the highest score in the category of preventive behaviors, regarding  
278 treatment compliance and obtaining information about health and disease, and the lowest in the  
279 category of proper eating habits (type of food they eat).

## 280 DISCUSSION

281 Osteoarthritis is the most common rheumatic disease that affects the elderly people,  
282 although it can be also a serious health problem in people under fifty. The disease is  
283 characterized by joint pain, impaired functioning of the musculoskeletal system, limited joint  
284 mobility, that leads to progressive levels of disability, influencing all spheres of patient's life:  
285 the physical, psychological, social and occupational (*Bannell, Hunter & Hinman 2012; Jordan*  
286 *et al. 2003*). The pain of the disease contributes to the feeling of anxiety, irritability, exhaustion,  
287 which in turn causes disturbances in the everyday life functioning. An increasing pain often  
288 leads to patient's isolation and loneliness (*Kool & Geenen, 2012*).

289 The progressive nature of osteoarthritis undoubtedly affects also the level of acceptance  
290 of disease and the development of individual pro-health behaviors, promote better health and  
291 well-being, or affecting the further development of disease and disability (*Sierakowska et al.,*  
292 *2010a*). An essential psychological factor that helps in coming to terms with the level of  
293 progressive disability and escalation of pain is the acceptance of disease.

294 Generally, in our study, there was observed that the acceptance of osteoarthritis is mainly  
295 affected by such factors such, age, pain, disability, and disease duration. Taking pro-health  
296 behaviors depended greatly on the level of disability, age and sex. One of the manifestations of

297 pro-health behaviors was doing physical exercises from two to three times a week. Considering  
298 the analysis of the main health problems, the study has shown a positive correlation between  
299 the perception of pain and the level of physical disability. The intensification of both variables  
300 impacted the intake of analgesics. The evaluation of the level of disability depended also on  
301 age and sex.

302 The dominant problem, from the patient's point of view, is pain experienced during  
303 performing physical activities, and to a lesser extent, during resting. The pain of the disease  
304 contributes to the feeling of anxiety, irritability, exhaustion, which in turn causes disturbances  
305 in the everyday life functioning (*Kool & Geenen, 2012; Chen et al, 2011*).

306 Analyzing the results obtained, our findings indicate a negative linear correlation between  
307 the level of acceptance of the disease, felt pain during movement and at rest and the level of  
308 disability. Severe pain and progressive difficulty in daily functioning significantly influence the  
309 level of acceptance of the disease.

310 Referring to disability in OA test Cuperus et al. (2015) also show that the progressive  
311 nature of the disease negatively impacts patients' functioning in everyday activities. As a result,  
312 in most cases, they need the help of others when performing basic tasks, e.g. walking, eating,  
313 personal hygiene, or shopping. In our study it has been observed that, that the main physical  
314 activities which require the help of other people are reaching, grasping, opening, receiving and  
315 handling things. It has been indicated that there is a statistically significant correlation between  
316 the perception of pain during movement and rest, and the level of disability in the performance  
317 of activities of daily living (HAQ DI). In the reviewed literature there is a significant correlation  
318 between the level of pain and disability in patients with OA. Pain created various limitations,  
319 to varying degrees, not only in the performance of professional duties, but also in daily activities  
320 and in the pursuing of personal interests (*Jadhav et al., 2001*). *Reis et al. (2014)* indicate, that  
321 among women diagnosed with OA, what is similar with our results, that there is a significant

322 relationship between pain and the level of disability in performing basic activities of daily  
323 living.

324 Taking the age factor into account it can be noticed that the younger group had a higher  
325 degree of acceptance of the disease than the elderly people. It has been also observed that along  
326 with the disease duration the acceptance of health situation deteriorated and the patients  
327 presented worse adaptation and a greater sense of psychological discomfort. The study of  
328 Creedon & *Weathers (2011)* shows that the people with diagnosed OA are older and that they  
329 are able to more easily accept their health and adopt a positive attitude towards the disease. The  
330 researchers emphasize, however, that the relationship between pain and acceptance of the  
331 disease is a normal part of the aging process and it can significantly limit the patient's ability  
332 to perform activities of daily life independently. *Baird (2003)* however, shows that women have  
333 greater difficulties in accepting their illness, disability and pain. In this report there are no  
334 significant differences concerning sex, by analyzing variable acceptance of OA.

335 In this study there has been also observed that there is a relationship between the disability  
336 in the performance of activities of daily life and sex and age. Women assessed their self-care  
337 ability worse (HAQ DI) than men. The review of the literature also pointed out to the  
338 relationship between the locomotion efficiency and patients' sex (*Wilmańska & Gulaj, 2006*)  
339 and age. Studies by *Kool and Geenen (2012)* on OA patients, showed that >56% of patients  
340 older than 77 years needed a constant regular care.

341 In our study patients, who experienced the pain of a fairly large severity and difficulty in  
342 performing activities of daily life, they more often reach for analgesics and non-steroidal non-  
343 inflammatory drugs. According to recommendations for therapeutic approach to OA on the  
344 basis of the recommendation of the American College of Rheumatology (ACR), European  
345 League Against Rheumatism (EULAR), Osteoarthritis Research Society International  
346 (OARSI), in the case of ineffectiveness, non-steroidal anti-inflammatory drugs, the

347 recommended pharmacotherapy of pain is based on paracetamol, at the lowest effective dose  
348 and as short as possible. The optimal therapeutic management of OA requires the combined use  
349 of non-pharmacological and pharmacological treatment. It should be noticed that the review of  
350 literature reveals that patients with osteoarthritis tend to overuse the aforementioned drugs  
351 (*Jordan et al., 2003; Hochberg et al., 2012; Zhang et al., 2008*). The patients with  
352 osteoarthritis overtake the non-steroidal anti-inflammatory drugs wanting to stimulate fast  
353 therapeutic effect, which only adds to the drugs' side effects. According to the authors, patients  
354 hold the false belief about their positive effects on the course of the disease, not taking into  
355 account the adverse drug reactions (*Jordan et al., 2003; Zhang et al., 2008*).

356 In the prophylaxis and during treatment of the osteoarthritis it is also important to form  
357 behaviors that are beneficial for health. Literature review reveals that little physical activity,  
358 lack of motivation for regular exercising is a substantial problem in patients with OA. To  
359 achieve the goal of motion exercises, it is important to know how to effectively fight the pain,  
360 what are the recommended types of physical exercises for an individual patient and how to  
361 effectively do them. It is advised that patients understand the benefits of physiotherapy, because  
362 many of them do not accept the recommendations for physical treatment out of fear of  
363 exacerbating the pain (*Hill, 2006; Sierakowska et al., 2010a; Sierakowska et al., 2010b*). In  
364 our study, almost half of the respondents did not use any form of rehabilitation.

365 In this study, there has been observed a statistically significant relationship between the  
366 declared health behavior and the age of patients. Respondents aged 61–76 years compared with  
367 older and younger patients, pointed to the higher occurrence of health behaviors. However the  
368 study of *Gignac et al. (2013)* shows that middle-aged people are more satisfied with coping  
369 with the disease in comparison with the subjects who were healthy and older. According to the  
370 authors of this study, the results may indicate that with age the physical ability deteriorates,  
371 which motivates patients to engage in pro-health behaviors. This is confirmed by the fact that

372 respondents who declared dysfunction of slight intensity in every area of everyday life pointed  
373 to medium/average occurrence of health behaviors, while patients who required total assistance  
374 in performing daily living activities declared a high occurrence of pro-health behaviors.  
375 Subjects with a higher level of pro-health behavior are involved in regular physical exercises  
376 that improve their efficiency and well-being. In study by *Hawker et al. (2011)* it is also showed  
377 the impact of pro-health behaviors on the progressive disability and everyday life functioning.

378 Detailed analysis of the categories of health behavior showed that the study group  
379 obtained the lowest average score in healthy eating habits, and the higher score in prevention.  
380 Nevertheless, according to *Juczyński* women during menopause declared that the overall  
381 behavior had somewhat lower score, especially for health practices, and the highest score, as in  
382 our study, was in prophylactics. Health behavior of adult males were lower than women  
383 (*Juczyński, 1999*). Standards of treatment in osteoarthritis indicate the importance of self-care,  
384 proper lifestyle and rehabilitation in OA. A patient who is able to self-manage his/her own lives,  
385 accepts the disease and becomes independent, adapts to changing conditions and learns to live  
386 and work, despite the existing restrictions at home, as well as occupational and social  
387 environment (*Hill, 2006; Sierakowska et al., 2010a; Sierakowska et al., 2014*).

388 It is worth noting that the social situation of the elderly, the possibility of obtaining  
389 emotional support, from the immediate environment significantly affects the level of  
390 acceptance of illness and disability. The task of the therapeutic team is not only an effective  
391 treatment, but also giving support and advice on how to deal with the problems of everyday  
392 life, stress and limitations caused by the disease (*Long et al., 2002; Tak & Laffrey, 2003;*  
393 *Sierakowska et al., 2010b*).

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397  
398 The study of patients with OA has its limitations due to the applied research tool  
399 questionnaire, based on assessment of their own health, which prevents an independent  
400 verification of data. A limitation of the study was also that it was conducted in a specific area  
401 of Poland (Podlasie voivodeship), so the results do not refer to the entire Polish population of  
402 patients diagnosed with osteoarthritis.

## 403 CONCLUSIONS

- 404 1. Although women declare slightly higher difficulties in everyday activities than men,  
405 they exhibit more positive health conducive behavior.
- 406 2. With age and progressive levels of disability as well as with the severity of pain, the  
407 acceptance of disease is reduced significantly.
- 408 3. The progressive levels of disability and younger age of the respondents motivate  
409 them to engage in health beneficial behavior. The subjects present positive pro-  
410 health behavior and undertake regular physical exercises.
- 411 4. High intensity of pain and progressive disability impact patients' decisions to follow  
412 treatment recommendations regarding analgesics.

413 Research has shown the need for taking measures aimed at achieving greater motivation  
414 of patients, particularly of the elderly people, who should engage in daily physical activity in  
415 order to improve their efficiency of learning. The challenge for health professionals should also  
416 be an effective fight against arthritis pain, primarily by non-pharmacological methods of pain  
417 management, as well as greater access to the various forms of rehabilitation. In planning the  
418 health education, the attention should be paid also to the pro-health dietary advice.

419 Further work is planned to develop and implement an education program to promote  
420 healthy and active lifestyles and rehabilitation for patients with osteoarthritis, especially for  
421 patients with longer disease duration and elderly people, with taking into account the level of

422 their disability HAQ DI >1 and Pain VAS >5 cm. It will be also important to motivate men to  
423 participate in organized educational activities as well as in rehabilitation. Three and six months  
424 after the end of the program it is planned to evaluate the effectiveness of health-related activities  
425 undertaken independently by the patients and their impact on the evaluation of pain, disability  
426 and acceptance of the disease, while using standardized measurement tools.

### 427 **Competing interests**

428 The authors declare that they have no competing interests.

### 429 **Authors contributions**

430 MS, IWS designed the study. IWS were local investigators. MS, IWS undertook the statistical  
431 analyses. All authors interpreted the results and participated in the preparation of the  
432 manuscript, read and approved the final version.

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437

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