Exercise in Ankylosing Spondylitis: Discrepancies Between Recommendations and Reality

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ABSTRACT. ***Objective.*** To determine the type and extent of exercise used by an ankylosing spondylitis (AS) cohort and to examine patients' perceptions of exercise. Recommendations for the management of AS identify exercise as the cornerstone of comprehensive management.

Methods. An exercise inventory questionnaire and the Exercise Benefits and Barriers Scale (EBBS) were administered to patients attending the AS clinic of a large teaching hospital. Benefits and barriers subscales of the EBBS were analyzed to identify the perceived benefits of, and barriers to, exercise. Higher benefits scores (range 29–116) indicate a more positive perception of exercise. Higher barriers scores (range 14–56) indicate a greater perception of barriers to exercise.

Results. Sixty-one patients with AS completed the questionnaires. Mean age was 38.0 years, and mean disease duration was 14.7 years. Walking (3 times/week) and stretching (3 times/week) were the most commonly reported types of exercise and were reported in 35.0% and 32.8%, respectively. The mean benefits EBBS score was 87.1 ± 12.5. The most frequently reported benefits of exercise were that it "increases my level of physical fitness" (96.4%) and "improves functioning of my cardiovascular system" (96.4%). The mean barriers EBBS score was 29.2 ± 5.3, and the most frequently reported barrier to exercise was that it "tires me" (71.4%).

Conclusion. Patients with AS perceive the benefits of exercise, with average EBBS benefits scores comparable to historical controls with similar conditions. Despite positive perceptions, the majority of patients with AS did not report participating in exercise on a frequent basis. (First Release March 1 2010; J Rheumatol 2010;37:835–41; doi:10.3899/jrheum.090655)

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The Assessment of SpondyloArthritis International Society and the European League Against Rheumatism (ASAS/EULAR) recommendations for the management of ankylosing spondylitis (AS) state that optimal management requires a combination of nonpharmacological and pharmacological treatments[1]. Specifically, nonpharmacological treatment of AS should include patient education and regular exercise[1]. There are currently no evidence-based guidelines regarding the specific frequency and duration of exercise for the AS population. However, the evidence supporting the most recent Cochrane systematic review of physiotherapy interventions for AS suggests that home exercise and/or recreational programs performed at least 30 minutes per day, 5 to 7 days a week, are effective in the improvement of pain and stiffness, and the maintenance of function[2]. Other studies have indicated that home exercises were superior to no exercise, while some authors suggest group exercises are better than home exercises[2,3]. Karapolat, *et al* found that both home and group exercises improved the Bath AS Disease Activity Index (BASDAI) and the Bath AS Metrology Index (BASMI) scores, as well as a number of subscores of the Nottingham Health Profile (energy level, pain, emotional reaction, and sleep)[4]. Further, home exercises have been shown to improve spinal mobility and fitness, while group exercises have been shown to improve pain, spinal mobility, and overall well-being[2]. Other forms of exercise for AS, such as tai chi, can increase flexibility, as measured by finger to floor distance, and improve disease activity scores[5]. Moreover, a recent review by Elyan and Khan[6] reported people with AS who participated in regular exercise demonstrate improvement in a number of outcome measures, including self-efficacy for exercise and self-reported mobility, function, fingertip to floor distance, spine and large-joint mobility, quality of life, pain, disability as measured by the Health Assessment Questionnaire, and depression. They

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also showed improved mobility, as measured by chest expansion, chin to chest distance, modified Schober test, occiput to wall, spinal mobility, and vital capacity. To date there have been few studies regarding the biological basis of exercise-related improvements in AS, but there is some evidence that exercise may improve cytokine production[3].

Despite the growing body of evidence to support the importance of exercise in the management of AS, fewer than one-quarter of patients with AS exercise frequently (3 or more times per week)[7]. Further, the extent to which patients with AS are adhering to exercise as a form of nonpharmacological management remains unclear. Understanding patient perceptions about the benefits and barriers to exercise could aid in focusing nonpharmacological strategies to improve outcomes for those with AS.

Our aim was to determine the type and extent of exercise done by a cohort of patients with AS, and to examine perceptions of exercise among patients with AS.

MATERIALS AND METHODS

Patients attending the Toronto Western Hospital AS clinic were recruited for the study. Inclusion criteria consisted of an established diagnosis of AS based on the modified New York criteria[8], being 18 years of age or older, and being able to read and write English. All patients diagnosed with AS, and who attended the AS clinic during the study period, were provided with verbal recommendations regarding the importance of regular exercise to maintain spinal mobility, posture, and spinal strength. These recommendations were provided by the patient's attending rheumatologist.

Demographic characteristics. A number of demographic variables were collected, such as age, sex, education (grade 8, higher than grade 8, high school, college, university), and employment status (employed, retired, homemaker, student, disabled, other).

Disease characteristics. Disease characteristics of the study participants were also explored. These included disease duration, disease location (axial, peripheral, axial and peripheral, remission), American College of Rheumatology (ACR) functional class, BASDAI, BASMI, Bath AS Functional Index (BASFI), total back pain score, nocturnal back pain score, and primary pharmacological management. The rheumatologist involved with the patient's management scored the BASMI and ACR functional class. The remaining disease-related outcome measures were self-administered questionnaires completed by the patient.

Exercise inventory. Consecutive patients were provided with a self-administered questionnaire regarding the various types of exercise (e.g., swimming, stretching/strengthening, yoga, etc.), and the frequency (from never to daily) of participation. This exercise inventory was developed for the purposes of our study. Types of exercise for the questionnaire were based on exercise interventions in the literature for patients with AS and also on exercises that are common to the local region. All authors reviewed the questionnaire for face and content validity, clarity, relevance, and format.

Exercise Benefits/Barriers Scale (EBBS)[9]. The EBBS is a validated tool (in a healthy adult population) developed by Sechrist and colleagues[9] to determine perceptions concerning the benefits of, and barriers to, exercise. The EBBS consists of 29 benefits items in 5 categories: physical performance, preventive health, psychological outlook, social interaction, and life enhancement. There are 14 barriers items in 3 categories: physical exertion, time expenditure, and exercise milieu. Respondents rate their agreement to each perceived benefit and barrier item on a Likert scale consisting of 4 response options from strongly disagree to strongly agree. The possible range of scores on the benefits scale is 29 to 116, and higher scores indicate a more positive perception of exercise. For the barriers scale the range is 14–56, higher scores indicating a greater perception of barriers to exercise. Table 1 outlines the statements found in the EBBS, with its corresponding category.

Data analysis. The benefits and barriers subscales of the EBBS were analyzed separately. Descriptive statistics were used to describe the study sample, to summarize the results from the study questionnaires, and to address the study objectives. SAS version 9.1 was used for all analyses. The study protocol was approved by the University Health Network Research Ethics Board, Toronto.

Table 1. Categories in the Exercise Benefits/Barriers Scale (EBBS).

Category	Corresponding Statements in the EBBS
Perceived benefits	
Life enhancement	Improvement of disposition
	Ability to sleep better
	Decreased fatigue
	Increased mental alertness
	Ability to carry out normal activities without tiredness
	Improved quality of work
	Improved overall body functioning
Physical performance	Increased muscle strength
	Higher levels of physical fitness
	Improved muscle tone
	Improved cardiovascular functioning
	Increased stamina
	Improved flexibility
	Improved physical endurance
	Improved self-concept
	Improvement in the way the body looks
Psychological outlook	Enjoyment of exercise
	Decrease in stress and tension
	Improvement in mental health
	Sense of personal accomplishment
	Relaxed feelings
	Improvement in feelings of well-being
Social interaction	Contact with friends
	Meeting people
	Good entertainment
	Increased acceptance by others
Preventive health items	Prevention of heart attacks
	Prevention of high blood pressure
	Longer life
Perceived barriers	
Exercise milieu	Places to exercise are too far away
	Exercise is too embarrassing
	Exercising costs too much
	Facilities have inconvenient schedules
	People in exercise clothes look funny
	Places to exercise are too few in number
Time expenditure	Time taken from family responsibilities
	Time taken from family relationships
	Too much time taken
Physical exertion	Exercise is tiring
	Exercise is fatiguing
	Exercise is hard work
Family discouragement	Lack of encouragement from spouse
	Lack of encouragement from family

RESULTS

Sixty-one patients attending the AS clinic completed the questionnaires. The mean age was 38.0 years, 75.4% were men, and the mean disease duration was 14.7 years. Table 2 provides further detail of the demographic and disease characteristics of the study participants.

Exercise profiles. Figure 1 illustrates the maximum reported frequency of exercise participation of the study sample. The greatest proportion (34.4%) of patients reported exercising on a daily basis, followed by 26.2% of patients who indicated they exercise less than once a week. Overall, 57.4% of patients reported engaging in at least 1 form of exercise 3 times per week. There was no significant difference in the demographic and disease characteristics outlined in Table 1 (data not shown) between those who exercised 3 times per week or more and those who did not.

Walking as a form of exercise at least 3 times per week (35.0%) and stretching at least 3 times per week (32.8%) were the specific types of exercise most frequently reported by respondents. Figure 2 illustrates the distribution of type and frequency of each exercise reported by the study participants.

Table 2. Characteristics of study participants (n = 61).

Characteristics	Mean (SD) or n (%)
Demographic	
Age, yrs	38.0 (12.2)
Male	46 (75.4)
Postsecondary education	42 (70.0)
Employed	41 (68.3)
Disease-related	
Disease duration, yrs	15.0 (10.7)
Disease location	
Axial	32 (52.5)
Peripheral	4 (6.6)
Axial and peripheral	21 (34.4)
Remission	4 (6.6)
American College of Rheumatology functional Class*	
I	14 (23.3)
II	44 (73.3)
III	2 (3.3)
IV	0 (0.0)
Bath AS Disease Activity Index	4.3 (2.8)
Bath AS Metrology Index	2.7 (2.5)
Bath AS Functional Index	3.6 (2.8)
Total back pain score	4.4 (3.0)
Nocturnal back pain score	4.1 (3.1)
Primary pharmacological management	
None	5 (8.2)
Anti-TNF agent	37 (60.7)
NSAID	17 (27.9)
Other (including DMARD, prednisone)	2 (3.28)

* American College of Rheumatology Classification of Global Functional Status in Rheumatoid Arthritis: Class I: completely able to perform usual activities of daily living (self-care, vocational, and avocational); Class II: able to perform usual self-care and vocational activities, but limited in avocational activities; Class III: able to perform usual self-care activities, but limited in vocational and avocational activities; Class IV: Limited in ability to perform usual self-care, vocational, and avocational activities. TNF: tumor necrosis factor; NSAID: nonsteroidal antiinflammatory drug; DMARD: disease-modifying antirheumatic drug.

Perceived benefits of exercise. The mean benefits EBBS score was 87.1 ± 12.5. Overall, the most frequently reported benefits of exercise were "exercising increases my level of physical fitness" (96.4%) and "exercise improves functioning of my cardiovascular system" (96.4%). The least perceived benefits were "exercise increases my acceptance by others" (33.9%), "exercise helps me decrease my fatigue" (55.4%), and "exercise allows me to carry out my normal activities" (57.1%). Listed in Table 3 are the mean scores for the benefit items with agreement or high agreement on the EBBS. The benefits with the highest mean score ("exercise increases my muscle strength" and "exercise increases my level of physical fitness") were related to physical performance.

Perceived barriers to exercise. Figure 3 illustrates the distribution of responses to the barriers scale. Overall, the most frequently reported barriers to exercise were "exercise tires me" (71.4%), "exercise is hard work" (60.7%), and "I am fatigued by exercise" (57.1%).

DISCUSSION

The evidence supporting home-based exercise/recreational programs in the management of AS suggests an exercise duration and frequency of 30 minutes per day, 5 to 7 days a week, for the improvement of pain and stiffness, and the maintenance of function[2]. In our study, about half of participants (47.5%) reported engaging in at least 1 form of exercise 4–5 times per week, with the frequency of exercise participation relatively high compared to that found elsewhere in the literature. For example, an Austrian study reported only 18% of patients with AS performed disease-specific exercise more than 3 times weekly[10]. The results of our study regarding exercise frequency are relatively higher than those found elsewhere; however, given that exercise is considered the cornerstone of AS management, the proportion of patients with AS exercising according to evidence-based findings should be greater if patients are to experience optimal benefits from this intervention.

With respect to type of exercise, among those who exercised 3 times per week or more, walking and stretching were most frequently reported. Although the weekly frequency of exercise is less than the evidence-based findings, our cohort is in fact performing the types of exercise that are recommended in the literature for patients with AS, specifically stretching[2].

Our results indicate that patients with AS recognize many potential benefits of exercise. Although not all patients with AS are exercising according to evidence-based findings from the literature, the reported exercise frequency is similar to adherence rates of pharmacological management for

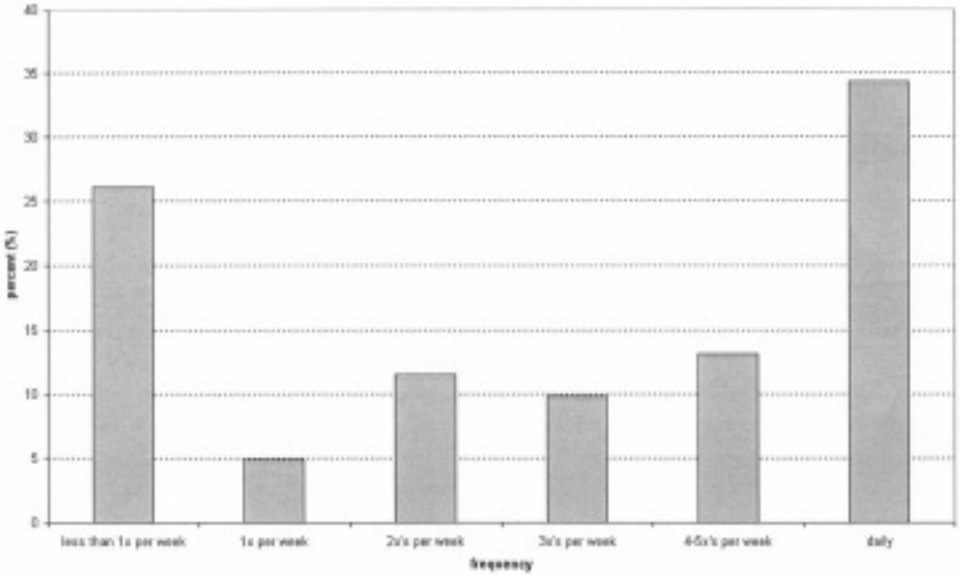

Figure 1. Maximum reported frequency of exercise participation.

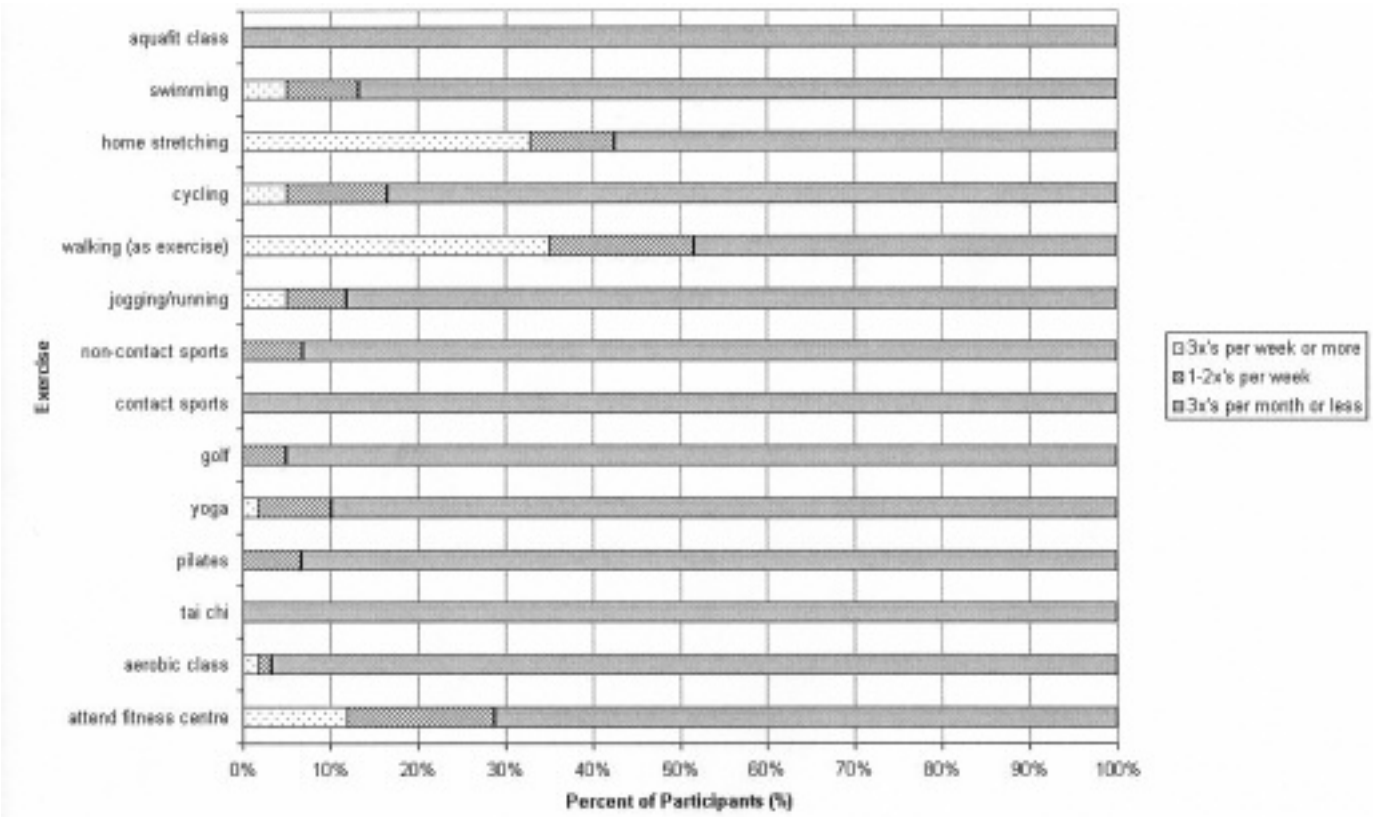

Figure 2. Type and frequency of exercise.

patients with selected rheumatic conditions (including AS), in which 47% of new patients treated with antiinflammatory agents and analgesics took their medication as prescribed[11]. In contrast, Falkenbach found that only 29% of patients with AS adhered to medical advice regarding daily exercise[12]. Since exercise is a recognized cornerstone for the management of AS, increased adherence to evidence-based exercise frequency and duration is critical in

Table 3. Benefits statements with agreement or high agreement on the Exercise Benefits/Barriers Scale (EBBS). There are 29 benefit items on the EBBS. Scoring: 4 = strongly agree; 3 = agree; 2 = disagree; 1 = strongly disagree.

Benefit Item	Mean Score	Category
Exercise increases my muscle strength	3.4	Physical performance
Exercise increases my level of physical fitness	3.4	Physical performance
Exercise improves cardiovascular functioning	3.3	Physical performance
I will live longer if I exercise	3.3	Preventive health
Exercise improves my mental health	3.2	Psychological outlook
Exercise will improve my muscle tone	3.2	Physical performance
Exercise increases my stamina	3.2	Physical performance
Exercise gives me a sense of personal accomplishment	3.1	Psychological outlook
Exercise improves my physical endurance	3.1	Physical performance
Exercise improves my flexibility	3.1	Physical performance
I enjoy exercise	3.1	Psychological outlook
Exercise improves the way my body looks	3.1	Physical performance
Exercising will keep me from having high blood pressure	3.1	Preventive health
Exercise improves my overall body function	3.1	Life enhancement
Exercise decreases my feelings of stress	3.0	Psychological outlook
My disposition is improved with exercise	3.0	Life enhancement

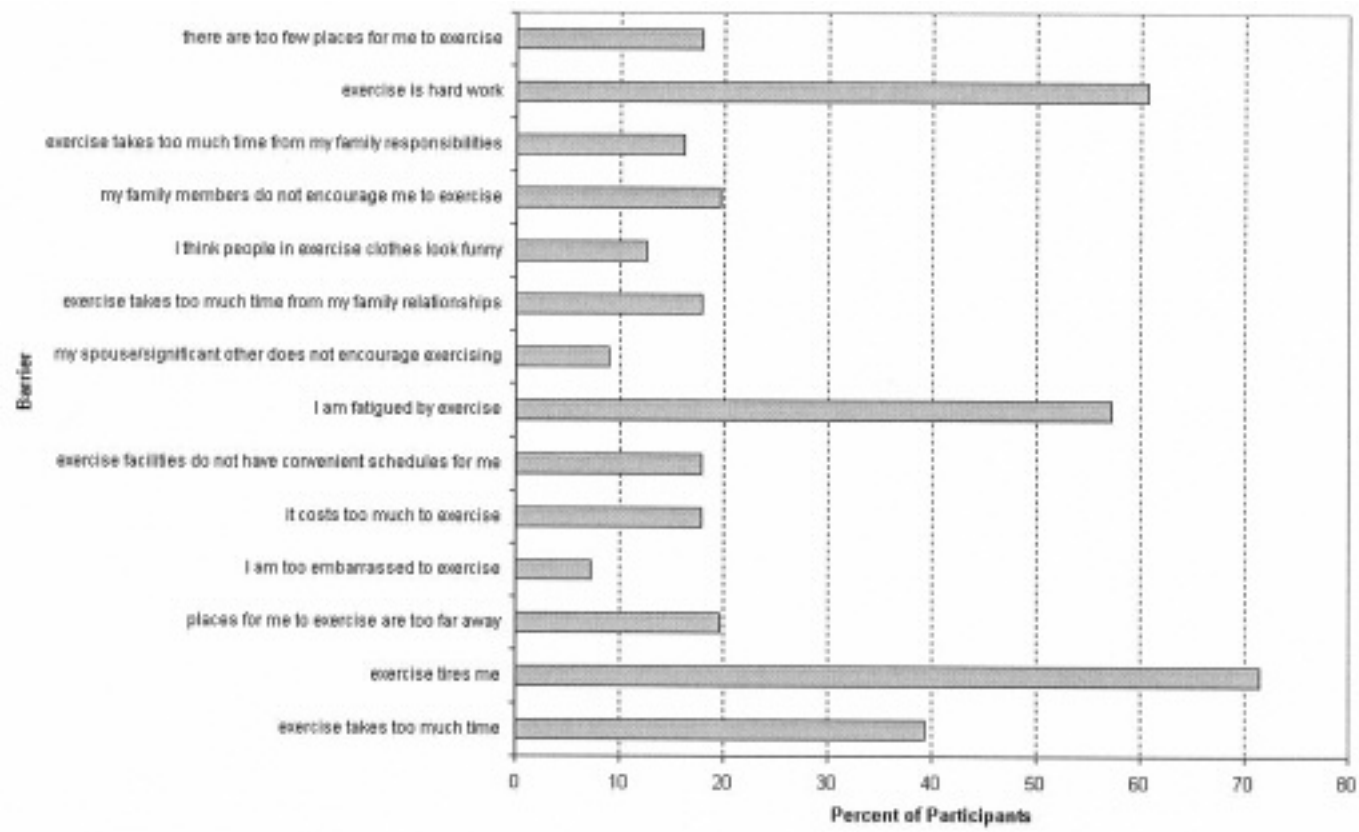

Figure 3. Agreement and high agreement with barrier statements.

order to gain the full benefits of the intervention. Based on the discrepancy of results found in the literature, further study into the adherence to the recommended exercise frequency in populations with AS may be of benefit.

The most conspicuous finding from our study was the frequently reported symptom of fatigue as a barrier to exercise. Specifically, the following barriers to exercise were reported with the highest frequency: "exercise tires me,"

"exercise is hard work," and "I am fatigued by exercise." Compounding this finding was the fact that few participants perceived the benefits of exercise in decreasing their fatigue. The concept of fatigue and AS is a phenomenon that has only recently been examined[13], with even less attention to the relationship of fatigue and exercise among those with AS. The prevalence of fatigue in this population has been reported to be 53%–63%, based on a BASDAI fatigue score greater than 50 mm[14,15]. Using this same BASDAI cutoff, only 35% of our cohort reported considerable fatigue levels. One explanation for our lower fatigue scores may be that the majority (60.7%) of patients in our cohort were on anti-tumor necrosis factor-α (TNF) therapy. A recent systematic review has found that anti-TNF therapy can improve fatigue in 50%–55% of patients as measured by the fatigue item on the BASDAI scale[13].

There is evidence that fatigue can effectively be measured with either a single-item question on the intensity of fatigue or with multiple items as in the Multidimensional Fatigue Inventory[14]. However, the discrepancy of relatively low fatigue scores and high fatigue-related barriers found in our study raises questions about respondents' understanding of the single-item question specifically related to fatigue in the EBBS, "I am fatigued by exercise." Further examination is warranted into reliable and valid self-report measures of fatigue in the population with AS, especially as fatigue relates to exercise.

When exercise is factored into the fatigue equation, it has been shown that home-based exercise programs (7 days a week for 12 weeks, n = 43), along with traditional medical management, significantly reduced fatigue compared to medical management alone[16]. Further, fatigue levels have been found to decrease after a 3-week course of spa therapy with an intensive physical exercise program[13]. This implies that exercise decreases fatigue in those with AS. Our findings suggest that patients did not perceive the benefits of exercise as it relates to fatigue and that they identify fatigue as a barrier to exercise. This finding creates a cause-and-effect dilemma: are patients with AS fatigued because they do not exercise, according to the evidence-based frequency, or are disease-related factors causing fatigue and thus preventing patients with AS from exercising? In addition to determining reliable and valid self-report measures of fatigue for patients with AS, further understanding is required regarding the relationship between fatigue and exercise. However, given the evidence-based benefits of exercise on fatigue, it is clear that patient education regarding the benefits of exercise on fatigue is important and may affect adherence rates to the recommended frequency of exercise in this patient population.

There are certain limitations to our study. First, our study sample is representative of an urban academic teaching hospital setting and therefore may not be representative of patients with AS living in other geographic communities. Specifically, living in an urban center allows greater access to exercise programs, community centers, and expertise that may not be available in more rural and remote settings. Second, the reliability of the EBBS for those with AS has not been validated. However, the average EBBS benefits scores found in our study were comparable to other patient populations, including patients with osteoarthritis and rheumatoid arthritis[17]. Third, most of our cohort was undergoing anti-TNF therapy. This may have skewed our results by overestimating the exercise frequency and adherence to exercise, as these patients may have been less symptomatic and thus more likely to engage in exercise. There have been only a limited number of studies examining the effect of anti-TNF therapy on exercise and therefore this needs further study[18]. Future studies could include an analysis of barriers to exercise in other chronic diseases and in healthy, age-matched controls. Inclusion of such cohorts would allow a clearer indication of variables related to AS itself (fatigue being one of the cardinal features), or a reflection of barriers to exercise experienced by patients at large.

Scores on the EBBS benefits subscale revealed that patients perceive the benefits of exercise. Despite these reported perceptions, overall, the majority of patients did not report participating in exercise at an evidence-based frequency, as suggested in the literature. The predominant perceived barriers identified for lack of exercise participation were related to fatigue. This suggests that further investigation into the relationship of exercise, fatigue, and the disease process itself is warranted. Notwithstanding, an encouraging finding from the study suggests that those who do exercise are choosing to engage in exercises that are evidence-based (i.e., stretching). The study provides useful information for clinicians when educating patients and planning programs for AS that include exercise.

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