Comparative analysis of the musculoskeletal health in Poland and Spain: a cross-sectional study using the International Classification of Functioning, Disability and Health

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Abstract

Background: The International Classification of Functioning, Disability and Health (ICF) is the framework for describing disability. The aim of the study was to make an ICF-based comparison between musculoskeletal health in Poland and Spain.

Methods: A comparative study was conducted to identify cross-cultural differences between Poland and Spain in the prevalence of ICF entities from the brief ICF core set for post-acute musculoskeletal conditions. A total of 840 people were included in the study. Information was recoded into ICF qualifiers to obtain comparable data.

Results: Significant differences in functioning were found between the two samples, with a higher prevalence in all the ICF entities for the Spanish sample. Similarities were found in the ICF components 'Body Functions' and 'Environmental Factors', with the most prevalent ICF entities being 'b280 Sensation of pain' and 'e225 Climate' respectively. For 'Activities and Participation', differences were observed, with 'd430 Lifting and carrying objects' being the most common for the Spanish sample and 'd450 Walking' for the Polish sample.

Conclusions: A theoretical application of the ICF has been empirically tested for the first time, a milestone in the development of this research methodology. Differences in the prevalence of ICF entities showed a better musculoskeletal health in the Polish sample.

Trial registration: NCT06283407

Background

Approximately 1.71 billion people worldwide suffer from musculoskeletal disorders. Due to the increase in non-communicable diseases and an ageing population, the number of people suffering from musculoskeletal disorders and related functional limitations is growing rapidly [1]. Currently, they are the leading cause of disability worldwide [2].

Disability is part of a person's existence and an integral part of the human experience. It results from the interaction between the physical consequences associated with an individual's health status and their contextual factors, including personal and environmental factors. This understanding of disability is based on the International Classification of Functioning, Disability and Health (ICF) [3]. The ICF is an international standard for describing, recording and reporting measures of health, functioning, and disability [4]. The World Health Organization (WHO) recommends the combined use of the ICF and the International Classification of Diseases (ICD), which is intended for reporting morbidity and mortality data [5]. The ICD-11 diagnosis does not provide information on the patient's experience of the condition, so the combined use of the ICD and ICF provides a more comprehensive picture of its impact on the patient's daily life [6].

Developed in 2001, the ICF is a multidimensional and biopsychosocial view of people, regardless of their health status, level or cause of disability [7]. The classification describes the interaction between the

changes associated with an individual's condition (impairments of body structures and functions, activity limitations and participation restrictions) and their specific context (personal and environmental factors). One of the purposes of the classification is to serve as a common language for health care professionals to describe the functioning of people with different conditions, thus enabling comparability of research results at national and international levels [4].

The ICF is very comprehensive, covering over 1400 categories. To facilitate its clinical application, the WHO and the ICF Research Branch introduced the ICF core sets, which are brief lists of ICF entities from the entire classification that are most appropriate for specific conditions and/or clinical contexts [8]. To date, 54 ICF core sets have been developed for various conditions, circumstances and situations [9]. As of 2019, only 23 core sets had been validated [10]. In 14 countries from the WHO Collaborating Centres, the current use of the ICF was reported to be mainly in clinical settings (i.e., data recording in rehabilitation settings, assessment of functional status, and description of disability), with Australia and Sweden being the countries with the most widespread use [11]. Although the framework established by the ICF has been almost universally adopted and some selected entities have become part of the ICD-11, the use of the ICF in primary and secondary care is still limited [12].

From a public health perspective, a key challenge for policy and clinical practice is to ensure a health care system that is effective, acceptable and sustainable [13]. One of the continuing difficulties in using research to achieve public health improvement goals is the lack of comparability of reported results [14]. Information on the functioning of people with musculoskeletal conditions is needed for health management and health service planning. WHO has adopted the ICF as a model for structured information on disability and functioning, but there is a need to conduct health assessment analyses using the ICF core sets in different settings and countries [15]. To date, no work has been published comparing levels of functioning assessed using the ICF core sets across countries.

The aim of the study was to compare the differences in musculoskeletal health between the Polish and Spanish populations, using the ICF as a framework. To this end, a comparative cross-sectional analysis between countries was carried out.

Methods

Study design

A comparative study was conducted to assess cross-cultural differences in the prevalence of the ICF entities from the brief ICF core set for post-acute musculoskeletal conditions in patients from Poland and Spain. Data from two previous studies assessing the content validity of this ICF core set in both countries were used [16, 17].

The study was published according to the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement [18].

Setting

The study was carried out on representative samples from regions of Poland and Spain. In Poland, the analysis covered adults living in the south-eastern areas of the country. To ensure an even distribution of institutions in each region, 25 institutions in different parts of south-eastern Poland were selected and invited to participate in the project. Finally, after obtaining consent, the study was conducted in 15 outpatient rehabilitation facilities.

In Spain, the study included adults from the region of Castilla y León (Spain) who were recruited from primary care physiotherapy services belonging to the Regional Healthcare System of Castilla y León (SACYL). These services provide community-based physiotherapy care in both urban and rural areas, and 32 of them participated in patient recruitment. This research was carried out between 2022 and 2023.

Participants

This study used two datasets of patients with post-acute musculoskeletal conditions.

A total of 840 people (528 people from Poland and 312 people from Spain) with musculoskeletal conditions were included. All were diagnosed by a general practitioner and confirmed by the ICD-10 diagnosis given at the time of referral to rehabilitation (osteoarthritis M15-M19, rheumatoid arthritis M05-M06, spine diseases M45-54 and other soft tissues disorders M70-M79).

Patients were recruited consecutively from those admitted to outpatient rehabilitation for the treatment of musculoskeletal problems. Inclusion criteria were: a) 18 years of age or older, b) musculoskeletal condition diagnosed according to ICD-10, and c) normal cognitive status allowing reliable research (Abbreviated Mental Test Score > 6). Exclusion criteria were: a) presence of mental disorders (e.g. depression or personality disorders) and b) referral from hospital services.

Sample Size

The size of the Polish sample was determined on the basis of statistical data on the average registered incidence (number of new patients with a given diagnosis appearing in the public health system) of musculoskeletal diseases in Podkarpackie (Poland) per 100 000 inhabitants [19]. Based on the incidence of musculoskeletal diseases, the actual percentage of people with a given disease was calculated in relation to the statistical data from the Central Statistical Office on the number of people in certain age groups in Podkarpackie (Poland), which amounted to 44 643 [20]. A sample selection calculator was then used to calculate the number of people needed for the study, assuming a maximum error of 4% and a 95% confidence level, which was 528 people.

In the case of the Spanish region of Castilla y León, data on the prevalence of musculoskeletal conditions were not available, so the sample size was calculated based on the total population (2 308 174 inhabitants), using a confidence level of 90%, a standard deviation (SD) of 0.5 and a margin of error of ± 5%. Although this calculation resulted in a target sample size of 273 subjects, a total of 312 were recruited.

Outcome measures

Basic socio-demographic data (sex, age, education, occupation) were collected during the study. The number of existing chronic conditions was used to assess general health.

A modified version of the brief ICF core set for post-acute musculoskeletal conditions was used to assess the cultural differences between the Polish and Spanish samples.

The brief ICF core set for post-acute musculoskeletal conditions includes a total of 31 entities. Ten of these entities belong to the component 'Body functions' (b134–b780), 15 to 'Activities and Participation' (d155–d550) and 6 to 'Environmental factors' (e110–e450). According to the Polish version, the ICF entities 'e310 Immediate family', 'e320 Friends' and 'e580 Health services, systems and policies' were added, while 'd415 Maintaining body position' was removed. Thus, a total of were 33 ICF entities were used as outcome measures.

To assess the impact of impairments/limitations or restrictions/barriers on musculoskeletal health in terms of functioning, each ICF entity was assessed using the ICF qualifiers (xxx.0 NO problem; xxx.1 MILD problem; xxx.2 MODERATE problem; xxx.3 SEVERE problem; xxx.4 COMPLETE problem; xxx.8 not specified and xxx.9 not applicable). In the case of the assessment of environmental factors, ICF qualifiers were assigned from the respondents' perspective, recording only whether they had a negative impact (barriers) on their condition. These qualifiers were therefore as follows: xxx.0 NO barrier; xxx.1 MILD barrier; xxx.2 MODERATE barrier; xxx.3 SUBSTANTIAL barrier; xxx.4 COMPLETE barrier [4].

Data collection

A total of 59 collaborating physiotherapists (27 in Poland and 32 in Spain) recruited participants and collected data. They were experienced professionals in the management of musculoskeletal conditions and were trained in the principles and clinical use of the ICF.

In Poland, the methodology for assessing the patient's health status was presented by members of the Polish Council for the Implementation of the International Classification of Functioning, Disability and Health. Polish physiotherapists carried out functional assessments of patients and recorded ICF qualifiers in a specific form.

In Spain, collaborating physiotherapists attended a workshop conducted by a researcher trained in the ICF by the ICF Research Branch. They conducted semi-structured interviews to assess the relevance of each ICF entity in relation to the patient's musculoskeletal condition.

Statistical analysis

The data were analyzed using the R program, version 4.3.3. First, a descriptive statistical analysis was performed to characterize the sample and qualifier distribution of each ICF entity using absolute and relative frequencies.

Comparison of the values of qualitative variables in groups was performed using the chi-square test (with Yates' correction for 2x2 tables) or Fisher's exact test when the chi-square test assumptions regarding the so-called expected numbers were not met.

The Mann-Whitney test was used to compare the values of quantitative variables in two groups. The significance level used in the analysis was 0.05. There were no missing data in this study, so data from all participants were included in the analyses.

Ethical considerations

The study was designed and conducted in accordance with the tenets of the Declaration of Helsinki 1996 (modified in 2013 at the 64th Assembly of the World Medical Association in Fortaleza, Brazil). All participants provided written an informed consent. This study was registered on clinicaltrials.gov with the identifier NCT06283407 and was also approved by the Bioethics Committee of the University of Rzeszów (Resolution No. 11/02/2020) and the Ethics Committees for Clinical Research of the Spanish health areas of Burgos-Soria, León-Bierzo, Palencia, Salamanca, Segovia and Valladolid (reference code for the Burgos-Soria area was CEIm 2690).

Results

Sample characteristics

The study included 840 people, 528 from Poland and 312 from Spain. Significant differences were found between the Polish and the Spanish samples for all characteristics except age.

A higher percentage of Spanish women (73.4%) than Polish women (57.4%) participated in the study. Participants had a higher level of education in Poland, with 96.8% of participants having completed secondary education or higher, compared to 60.9% in the Spanish sample. A similar situation was observed in terms of employment status, with 69.5% of participants in Poland being actively working, compared to 56.1% in Spain. Finally, Spanish participants had a better general health status with a mean of 1.9 of chronic diseases compared to 2.8 for Polish participants. Detailed characteristics of the two samples are shown in Table 1.

Table 1
Sociodemographic characteristics of the study samples

Feature		Poland (N = 528)	Spain (N = 312)	Total (N = 840)	p
Sex	Male	225 (42.61%)	83 (26.60%)	308 (36.67%)	p < 0.001 *
	Female	303 (57.39%)	229 (73.40%)	532 (63.33%)	
Age [years]	Mean (SD)	54.95 (5.64)	55.41 (12.2)	55.12 (8.67)	p = 0.083
	Median (quartiles)	54.50 (51–58)	56.00 (48–63)	55 (50–59)	
Education	Primary	17 (3.22%)	122 (39.10%)	139 (16.55%)	p < 0.001 *
	Secondary	340 (64.39%)	103 (33.01%)	443 (52.74%)	
	University	171 (32.39%)	87 (27.88%)	258 (30.71%)	
Employment status	Actively working	367 (69.51%)	175 (56.09%)	542 (64.52%)	p < 0.001 *
	Not working	161 (30.49%)	137 (43.91%)	298 (35.48%)	
Number of comorbidities	Mean (SD)	2.83 (1.57)	1.86 (1.55)	2.47 (1.63)	p < 0.001 *
	Median (quartiles)	3 (2–4)	2 (1–3)	2 (1–3)	
	n	528	312	840	

p - Qualitative variables: chi-squared or Fisher's exact test. Quantitative variables: Mann-Whitney test

* statistically significant (p < 0.05)

General overview of differences between Polish and Spanish samples

Statistical analysis revealed significant differences in the level of functioning between the Polish and Spanish samples were found. In the Spanish sample, subjects reported a higher prevalence of impairments/limitations/barriers in all ICF entities analized.

Differences in impairments in body functions

In the ICF component ‘body functions’, the highest prevalence was found in the ICF entity ‘b280 Sensation of pain’ for both samples (74.2% in the Polish sample and 86.9% in the Spanish sample). The less relevant ICF entity was ‘b620 Urination functions’, which was also consistent across samples (15.7% and 26.6%, respectively). Other categories with similar prevalence were ‘b530 Weight maintenance functions’ (57.4% and 55.1%) and ‘b134 Sleep functions’ (64.0% and 78.5%).

The higher difference found for this component corresponded to the ICF entity ‘b740 Muscle endurance functions’, which was found to be problematic for 75.3% of the Spanish sample but only for 30,9% of the Polish sample (difference of 44.5% between samples). Full details of the differences in prevalence of impairments in body functions are shown in Table 2.

Table 2
Prevalence of impairments in body functions in the Polish and Spanish samples.

ICF Entity	Qualifier	Poland (N = 528)	Spain (N = 312)	Total (N = 840)	p
b134	No problem	190 (35.98%)	67 (21.47%)	257 (30.60%)	p < 0.001 *
	Mild problem	162 (30.68%)	58 (18.59%)	220 (26.19%)	
	Moderate problem	112 (21.21%)	57 (18.27%)	169 (20.12%)	
	Severe problem	48 (9.09%)	118 (37.82%)	166 (19.76%)	
	Complete problem	16 (3.03%)	12 (3.85%)	28 (3.33%)	
b260	No problem	409 (77.46%)	157 (50.32%)	566 (67.38%)	p < 0.001 *
	Mild problem	77 (14.58%)	48 (15.38%)	125 (14.88%)	
	Moderate problem	23 (4.36%)	32 (10.26%)	55 (6.55%)	
	Severe problem	16 (3.03%)	70 (22.44%)	86 (10.24%)	
	Complete problem	3 (0.57%)	5 (1.60%)	8 (0.95%)	
b280	No problem	136 (25.76%)	41 (13.14%)	177 (21.07%)	p < 0.001 *
	Mild problem	93 (17.61%)	41 (13.14%)	134 (15.95%)	
	Moderate problem	190 (35.98%)	59 (18.91%)	249 (29.64%)	
	Severe problem	106 (20.08%)	151 (48.40%)	257 (30.60%)	
	Complete problem	3 (0.57%)	20 (6.41%)	23 (2.74%)	
b435	No problem	185 (35.04%)	200 (64.10%)	385 (45.83%)	p < 0.001 *
	Mild problem	240 (45.45%)	59 (18.91%)	299 (35.60%)	
	Moderate problem	80 (15.15%)	24 (7.69%)	104 (12.38%)	
	Severe problem	13 (2.46%)	28 (8.97%)	41 (4.88%)	
	Complete problem	10 (1.89%)	1 (0.32%)	11 (1.31%)	
b530	No problem	225 (42.61%)	140 (44.87%)	365 (43.45%)	p = 0.015 *
	Mild problem	188 (35.61%)	59 (18.91%)	247 (29.40%)	
	Moderate problem	83 (15.72%)	38 (12.18%)	121 (14.40%)	
	Severe problem	27 (5.11%)	71 (22.76%)	98 (11.67%)	
	Complete problem	5 (0.95%)	4 (1.28%)	9 (1.07%)	
b620	No problem	445 (84.28%)	229 (73.40%)	674 (80.24%)	p < 0.001 *
	Mild problem	58 (10.98%)	40 (12.82%)	98 (11.67%)	

ICF Entity	Qualifier	Poland (N = 528)	Spain (N = 312)	Total (N = 840)	p
	Moderate problem	16 (3.03%)	20 (6.41%)	36 (4.29%)	
	Severe problem	5 (0.95%)	22 (7.05%)	27 (3.21%)	
	Complete problem	4 (0.76%)	1 (0.32%)	5 (0.60%)	
b730	No problem	305 (57.77%)	62 (19.87%)	367 (43.69%)	p < 0.001 *
	Mild problem	161 (30.49%)	75 (24.04%)	236 (28.10%)	
	Moderate problem	48 (9.09%)	37 (11.86%)	85 (10.12%)	
	Severe problem	12 (2.27%)	128 (41.03%)	140 (16.67%)	
	Complete problem	2 (0.38%)	10 (3.21%)	12 (1.43%)	
b740	No problem	365 (69.13%)	77 (24.68%)	442 (52.62%)	p < 0.001 *
	Mild problem	103 (19.51%)	59 (18.91%)	162 (19.29%)	
	Moderate problem	31 (5.87%)	39 (12.50%)	70 (8.33%)	
	Severe problem	16 (3.03%)	125 (40.06%)	141 (16.79%)	
	Complete problem	13 (2.46%)	12 (3.85%)	25 (2.98%)	
b755	No problem	158 (29.92%)	181 (58.01%)	339 (40.36%)	p < 0.001 *
	Mild problem	131 (24.81%)	51 (16.35%)	182 (21.67%)	
	Moderate problem	125 (23.67%)	25 (8.01%)	150 (17.86%)	
	Severe problem	66 (12.50%)	54 (17.31%)	120 (14.29%)	
	Complete problem	48 (9.09%)	1 (0.32%)	49 (5.83%)	
b780	No problem	226 (42.80%)	74 (23.72%)	300 (35.71%)	p < 0.001 *
	Mild problem	198 (37.50%)	55 (17.63%)	253 (30.12%)	
	Moderate problem	83 (15.72%)	55 (17.63%)	138 (16.43%)	
	Severe problem	15 (2.84%)	122 (39.10%)	137 (16.31%)	
	Complete problem	6 (1.14%)	6 (1.92%)	12 (1.43%)	

Differences in Activity limitations and/or Participation restrictions

The analysis of the prevalence of entities belonging to the ICF ‘activities and participation’ showed that ‘d430 Lifting and carrying objects’ was the most common entity for the Spanish sample (65.4%) and also showed the highest difference between the samples (38.7%). In the Polish sample, the most common ICF entity was ‘d450 Walking’ (47.7%), with a similar prevalence as in the Spanish sample (52.6%).

The ICF entity ‘d240 Handling stress and other psychological demands’ was relevant in both samples (61.9% for Spain and 45.6% for Poland). In the Spanish sample, the ICF entities ‘d410 Changing basic body position’ and ‘d230 Carrying out daily routine’ were also important (prevalence of 62.8% and 56.7%, respectively). In the Polish sample, no other ICF entity reached a prevalence of more than 50% (see Table 3 for more details).

Table 3
Prevalence of activity limitations and participation restrictions in the Polish and Spanish samples.

ICF Entity	Qualifier	Poland (N = 528)	Spain (N = 312)	Total (N = 840)	p
d155	No problem	375 (71.02%)	178 (57.05%)	553 (65.83%)	p < 0.001 *
	Mild problem	105 (19.89%)	48 (15.38%)	153 (18.21%)	
	Moderate problem	34 (6.44%)	28 (8.97%)	62 (7.38%)	
	Severe problem	10 (1.89%)	54 (17.31%)	64 (7.62%)	
	Complete problem	4 (0.76%)	4 (1.28%)	8 (0.95%)	
d177	No problem	405 (76.70%)	182 (58.33%)	587 (69.88%)	p < 0.001 *
	Mild problem	89 (16.86%)	53 (16.99%)	142 (16.90%)	
	Moderate problem	26 (4.92%)	26 (8.33%)	52 (6.19%)	
	Severe problem	4 (0.76%)	46 (14.74%)	50 (5.95%)	
	Complete problem	4 (0.76%)	5 (1.60%)	9 (1.07%)	
d230	No problem	342 (64.77%)	135 (43.27%)	477 (56.79%)	p < 0.001 *
	Mild problem	125 (23.67%)	65 (20.83%)	190 (22.62%)	
	Moderate problem	42 (7.95%)	36 (11.54%)	78 (9.29%)	
	Severe problem	11 (2.08%)	70 (22.44%)	81 (9.64%)	
	Complete problem	8 (1.52%)	6 (1.92%)	14 (1.67%)	
d240	No problem	287 (54.36%)	119 (38.14%)	406 (48.33%)	p < 0.001 *
	Mild problem	147 (27.84%)	69 (22.12%)	216 (25.71%)	
	Moderate problem	71 (13.45%)	42 (13.46%)	113 (13.45%)	
	Severe problem	14 (2.65%)	74 (23.72%)	88 (10.48%)	
	Complete problem	9 (1.70%)	8 (2.56%)	17 (2.02%)	
d410	No problem	365 (69.13%)	116 (37.18%)	481 (57.26%)	p < 0.001 *
	Mild problem	120 (22.73%)	61 (19.55%)	181 (21.55%)	
	Moderate problem	25 (4.73%)	43 (13.78%)	68 (8.10%)	
	Severe problem	13 (2.46%)	85 (27.24%)	98 (11.67%)	
	Complete problem	5 (0.95%)	7 (2.24%)	12 (1.43%)	
d430	No problem	387 (73.30%)	108 (34.62%)	495 (58.93%)	p < 0.001 *
	Mild problem	84 (15.91%)	58 (18.59%)	142 (16.90%)	

ICF Entity	Qualifier	Poland (N = 528)	Spain (N = 312)	Total (N = 840)	p
	Moderate problem	44 (8.33%)	46 (14.74%)	90 (10.71%)	
	Severe problem	11 (2.08%)	85 (27.24%)	96 (11.43%)	
	Complete problem	2 (0.38%)	15 (4.81%)	17 (2.02%)	
d445	No problem	411 (77.84%)	166 (53.21%)	577 (68.69%)	p < 0.001 *
	Mild problem	82 (15.53%)	53 (16.99%)	135 (16.07%)	
	Moderate problem	24 (4.55%)	30 (9.62%)	54 (6.43%)	
	Severe problem	9 (1.70%)	59 (18.91%)	68 (8.10%)	
	Complete problem	2 (0.38%)	4 (1.28%)	6 (0.71%)	
d450	No problem	276 (52.27%)	148 (47.44%)	424 (50.48%)	p < 0.001 *
	Mild problem	147 (27.84%)	51 (16.35%)	198 (23.57%)	
	Moderate problem	66 (12.50%)	36 (11.54%)	102 (12.14%)	
	Severe problem	28 (5.30%)	72 (23.08%)	100 (11.90%)	
	Complete problem	11 (2.08%)	5 (1.60%)	16 (1.90%)	
d465	No problem	482 (91.29%)	196 (62.82%)	678 (80.71%)	p < 0.001 *
	Mild problem	20 (3.79%)	34 (10.90%)	54 (6.43%)	
	Moderate problem	17 (3.22%)	28 (8.97%)	45 (5.36%)	
	Severe problem	7 (1.33%)	53 (16.99%)	60 (7.14%)	
	Complete problem	2 (0.38%)	1 (0.32%)	3 (0.36%)	
d510	No problem	444 (84.09%)	225 (72.12%)	669 (79.64%)	p < 0.001 *
	Mild problem	57 (10.80%)	37 (11.86%)	94 (11.19%)	
	Moderate problem	18 (3.41%)	23 (7.37%)	41 (4.88%)	
	Severe problem	5 (0.95%)	26 (8.33%)	31 (3.69%)	
	Complete problem	4 (0.76%)	1 (0.32%)	5 (0.60%)	
d520	No problem	445 (84.28%)	215 (68.91%)	660 (78.57%)	p < 0.001 *
	Mild problem	58 (10.98%)	44 (14.10%)	102 (12.14%)	
	Moderate problem	12 (2.27%)	23 (7.37%)	35 (4.17%)	
	Severe problem	4 (0.76%)	29 (9.29%)	33 (3.93%)	
	Complete problem	9 (1.70%)	1 (0.32%)	10 (1.19%)	

ICF Entity	Qualifier	Poland (N = 528)	Spain (N = 312)	Total (N = 840)	p
d530	No problem	495 (93.75%)	254 (81.41%)	749 (89.17%)	p < 0.001 *
	Mild problem	21 (3.98%)	31 (9.94%)	52 (6.19%)	
	Moderate problem	2 (0.38%)	9 (2.88%)	11 (1.31%)	
	Severe problem	6 (1.14%)	17 (5.45%)	23 (2.74%)	
	Complete problem	4 (0.76%)	1 (0.32%)	5 (0.60%)	
d540	No problem	439 (83.14%)	198 (63.46%)	637 (75.83%)	p < 0.001 *
	Mild problem	69 (13.07%)	52 (16.67%)	121 (14.40%)	
	Moderate problem	11 (2.08%)	28 (8.97%)	39 (4.64%)	
	Severe problem	5 (0.95%)	32 (10.26%)	37 (4.40%)	
	Complete problem	4 (0.76%)	2 (0.64%)	6 (0.71%)	
d550	No problem	501 (94.89%)	270 (86.54%)	771 (91.79%)	p < 0.001 *
	Mild problem	18 (3.41%)	27 (8.65%)	45 (5.36%)	
	Moderate problem	5 (0.95%)	9 (2.88%)	14 (1.67%)	
	Severe problem	2 (0.38%)	5 (1.60%)	7 (0.83%)	
	Complete problem	2 (0.38%)	1 (0.32%)	3 (0.36%)	

Differences in barriers in Environmental Factors

The most relevant environmental factor in both samples was ‘e225 Climate’, with a prevalence of 58.0% in the Spanish sample and 31.8% in the Polish sample. The prevalence of the remaining ICF entities was low in both samples, with no other entity exceeding 40% in the Spanish sample or 30% in the Polish sample. The highest difference between the samples for these factors was found for ‘e115 Products and technology for personal use in daily living’ (29.5%). More detailed information on environmental factors can be found in Table 4.

Table 4
Prevalence of barriers in Environmental Factors in the Polish and Spanish samples.

ICF Entity	Qualifier	Poland (N = 528)	Spain (N = 312)	Total (N = 840)	p
e110	No problem	451 (85.42%)	197 (63.14%)	648 (77.14%)	p < 0.001 *
	Mild problem	15 (2.84%)	48 (15.38%)	63 (7.50%)	
	Moderate problem	17 (3.22%)	16 (5.13%)	33 (3.93%)	
	Severe problem	25 (4.73%)	43 (13.78%)	68 (8.10%)	
	Complete problem	20 (3.79%)	8 (2.56%)	28 (3.33%)	
e115	No problem	474 (89.77%)	188 (60.26%)	662 (78.81%)	p < 0.001 *
	Mild problem	15 (2.84%)	53 (16.99%)	68 (8.10%)	
	Moderate problem	14 (2.65%)	29 (9.29%)	43 (5.12%)	
	Severe problem	20 (3.79%)	38 (12.18%)	58 (6.90%)	
	Complete problem	5 (0.95%)	4 (1.28%)	9 (1.07%)	
e120	No problem	497 (94.13%)	219 (70.19%)	716 (85.24%)	p < 0.001 *
	Mild problem	6 (1.14%)	38 (12.18%)	44 (5.24%)	
	Moderate problem	8 (1.52%)	19 (6.09%)	27 (3.21%)	
	Severe problem	9 (1.70%)	32 (10.26%)	41 (4.88%)	
	Complete problem	8 (1.52%)	4 (1.28%)	12 (1.43%)	
e225	No problem	360 (68.18%)	131 (41.99%)	491 (58.45%)	p < 0.001 *
	Mild problem	85 (16.10%)	46 (14.74%)	131 (15.60%)	
	Moderate problem	50 (9.47%)	43 (13.78%)	93 (11.07%)	
	Severe problem	21 (3.98%)	81 (25.96%)	102 (12.14%)	
	Complete problem	12 (2.27%)	11 (3.53%)	23 (2.74%)	
e310	No problem	439 (83.14%)	200 (64.10%)	639 (76.07%)	p < 0.001 *
	Mild problem	9 (1.70%)	37 (11.86%)	46 (5.48%)	
	Moderate problem	22 (4.17%)	15 (4.81%)	37 (4.40%)	
	Severe problem	34 (6.44%)	42 (13.46%)	76 (9.05%)	
	Complete problem	24 (4.55%)	18 (5.77%)	42 (5.00%)	
e320	No problem	440 (83.33%)	207 (66.35%)	647 (77.02%)	p < 0.001 *
	Mild problem	23 (4.36%)	39 (12.50%)	62 (7.38%)	

ICF Entity	Qualifier	Poland (N = 528)	Spain (N = 312)	Total (N = 840)	p
	Moderate problem	23 (4.36%)	18 (5.77%)	41 (4.88%)	
	Severe problem	28 (5.30%)	39 (12.50%)	67 (7.98%)	
	Complete problem	14 (2.65%)	9 (2.88%)	23 (2.74%)	
e355	No problem	407 (77.08%)	210 (67.31%)	617 (73.45%)	p < 0.001 *
	Mild problem	51 (9.66%)	32 (10.26%)	83 (9.88%)	
	Moderate problem	39 (7.39%)	10 (3.21%)	49 (5.83%)	
	Severe problem	28 (5.30%)	43 (13.78%)	71 (8.45%)	
	Complete problem	3 (0.57%)	17 (5.45%)	20 (2.38%)	
e450	No problem	408 (77.27%)	218 (69.87%)	626 (74.52%)	p = 0.001 *
	Mild problem	72 (13.64%)	23 (7.37%)	95 (11.31%)	
	Moderate problem	28 (5.30%)	12 (3.85%)	40 (4.76%)	
	Severe problem	16 (3.03%)	47 (15.06%)	63 (7.50%)	
	Complete problem	4 (0.76%)	12 (3.85%)	16 (1.90%)	
e580	No problem	415 (78.60%)	177 (56.73%)	592 (70.48%)	p < 0.001 *
	Mild problem	50 (9.47%)	33 (10.58%)	83 (9.88%)	
	Moderate problem	35 (6.63%)	20 (6.41%)	55 (6.55%)	
	Severe problem	22 (4.17%)	62 (19.87%)	84 (10.00%)	
	Complete problem	6 (1.14%)	20 (6.41%)	26 (3.10%)	

Discussion

The aim of the study was to compare the differences in musculoskeletal health between the Polish and Spanish populations, using the ICF as a framework. Despite the potential of the ICF to provide a gold standard against which to measure different aspects of intergroup functioning, this is the first study conducted for this purpose [21].

According to our findings, there were significant differences in musculoskeletal health between the Polish and Spanish populations in all ICF entities analyzed. Regarding the different ICF domains, the main differences were found in the ICF component ‘activities and participation’. For the Polish sample, the most frequently reported ICF entity was ‘d450 Walking’ (47.7%), whereas for the Spanish sample they were ‘d430 Lifting and carrying objects’ (65.4%). The ability to walk is considered essential for most activities of daily living [22]. Typical symptoms of musculoskeletal disorders are pain, joint stiffness and reduced mobility. Pain often increases with distance covered [23]. Winter et al. showed that patients with musculoskeletal

disorders have limited walking ability [24]. Jun et al. showed that people with musculoskeletal conditions often have problems with upper limb activities [25]. As activity limitations are largely dependent on the anatomical location of the musculoskeletal injury, a possible explanation for this finding is a different prevalence of such conditions between the two samples. This highlights the importance of activity assessment in clinical practice, providing clinicians with feedback on the functional problems experienced by patients on a daily basis and helping to set therapeutic goals. Regarding more general aspects of this ICF component, both populations showed a high prevalence of ICF entity ‘d240 Handling stress and other psychological demands’ (61,9% in Spain and 45.6% in Poland). Patients with musculoskeletal pain were reported to have significantly more symptoms of anxiety, depression, fatigue and insomnia. Therefore, primary care providers should consider mental health issues when treating patients with musculoskeletal conditions [26].

There were fewer differences between the samples in the ‘body functions’ component. The ICF entity 'b280 sensation of pain' was the most common ICF entity in both populations (prevalence of 78.9% in Spain and 74.2% in Poland). Other ICF entities related to movement, such as ‘b755 Involuntary movement reaction functions’ and ‘b780 Sensations related to muscles and movement functions’, were also found to be important, with small differences in prevalence between countries. The musculoskeletal system is primarily involved in locomotion, movement and the performance of physical tasks [27]. Musculoskeletal pain is a major burden and challenge for patients, families and carers because it is associated with functional limitations and loss of independence [28, 29]. It is considered the main reason for seeking health care from primary care providers [30]. Moreover, pain associated with musculoskeletal problems leads to drug dependence, suffering, social isolation and emotional distress [31]. Another finding was the high prevalence of problems related to ‘b134 Sleep functions’, which has also been liked to musculoskeletal problems in the literature [32]. Finally, ICF entities covering the functioning of other body systems also showed a similar importance, highlighting the multidimensional nature of movement [33].

With regard to the ICF component ‘environmental factors’, it was expected that the main differences between the Polish and Spanish populations would be found here. However, the most relevant ICF entity for both samples was ‘e225 Climate’ (prevalence was 58.0% in Spain and 31.8% in Poland), a remarkable finding given the marked differences in climate between the two regions. Weather parameters, including changes in temperature, humidity and pressure, are often considered risk factors for the occurrence of chronic diseases or adverse health events [34]. Changes in weather conditions are often cited by patients with musculoskeletal disorders as an important factor in triggering the onset and development of symptoms [35]. According to the review by Beukenhorst et al, 67% of studies showed an association between pain and weather variables [36]. The authors suggested that future research should consider the extent and nature of modifiable risk factors for musculoskeletal pain and strategies for managing them [36]. In general, environmental factors had a higher prevalence in Spain, but the relative importance of ICF entities was similar in both contexts.

Perhaps the greatest difficulty in conducting a cross-country study of this kind is obtaining comparable data. The ICF provides a definition of the universe of functioning and disability that allows direct comparisons of levels of functioning between groups of people. However, as each population has its own

specific background, it was expected that there would be differences in socio-demographic characteristics between the samples. In our study, significant differences were found in all areas except age, which poses a challenge to comparability.

Spanish women had a higher prevalence of musculoskeletal disorders than Polish women (73.4% and 57.4%, respectively). In the data collection for this study, sex was used as a descriptive measure for the samples. This means that only biological differences between men and women were considered, while other multidimensional concepts related to the concept of gender were not taken into account [37]. Although a high prevalence in women is consistent with previous studies [38, 39], it doesn't explain the difference found between Poland and Spain.

Another finding related to the context of the two samples was the difference in education and employment status, with the Polish population having higher levels of both. A high level of education has been associated with a protective effect on the incidence of musculoskeletal problems [40] and could explain the greater impact observed in the Spanish population on the ICF entities analyzed. In the case of employment status, its effect is controversial because, although it is recommended to stay active and return to work as soon as possible to reduce chronicity and disability related to musculoskeletal problems [41], it also implies exposure to ergonomic risk factors that may lead to injury [42].

Finally, a higher number of comorbidities was observed in the Polish sample, suggesting a lower level of general health compared to the Spanish sample. This is in line with the difference in life expectancy between the two regions. According to Eurostat, the life expectancy is 83.8 years in Castilla y León (Spain) compared to 78.5 years in Podkarpackie (Poland) [43]. Roffia et al. confirmed the importance of health care expenditure and the health care system in explaining differences in life expectancy between OECD countries [44]. Spain's consistency in developing a health system with primary care at its core differs from Poland's health system, which is more focused on the hospital sector and limits the development of health promotion and disease prevention activities [45, 46]. Primary health care, with its multisectoral approach to population health, can address most of the determinants of health and must therefore needs to be sufficiently developed in national health systems [47]. However, although Spain has made significant progress in general health with a strong primary care-based health system, there seems to be room for improvement in musculoskeletal health when looking at the data from Poland.

There are some limitations that should be taking into account when interpretating the findings of this study. The first is that although the data collection took place during the interaction between the physiotherapist and the patient, the Polish sample is dominated by the physiotherapist's perspective, whereas in the Spanish case a more patient-centered perspective was used. Another limitation is the different method of calculating sample sizes for the two populations. Despite this, and given that the samples were representative of the populations analyzed, we are moderately confident that this will not bias our results. Finally, the socio-demographic data in the two samples are different, but we believe that this is inherent to this type of study and is part of the process of comparing populations from different countries.

Conclusions

A theoretical application of the ICF has been empirically tested for the first time, which is a milestone in the development of the methodology for conducting this type of research. This study has also provided an insight into the musculoskeletal health of the Polish and Spanish populations and the impact of these conditions in terms of disability. There are many tools to assess patient functioning, but variability in measures presents challenges to data harmonization and the comparability and generalizability of findings. ICF provides

a classification system that can support content harmonization and comparison of levels of functioning between different populations. Significant differences were found between the two samples, indicating better musculoskeletal health in the Polish sample. Identifying the strengths and weaknesses of different health care models has the potential to improve the health of populations by allowing a best practice-based approach to be implemented.

Abbreviations

ICF: The International Classification of Functioning, Disability and Health

WHO: The World Health Organization

ICD: The International Classification of Diseases

STROBE: The Strengthening the Reporting of Observational Studies in Epidemiology

Declarations

Ethics approval and consent to participate

The study was designed and conducted in accordance with the tenets of the Declaration of Helsinki 1996 (modified in 2013 at the 64th Assembly of the World Medical Association in Fortaleza, Brazil). This study was approved by the Bioethics Committee of the University of Rzeszów (Resolution No. 11/02/2020) and the Ethics Committees for Clinical Research of the Spanish health areas of Burgos-Soria, León-Bierzo, Palencia, Salamanca, Segovia and Valladolid (reference code for the Burgos-Soria area was CEIm 2690).

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and analysed during the current study are available in the University of Rzeszow repository, https://repozytorium.ur.edu.pl/handle/item/10558

Competing interests

The authors declare no conflict of interest.

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Authors' contributions

AWS: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Roles/Writing—original draft. Prepared Figure 1 and Tables 1,2,3 and 4, Writing—review & editing. AS: Validation, Supervision, Roles/Writing—original draft, Writing—review & editing. SJB: Data curation, Writing—review & editing. BS: Validation, Writing—review & editing. LCL: Data curation, Writing—review & editing. HHL Data curation, Formal analysis, Funding acquisition, Methodology, Visualization, Roles/Writing—original draft, Writing—review & editing. The authors read and approved the final manuscript.

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Figures

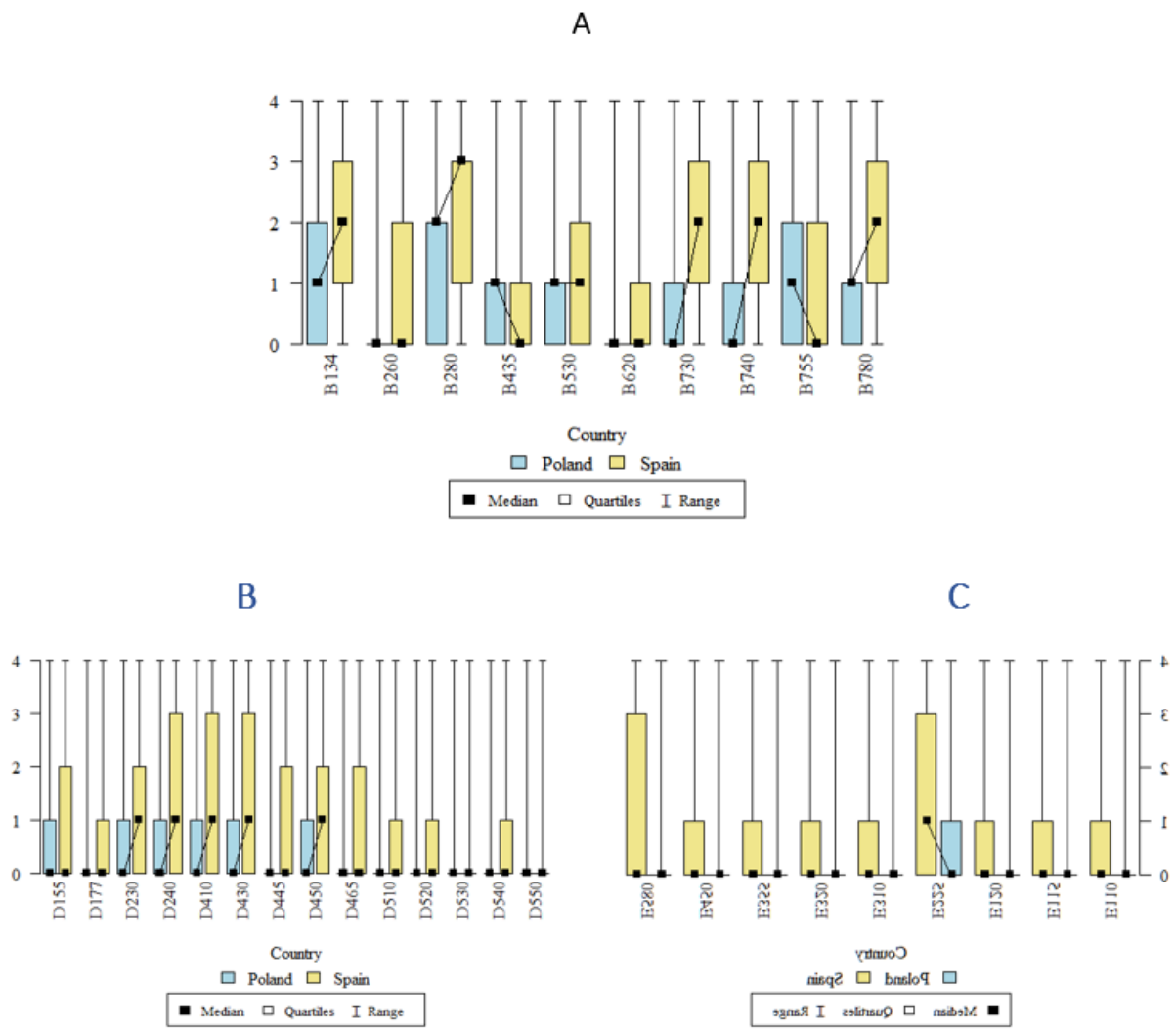

Figure 1

Distribution of qualifiers for individual categories of the ICF Core Set. A – Body Function qualifiers, B – Activity and Participation qualifiers, C – Environmental Factors qualifiers.