

Physical Activity and Exercise: Perspectives of Adults With Ankylosing Spondylitis

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Background: Exercise is a key component of the management of ankylosing spondylitis (AS). Despite numerous benefits, compliance with exercise programs is low. Little attention has been accorded to the experiences of individuals with AS toward physical activity (PA). This study aimed to explore the attitudes toward PA and exercise of adults with AS. **Methods:** A qualitative descriptive design using thematic analysis was used. Seventeen adults with AS participated in individual, semistructured interviews. Interviews were recorded, transcribed, coded and analyzed for themes and subthemes. **Results:** Four themes emerged from the analysis: (1) benefits, (2) barriers, (3) motivation, and (4) strategies and enablers. *Benefits* included amelioration of symptoms, improvements in general health, and enhancement of quality of life. Subthemes of *barriers* to PA included lack of resources, negative attitudes to exercise, misinformation, and condition-related factors. *Motivation* to exercise was influenced by intrinsic and extrinsic factors. Participants proposed *strategies* to enhance PA participation and exercise engagement. **Conclusions:** Awareness of the benefits of PA appears insufficient to motivate individuals with AS to exercise; a number of factors influence individual motivation to exercise. Many perceived barriers to PA may be considered modifiable. Individually-tailored interventions, collaboratively developed by the individual and the healthcare professionals, were proposed as strategies for effective PA and exercise prescription.

Keywords: motor activity, qualitative research, health promotion

Ankylosing spondylitis (AS) is a chronic inflammatory rheumatic disease that primarily affects the axial skeleton. Clinically it is characterized by inflammatory back pain and stiffness, with decreased spinal mobility, fatigue and limitations in physical function.¹ Enthesitis and peripheral joint involvement may also be present. Accompanying extra-articular features may include uveitis, osteoporosis, inflammatory bowel disease, psoriasis, and cardiac, pulmonary and kidney involvement.^{2,3} AS is associated with decreased work productivity and lower health-related quality of life.^{4,5}

Therapeutic exercise is, along with pharmacology, a key component in the management of AS.⁶ Recent systematic reviews have shown exercise-based interventions, led primarily by physical therapists, to be effective in improving physical function, mobility, disease activity and quality of life outcomes.^{7,8} Despite these benefits, compliance with exercise programs in individuals with AS is low, curtailing the efficacy of exercise-based interventions.⁹⁻¹¹ The majority of adults with AS do not participate in regular exercise and may engage in less health-related physical activity (PA) than the general population.^{10,12-14}

Correlates of participation in PA in the general adult population have been extensively explored;¹⁵ however, among individuals with arthritis they are less well understood. The majority of studies to date have centered on individuals with osteoarthritis and rheumatoid arthritis.¹⁶ Physical, psychological, social and environmental factors are perceived as influencing exercise participation.¹⁷ A number of these factors are possibly mediating variables of PA, which are potentially modifiable.

The clinical features of AS, in particular the axial involvement, distinguish it from other rheumatic conditions. As such, an understanding of PA behavior in a specific AS cohort, distinct from rheumatoid arthritis and osteoarthritis, is needed. A small number

of studies (primarily questionnaire-based) have explored PA among adults with AS, with this cohort reporting significantly more barriers to PA than the general population.¹⁸ Condition-related barriers were the most frequently cited barriers to PA, with lack of time and being tired after exercise commonly reported general barriers.^{10,12,18} Intrinsic motivation and valuing exercise as beneficial have shown positive associations with exercise level and function.¹⁹ These perceived benefits have included symptomatic relief, disease stability, improved fitness and increased vitality.¹⁸

In a rare qualitative inquiry in an AS cohort, Stockdale et al²⁰ explored the impact of anti-TNF α medication on exercise behavior among individuals with AS. The study, which recruited from a single hospital and included only individuals stabilized on anti-TNF α medication, concluded that effective pharmacological management of symptoms improved motivation to exercise, and enabled participants to recommence, or further engage with, physical therapy exercises and PA.

Evidence-based practice involves the integration of clinical expertise, quality research evidence, and patient attitudes.²¹ A greater understanding of the range of attitudes toward exercise held by adults with AS, irrespective of pharmacological management and baseline PA, will help to understand the poor engagement with exercise programs.¹¹ It will also help physical therapists and healthcare practitioners (HCPs) tailor exercise strategies and communicate these effectively. Exploring the perceived barriers to exercise might offer insight into strategies to maximize compliance with exercise to derive the most benefits. Therefore the aim of this study was to gain insight into the attitudes of individuals with AS toward PA and exercise.

Methods

Study Design

A qualitative descriptive design using thematic analysis was implemented in this exploratory study.^{22,23} Thematic analysis is

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a qualitative analytic method used for identifying, analyzing and reporting patterns (or themes) within data.²³ Ethical approval was granted in May 2014 by the local research ethics committee.

Participants and Recruitment

An invitation to participate in the study was extended to potentially eligible individuals ($n = 16$) attending the Rheumatology outpatient clinics of St. James's Hospital, Dublin, between July 2014 and September 2014. During this time, notice of the study was also sent to the membership of 2 national patient support groups; 15 individuals expressed an interest in partaking in the study as a result of this recruitment arm. Adults (over 18 years) with a diagnosis of AS, and able to read and understand English were eligible for inclusion. Purposive sampling was used to capture diversity of experiences by recruiting based on sex, disease duration and habitual PA levels (completing at least 30 minutes of moderate and/or vigorous exercise on 0 to 2 days per week, 3 to 4 days per week, or 5 to 7 days per week).²⁴ Recruitment continued until no new relevant knowledge was being obtained from additional participants.²⁵ An ongoing, iterative approach to data processing, starting on completion of the first interview, aided the research team in determining that the generated data were comprehensive, and that replication was occurring.²⁶ After 14 interviews, no new knowledge was being obtained.

Data Collection

Eligible participants who agreed to take part in the study met with the lead researcher (TOD) in a university consultation room, or at a location of the participant's choosing. Participants gave written informed consent to be involved in the study before completing brief demographic and condition-related questionnaires. The data generated by these questionnaires allowed for a detailed description of study participants.

Questionnaires. Demographic characteristics including age, gender, employment status, education level completed, marital status, number of dependents, smoking history, and area of residence were ascertained. In addition, participants were asked about disease duration, time since diagnosis, current medication use and any other comorbidities that may limit their habitual PA. A

single-item questionnaire assessed compliance with PA recommendations.²⁷ Self-administered questionnaires, validated in AS cohorts, were used to measure aspects of the condition.²⁸ Disease activity was measured on the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI).^{29,30} The Bath Ankylosing Spondylitis Functional Index (BASFI) assessed activities of daily living and functional ability.^{31,32} The Ankylosing Spondylitis Quality of Life Questionnaire (ASQoL) was used to measure the impact of AS on health-related quality of life.^{29,33}

Participant Interviews. Subsequent to these descriptive questionnaires, a semistructured interview was conducted following the interview guide shown in Table 1. The guide was used as a prompt for the interviewer to ensure all topics of interest were covered. The guide consisted of open-ended questions; these were supplemented by exploratory questions which were posed to probe deeper into areas of interest. All interviews were conducted by the lead researcher (a physical therapist not involved in the participant's clinical management) and were digitally recorded on a dictaphone. Field memos were noted after interviews. The interview guide was piloted on 2 participants; as this resulted in only minor changes to the guide, the pilot interviews were retained in the final analysis.

Data Analysis

All audio recordings of the interviews were transcribed verbatim by the lead author. To minimize errors in this process, recordings were listened back to for accuracy, and transcripts were corrected as appropriate.²⁴ Before the data-set was finalized member checking was conducted; participants reviewed their transcript and were offered the opportunity to make amendments. Data generated by the interviews was analyzed using NVivo version 10 software (QRS International, Victoria, Australia). Descriptive statistics of participant characteristics were analyzed using SPSS for Windows version 21 (IBM, Armonk, New York, USA).

In the absence of a standardized procedure for performing thematic analysis, the 6-phase approach proposed by Braun and Clarke²³ was used as a guide. This involved (1) familiarization with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing this report.

Table 1 Interview Guide for Semistructured Interviews

Topics	Guide questions
Routine physical activity and exercise	Can you talk me through the exercise that you do in a typical week?
Motivation to be physically active	Tell me about your motivations to be physically active.
Exercise and ankylosing spondylitis	Can you tell me how exercise affects your condition?
Self-efficacy	In your own words, tell me how confident you are in your ability to exercise.
Benefits of physical activity	What, in your view, are the benefits of being physical active?
Barriers to physical activity	What limits your ability to be physically active?
Drawbacks of physical activity	Talk me through any downsides of exercising you see?
Physical activity advice	Talk to me about the people who have given you advice about physical activity.
Locus of control	Who is responsible for your physical activity?
Strategies to increase compliance with physical activity and exercise	What can be done to make it easier for you to be physically active?
Any other comments	Are there any other comments you would like to make regarding physical activity or exercise?
Examples of probing questions	Can you give me an example? Can you tell me more about that?

Initial familiarization began during the transcription process and review of field memos. Interviews were read twice to obtain an overview of the material and initial ideas were noted. Sections of the transcripts relating to the study aims were identified; superfluous topics (eg, relating to diet and AS) were omitted. The entire data-set was systematically labeled by the lead researcher with semantic codes generated from the data. An inductive approach to analysis was adopted; codes were descriptive and of low inference (eg, "I don't like exercise"). Codes were collated into broad themes and patterns, and from this an initial thematic map emerged which was captured in a codebook (see Supplement 1 for the final code book). A second member of the research team (EMcG) reviewed the representativeness of the code book. After this phase, all relevant extracts within each theme were reviewed by the lead author, using the code book, to map out the diversity of views and experiences. A second researcher (EMcG) independently coded 20% of the transcripts to check intercoder agreement; areas of disagreements were debated and the codebook was revised accordingly. The entire data-set was then reread, with revisions at the level of coded data and at the level of the data-set performed. Themes were discussed and finalized by the research team. Finally, this report was produced following the 'Consolidated criteria for reporting qualitative research' (COREQ).³⁴

Results

Seventeen interviews were completed. Interviewees included 9 men and 8 women with a diagnosis of AS. Mean (standard deviation) age was 39.3 years (9.5) and median (interquartile range; min to max) duration of symptoms was 12.0 years (14.0; 2.0 to 36.0). Individual participant characteristics are summarized in Table 2 and Table 3. The majority of the interviews took place in the university (n = 14; 82.4%), with the remainder conducted in a community center, at a participant's

home and at a participant's workplace. The median duration of these interviews was 22.8 minutes (IQR 12.0; range 15 to 51 minutes).

Analysis of transcripts identified 4 main themes and 12 sub-themes (see Table 4). In the first theme, participants described the benefits of PA and exercise they perceived. Secondly, they outlined their experiences of the barriers to PA participation and exercise compliance. In the third theme, participants discussed elements influencing their motivation to be physically active. Finally, participants described strategies and enablers that positively influenced their PA and exercise behavior.

Theme 1: Benefits—Perceived Benefits of Physical Activity and Exercise

In this theme, participants discussed the benefits of PA and exercise. Three subthemes were identified. A distinction was made between the positive effects of PA on the symptoms of AS, and the general health benefits that would be gained irrespective of having a chronic condition. This theme also includes participant's perceptions of PA as positively influencing aspects of daily living, and enriching quality of life.

Improves AS Symptoms. Physical activity and exercise were viewed by all respondents as having a positive impact on the characteristic symptoms of AS, pain and joint stiffness. For some, exercise also helped expedite the resolution of flare-ups. In addition to relieving pain and improving flexibility, some participants experienced a reduction in fatigue levels with regular PA. However, a number of participants were of the view that PA did not help alleviate fatigue.

"It's good because exercise keeps my joints supple and keeps movement in them, and I think that was my saving grace because otherwise I would have been a lot stiffer and a lot sorer." (P 12)

Table 2 Participant Characteristics

Participant	Sex	Age (years)	Education completed	Employment	Marital status	Children	Residence	Smoker	Days PA
P1	F	40	LC	Unemployed	Single	0	Rural	No	1
P2	M	27	LC	Full-time	Married	0	Rural	No	5
P3	F	30	Third level	Full-time	Single	2	Urban	Yes	7
P4	M	46	Third level	Part-time	Married	2	Urban	No	0
P5	M	48	Third level	Full-time	Married	2	Urban	Former	7
P6	M	34	LC	Student	Separated	0	Urban	Former	3
P7	F	35	Postgrad	Student	Single	0	Urban	No	4
P8	M	48	LC	Full-time	Married	2	Urban	No	6
P9	M	39	Postgrad	Full-time	Married	1	Urban	No	6
P10	M	37	LC	Full-time	Married	1	Urban	No	2
P11	M	36	Postgrad	Full-time	Married	1	Urban	No	2
P12	F	61	JC	Full-time	Single	0	Urban	Former	3
P13	F	22	Third level	Full-time	Single	0	Rural	No	5
P14	M	43	Third level	Full-time	Married	0	Urban	No	6
P15	F	39	Postgrad	Full-time	Married	3	Urban	No	4
P16	F	33	Third level	Full-time	Single	0	Urban	Yes	3
P17	F	50	Postgrad	Retired	Married	1	Rural	No	4

Abbreviations: F, female; JC, Junior Certificate; LC, Leaving Certificate; M, male; PA, physical activity.

“The more active I am, the better able I am to control the fatigue.” (P17)

“It [exercise] doesn’t help with the fatigue at all. Nothing helps with that.” (P3)

General Health Benefits. Exercise was generally believed to be a positive experience, associated with psychological and physical benefits independent of their condition. The general health benefits reported by some participants included improved sleep, increased appetite, reduced stress, and improved mood. Some expressed that they felt emotional, and in one case spiritual, benefits. There was widespread acknowledgment of the benefits across components of health-related physical fitness (eg, weight management), and in controlling risk factors for other conditions.

“Physically you feel better. You feel stronger. Your body actually starts calling out for exercise. . . . The feel good factor that you get from exercise, I don’t think it can be overstated irrespective of whether that’s a 20 minute or a half-hour session, or a longer session. I think the feeling you get both physically and mentally is my main reason for doing it.” (P9)

Exercising positively impacted on self-perception. For some, the ability to exercise to a level that was comparable to peers without AS was a source of personal pride. Self-efficacy was improved in some participants, who felt that through exercise they were able to better manage their condition on both a daily basis and during times of flare-ups.

“The more I look after myself, the better I feel about myself and basically I don’t feel as if there is anything wrong with me.” (P2)

Daily Living and Quality of Life. Participants found that exercising had enhanced various aspects of their daily lives. Specific functional tasks, such as driving and sporting performance, were improved. Exercising also held wider social benefits.

“My running is just meeting a friend. We just go for a jog . . . around the cliffs, around by the sea. It’s lovely. We just chat. It’s nice.” (P10)

“I found my ability to do things, pick up my 5-year-old daughter and throw her around, just silly things like that, have dramatically increased.” (P8)

Theme 2: Barriers—Factors Hindering or Obstructing Physical Activity

In this theme, 4 subthemes constituting barriers to PA were identified. A negative personal disposition toward PA and exercise was an individual barrier. Ineffective communication of PA advice and exercise prescription between the individual and HCPs was a significant hindrance to those prepared to engage with PA. Participants discussed barriers which were a direct result of the symptoms of AS. Lack of resources, a common barrier to PA across many groups, was also discussed.

Negative Attitude to Exercise. Not all participants viewed exercise as an enjoyable experience. Exercises were regarded by some as unwelcomed reminders of functional limitations; certain types of exercises were consequently avoided. For some the potential benefits of exercise did not seem worth the exertion or the transient pain experienced on occasion. Low exercise self-efficacy, and the fear of causing harm or injury, were cited as reasons not to exercise. For some, the resulting noncompliance with an exercise program negatively affected self-esteem.

“Exercises create pain. You’ll feel the stiffness again. You feel it in your muscles if you’re doing it. You don’t really want to be doing them. You don’t want the reminder of how limited you are in some things.” (P4)

“It’s [not exercising] a lost opportunity and later on that night is when you will dwell on those type of things and all sorts of negative thoughts.” (P6)

Table 3 Condition-Related Features of Individual Participants

Participant	Comorbidity	Time since diagnosis (years)	Symptom duration (years)	Pharmacology	BASDAI	BASFI	ASQoL
P1	FM	3	8	NDAIDs	7.1	6.2	17
P2	None	3	5	Anti-TNF α	1.5	0.0	2
P3	None	2	12	Anti-TNF α	5.9	4.2	16
P4	None	19	31	Anti-TNF α	4.8	3.2	8
P5	None	5	24	Anti-TNF α	1.0	1.8	3
P6	None	0	2	NSAIDs	6.9	5.2	17
P7	None	6	9	Anti-TNF α	1.2	0.1	3
P8	None	16	26	Anti-TNF α	1.1	1.4	0
P9	None	7	18	Anti-TNF α	0.0	0.0	0
P10	None	3	11	None	4.9	3.5	7
P11	None	5	6	Anti-TNF α	3.1	0.5	1
P12	None	34	36	None	1.0	1.3	2
P13	PFPS	1	8	Anti-TNF α	5.0	3.8	12
P14	None	2	6	None	0.0	0.0	0
P15	None	4	14	Anti-TNF α	1.1	0.0	0
P16	None	2	15	Anti-TNF α	2.5	4.0	7
P17	None	8	12	Anti-TNF α	6.0	6.0	12

Abbreviations: ASQoL, ankylosing spondylitis quality of life questionnaire; BASDAI, Bath ankylosing spondylitis disease activity index; BASFI, Bath ankylosing spondylitis functional index; FM, fibromyalgia; NSAIDs, nonsteroidal anti-inflammatory drugs; PFPS, patellofemoral pain syndrome; TNF α , tumor necrosis factor alpha.

Table 4 Overview of Themes, Categories, and Subcategories

Theme	Subtheme	Label
Benefits	1. Improves AS Symptoms	Signs and symptoms
		Physical fitness
	2. General health benefits	General health
		Mental health
		Self-perception
		Self-efficacy
Barriers	1. Lack of resources	Positivity
		Function
		Social
		Time
	2. Misinformation	Financial
		Access
		Expertise
		Quality
	3. Negative attitude to exercise	Motivation
		I don't like exercise
		Outcomes
		Self-efficacy
Motivation	1. Intrinsic	AS-related signs and symptoms
		Pharmacology
		Comorbidities and injuries
		Symptomatic relief
	2. Extrinsic	General health
		Functional improvement
		View exercise positively
		Personal drive
		Competitive
		Social support network
		Group exercise
		Monitoring by health care professional
Strategies and enablers	1. Approaches to management of AS	Commit to exercise
		Exercise and pharmacology
		Flare-up
	2. External support	Professional expertise
		Family and friends
		Support groups
		Technology
	3. Individualized programs	Individualized
		Trial and error
		Routine
		Enjoy it
		Types of exercise
		Group exercise
		Practical resources

“When you’re doing these exercises, you can get disheartened because there are no immediate results and you don’t even know how effective it’s been.” (P16)

Misinformation. A general lack of awareness and knowledge of AS among the general public and some HCPs was a barrier to exercise prescription and condition management. Interviewees cited vague or conflicting advice about exercising as a barrier.

“I was hearing it from my wife. ‘Don’t get injured. Don’t get injured.’ And I suppose that got into my head and I got a little bit lazy.” (P5)

“Quite often I’m getting one thing from my rheumatologist and then another thing from my physio so that’s really confusing.” (P13)

In situations when exercise was prescribed, it was often not in a manner that was meaningful to the individual, or was pitched at a level that was either too easy or too difficult.

“When I see a rheumatologist, they tend to concentrate on just getting you going. Like everyday tasks. Which is great, obviously it’s really important. You have to get back to work and you have to be able to dress yourself, but after that, there’s no real push to do anything further.” (P7)

Condition-Related Factors. Signs and symptoms of AS, principally pain and stiffness, were significant barriers to PA discussed by interviewees. Fatigue and a lack of energy were also obstacles to being active. During flare-ups, some regarded these exacerbated symptoms as insurmountable barriers to exercise.

“When I have a flare-up I usually do less because I just want to sleep all the time and I know in my head that it’s the wrong thing to do. It’s a real struggle to fight that.” (P13)

As a result of AS-related limitations, a range of exercises and sporting activities became too difficult to engage in. This was further exacerbated by concurrent musculoskeletal conditions or comorbidities.

“It’s kind of like you’re in the middle of a large circle and then bit by bit the circle is shrinking because you keep knocking things out that in your experience cause pain. So that goes. It all kind of shrinks down.” (P16)

Lack of Resources. Interviewees expressed difficulty with finding time to exercise. Time spent with family, working and studying were prioritized over exercise. Participants who were not in full-time employment discussed the barriers posed by financial costs associated with exercise. Access to exercise facilities was hindered for some by unsuitable opening times, inconvenient locations and associated travel costs. Cheaper outdoor exercise was subject to the weather. Some found the convenience of exercising at home to be negated by an unsuitable home environment and a lack of physical space.

“Unfortunately exercise time keeps getting pushed down the priority list. Family-time comes first, and then work-time. Obviously you have to pay the bills.” (P11)

“Evidence will tell me it’s the best thing in the world for me but I just find it really challenging to do it, to work it into a day, to work it into a routine.” (P4)

Theme 3: Motivation—Factors Influencing Drive to Engage in Physical Activity

In this theme, participants discussed factors influencing motivation to exercise. These factors were encompassed in 2 subthemes, labeled ‘intrinsic motivation’ and ‘extrinsic motivation.’

Intrinsic Motivation. An intrinsic drive to exercise was an important motivator for regular exercisers. This was compelled by personal interest and enjoyment in exercise. The spirit of competition, with others or with oneself, and personal goal-setting around work, sporting activities, domestic tasks and recreational pursuits, were key drivers of exercise.

“An external, or extrinsic motivation is only going to take you so far. You’re not going to make a kid love sport by giving him a fiver every time they score a goal. It has to come from within. So the individual has to really want to do it and has to recognize the benefits.” (P8)

“To be able to keep up with my family, to do things with them and to be able to do things with my friends would be a big thing. That I don’t end up getting isolated because of a physical barrier.” (P17)

The perception that exercise had positive effects on symptoms and on general health, in the short- and long-term, were strong motivators. Participants who believed exercise would produce tangible benefits, and who had positive past experiences with exercise, were motivated to continue.

“If you have the condition and you’re in pain, you’re going to do it because it’s going to keep you from being in pain. You know, it’s the best painkiller I’ve found anyway.” (P2)

“The motivation for me was driven by the memories of the bad times and if I ever get lazy, I can remember times where it was so bad and so debilitating. That alone is a motivation for me.” (P5)

Respondents who lacked a strong internal drive to exercise often found motivation waning, and struggled with longer-term compliance with exercise programs.

“You’d think that you should be able to self-manage. You’d think that the benefits are for you and you alone and therefore you should be the one getting up and doing it, or for your kids and for your family, and that you’re able to stay motivated. And that should be enough of a motivator but for me it’s not.” (P4)

Extrinsic Motivators. Family, friends, team- or club-mates, other adults with AS, instructors, and health-care professionals were all discussed as external motivators for PA. The dynamics and camaraderie of group exercise, and a sense of social responsibility toward others, were motivating factors.

“The fact that they’re telling me, ‘it’s okay to do this,’ even though I’m not good at doing it makes me feel better.” (P17)

“If you have someone telling you to do it, or if you’re in a group of people and they’re all doing it, it just seems to be easier to do.” (P11)

“Sometimes it’s better to commit to something and then you feel an obligation to do it whereas if you haven’t really committed to something, you’re only halfway in, it’s much easier to step back out of it and not bother doing it.” (P6)

Monitoring by a health care professional was a positive motivator for participants with low intrinsic motivation to exercise. When close monitoring was lessened, some were able to continue exercising effectively while others found maintaining motivation challenging.

"I had somebody to report back to and it was almost to please that person rather than yourself. That self-management bit; that is the hardest part." (P4)

Theme 4: Strategies and Enablers—Approaches to Enhancing Physical Activity Participation

Respondents discussed strategies they believed to be important in enhancing PA participation and promoting adherence to exercise programs. Three subthemes emerged. Approaches to managing the condition, both during times of flare-up and relative remission, were discussed. Interviewees described their preference for developing individualized exercise plans, and integrating them into their routines. Finally, the importance of external supports in successfully implementing PA programs were acknowledged.

Approaches to Management of Ankylosing Spondylitis. A combination of pharmacology and exercise was suggested by many as the best management strategy. Participants spoke of the "life-changing" (P5) effects of biologic medications, which allowed them to increase their PA. However, a large number reported that pharmacological management was so effective that the impetus to engage in exercise was lowered.

"I would see the two as critical. I can't imagine just being on the biologic and not doing exercise, but equally I can't imagine just doing exercise and not taking biologics." (P8)

"I didn't like how I felt when I was just using medication and I feel much better in myself and I'm mentally and spiritually and everything a lot better with being able to do the exercise." (P17)

In the event of a flare-up, a range of coping strategies were proposed: an increase in the usage of thermal modalities and anti-inflammatories, a decrease in intensity or frequency of exercise, and continuation of exercise in a modified form.

Individualized Programs. Most participants felt that individualized exercise prescriptions were preferable to generic programs. Personal interest and ability were viewed as important factors to consider when devising an exercise regimen; integration into a routine was deemed a requisite to successful implementation of an exercise program. An element of trial and error was to be expected when developing a successful routine. Regular exercisers had successfully incorporated PA into activities such as their daily commutes by walking or cycling to work. Others incorporated AS-specific stretches into existing sporting regimes.

"Just like I'd prioritize the kids' homework or anything that's important to me, I'll prioritize exercise." (P15)

"First of all you need to think about your lifestyle. Lifestyle in the sense of how you live your life and where you have time you can use, and sometimes that might mean sacrifices." (P8)

"I think I had to fail at a couple of things to work out what was right for me." (P5)

Within the exercise programs adopted by regular exercisers, a range of PA and exercises were reported. These included AS-specific exercises, home and gym based-fitness training, water-based activities, group exercise classes, and individual and team sports. It was suggested that more locally based AS classes, or classes that modified components to meet participants' abilities, would be beneficial. There was a desire for more competitive activities to be offered to individuals with lower disease activity. As access to gyms was prohibitively expensive for some, the notion of subsidized classes or gym membership, and a flexible attendance system to allow for missing classes in times of flare-up, were proposed as methods of enabling PA participation.

External Support. A number of professions were identified as providing expertise across different aspects of PA, principally physical therapists and rheumatologists, but also extending to therapy assistants, coaches and physical trainers, rheumatology nurses, psychologists, occupational therapists and general practitioners. Triangulation of care between multiple professionals, preferably with specific AS expertise, was put forward as an effective management strategy.

"I think you could say it's not so much a team of support but more having a number of trusted advisors." (P8)

The inclusion of family and friends in exercise strategies was seen by some (particularly those with lower intrinsic motivation) as important in building a supportive and encouraging environment. Patient interest groups were a further avenue for support, although for some respondents the support group experience was less positive.

"Having someone else to kind of moan to that understands what you're going through, rather than moaning to my wife who doesn't have arthritis." (P11)

"There're just too many people whining about a whole variety of different things." (P5)

Online resources from reputable health organizations were used primarily when seeking out information; online content was approached cautiously. Technological support in the form of mobile device applications (both AS-specific and general fitness) were viewed as positive adjuncts to exercise regimes by those who had trialed them.

Discussion

This qualitative study gives a unique insight into the attitudes of adults with AS toward PA. It expands on the limited literature relating to perceived benefits of, and barriers to, exercise. In addition it explores intrinsic and extrinsic motivational factors, and their influence on PA compliance. A number of strategies to enhance PA participation were proposed by respondents.

This study has identified a number of barriers to PA heretofore not recognized in an AS cohort. The delivery and communication of PA advice were problematic. In some instances PA was not discussed, or was mentioned in a cursory way. In addition, conflicting advice from multiple HCPs introduced uncertainty, which impeded effective PA participation. These findings are similar to those observed in studies involving individuals with arthritis. Approximately 50% of adults with arthritis report that they would like help from a HCP to become more physically active,³⁵ yet less than 50% report ever being advised that PA might help their condition.^{35,36}

In cases where PA was discussed, exercise was often pitched at levels unsuitable to the individual; the degree of exercise difficulty was either inappropriately high and not performed, or too low and not sustained. Providing advice without tailoring it to the needs of the individual appears insufficient to establish health behaviors.³⁶ Advice from HCPs with specific expertise in both PA advice and AS pathology are needed to effectively tailor PA plans.

A wide array of physical activities are practiced by adults with AS,^{10,12,13} and this diversity was reflected in this current study. Although the optimal therapeutic exercise prescription remains unclear,⁸ personal preferences should be acknowledged by HCPs and incorporated into exercise prescriptions. For example, respondents in this study reported that AS-specific exercises were successfully integrated into training routines for activities as diverse as rock climbing, rugby and marathon training. Existing comorbidities, musculoskeletal injuries and certain systemic components of AS were viewed as obstacles to PA; modified exercises, incorporated into individual management plans, could overcome these obstacles.

The benefits of PA identified in this study were numerous, and spanned the International Classification of Functioning, Disability and Health (ICF) core set for AS.³⁷ The benefits included improvements to specific AS-related impairments and disability, positive physical and psychological effects, and enhanced quality of life. Many of these symptomatic and physiological benefits are in keeping with findings from quantitative studies examining the effects of exercise in this cohort.^{7,8} All participants in this study acknowledged the benefits of exercise, yet some classified themselves as nonexercisers. This suggests a knowledge-based approach to promoting PA is likely to be insufficient in affecting behavior change.

It has been suggested that general health benefits of PA, such as those discussed in this study, may be perceived as less important than condition-related benefits for individuals with AS;¹⁸ however, it is unclear to what degree adults with AS are aware of the full scope of potential benefits of PA. Raising awareness of all the potential benefits of exercise should be a component of discussions and education about PA. In studies of adults with arthritis, a higher awareness of the benefits of exercise is associated with meeting recommendations for weekly PA participation.^{38,39}

Symptoms of AS were viewed as motivators by some, but as barriers by nonexercisers. Efficacious pain management was deemed a prerequisite to being physically active. This is in agreement with quantitative studies which demonstrated that a dual pharmacological and nonpharmacological approach to AS management yields superior effects than either used independently.^{40,41} However, in contrast with the findings of the qualitative study by Stockdale, et al²⁰ in which effective pharmacological treatment increased motivation to exercise, this study found that in some cases, conversely, successful symptomatic control diminished individual motivation to exercise. This may be problematic as it is precisely when symptoms are low that PA should be maximized and encouraged by HCPs. Unfortunately individuals with low disability are less likely to engage in PA than those with higher disability.¹³

Participants in this study had divergent views of the relationship between fatigue and PA. Fatigue was viewed as a barrier by some, but conversely exercise was seen as an effective strategy for alleviating fatigue by others. This mixed perception is reflected in the existing evidence base.^{10,18,42} Participants proposed exercise, rest and pacing of activities as strategies to cope with fatigue. These strategies are similar to those suggested in the literature.^{42,43}

A negative personal disposition toward exercise posed a significant barrier to PA. Not enjoying exercise, not valuing the potential

benefits as worth the effort, and lacking self-efficacy were factors limiting PA engagement. These factors were often associated with low motivation to exercise. A strength of this study was that interviewees spanned the self-determination continuum, expressing types of motivation ranging from amotivation, through extrinsic motivation, to intrinsically regulated motivation.⁴⁴ Strategies to increase motivation to exercise have been shown to have a positive effect on the physical function of adults with AS by influencing PA. Strategies such as motivational interviewing and goal-setting should be considered, although these are under-researched in this cohort.^{19,45}

Developing a support network of HCPs with AS expertise, family and friends, and AS peers, was proposed as an important strategy to aid exercise compliance, particularly when motivation was extrinsic. Collaboration, rather than prescription, was the preferred approach between HCPs and patients. The importance of building routine, developing self-efficacy and incorporating exercise into daily life was emphasized. To achieve this, a process of trial and error coupled with an adaptable disposition was necessary. As with the general population, resources (time, finances, and access) were important factors in determining participation with PA in an AS cohort.^{12,15} In the absence of specific guidance on the delivery of exercise programs in this cohort, these factors may guide HCPs when developing management plans.

Study Limitations

Efforts to enhance rigor and establish the trustworthiness of this qualitative project were made throughout, although some limitations must be acknowledged. This study was interested in mapping diversity; to this end, triangulation of data sources, through purposive sampling, maximized the range of experiences related by participants.⁴⁶ Despite the purposive selection of participants, nonvolunteers may have held different views. Our research team (made up of physical therapists and a rheumatologist) had experience in researching PA and exercise among adults with rheumatic conditions. Despite every effort to be cognizant of the bias inherent within the research team, this could not be confidently ascertained. Peer examination by colleagues with experience of qualitative research challenged assumptions held by the research team, and helped garner fresh perspectives.

The findings of this study are bound to the contextual factors in which they were generated.⁴⁶ This study explored attitudes toward PA of adults with AS living in Ireland; the sample was selected to capture the variety of experiences within this context. As such, transferability of results to other settings should be broached cautiously. To aid this, a detailed description of the methods used in the study, of participant characteristics and other contextual factors has been provided. Additional factors which may influence PA behavior (such as ease of access to exercise facilities, or individual levels of depression and anxiety) were not measured; these are further limitations to the external validity of this study. Exploration of experiences in other settings and countries may reveal additional insight.

Conclusions

This qualitative study explored the range of attitudes held by adults with AS toward PA and exercise. A number of barriers to PA were identified, many of which may be considered modifiable and which should be addressed when prescribing exercise and PA. Benefits of exercise were recognized by exercisers and nonexercisers alike.

However, awareness of these benefits alone appears insufficient to motivate individuals to exercise; a number of intrinsic and extrinsic motivational factors were discussed. Individually-tailored interventions, developed collaboratively by the individual and by HCPs with expertise in AS and incorporated into daily routine, were proposed as an effective model of PA and exercise prescription.

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