Predicting Physical Activity and General Health Perception Among Patients with Rheumatoid Arthritis

EVA EURENIUS, NINA BRODIN, STAFFAN LINDBLAD, CHRISTINA H. OPAVA, and THE PARA STUDY GROUP

ABSTRACT. ***Objective.*** To describe changes over one year in physical activity, body functions, and disease activity in patients with rheumatoid arthritis (RA) and to identify predictors for physical activity and general health perception.

Methods. One hundred two patients with RA were recruited for the study (median age 57 yrs, range 19–84; median disease duration 15 mo, range 4–78; 76% women). Self-reported data on physical activity and health locus of control, tests of lower extremity function, grip force, joint range of motion, balance, and measures of disease activity, including pain, general health perception, Health Assessment Questionnaire (HAQ), and Disease Activity Score (DAS28), were collected on 2 occasions, one year apart. Each variable was dichotomized to fit logistic regression models, performed to identify which variables predicted physical activity and general health perception over one year.

Results. Physical activity was stable, while lower extremity function, grip force, and range of motion improved and DAS28 decreased significantly over one year. A high physical activity level at baseline was the only predictor of high physical activity (odds ratio 3.85, 95% confidence interval 1.67–9.09) one year later. Low pain (OR 8.47, 95% CI 2.97–24.39), high physical activity (OR 3.72, 95% CI 1.39–10.10), and good lower extremity function (OR 2.94, 95% CI 1.04–8.33) were identified as predictors of good general health perception.

Conclusion. While pain is a well known predictor of general health perception, to our knowledge, this is the first study to identify predictive factors related to physical activity and lower extremity function as important for perceived health among patients with RA. (J Rheumatol 2007;34:10–15)

Key Indexing Terms:
ARTHRITIS BODY FUNCTION EPIDEMIOLOGY
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Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure[1]. It can be categorized into occupational, sports, conditioning, household, or other activities. Physical activity maintains good health and reduces risk of cardiovascular disease[2], type 2 diabetes[3], obesity[4], osteoporosis[5], depression[6], and colorectal cancer[7]. It is therefore recommended that every individual get at least 30 minutes of moderate intensity physical activity, such as brisk walking, most days of the week[8,9].

Physical activity is positively associated with general health perception at all ages[10-13]. Both moderate and high intensity physical activity predict good general health perception in 50–59-year-old working men[14]. Conversely, a perception of good general health is a positive predictor of maintaining healthy physical activity in older individuals[15]. Prospective studies following adolescents into young adulthood[16-19] identified other predictors that explained 10–82% of healthy physical activity levels. The identified predictors include high level of aerobic fitness and a high percentage of type I muscle fibers, good running and strength performance,

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high physical education marks, frequent physical activity[17-19], and good mental health[16].

Recommendations for regular moderate physical activity also apply to individuals with arthritis[20]. People with arthritis have been shown to be as physically active as the population[21] or less so[22,23]. People with arthritis reduce their leisure-time physical activity by two-thirds after disease onset and remaining activities are conducted at a much lower level[24]. Correlation between physical activity, general health perception, and body functions seems to be lower among patients with rheumatoid arthritis (RA)[21] than in the general population[25]. It seems that disease-related factors such as pain and difficulties with daily activities relate to the perception of general health among patients with RA[21]. A prospective study of patients with juvenile chronic arthritis concluded that prediction of general health perception was difficult, probably due to the broad spectrum of factors affecting the outcome[26].

Previously identified predictors of patient exercise behavior 6 months after a clinic visit include patient and rheumatologist exercise behaviors, whereas self-efficacy and perceived behavioral control are not[27]. High internal health locus of control (HLOC) relates to physical activity in the population, although this was not found in patients with longterm RA[28]. However, our knowledge of predictors of physical activity and general health perception among patients with RA, related to physical activity, HLOC, body functions, and disease activity, is still limited.

Our purpose was to describe changes over a one-year period in physical activity, body functions, and disease activity, including pain, general health perception, Health Assessment Questionnaire (HAQ), and Disease Activity Score (DAS28), in patients with RA, and to identify predictors for physical activity and general health perception.

MATERIALS AND METHODS

Patients. One hundred two of 298 patients with RA originally recruited from 17 rheumatology units for a survey of physical activity and body functions[21] were reexamined one year (median 12, range 9–15 mo) after an initial examination. Although not systematically selected, the 102 patients (76 women, 26 men) proved to be a representative subgroup of the originally recruited 298 patients identified through the Swedish RA register. Hence there were no statistically significant differences in age, gender distribution, pain, general health perception, disability (HAQ), or disease activity (DAS28) of the subgroup when compared with the original sample. At the time of inclusion in this study the median age of the subgroup was 57 years (range 19–84) and their median disease duration (time since self-reported onset of symptoms) was 15 months (4–78). Regarding medication, 86 were receiving disease modifying antirheumatic drugs (DMARD), 34 were receiving oral corticosteroids, 60 nonsteroidal antiinflammatory drugs (NSAID), and 30 analgesics. Seven patients took no medication and data were missing for one patient; several patients were receiving more than one type of medication. Physical therapists examined the patients in connection with ordinary, clinically motivated, outpatient physician visits from February 1999 to March 2002. To be included in the study each patient had to be able to perform at least 3 of 5 tests of body functions described below (one for aerobic fitness is reported elsewhere) and to complete one of 2 questionnaires described below.

One hundred ninety-six (76% women, median age 57, range 20-90 yrs) of the original 298 patients were never reexamined. There were several reasons for this. Three of the original 17 participating units chose, due to practical circumstances, not to reexamine their patients (n = 31). An additional 136 patients were never reexamined because some of the remaining 14 units cut back their participation during the course of the study. Twenty-nine patients were not reexamined because of logistics problems, mainly physician visits being scheduled or rescheduled without notifying the physical therapist.

Assessments. Self-reported questionnaires were used specifically for the study: (1) A written self-report measure of physical activity with questions taken from a larger questionnaire created by leading experts in Sweden and previously used in a large representative sample of the general population for ages 20–65 for a national epidemiological survey on physical activity and health habits. The measure includes 8 questions (total score 0–32): 3 questions on frequency of low, moderate, and high intensity planned and structured exercise for at least 20 minutes at a time; 4 questions on the duration of daily physical activity related to seasonal variations; and one question about the intensity of daily work[25]. The physical activity score is calculated by multiplying weighted values of frequency, duration, and intensity of reported activities. Summary scores of > 12.5 represent the amount of physical activity recommended for maintaining good health[25]. No systematic or random differences between test and retest over a week were found among patients with RA (data not shown). (2) The Multidimensional Health Locus of Control Scales, form C (MHLC-C) focuses on patient beliefs as to where control of their health lies. All 18 items include the word condition, for which the word arthritis was substituted in our study. Items are divided into 4 subscales (number of items in parentheses): internal (6), chance (6), doctors (3), and other people (3). Summary scores are calculated for each subscale; a high score for an item indicates that the subject believes control of their health depends on that particular source of power[29,30]. Internal (total score 6–36) and doctors (total score 3–18) subscales were used in our study, but only for baseline assessment.

The following tests of body functions, valid and reliable for patients with RA, were specifically used for the purposes of the study: timed stands test (time needed to rise 10 times from a standard chair is recorded in seconds[31,32]) for assessing lower extremity function; the electronic grip force measurement device Grippit (AB Detektor, Gothenburg, Sweden) for assessing peak grip force in Newtons (N)[33]; Escola Paulista de Medicina–Range of Motion (EPM-ROM) scale to estimate general joint range of motion (0–30, 0 = motion with no restriction), based on 10 bilateral motions in 7 joints measured with a goniometer[34]; balance while walking in a figure-eight with an inner circle diameter of 1.5 m and outer 1.8 m. Subjects walked with shoes on, 2 laps on the 150 mm-wide track. Touches and number of oversteps were counted[35].

The following measures, the minimum core set of disease activity recommended by the European League Against Rheumatism[36], were taken from the Swedish RA register: self-reported pain rated on a visual analog scale (VAS; 0–100, 0 = no pain); self-reported general health perception rated on VAS (0–100, 0 = totally fine); HAQ Disability Index to assess patients' estimated disability (0–3, 0 = without difficulty) during the previous week[37,38]; DAS28 based on a calculation of erythrocyte sedimentation rate (ESR, mm/h), number of swollen (0–28) and tender (0–28) joints (28-joint count), and self-reported general health perception[39]. The DAS28 is scored 0–10 with scores below 3.2 indicating low disease activity and those above 5.1 high activity, with moderate activity in between.

Procedures. Tests of body functions and the questionnaires were administered by the physical therapist within 10 days before or after the regular physician visit, in which data on pain, general health perception, disability (HAQ), and disease activity (DAS28) were collected for the Swedish RA register. Whenever possible, each patient was reexamined by the same physical therapist and doctor within one year after the initial examination. The patient sample may be regarded as one of convenience, since recruitment was governed by practical considerations such as physical therapist working hours, patient availability, and other logistics at the participating units.

Statistics. Descriptive results are presented as medians and ranges. Wilcoxon's matched pairs test was used to analyze changes over a one-year period in physical activity, body functions, and disease activity, including pain, general health perception, HAQ, and DAS28. Each variable included in

the logistic regression models was dichotomized according to median value in the present sample. Results for logistic regressions are expressed as odds ratios (OR) and 95% confidence intervals (95% CI). The relation between each of the 2 dependent variables (physical activity and general health perception) and the independent variables was examined in 2 separate series of simple logistic regression analyses. All independent variables with significance levels below 0.25 in the simple analyses were carried forward, along with gender and age, to stepwise multiple logistic regression analyses[40]. The model with the highest sensitivity was calculated by excluding independent variables with significance levels above 0.10[40]. Remaining variables were taken back to a multiple logistic regression analysis, where the recalculated OR reflected the total effect of the independent variables included.

Ethics. The Regional Ethics Research Committee at Karolinska Institutet approved the design of the study. We obtained informed consent from each study participant.

RESULTS

Ninety-eight (72 women, 26 men) of the 102 patients responded to the physical activity questionnaire twice. Their median physical activity score at baseline was 14 (range 5–30); 15 (range 5–30) for men and 14 (range 5–30) for women. Sixty-three patients achieved recommended levels of physical activity for maintaining good health (≥ 12.5), while 35 did not. At reassessment one year later, the median physical activity score was 13.25 (1–27.5), 12.5 (1–26) for men and 13.5 (5–27.5) for women, and 56 patients achieved healthy physical activity levels. No statistically significant change of physical activity was found ($p > 0.05$). One hundred patients answered the MHLC-C at baseline and the median score for the internal subscale was 17 (6–32) and 14 (6–18) for the doctors' subscale. While balance, pain, general health perception, and disability (HAQ) remained stable, lower extremity function, grip force, and range of motion improved and disease activity (DAS28) decreased significantly over a one-year period (Tables 1 and 2).

A series of simple logistic regression analyses identified high physical activity level at baseline as the only statistically significant predictor of high physical activity level one year later, with odds almost 4 times higher than those for patients with low baseline physical activity levels. Low age, high internal health locus of control, and low disability (HAQ) were also retained for further analysis as p values for their relations with high physical activity were below 0.25 (Table 3). In the next series of simple logistic regression analyses, high physical activity levels, good lower extremity function, low pain, good general health perception, and low disability (HAQ) at baseline were found to be statistically significant predictors of good general health perception after one year. Female gender, high internal and high doctors' health locus of control, and good range of motion were also related ($p < 0.25$) to good general health perception and were retained for further analysis (Table 3).

In forward stepwise multiple logistic regression analysis to predict high physical activity level, the best model, with a sensitivity of 65%, included only high baseline physical activity levels (Table 4). The best model for predicting good general health perception, with a sensitivity of 77%, included low pain, high physical activity level, and good lower extremity function (Table 4).

Table 1. Descriptive data on disease activity regarding 102 patients with RA assessed at baseline and one year later.

	Baseline Median (Range)	One year Median (Range)	p
General health perception, 0-100	30 (0–92)	23 (0–99)	0.115
Pain, 0–100	36 (0–93)	27.5 (0–96)	0.210
HAQ, 0–3	0.57* (0–2.38)	0.50** (0–2.00)	0.688
DAS28, 0–10	3.46† (0–7.21)	2.82† (0.06–6.90)	0.037

HAQ: Health Assessment Questionnaire Disability Index; DAS28: disease activity score. * 4 missing, ** 6 missing, † 9 missing.

Table 2. Descriptive data on body functions at baseline and one year later for 102 patients with RA.

	Baseline Median (Range)	One year Median (Range)	p
Lower extremity function, s	24* (11.4–64.0)	23* (10.0–93.0)	0.009
Grip force, (Newtons)	284* (20–1108)	321.5* (44–1127)	0.027
Range of motion, 0–30	5.5† (0.0–15.0)	4.0† (0.0–15.0)	0.000
Balance, oversteps, n	4** (0–54)	5** (0–65)	0.092

* 7 missing, ** 8 missing, †1 missing.

DISCUSSION

Our results indicate that among our patients with RA, physical activity was stable over a one-year period, as were balance, pain, general health perception, and disability (HAQ). Disease activity (DAS28) decreased and lower extremity function, grip force, and range of motion improved.

High baseline physical activity was the only predictor of high physical activity one year later. Low pain, high physical activity levels, and good lower extremity function at baseline predicted good general health perception. While pain is a well known predictor of general health perception, to our knowledge this is the first study to identify factors related to physical activity and body functions as important to the perception of health among patients with RA. Although statistically significant, some of these predictors have a 95% CI close to 1 and must therefore be interpreted with some caution. It is noteworthy, however, that the relatively low levels of pain, among these appropriately medicated patients recruited from the Swedish RA register, still had an influence on perceived health.

In our previous cross-sectional study of a larger sample of patients with RA, including the patients in this study, 53% reached the levels of physical activity recommended for maintaining good health[21]. In the present study 64% reached sufficient levels at baseline and 57% at reassessment one year later. Similar proportions of physically active individuals have

Table 3. Results of simple logistic regression analysis with high physical activity level and good general health perception after one year as dependent variables. Odds ratios (OR) and 95% confidence intervals (95% CI) are given for each independent variable at baseline.

	High Physical Activity		Good General Health Perception	
	OR (95% CI)	p	OR (95% CI)	p
Gender, female	1.27 (0.51–3.13)	0.616	0.41 (0.97–6.22)	0.056
Age, low	1.96 (0.88–4.35)	0.095	1.16 (0.53–2.56)	0.697
Physical activity, high	3.85 (1.67–9.09)	0.001	2.78 (1.23–6.25)	0.013
Disease duration, < 12 mos	0.67 (0.28–1.61)	0.379	1.00 (0.42–2.33)	1.000
Health locus of control				
Internal, high	2.00 (0.89–4.35)	0.091	1.61 (0.74–3.57)	0.232
Doctor's, high	1.96 (0.86–4.55)	0.382	0.69 (0.30–1.59)	0.110
Lower extremity function, good	1.32 (0.59–2.94)	0.498	2.44 (1.10–5.55)	0.029
Grip force, high	1.39 (0.62–3.03)	0.427	1.39 (0.63–3.03)	0.423
Range of motion, good	1.56 (0.71–3.45)	0.276	2.01 (0.93–4.55)	0.076
Balance, good	1.27 (0.57–2.78)	0.568	1.03 (0.47–2.27)	0.948
Pain, low	1.12 (0.51–2.44)	0.770	5.00 (2.08–11.11)	0.000
General health perception, good	0.64 (0.29–1.41)	0.264	2.63 (1.18–5.88)	0.018
HAQ, low	1.72 (0.77–3.86)	0.184	3.24 (1.43–7.42)	0.005
DAS28, low	0.85 (0.39–1.85)	0.679	0.89 (0.40–1.92)	0.758

HAQ: Health Assessment Questionnaire Disability Index; DAS28: disease activity score.

Table 4. Results of multiple logistic regression analysis with high physical activity level and good general health perception after one year as dependent variables. Recalculated odds ratios (OR) and 95% confidence intervals (95% CI) reflect the total effect of the independent variables at baseline.

	OR (95% CI)	p
Model for high physical activity level		
Physical activity, high	3.85 (1.67–9.09)	0.001
Model for good general health perception		
Pain, low	8.47 (2.97–24.39)	0.000
Physical activity, high	3.72 (1.39–10.10)	0.009
Lower extremity function, good	2.94 (1.04–8.33)	0.042

been found in other RA populations[22,41,42], and in the general population[25]. However, efforts to increase physical activity levels of patients in order to enhance longterm health are needed.

Providing explanations for the improvement of disease activity (DAS28) and body functions observed after one year was beyond the scope of our study. They may represent a regression to the mean, results of medication changes, or of multiprofessional interventions. Unfortunately, such interventions were not documented, but it is noteworthy that the vast majority of patients were already receiving DMARD at baseline. It is also notable that none of the self-reported measures indicated any improvement during the study period, which is in agreement with reports on another cohort of Swedish patients with early RA[43,44] and raises questions whether present treatment recommendations, although reducing disease activity (DAS28) and improving body functions, are effective in dealing with patients' perception of health.

Our results confirm previous reports on exercise and physical activity as predictors of exercise behavior and physical activity both in individuals with RA 6 months after a visit with their rheumatologist[27] and in the general population[17-19]. While various body functions are known as predictors of physical activity in the general population[17-19], this did not seem to hold true for our sample of individuals with RA. This may indicate that factors, other than impairments, that were not assessed in our study may be of greater importance for predicting physical activity. One such factor may be fatigue, others might be related to personal or environmental factors such as education, employment, social support, and access to physical activity facilities.

Our finding that health locus of control did not predict physical activity is in line with previous findings indicating that self-efficacy and perceived behavioral control do not seem to predict exercise behavior in patients with RA[27]. On the other hand, other studies support cognitive factors, such as self-efficacy, as strong predictors of exercise behavior[45-47].

Although self-reported pain was rather low, pain was the main predictor of general health perception in our study. This is consistent with our previous cross-sectional study in which general health perception related mainly to pain and disability (HAQ)[21]. One reason for this may be that pain is still underestimated in the treatment of patients with RA, who continue to experience pain despite the introduction of new drugs and early active rehabilitation. Thus it seems that more efforts are required to reduce pain in patients with RA.

Selection bias in recruitment for our study cannot be excluded. One obvious limitation relating to generalizability for all patients included in the Swedish RA register is their short disease duration. In addition, no patients with severe disability were included. Therefore our results may not be valid for patients with longer disease duration and severe activity limitations. Concerning internal validity, all tests of body function and all disease activity measures were developed

specifically for patients with RA and are known to possess good reliability and validity in this population. However, the fact that many physical therapists were involved in testing body function at participating units may be expected to cause some variation in outcome. To avoid this, at least one physical therapist from each unit was trained before both baseline and followup assessments to perform the tests accurately and to use written guidelines to remember training instructions. Also, we believe that learning effects are minimally represented in our sample because each patient was only examined twice and at a one-year interval. All variables were dichotomized by median values obtained in the present sample. This may not be ideal, but was done to obtain groups as equally sized as possible and to avoid subgroups that were too small for statistical analysis.

There may be some doubt regarding the validity of the questionnaire for self-reporting physical activity used in this study. The questionnaire was chosen mainly because it had previously been used in a large representative population-based survey providing norm data that could be used for comparison with our sample. Its reliability and validity have not been addressed. However, unpublished data indicate good reliability among patients with RA. Further, because many experts were involved in the development of the questionnaire within the national survey, there is reason to believe that it at least has appropriate face and content validity. Moreover, the questionnaire was originally developed for ages 20–65 and 27 individuals over the age of 65 in our sample may have biased our findings. Previous analyses revealed no major differences in results for a group of patients up to age 65 compared with a group that also included those above age 65[21]. Another issue of concern may be that the questionnaire was not validated for people with arthritis. However, the questionnaire was developed for the general population, which includes individuals with arthritis, persistent pain, and other chronic diseases. Nevertheless, we cannot exclude the possibility that answers from patients with arthritis may be biased either by overestimation of physical activity or social desirability[48]. Unfortunately, such possible bias is hard to exclude entirely from any epidemiologic research that relies on self-reporting.

In future studies, it would be interesting to follow the clinical course of RA for more than one year to study changes in physical activity, body function, and disease activity in order to investigate whether predictors of physical activity and general health perception remain the same. Another interesting area for further research would be the study of interventions that support healthy physical activity and their effects on general health perception.

In conclusion, our study predicts physical activity and health perception in patients with RA. We point to the importance of identifying pain, physical activity, and lower extremity function in order to take appropriate action and thereby maintain good longterm health perception. Also, actively detecting low physical activity levels enables care providers to support patients in improving this deficiency over time in order to reach the recommended level of activity for maintaining good health.

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