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Repository Citation

Liu S, Shridharmurthy D, Lapane KL, Dube CE, Gravallesse EM, Kay J. (2020). Physical activity and attitudes towards exercise in people with axial and peripheral spondyloarthritis. Population and Quantitative Health Sciences Publications. <https://doi.org/10.3899/jrheum.200354>. Retrieved from https://escholarship.umassmed.edu/qhs_pp/1384

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Physical activity and attitudes towards exercise in people with axial and peripheral spondyloarthritis

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Role of funding source: This work was supported by a charitable contribution to the UMass Memorial Foundation from Timothy S. and Elaine L. Peterson. Research reported in this publication was also supported by the SAA/Jane Bruckel Early Career Investigator in AxSpA Award.

Other commercial support: None.

Conflict of Interests: Authors have no competing interests directly related to this study.

Accepted Article

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Running head: Physical activity in spondyloarthritis

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Abstract

Objective: To evaluate physical activity and attitudes towards exercise among people with axial and peripheral spondyloarthritis (SpA).

Methods: Using baseline information from an on-going, longitudinal, prospective SpA cohort study (n=264), self-reported attitudes and beliefs towards exercise were assessed using questionnaires. Total metabolic equivalent (MET) hours of self-reported physical activity per week, time spent in activities, and activity levels were calculated from the Nurses' Health Study Physical Activity Questionnaire II (NHSPAQ II). Adjusted multivariable linear models estimated the relationship between physical activity and disease status (axial versus peripheral).

Results: Regardless of predominant anatomic distribution of disease, most participants were well-educated, non-Hispanic white men. Approximately 40% met the United States Department of Health and Human Services physical activity recommendations. Positive attitudes, beliefs, and perceived benefits towards exercise were similar by anatomic distribution of disease. Despite similar MET-hours per week, participants with axial disease had greater concerns regarding discomfort and joint injuries than those with peripheral disease. Compared to those with peripheral SpA (n=201), participants with axial SpA (n=63) spent less time engaging in light and moderate activities (adjusted β in light activity: -1.94 minutes/week, 95% Confidence Interval (CI): -2.96 to -0.93; adjusted β in moderate activity: -1.05 minutes/week, 95% CI: -2.12 to 0.02).

Conclusion: Participants with axial SpA had greater concerns regarding discomfort and injuries from exercise than those with peripheral SpA. Although no differences in time spent in

vigorous activities were observed, participants with axial SpA spent less time than those with peripheral SpA in light to moderate activities.

Key Indexing Terms: Ankylosing spondylitis, Cohort studies, Exercise, Spondyloarthropathy

INTRODUCTION

Spondylarthritis (SpA) is one of the most prevalent forms of inflammatory arthritis among adults, occurring in 0.5 to 1% of the population (1, 2). In the United States (US), ~2.7 million people are affected with various forms of SpA (2). SpA can be characterized as axial or peripheral disease based on the clinical manifestations (1, 3). Features of axial SpA include low back pain due to sacroiliitis and neck and back stiffness with limited spinal motion (1, 4, 5). Peripheral SpA is characterized by enthesitis, dactylitis, and arthritis affecting predominantly large joints (6). Both axial and peripheral SpA may be associated with extra-articular manifestations, such as uveitis, psoriasis, and inflammatory bowel disease (4, 6).

Despite the health-related benefits of regular physical activity (7, 8), patients with inflammatory arthritis, including those with SpA, are generally less active than individuals without disease (9, 10). Factors that may account for this difference include the paucity of recommendations for exercise in this population, failure of healthcare providers to regularly engage these patients in exercise, and disease-specific limitations related to SpA (11). However, information on self-reported physical activity and attitudes towards exercise have not been well-characterized among SpA patients in the US.

The distribution of disease and resultant physical limitations differ between axial and peripheral SpA. Therefore, physical activity interventions should be tailored according to these differences. Functional limitations among people with SpA are more strongly associated with peripheral joint involvement than with axial manifestations (12). However, the extent to which these differences in functional limitations translate into differences in attitudes towards exercise and/or physical activity or in the types, modes, or intensity of physical activity remains unknown. The present study sought to evaluate the extent to which self-reported physical

activity and attitudes towards exercise differ between people with axial SpA and those with peripheral SpA, using a US-based cohort. We hypothesized that people with predominantly axial disease might be more positively inclined towards exercise and be more physically active than those with predominantly peripheral joint involvement. Information regarding potentially different attitudes towards exercise, physical activity behavior, and how they vary relative to predominant anatomic distribution of disease could inform the development of more effective interventions to promote physical activity for people with SpA.

MATERIALS AND METHODS

The University of Massachusetts Medical School Institutional Review Board approved this study (ID: H00005916; H00006291). Participants have provided written informed consent to participate in the research. As part of the informed consent process, subjects were informed that their identity would remain confidential in any study results made public and therefore patient's written informed consent to publish the material was waived. The study was conducted using aggregated data for the analysis and no identifiable information was contained in the study. The reporting guidelines following the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) Statement has been used for the present study.

Data source

We used data from an ongoing, longitudinal, prospective registry at a single site (the Rheumatology Center at UMass Memorial Medical Center). The cohort, which was created to address clinical and translational research questions, consists of people with SpA, including those with psoriasis and other comorbid diseases. Participants met the Assessment of

SpondyloArthritis International Society (ASAS) classification criteria for either axial or peripheral SpA (1, 6). Exclusion criteria were participants aged <18 years, prisoners, pregnant women, non-English speakers, and/or people unable to complete the questionnaires. In addition to enrollment visits, participants are contacted by research staff to schedule 2 additional follow-up visits at approximately 12-month intervals from their baseline visit. Biological specimens and information regarding disease activity, function, and physical activity were collected at each study visit.

Study sample

We used cross-sectional data from the baseline visits of 264 people with SpA who had been enrolled prospectively into the registry between November 2014 to May 2019. For the current analysis, participants were classified as having predominantly axial or peripheral SpA using the ASAS classification criteria (1, 6).

Attitudes and beliefs towards exercise

Five domains of attitudes and beliefs regarding exercise were assessed using self-reported questionnaires (13) including: 1) general attitude towards exercise (e.g., regular exercise, type of exercise); 2) support from other people in the regular performance of exercise; 3) benefits (e.g., “helping disease”, pain relief, and improving strength and function) of exercise/physical activity; 4) complications of and/or concerns regarding physical activity (e.g., time, discomfort, joint injuries); and 5) exercise/physical activity behavior. A continuous scale (range: 0-100) was used to evaluate attitudes and beliefs regarding exercise. High scores indicate a favorable attitude towards, approval of, or agreement with the benefits of

exercise and/or that the individual is strongly or extremely likely to engage in exercise/physical activity.

Measurement of physical activity

Physical activity was measured using the validated Nurses' Health Study Physical Activity Questionnaire II (NHSPAQ II) (14). The NHSPAQ II is a simple, short, self-report scale that evaluates types (e.g., swimming, walking, running etc.) and determinants (frequency, intensity, and duration) of physical activity participation over the previous week (15). We assessed physical activity in 2 ways. First, to calculate the overall energy expenditure engaging in physical activity, we used the total metabolic equivalent (MET) hours of physical activity per week (MET-hours/week) to incorporate the frequency, duration, and intensity by different type of activities (16, 17). Since each activity is assigned a MET score, which is a measure of energy expenditure, we calculated the total MET-hours/week (16). We then multiplied the amount of time spent on each activity by its typical energy expenditure requirement in MET to calculate overall MET-week for that activity. For example, if a participant engaged in aerobic exercise (MET: 6.0) for 30 minutes during the previous week, the total MET-hours/week = $6 \times 0.5 \text{ hour} = 3.0 \text{ MET-hours/week}$. We then summed the contribution of each activity for each activity engaged in over that week. Second, activity intensities were further classified as light (1.1-2.9 MET), moderate (3.0-5.9 MET) and vigorous (≥ 6.0 MET) to characterize the total time spent engaged in these different levels of recreational activities (18). We then summed the total number of minutes that participants engaged in each level of activity. Participants were classified as either meeting or not meeting the 2008 US Department of Health and Human Services (DHHS) physical activity recommendations of: 1) ≥ 75 minutes per week for vigorous activities; 2) ≥ 150 minutes per week for moderate activities;

or 3) a combination of moderate and vigorous activities that yielded an equivalent total weekly energy expenditure in MET to either 1) or 2) (18).

Sociodemographic and clinical characteristics

Sociodemographic characteristics included age (in years), sex (male/female), race/ethnicity, education, marital status, and employment and insurance status. Race/ethnicity was based on self-report (non-Hispanic white, non-Hispanic black, Hispanic, and other).

Educational levels were collapsed into high school or less, at least some college, and graduate school. Marital status was categorized using a binary variable (yes: married; no: other).

Employment status was collapsed into paid employment, disabled, unemployed, retired, homemaker, and other. Insurance status was self-reported and categorized into private, Medicaid, Medicare, and uninsured. Body mass index (BMI) was calculated from measured height and weight [weight (kg)/height (m)²] and was classified as < 18.5 kg/m², 18.5–24.9 kg/m², 25.0–29.9 kg/m², or ≥ 30 kg/m² (19).

Clinical characteristics included measures for years since diagnosis, disease severity, disease activity, and current treatments. The time since diagnosis was calculated as the number of years between the enrollment date and the date when the participant was diagnosed with axial or peripheral SpA. Disease severity was evaluated using the participant's global assessment on a 100-point visual analog scale (VAS) (higher score indicating more severe symptoms) (20). Pain over the past week was also evaluated using a 100-point VAS (higher score indicating more severe symptoms). Disease activity was measured using the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) (21) and Bath Ankylosing Spondylitis Functional Index (BASFI) (22). Both scales range from 0 to 10 and higher scores indicate higher disease activity. Current medication use, including conventional synthetic

disease-modifying antirheumatic drugs (csDMARDs), corticosteroids, biological medications, nonsteroidal anti-inflammatory drugs (NSAIDs), and opioids, was self-reported and coded as a series of binary variables (yes/no). Participants were asked whether they had undergone physical therapy for their disease within the previous 6 months; their responses were categorized as yes, no, and unknown.

Statistical analyses

We first described sociodemographic and clinical characteristics separately for participants with peripheral SpA and axial SpA. The data were summarized using descriptive statistics, such as the means for each continuous variable and the percentages for each categorical variable. For the continuous variables of interest, the distributions were visually inspected to evaluate departures from normality. Given the skewed distributions, the median, 25th and 75th percentiles were computed to describe the attitudes and beliefs towards exercise in participants with SpA classified by predominant anatomic distribution. To evaluate the association between predominant anatomic distribution and attitudes and beliefs towards exercise, two sample t-tests (if normally distributed) or Mann-Whitney U tests (if skewed) were conducted for continuous variables. The relative proportions of each activity type in which participants engaged over the past week were calculated separately for those with peripheral SpA and those with axial SpA. The median, 25th, and 75th percentiles were used to summarize the skewed MET-hours/week and the time spent (minutes) in each activity level (i.e., light, moderate, vigorous).

For overall time of MET-hours/week and time spent in each physical activity levels (i.e., light, moderate, vigorous), we developed four models to examine the relationship between physical activity and predominant anatomic distribution of SpA (axial versus peripheral). Due to

the skewed nature of the data, we fitted generalized linear models using maximum likelihood methods with the underlying assumptions that the distributions were other than normal (23, 24). Multivariable models were used to estimate crude and adjusted beta coefficients and 95% confidence intervals (CIs). To develop the final model, we used an iterative approach that considered sociodemographic and clinical characteristics during the model building process for each outcome. Positive beta coefficients corresponded to the higher MET-hours/week or more time spent engaging in each physical activity level. The proportion of participants who met the physical activity guideline were calculated both for axial SpA and peripheral SpA. Logistic models estimated adjusted odds ratios (aORs) and 95% CIs to examine the association between meeting the 2008 DHHS physical activity recommendations and predominant anatomic distribution of SpA.

RESULTS

In the present study, 201 people with peripheral SpA and 63 people with axial SpA were included. Overall, 23.9% of participants had axial SpA (Table 1). Participants with axial SpA were younger and had a shorter average duration of disease since diagnosis than those with peripheral SpA. Irrespective of predominant anatomic distribution (axial versus peripheral), most were non-Hispanic white men, married, had attended at least some college, and had a BMI $\geq 25.0\text{kg/m}^2$. The distributions of disease activity measures were similar in both groups. While csDMARDs were used by participants with predominantly peripheral disease (34.3%), only 1.6% of participants with axial SpA were treated with csDMARDs. Over half of participants with axial SpA had received physical therapy, whereas only one in five participants with peripheral SpA had received physical therapy during the previous 6 months .

Table 2 shows the attitudes and beliefs of participants towards exercise. In general, the attitudes and beliefs towards and perceived benefits of exercise were similar, regardless of whether a participant had predominantly axial or peripheral disease: the median score for general attitude towards regular exercise was 81.0 for participants with axial SpA and 88.0 for participants with peripheral SpA. However, the median scores for pain relief were 67.0 for participants with axial SpA and 70.0 for participants with peripheral SpA. The median proportions of participants who were concerned about discomfort and joint injuries resulting from exercise or other physical activity were 61.0% and 34.5% respectively, for those with axial SpA, and 50.0% and 20.0%, respectively, for those with peripheral SpA. When asked to recall regular exercise before age 30 years, 57.9% of those with axial SpA and 80.0% of those with peripheral SpA reported having exercised regularly at least once per week.

Table 3 displays the types of activities in which participants usually engaged. Overall, these were similar, irrespective of predominant anatomic distribution. Among participants axial SpA, walking was the most common type of physical activity (83.6%), followed by back stretching or strengthening exercises (62.3%), brisk walking (44.3%), and bicycling (30.0%). Among those with peripheral SpA, walking was the most common type of physical activity (81.1%), followed by back stretching or strengthening exercises (45.3%), brisk walking (44.5%), and other activities (28.9%).

The associations between predominant anatomic distribution and time spent in different levels of physical activity are shown in Table 4. Despite there having been no difference between the two groups in the average MET-hours per week (adjusted β : 0.01; 95% CI, -1.66 to 1.68) after adjusting for sociodemographic and clinical characteristics such as sex, marital status, NSAID use, and physical therapy within the past 6 months, participants with axial SpA

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spent fewer minutes engaging in light and moderate activities (adjusted β in light activity: -1.94 minutes/week, 95% CI: -2.96 to -0.93; adjusted β in moderate activity: -1.05 minutes/week, 95% CI: -2.12 to 0.02). The proportion of participants that met the physical activity recommendations was 49.2% for those with axial SpA and 41.3% for those with peripheral SpA, but this did not differ between the two groups after adjusting for sociodemographic and clinical factors.

DISCUSSION

To our knowledge, this is the first study to describe and compare self-reported physical activity and attitudes towards exercise among people with SpA by predominant anatomic distribution of disease, using cross-sectional data from an on-going, longitudinal, single-site, prospective, US-based cohort. In this cohort, approximately one in four participants had predominantly axial disease. The median level of physical activity measured by MET-hour/week in participants with SpA observed in our US-based study is consistent with that in studies using Scandinavian cohorts (25, 26). Participants with SpA, whether axial or peripheral, generally expressed similar attitudes and beliefs towards and perceived benefits of exercise, although participants with axial SpA had slightly greater concerns about exercise/physical activity than those with peripheral SpA. Walking was the type of physical activity reported most commonly by participants, regardless of their predominant anatomic distribution of disease.

The reader may recall that we had anticipated greater inclination towards exercise among participants with axial SpA. However, our findings did not support this hypothesis. The axial SpA and peripheral SpA groups reported similar weekly energy expenditure and time spent participating in vigorous activities. Furthermore, participants with axial SpA appeared to spend

less time engaging in light to moderate activities than did those with peripheral SpA. This potentially reflects the greater concern about discomfort and joint injuries as well as less perceived benefits of physical activity expressed by people with axial SpA, compared to that by those with peripheral SpA, which might have influenced the type of exercise in which participants engaged. Also, since over half of the participants with axial SpA in our study had received physical therapy during the previous 6 months, they might have been more limited physically than those who did not require physical therapy treatment and thus may have been less active than we had anticipated (27). Whereas the majority of participants in both groups reported participation in light to moderate physical activities, such as walking and back stretching or strengthening exercises, only 25% of participants with axial SpA and 16% of participants with peripheral SpA reported participation in swimming, which can be an activity of moderate to vigorous intensity. These exercise patterns of people with axial SpA are consistent with findings of studies conducted in Norway and France; however, these European studies did not evaluate people with peripheral SpA and thus did not make any comparison between axial and peripheral SpA (7, 26).

We observed that participants in our US-based cohort of SpA patients generally express positive attitudes towards exercise, particularly regarding the perceived benefits (e.g., improved “abilities to do things,” muscle strength etc.) of being physically active. This is consistent with findings of European studies conducted in similar clinical settings, in which questionnaires were used to elicit self-reported attitudes/beliefs towards exercise (8, 28-30). Although most perceived the advantages of being physically active, only half of SpA patients in our cohort achieved the weekly amount of physical activity recommended by the US DHHS guideline (18). Symptoms such as pain were frequently reported as being the barrier to

exercise and physical activity (31). We observed that, despite their beliefs in the benefits of exercise and being physically active, participants in our cohort rated the impact of physical activity on pain relief less favorably. Our observation that, in our US-based cohort, half of SpA patients did not meet this physical activity guideline is comparable to that reported among people with SpA in European cohorts (7, 29, 31). Indeed, studies conducted in Ireland and Spain have also found that people with SpA often consider themselves to be “non-exercisers” and need more education about exercise (28, 32). To address this knowledge gap, studies are needed to evaluate the extent to which behavioral interventions that are tailored to patients’ attitudes and beliefs towards regular exercise can increase and sustain levels of physical activity.

Given that people with SpA are at increased risk of developing cardiovascular disease (33-35), understanding how best to promote different types of physical activity in these patients may yield beneficial effects beyond those to the musculoskeletal system (33, 34). Since we assessed patients only at a single time point, we could not determine the extent to which dissimilarities in physical activity might be associated with differences in longitudinal disease outcomes. The relative benefits of different types or levels of activity to people with SpA has not been studied adequately, despite the demonstration that regular exercise (e.g., ≥ 150 minutes of moderate to vigorous activity per week) is generally associated with better long-term disease-specific function among people with axial SpA (36). An evidence base is needed to better inform specific recommendations for people with axial or peripheral SpA regarding the type, mode, and intensity of physical activity. In addition, we observed that 80% of participants with peripheral SpA reported having performed regular exercise at least once per week before

age 30. However, the extent to which an association between exercise behavior during younger years (or before diagnosis) and current activity level remains unclear.

By using an on-going, longitudinal, single-site, prospective cohort, this study has several strengths. Our analytical sample consisted of ~250 participants with SpA, which was comparable to that of other studies that examined physical activity in people with SpA (7, 25, 29). A large amount of information on socio-demographics, medical history regarding diagnosis and treatment, clinical examinations, and laboratory data was collected for the cohort participants. As such, we were able to compare and contrast many factors associated with physical activity by predominant anatomic distribution of disease. Additionally, the frequency and duration of each type of physical activity were also collected, allowing us to calculate total energy expenditure in MET-hour/week: a summary measure that has been used to quantify the longitudinal association of different types of physical activities and outcomes (e.g., cardiovascular risk, disease activity, and symptoms) (37, 38).

Several limitations must be acknowledged. First, the sample size limits the statistical power to conduct additional stratified analyses. Second, NHSPAQ II, which was used to assess self-reported physical activity, is a summated construct based on the mode, frequency, intensity, and duration of the types of activity. Thus, activities of daily living and therapeutic exercises may not be evaluated distinguishably (14, 15). Differences of reporting between subgroups is also a possibility (39-41). However, our observations are consistent with those of studies that used objective measures of physical activity (42, 43). In addition to using self-reported physical activity/exercise, physical function/performance testing might also be used to evaluate exercise capacity in this particular group (44). Third, the characteristics of those who agreed to participate in the current cohort may differ from those who did not participate. Fourth,

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generalizability is a concern, since our study participants were recruited from a single site: a rheumatology clinical practice at an academic medical center. Indeed, we found that the majority of the participants were well-educated, which may have had an effect on how patients reported their physical activity levels (41, 45). Other than for more female participants and a higher overall BMI, the characteristics of our US-based study sample, such as age and disease duration, are comparable to those of participants in the European studies of physical activity in people with SpA (31). A larger study using both self-reported and objective measures obtained from a socio-demographically more diverse group of people with axial and peripheral SpA would complement data from the present study to further understand the relative amounts of time spent by each group engaged in different physical activities.

In summary, we found that although participants with SpA have generally positive attitudes towards exercise and physical activity, those with axial disease were slightly more concerned about discomfort and joint injuries than those with peripheral disease. Furthermore, we observed similar levels of weekly energy expenditure and participation in vigorous physical activities among participants with axial SpA and those with peripheral SpA, but less time spent engaging in light to moderate activities among participants with axial SpA. Given the potential health benefits to this patient population of engaging in regular physical activity, further research is needed to understand how best to improve patients' physical activity, taking into account their attitudes and beliefs. In addition, a prospective evaluation of the longitudinal relationship between physical activity and disease outcomes will be critical to understanding the long-term effects of exercise in this patient population.

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Table 1. Characteristics of participants with spondyloarthritis (SpA) by predominant anatomic distribution (peripheral or axial) (N=264).

Characteristic	Peripheral SpA (N=201)	Axial SpA (N=63)
Socio-demographics		
Age in years, mean (SD)	53.7 (12.1)	44.4 (12.8)
Women (%)	46.9	43.1
Race/ethnicity (%)		
Non-Hispanic white	92.3	86.2
Non-Hispanic black	0.5	1.7
Hispanic	3.6	6.9
Other	3.6	5.2
Education level (%)		
≤ High school	14.5	20.4
Some college	54.9	46.3
Graduate school	30.6	33.3
Married (%)	73.1	69.6
Work status (%)		
Paid employment	63.8	67.2
Disabled	9.6	13.8
Unemployed	0.5	1.7
Retired	18.1	3.5
Homemaker	4.3	3.5
Other	3.7	10.3
Insurance status (%)		
Private	83.2	84.2
Medicaid	3.8	3.5
Medicare	11.4	12.3
Uninsured	1.6	0.0
Body mass index (%)		
< 18.5 kg/m ²	0.0	3.3
18.5–24.9 kg/m ²	15.0	16.7
25.0–29.9 kg/m ²	34.7	36.7
≥ 30 kg/m ²	50.3	43.3
Disease severity/activity, mean (SD)		
Patient global assessment	68.6 (24.6)	63.5 (24.1)
Pain in the past week	35.7 (31.1)	40.5 (30.6)
BASDAI*	3.7 (2.5)	3.9 (2.5)
BASFI*	2.4 (2.4)	2.9 (2.5)
Years since diagnosis	19.1 (14.4)	12.0 (12.7)
Current treatment		
csDMARDS* alone (%)	34.3	1.6
Corticosteroids alone (%)	6.5	3.2
csDMARDS + corticosteroids (%)	38.8	4.8
Biologic medications (%)	42.3	39.7
NSAIDs* (%)	58.7	58.7
Opioids (%)	8.5	11.1
Physical therapy in the past 6 months (%)	20.7	52.0

*BASDAI = Bath Ankylosing Spondylitis Disease Activity Index, BASFI = Bath Ankylosing Spondylitis Functional Index, csDMARDS = conventional synthetic disease-modifying anti-rheumatic drugs, NSAIDs = Non-steroidal anti-inflammatory drugs,

Table 2. Attitudes and beliefs* towards exercise in people with axial and peripheral SpA (N=264).

	Peripheral SpA (N=201)	Axial SpA (N=63)	95% confidence interval
<i>Median (25th – 75th percentile)</i>			
General attitude towards			
Regular exercise	88.0 (51.0 – 98.0)	81.0 (50.0 – 99.0)	-14.1 – 7.3
Swimming and aquatic exercise	82.0 (50.0 – 99.0)	86.5 (48.0 – 100)	-13.2 – 12.4
Moderate activity for reduced symptoms	76.0 (50.0 – 99.0)	72.5 (50.0 – 91.0)	-9.3 – 11.9
Moderate activity for arthritis	84.0 (59.5 – 99.5)	80.0 (64.0 – 97.0)	-7.9 – 11.6
Support from people for			
Regular exercise	97.0 (77.0 – 100)	98.0 (75.0 – 100)	-10.5 – 5.7
Swimming and aquatic exercise	93.0 (51.0 – 100)	94.0 (77.0 – 100)	-13.1 – 4.0
Benefits in exercise/physically active			
Help disease	96.5 (74.0 – 100)	89.0 (74.0 – 100)	-6.4 – 9.3
Improve abilities to do things	98.0 (80.0 – 100)	89.0 (70.0 – 100)	-0.7 – 15.4
Better for themselves	99.0 (85.0 – 100)	94.0 (75.0 – 100)	-2.6 – 8.9
Pain relief	70.0 (50.0 – 97.0)	67.0 (41.0 – 95.0)	-7.9 – 14.2
Improve muscle strength	99.0 (87.0 – 100)	91.0 (80.0 – 100)	-2.5 – 8.9
Take care of home and family	97.0 (76.0 – 100)	86.0 (69.0 – 100)	-3.2 – 12.0
Improve general function	97.0 (83.0 – 100)	92.0 (71.0 – 100)	-1.6 – 12.6
Complication and/or concerns			
Discomfort	50.0 (11.0 – 74.5)	61.0 (32.0 – 85.0)	-22.4 – 2.0
Joint injuries	20.0 (1.0 – 50.0)	34.5 (10.0 – 53.0)	18.6 – 3.0
Take time away from things	10.0 (0 – 32.5)	22.5 (4.0 – 42.0)	-17.2 – 2.8
Boring	22.0 (2.0 – 50.0)	35.5 (6.0 – 52.0)	-17.1 – 5.9
Behavior for exercise/physical activity			
Likely for at least 3 times per week for 10 minutes	99.0 (67.0 – 100)	98.0 (75.0 – 100)	-12.3 – 5.4
Regular exercise prior to age 30	<i>Percentage</i>		
Sporadic	10.9	18.4	
≥1 time per month	6.4	13.2	
≥1 time per week	80.0	57.9	

* Zero indicates unfavorable/disapprove/disagree strongly/extremely unlikely, and 100 indicates favorable/approve/agree strongly/extremely likely.

Table 3. Type of activities that patients usually participate in by predominant anatomic distribution of disease (N=264).

Activity	Peripheral SpA (N=201)	Axial SpA (N=63)
	Percentage	
Jogging/running	10.1	14.8
Brisk walking	44.5	44.3
General walking	81.1	83.6
Swimming	15.8	25.0
Water exercising	5.1	6.7
Aerobic/calisthenics	14.7	18.0
Weightlifting	20.2	26.2
Bicycle/exercise bike	28.5	30.0
Team sports	8.7	6.7
Yoga/Pilates	8.7	15.0
Back stretching or strengthening exercises	45.3	62.3
Other	28.9	21.3

Table 4. Association between predominant anatomic distribution (peripheral or axial) and time spent in different levels of physical activity (N=264).

	Peripheral SpA (N=201)	Axial SpA (N=63)	Crude β coefficients [†] (95% CIs*)	Adjusted β coefficients [†] (95% CIs*)
	<i>Median (25th- 75th percentile)</i>			
Recreational activity in MET*-hours/week	36.9 (14.0 – 96.2)	33.7 (16.0 – 175.1)	0.24 (-0.70 to 1.18)	0.01 (-1.66 to 1.68)
Time in levels of recreational activity (minutes/week)				
Light activities (< 3.0 MET)	210.0 (60.0 – 480.0)	210.0 (60.0 – 480.0)	0.35 (-1.66 to 2.35)	-1.94 (-2.96 to -0.93)
Moderate activities (3.0 to 5.9 MET)	210.0 (210.0 – 930.0)	480.0 (210.0 – 930.0)	0.05 (-0.78 to 0.88)	-1.05 (-2.12 to 0.02)
Vigorous activities (\geq 6.0 MET)	120.0 (0 – 405.0)	90.0 (0 – 690.0)	0.29 (-0.74 to 1.32)	0.0002 (-1.21 to 1.21)
	<i>Proportion of meeting guideline</i>		Crude odds ratio [†] (95% CIs*)	Adjusted odds ratio [†] (95% CIs*)
Meeting physical activity guideline	41.3	49.2	0.73 (0.41 to 1.28)	0.70 (0.35 to 1.40)

* MET: metabolic equivalent; CIs: confidence intervals.

[†]Beta coefficients and odds ratios (95% confidence intervals) were estimated using participants with predominantly peripheral disease as the reference group. All models were adjusted for sex, marital status, NSAID use, and physical therapy in the past 6 months.