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Decreased health-related physical fitness in adults with ankylosing spondylitis: a cross-sectional controlled study

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Abstract

Objectives (1) Assess the health-related physical fitness of adults with ankylosing spondylitis (AS) and compare these to the general population, and (2) examine the relationships between physical fitness and condition-specific outcomes.
Design Cross-sectional, controlled study.
Setting Exercise research laboratory.
Participants Thirty-nine adults with AS (32 men, 7 women) and 39 age- and gender-matched controls.
Intervention Comprehensive physical fitness assessment, and completion of questionnaires assessing disease activity, physical function and quality-of-life.
Main outcome measures Body composition was assessed by bio-impedance analysis. Flexibility was measured with the Bath AS Metrology Index (BASMI). Cardiorespiratory fitness was assessed by submaximal treadmill test with breath-by-breath gas analysis and heart rate monitoring. Muscular strength and endurance were measured by isokinetic dynamometry of concentric knee flexion/extension.
Results The AS group demonstrated significantly lower cardiorespiratory fitness [mean difference $-1.3\,mL\,min^{-1}\,kg^{-1}$ (95% CI −1.1 to −1.4)], flexibility [0.4 BASMI units (0.2 to 0.7)], muscular strength [−31.6 peak torque per body weight dominant knee extension (−56.1 to −7.1)], and increased body fat [0.4% (0.0 to 1.2)] compared to population controls ($p < .05$). There were significant associations between each fitness component and physical function ($p < .05$). Higher aerobic capacity was significantly associated with improved quality-of-life. Fitness was not significantly associated with disease activity.
Conclusion Adults with AS have significantly reduced health-related physical fitness compared to population controls. Decreased body fat, and higher aerobic capacity, muscular fitness and flexibility are significantly associated with improved function. These findings have implications for clinicians assessing adults with AS, and for targeted-exercise prescription in this cohort.

Keywords: Spondylitis, ankylosing; Spondyloarthritis; Physical fitness; Motor activity; Exercise

Introduction

Ankylosing spondylitis (AS) is a chronic rheumatic condition characterised by inflammatory back pain and stiffness [1]. The European prevalence of AS is 24 per 10 000, with an estimated 1.30–1.56 million cases [2]. Males are more commonly affected than females in a ratio of approximately 2 to 1 [1]. Accompanying extra-articular features of AS may include uveitis, osteoporosis, bowel disease, and cardiac, pulmonary, skin (psoriasis) and kidney involvement [3]. It is associated with decreased work productivity and lower health-related quality of life (QoL) [4,5].

Physical fitness may be generally defined as a set of attributes that relate to the ability to perform physical activity, and the capacity to reduce the risk for developing diseases associated with physical inactivity [6]. These attributes

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are generally divided into health-related components or skill-related components (i.e. agility, balance, coordination, speed, power and reaction time). The health-related components include: (1) body composition, (2) cardiorespiratory capacity, (3) muscular strength and endurance, and (4) flexibility.

In AS cohorts restrictions in joint mobility, particularly of the spine, are well documented [7]. With the recognition of increased risk of cardiovascular disease in AS, cardiorespiratory fitness has more recently been explored and a reduction in aerobic capacity among adults with AS has been reported [8–12]. Cachexia, the accelerated loss of skeletal muscle in the context of a chronic inflammatory response, is a common feature of other rheumatic conditions, however body composition studies have not consistently demonstrated cachexia in AS populations [13–17].

Therapeutic exercise is recognised as a key component in the management of AS [18]; short- and long-term improvements in condition-related symptoms and general fitness have been demonstrated [19,20]. Exercise-based interventions have traditionally focused on flexibility and spinal mobility [19]. Multimodal exercise programmes, integrating aerobic and strength components, have shown additional beneficial effects on physical fitness [21–24]. The optimal exercise programme remains unclear [19,20]. A comprehensive profiling of the health-related physical fitness of adults with AS will assist researchers and health-care practitioners in designing more comprehensive, targeted exercise interventions.

The aims of this study were to: (1) assess the health-related physical fitness of adults with AS and compare these to the general population, and (2) examine the relationship between physical fitness and condition-specific outcomes.

Method

Design

This was a cross-sectional, controlled study undertaken between May 2013 and March 2014. Approval for the study was granted by the St. James's Hospital Research Ethics Committee. The STROBE guidelines for reporting observational studies were followed in drafting this report [25].

Participants & centre

A convenience sample of adults with AS was recruited from a dedicated AS clinic in the Rheumatology Department of St. James's Hospital, Dublin. An invitation to participate in the study and an information leaflet were extended to consecutive attendees of the clinic who potentially met the recruitment criteria. Control group participants were recruited by posters in the locality, and were screened for the same eligibility criteria as participants with AS.

Eligibility criteria

Adults between 18 and 64 years of age diagnosed by a rheumatologist as meeting the modified New York criteria for AS were eligible for inclusion in the study [26]. Participants were excluded if they had a concomitant cardiac, respiratory or neurological condition, a comorbidity restricting their physical activity, an acute lower limb injury, uncontrolled epilepsy, a cognitive impairment, were pregnant, were unable to ambulate without a mobility aid or had changed medication within 6 weeks of testing. Non-English speakers were also excluded. Frequency matching of controls for gender and age was used to increase the similarity in distribution of these potentially confounding variables between groups.

Assessment

Participants enrolled in this study attended an exercise laboratory on one occasion to complete sociodemographic and clinical questionnaires, and to undergo a comprehensive physical fitness assessment. Participants were asked to refrain from smoking, eating or drinking, or engaging in strenuous exercise prior to testing. A standardised test protocol was used for all assessments, with all measures taken by the same experienced physiotherapist.

Outcome measures

Sociodemographic and condition-related variables

Participant age, gender, employment status, education level achieved, smoking history, and weekly exercise frequency were self-reported. Subjects with AS were additionally asked about symptom duration, time since diagnosis and current medication usage. A number of commonly used questionnaires endorsed by the Assessment of SpondyloArthritis international Society (ASAS) were self-administered [27]. These comprised a number of questions answered on a numeric rating scale from 0 (best response, e.g. "no pain") to 10 (worst response, e.g. "most severe pain"). Disease activity was measured on the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) [28,29]. The Bath Ankylosing Spondylitis Functional Index (BASFI) assessed activities of daily living and functional ability [30,31]. While not part of the ASAS core set of questionnaires, the Ankylosing Spondylitis Quality of Life Questionnaire (ASQoL) was used to measure the impact of AS on health-related QoL [32]; the reliability and construct validity of the instruments have previously been established [28].

Anthropometric measures

Barefoot standing height (Leicester portable height measure, Invicta Plasics Ltd. Leicester, United Kingdom) and mass (MC-180 MA, Tanita Corp, Tokyo, Japan) were measured, from which body mass index (BMI) was calculated.

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