Physical activity and sedentary behaviour in people with inflammatory joint disease: a cross sectional study
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Abstract
Objectives: To determine 1) whether patients with inflammatory joint disease (IJD) meet current guidelines on physical activity; 2) which factors influence physical activity levels and sedentary behaviour in patients with IJD.

Method: Cross-sectional study of 137 patients with medical diagnosis of an IJD prior to commencing a NHS-run inflammatory Arthritis Exercise Programme. Physical activity and sedentary behaviour (SB) were measured objectively using a thigh worn physical activity monitor for seven consecutive days. Activity levels were subdivided into low physical activity (LPA) and moderate-vigorous activity (MVPA). Firstly, activity levels were analysed against current guidelines of 150 minutes of MVPA a week. Secondly time spent in SB, LPA and MVPA were analysed against possible determinants.

Results: 29% of patients with IJD met current physical activity guidelines. Patients on average spend 10 hours a day in SB. Poor physical fitness measured by 6-minute walk test was the only significant predictor (p=0.019) of high SB (R² = 4.7%). Attending an exercise facility in the community (p=0.034) and low role limitations due to physical health (p=0.008) predicted high LPA following a backward multiple regression (R² = 8.0%). Low role limitations due to emotional problems (p=0.031), higher physical fitness (p=0.002) and healthier exercise attitudes and beliefs (p=0.021) predicted meeting current physical activity guidelines following a backward conditional logistic regression explaining between 22.2% and 31.7% of variance.

Conclusions: Patients with IJD are inactive and spent a lot of time in SB. Good general health predicts high activity levels. No disease-specific factors were found to determine SB, LPA or MVPA.
Significance and Innovations

- The majority of people with inflammatory joint disease do not meet current Physical Activity Guidelines. People on average spend more than 10 hours of their waking time in sedentary behaviour.
- People who attend an exercise facility in the community are more physically active.
- No disease-specific factors could be found to determine sedentary behaviour, low physical activity or moderate-vigorous physical activity in people with inflammatory joint diseases.

Introduction

Physical activity defined as “any bodily movement produced by skeletal muscles that results in energy expenditure” [1] has been shown to be of great benefit to people with inflammatory joint disease (IJD) such as Rheumatoid Arthritis (RA), Inflammatory Arthritis (IA) and Spondyloarthopathies (SpA) [2]. It can help improve joint range of movement, muscle strength, aerobic capacity and overall function [3]. There is also evidence that regular physical activity does
not have any harmful effects such as an increase in joint pain, radiological joint damage or an increase in disease activity [3,4]. However, people with IJD are generally less active compared to healthy controls [5,6]. A significant proportion of people with RA have been shown to be physically inactive, characterised by a failure to participate in bouts of moderate-to-vigorous physical activity (MVPA) of 10 minutes or more over one week [7]. People with RA have also been shown not to meet Physical Activity Guidelines for healthy physical activity levels; but instead demonstrate reduced physical activity and increased sedentary time relative to healthy controls [5,8]. Lack of motivation to exercise, lack of belief in its benefits, and beliefs about negative side effects of exercise have been reported as important barriers to exercise in people with RA. [9,10].

People with IJD have an increased risk of developing cardiovascular disease (CVD) compared to the general population [11,12,13]. Cardiorespiratory fitness is low in people with RA and this is likely to be associated with the increased incidence of CVD-related deaths in RA [14]. This is important as emerging evidence suggests that more time spent in sedentary behaviour (SB), defined as an energy expenditure ≤1.5 METs while in a sitting or reclining posture [15], is independently associated with greater risk of developing CVD, cancer and diabetes [16]. Conversely, people with RA who have higher cardiovascular fitness have a better CVD risk profile and a lower 10-year CVD events risk compared with those with lower cardiovascular fitness [14]. There are also several additional health benefits of physical activity for people with IJD beyond reducing health risks such as reduced levels of fatigue, reduced disease activity, reduced stiffness and increased joint health [5,17,18,19].

Current knowledge of the determinants of physical activity levels in people with IJD is limited. Studies investigating the determinants are largely confined to people with RA and do not extend to those with other common and clinically important IJD [5,17,19]. Methods of physical activity monitoring across these studies also differ, limiting scope for comparison [7,8,17,19]. The majority of studies have used subjective self-report methods to measure physical activity levels.
which have been suggested to be subject to recall bias and be less valid than objective methods [20]. Studies that have adopted objective measures of physical activity in RA appear to lack internal validity due to monitor removal during activities such as swimming; and external validity due to variable definitions of low and high physical activity levels that do not follow current guidelines [5,15,17,21-23]. Several putative factors that have been identified in other adult populations [24] which could influence physical activity levels and time spent sedentary such as social deprivation and exercise self-efficacy have not been investigated in people with IJD.

The scarce evidence on determinants of physical activity and SB poses a significant challenge to clinicians who seek to address physical inactivity and SB in this patient group. A greater understanding of the determinants of physical activity levels and SB in people with IJD may facilitate a move towards alternative and enhanced approaches to physical activity interventions in the future.

Therefore, the main objectives of this study were: 1) to determine whether patients with IJD meet the current Guidelines on Physical Activity; 2) to determine which factors influence physical activity levels in patients with IJD ; and 3) to determine which factors influence SB in patients with IJD.

Methods

Design: This was a cross-sectional study approved by the NHS Health Research Authority, NRES Committee South West – Exeter, UK [Ref: 14/SW/1183]. All participants provided written informed consent according to the Declaration of Helsinki.

Participants: Patients were recruited from referrals into the National Health Service (NHS)-run Inflammatory Arthritis Exercise Programme (IAEP) across Greater Glasgow & Clyde (GG&C)
Health Board. The NHS is a nation-wide universal health care system in Britain which is free at point of provision. GG&C Health Board is the largest Health Board in Scotland serving 1.2 million people with wide and variable socioeconomic characteristics. The IAEP is a 12-week exercise programme run by rheumatology physiotherapists across GG&C Health Board. Any adult within the Health Board who has a clinician confirmed IJD and is under the care of the Rheumatology Department can be referred into the programme.

**Inclusion criteria:** Patients were included in the study if they met all of the following inclusion criteria: 1) physician-confirmed diagnosis of an IJD such as Rheumatoid Arthritis, Psoriatic Arthritis, Ankylosing Spondylitis or any other type of inflammatory arthritis/polyarthritis, 2) were aged 18 years or over.

**Exclusion criteria:** Patients were excluded from the study if they met any of the following criteria: 1) did not provide informed consent to be part of the study, 2) were unable to complete the study within the designated data collection period, 3) the presence of co-morbidity severely limiting the patient’s ability to participate in an exercise programme such as unstable angina, heart failure, uncontrolled heart arrhythmias, uncontrolled hypertension, severe respiratory condition, uncontrolled epilepsy, uncontrolled diabetes, recent medical instability such as a stroke, wheelchair user and pregnancy.

**Recruitment Strategy:** The study population of interest was comprised of patients who were under the care of the Rheumatology Department across GG&C Health Board and who were referred into the IAEP between March 2015 to July 2017. Referrals into this programme came from rheumatology consultants, rheumatology nurse specialists, rheumatology allied health professionals and patient self-referrals. Every patient who was referred into this programme and met the inclusion/exclusion criteria for the study was informed in writing and verbally of the research project by their rheumatology physiotherapist whom they see prior to attending the
programme. If the patient was interested in being part of the study, they were then contacted by the researcher to discuss the study in more depth and to gain written informed consent to become part of the study sample.

**Data collection:** Data was collected by the researcher prior to the patient commencing the IAEP. Physical activity and SB were objectively measured by wearing an ActivPAL (PAL Technologies Ltd, Glasgow, UK) physical activity monitor permanently for 7 consecutive days prior to commencing the IAEP. This device measures body motion which is defined by an energy expenditure classification and a postural classification enabling free-living behaviour to be more accurately quantified [25]. The device records acceleration counts used to determine energy expenditure which can be converted into physical activity levels [26]. It also records body position which enables true sedentary behaviour to be recorded as classified by the Sedentary Behaviour Research Network [15]. The ActivPAL was programmed to collect data for 7 consecutive days as this provides a reliable measure of adult activity behaviours [27]. It was waterproofed as per the manufacturers guidelines and worn centrally on the anterior aspect of the left or right thigh. The ActivPAL was fitted by the researcher on the day of data collection and removed by the patient at the beginning of day 8 and posted back to the researcher in a self-addressed stamped envelope. It was programmed to commence data collection from midnight on the day that the device was fitted. Participants were also asked to self-monitor their physical activity via a hard copy activity diary whilst wearing the ActivPAL. This was specifically to record rise time and bedtime on each day of monitoring so that sleep time could be deducted from the data to enable analysis on just the waking time data. ActivPAL software was used for physical activity monitor programming, data processing and data analysis. Low physical activity (LPA) was defined as <100 steps/minute and moderate-vigorous physical activity (MVPA) was defined as ≥100 steps/minute [26]. True SB as defined by the Sedentary Behaviour Research Network [15] was calculated from the ActivPAL data.
Health related quality of life (HRQoL) was measured using the Short Form – 36 (SF36) and Hospital Assessment Questionnaire – Disability Index (HAQ-DI) [28]. Self-perceived levels of control were measured using the Arthritis Self-efficacy Scale (ASES); attitudes and beliefs towards physical activity were measured using the Exercise Attitudes and Beliefs Questionnaire for patients with Rheumatoid Arthritis (RA-EAQ); and mental health was measured using the Hospital Anxiety and Depression Scale (HADS); all of which have good psychometric properties which have been verified in populations with IJD [29-32]. The Scottish Index of Multiple Deprivation (SIMD) measures across seven domains: current income, employment, health, education, skills and training, housing, geographic access and crime. These seven domains are calculated and weighted for small areas, called 'data zones', with roughly equal population and can be obtained using the participant’s postcode [33].

The Disease Activity Score (DAS-28) was recorded as a marker of disease activity by the researcher who was trained in undertaking the DAS-28. Acute phase reactants from blood test results (within 3 months of each data collection session) were obtained from the patient’s medical records to complete the DAS-28 score. Disease duration was measured from the date of physician-confirmed diagnosis which was obtained from the participant’s medical records. Drug therapy was obtained from the patient’s medical records and clarified with the patient in case of any recent changes; the level of pain on average over the past week was measured using the Visual Analogue Scale (VAS) and the level of fatigue was measured in the same way using the same 0-100mm line as the pain VAS [18,19].

To evaluate whether there are any physical-condition-related and/or environmental factors that could determine physical activity levels and sedentary behaviour the following measurements were undertaken. Body Mass Index (BMI) which was calculated from the patient’s height and weight on the day of data collection; 6-minute walk test [34] using the American Thoracic Society and current clinical practice protocol [35,36] which measures fitness levels and is well established in IJD research [37]; grip strength using a JAMAR grip dynamometer using the Southampton...
protocol for adult grip strength measurement [38] which has also been well established in IJD research [34,37]; and a custom made environmental questionnaire that was developed with assistance from the study Advisory Board which consisted of rheumatology clinicians, NHS health improvement officers, patients and academics. The questionnaire asked about cost, affordability, transportation to/from and the variety of activities on offer at the community exercise facilities.

**Statistical Analysis:** Descriptive statistics were used to summarise the variables. All variables were then assessed for normality of distribution using the Kolmogorov-Smirnov test. A Kruskal-Wallis test was carried out between the different diagnostic groups which showed no difference in activity levels between the groups, therefore these were grouped together for analysis. Time spent in SB, LPA and MVPA were analysed against the possible determinants: HAQ-DI, SF-36, age, disease duration, DAS-28, pain, fatigue, medication, ASES, RA-EAQ, HADs, SIMD, BMI, general fitness and grip strength using Pearson (rp) or Spearman’s (rs) correlation; and whether they attended an exercise facility in the community using a Mann-Whitney test. Associations found to have a p-value <0.2 were taken forward to multiple linear regression modelling. Due to MVPA not being normally distributed MVPA was dichotomised into those meeting and not meeting 150mins of MVPA a week following the updated physical activity recommendations published by the American College of Sports Medicine [23] which have removed the requirement of activity taking place in bouts of ≥10 minutes. The groups were then analysed against the possible determinants listed above using Mann-Whitney or Chi-Square tests. Associations found to have a p-value <0.2 [39] were taken forward to multiple logistic regression modelling. Data analysis was undertaken using SPSS version 25 and statistical significance level was p<0.05 for all multivariate tests.

**Results:** 137 participants – sociodemographic information Table 1. A Kruskal Wallis test revealed that diagnosis was not associated with SB or physical activity levels (SB p=0.50, LPA p=0.36, MVPA p=0.89), therefore all participants were grouped together for analysis.
The total number of MVPA & LPA data was 122 as some participants were unable to wear the activity monitor due to being allergic to the tape used to attach the device, and some monitors were also not returned. Total number of SB data was 115 due to previous reasons plus incomplete sleep diaries therefore being unable to extract true SB during waking time hours (Table 2).

Meeting current activity guidelines

2% (n=3) of participants met the older American College of Sports Medicine Guidelines and EULAR recommendations on Physical Activity which are 150mins of MVPA in bouts of 10mins or more in a week.

29% (n=35) of participants met the recently updated American College of Sports Medicine Guidelines on Physical Activity which are 150mins of MVPA a week with no requirement of bouts of activity lasting at least 10 minutes.

A strong association was found between more time spent in LPA and less in SB (rp=-0.651, p=0.000); a moderate association with more time spent in LPA and more time spent in MVPA (rs=0.342, p=0.000); and a moderate association with more time spent in MVPA and less time spent in SB (rs=-0.252, p=0.007)
Determinants of SB

A backward multiple regression was run to predict SB from associations found to have a p-value <0.2 (Tables 3-5). The 6-minute walk test (p=0.019) was the only variable left in the model which statistically predicted SB $F(1, 113) = 5.632$, $p=0.019$, $R^2 = 4.7\%$. The model indicates ($b=-1.787$) that for every metre walked on the 6-minute walk test, SB reduces by 1.8 mins a week.

Determinants of LPA

A backward multiple regression was run to predict LPA from associations found to have a p-value <0.2 (Tables 3-5). Whether or not they attended an exercise facility in the community and the SF-36 domain of role limitations due to physical health (SF-36_PH) were retained in the final model $F(2, 119) = 5.724$, $p=0.004$, $R^2 = 8\%$. SF-36_PH was statistically significant $p=0.008$ and attending an exercise facility in the community $p=0.034$. The model indicates that for every 25% increase in the SF-36_PH scale, LPA increases by 5.9 mins a week and if you attend an exercise facility in the community, LPA increases by 356.7 mins [5.94 hours (5hrs & 57mins)] a week.

Determinants of participants meeting 150mins of MVPA a week

A backward conditional logistic regression was performed to assess the impact of associations found to have a p-value <0.2 on the likelihood of participants meeting 150mins of MVPA a week (Table 6). The final model was statistically significant $X^2(3, N=122)=30.571$, $p<0.001$ which consisted of the SF-36 domain of role limitations due to emotional problems (SF-36_EP), 6-minute walk test (MWT6) and exercise attitudes and beliefs questionnaire (RAEAQ). The model as a whole explained between 22.2\% (Cox and Snell R square) and 31.7\% (Nagelkerke R squared) of the variance in meeting 150mins of MVPA a week and correctly classified 78.7\% of cases. Participants with lower role limitations due to emotional problems ($p=0.031$), better fitness ($p=0.002$) and healthier exercise attitudes and beliefs ($p=0.021$) were more likely to meet the 150mins of MVPA a week.
Discussion:

Despite the evidence for the effectiveness, feasibility and safety of the physical activity guidelines in people with IJD [2]; based on the results of this study only 2% met previous Physical Activity Guidelines [40] and 29% met the updated Physical Activity Guidelines based on the ACSM Guidelines of 150mins of MVPA a week [23]. This means that only a minority of people with IJD are undertaking the recommended amount of physical activity a week to keep themselves healthy and to decrease their risk of developing non-communicable diseases [41]. The results suggest that on average 10 hours a day are spent in SB during waking hours and only 17 minutes a day in MVPA. This does however correlate with the findings of Hernandez-Hernandez et al. and Paul et al. [5,8] that patients with RA spend more time in SB and less time in MVPA compared to healthy controls. It also correlates with the findings of Swinnen et al. [6] that people with SpA exhibit lower physical activity levels compared to healthy controls. This is a major health concern as increased time spent in SB is independently associated with a greater risk of developing CVD, cancer and diabetes; and people with an IJD already have an increased risk of developing CVD compared to healthy controls [11,12]

A lack of time spent in LPA and MVPA found in this study suggests possible reasons for why cardiorespiratory fitness has been found to be low in people with RA [14]. They appear to spend long periods during waking hours in SB and only short amounts of time undertaking physical activity. A strong correlation in this study has been found between more time spent in LPA and less time spent in SB. Also, a moderate correlation has been found between more time spent in LPA and more time spent in MVPA. Therefore, indicating an important and significant public health message to try and break up SB by sitting less and moving more. This may result in an increase in physical activity levels, improving cardiorespiratory fitness and reducing the health risk of developing non-communicable diseases [41]. As previously stated, people with IJD have a higher CVD risk compared to the general population and the exact reasons for this are debatable [11]. It has however been found that people with an IJD who have a higher cardiovascular fitness
have a better CVD risk profile and a lower 10-year CVD events risk [14]. SB is a modifiable CVD risk factor that clinicians should be aiming to address as a high priority in people with IJD.

Limited determinants of SB in people with IJD have been found in this study following bivariate analysis and when taken forward to multivariant regression analysis. Independent determinants of SB were found to be total drug burden with the more medications a person was prescribed, the more time spent in SB; the more role limitations a person self-reported to have due to physical health, the more time spent in SB; and the lower a person’s fitness, the more time spent in SB. When taken forward to multivariant analysis no health-related quality of life, disease specific, psychological, personal or physical conditioning factors apart from the 6-minute walk test, which measures general fitness and endurance, could be found to determine SB in this patient sample. The 6 minute walk test only explained 4.7% indicating that either everyone in the study had high amounts of SB, which Table 2 does suggest, therefore resulting in too little variation to be able to explain differences between patients; or that there are other possible determinants of SB in people with IJD that have not been investigated in this study.

More time spent in LPA was associated with attending an exercise facility in the community and having less self-reported role limitations due to physical health. However, these determinants only explained 8% therefore again indicating that there are other possible determinants of LPA in people with IJD that have not been investigated in this study. These study findings correspond with findings of Larkin and Kennedy [19] that an increase in physical health rating increases physical activity levels and of Rongen-van Dartel et al. [17] that level of activity is not associated with pain, disability, coping or cognition. However, it does not agree with their findings that there is an association between increased physical activity and decreased fatigue. This may however be explained by the heterogeneity of the study designs and the fatigue measurement tools used. Nonetheless this study does demonstrate that people with an IJD who attend an exercise facility in the community are more likely to gain the health benefits that activity can bring as their overall activity levels are increased.
People with IJD who have lower role limitations due to emotional problems, better fitness levels and better exercise attitudes and beliefs were more likely to meet the current ACSM Physical Activity Guidelines [23] of 150mins of MVPA a week. The percentage of variance was low (31.7%) therefore there are likely to be other determinants that were not investigated in this study. These findings appear to inversely correspond with findings of Larkin and Kennedy [19] that an increase in physical activity increases motivation to exercise, increases mental health and increases beliefs about the benefits of physical activity.

From these findings there is the probability that if people with IJD meet the Physical Activity Guidelines [23] then they will have better fitness levels which will decrease their CVD-risk profile and lower their 10-year CVD events risk [5,14]. They may also improve their mental health and wellbeing; as depression has been found to be more common in patients with RA than in healthy individuals [42,43].

A limitation of this study may be the wearing of an activity monitor. Although limited standardised information was given about the device, participants may have been more active due to wearing the device. If this is the case, genuine activity levels could be over recorded and SB under recorded. This could make the overall findings with regards to time spent in SB, LPA and MVPA even more alarming. Another limitation could be that the study participants were recruited from referrals made into a NHS-run IAEP therefore already showing an interest and willingness to becoming more active. They may have also received a consultation from a health professional on the benefits of exercise and been given advice and information prior to being recruited into the study. If so, generalisability to the wider IJD population may be reduced as this study may not have recruited the most inactive of participants. However, this would essentially mean that the issues described in this paper are even more pronounced in that wider population.
In conclusion, the majority of people with IJD in this study do not meet the current guidelines on physical activity. Those who do appear to have increased fitness, better mental health and better exercise attitudes and beliefs. However, many hours a day are spent in SB. Few determinants of SB and physical activity can be found when factors such as health-related quality of life, disease specific, psychological, personal or physical conditioning are investigated. There is a strong correlation with regards to more time spent in LPA and less time spent in SB with a moderate correlation with more time spent in LPA and more time spent in MVPA. This therefore may mean that if SB can be broken up, then more LPA will be undertaken which may result in more MVPA. Further research looking into physical activity levels over time is required to fully address this. Further research is also needed into other possible determinates of physical activity and SB that have not been investigated in this study.

References


3. Hurkmans, E., Van Der Giesen, F.J., Vliet Vlieland, T.P., Schoones, J. and Van Den Ende, E.C. Dynamic exercise programs (aerobic capacity and/or muscle strength training) in


Table 1: Participants sociodemographic information
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female 82% (n=112)</td>
<td>Male 18% (n=25)</td>
</tr>
<tr>
<td>Age</td>
<td>Mean 57.8 years</td>
<td>Standard Deviation 11.9 years</td>
</tr>
<tr>
<td>Presenting Condition</td>
<td>Rheumatoid Arthritis 53.3% (n=73)</td>
<td>Inflammatory Arthritis excluding RA 27% (n=37)</td>
</tr>
<tr>
<td>Disease Duration</td>
<td>Mean 8.5 years</td>
<td>Standard Deviation 11.9 years</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>Mean 31.61</td>
<td>Standard Deviation 7.37</td>
</tr>
<tr>
<td>Body Mass Index Category</td>
<td>Underweight 1% (n=1)</td>
<td>Healthy 18% (n=24)</td>
</tr>
<tr>
<td>Scottish Index of Multiple</td>
<td>1 – 25.5% (n=35)</td>
<td>2 – 20.4% (n=28)</td>
</tr>
</tbody>
</table>
Table 2: Waking time activity levels and Sedentary Behaviour across 7 days monitoring.

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB (mins)</td>
<td>115</td>
<td>2095.80 (34.930 hrs)</td>
<td>6016.80 (100.280 hrs)</td>
<td>4100.94 (68.349 hrs)</td>
<td>766.68 (12.778 hrs)</td>
</tr>
<tr>
<td>LPA (mins)</td>
<td>122</td>
<td>7.90 (68.71 hrs)</td>
<td>4122.47 (31.71 hrs)</td>
<td>1902.65 (13.54 hrs)</td>
<td>812.34</td>
</tr>
<tr>
<td>MVPA (mins)</td>
<td>122</td>
<td>0.34 (9.78 hrs)</td>
<td>586.76 (2 hrs)</td>
<td>120.06 (1.85 hrs)</td>
<td>111.11</td>
</tr>
</tbody>
</table>

SB - Sedentary Behaviour, LPA – Low Physical Activity, MVPA – Moderate to Vigorous Physical Activity
Table 3: Possible determinants of physical activity and sedentary behaviour: bivariate analysis.

<table>
<thead>
<tr>
<th></th>
<th>HAQ-DI</th>
<th>SF36_PF</th>
<th>SF36_PH</th>
<th>SF36_EP</th>
<th>SF36_EF</th>
<th>SF36_EWB</th>
<th>SF36_SF</th>
<th>SF36_P</th>
<th>SF36_GH</th>
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<tr>
<td><strong>95% C.I.</strong></td>
<td>Lower</td>
<td>1.21</td>
<td>32.80</td>
<td>13.52</td>
<td>36.32</td>
<td>29.51</td>
<td>58.67</td>
<td>49.77</td>
<td>36.44</td>
</tr>
<tr>
<td></td>
<td>Upper</td>
<td>1.43</td>
<td>40.63</td>
<td>24.44</td>
<td>51.27</td>
<td>36.40</td>
<td>66.29</td>
<td>58.99</td>
<td>43.74</td>
</tr>
<tr>
<td><strong>Time in SB</strong></td>
<td>p=0.41</td>
<td>p=0.18</td>
<td>p=0.04</td>
<td>p=0.14</td>
<td>p=0.56</td>
<td>p=0.93</td>
<td>p=0.32</td>
<td>p=0.06</td>
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<tr>
<td></td>
<td>rs=0.08</td>
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<td>rs=-0.19</td>
<td>rs=-0.14</td>
<td>rs=-0.06</td>
<td>rs=-0.01</td>
<td>rs=-0.09</td>
<td>rs=-0.18</td>
<td>rs=-0.13</td>
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<tr>
<td><strong>Time in LPA</strong></td>
<td>p=0.47</td>
<td>p=0.33</td>
<td>p=0.06</td>
<td>p=0.14</td>
<td>p=0.06</td>
<td>p=0.13</td>
<td>p=0.02</td>
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<tr>
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<tr>
<td><strong>Meeting</strong></td>
<td>Man-</td>
<td>Man-</td>
<td>Man-</td>
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<td>Man-</td>
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<td>Man-</td>
</tr>
<tr>
<td><strong>150mins of</strong></td>
<td>Man-</td>
<td>Man-</td>
<td>Man-</td>
<td>Man-</td>
<td>Man-</td>
<td>Man-</td>
<td>Man-</td>
<td>Man-</td>
<td>Man-</td>
</tr>
<tr>
<td><strong>MVPA a week</strong></td>
<td>p=0.05</td>
<td>p=0.01</td>
<td>p=0.01</td>
<td>p=0.00</td>
<td>p=0.07</td>
<td>p=0.09</td>
<td>p=0.01</td>
<td>p=0.01</td>
<td>p=0.02</td>
</tr>
</tbody>
</table>


Health related quality of life.
Table 4: Possible determinants of physical activity and sedentary behaviour: bivariate analysis.

<table>
<thead>
<tr>
<th></th>
<th>Age (yrs)</th>
<th>Disease Duration (yrs)</th>
<th>DAS-28</th>
<th>VAS for pain</th>
<th>Fatigue</th>
<th>Total Drug Burden</th>
</tr>
</thead>
<tbody>
<tr>
<td>95% C.I.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>55.63</td>
<td>6.76</td>
<td>3.58</td>
<td>4.78</td>
<td>6.09</td>
<td>6.27</td>
</tr>
<tr>
<td>Upper</td>
<td>59.75</td>
<td>10.05</td>
<td>4.08</td>
<td>5.69</td>
<td>6.94</td>
<td>7.29</td>
</tr>
<tr>
<td>Time in SB</td>
<td>p = 0.49</td>
<td>p = 0.25</td>
<td>p = 0.83</td>
<td>p = 0.28</td>
<td>p = 0.80</td>
<td>p = 0.01</td>
</tr>
<tr>
<td></td>
<td>rs = 0.07</td>
<td>rs = 0.11</td>
<td>rp = -0.02</td>
<td>rs = 0.10</td>
<td>rs = 0.02</td>
<td>rs = 0.23</td>
</tr>
<tr>
<td>Time in LPA</td>
<td>p = 0.61</td>
<td>p = 0.69</td>
<td>p = 0.99</td>
<td>p = 0.14</td>
<td>p = 0.12</td>
<td>p = 0.08</td>
</tr>
<tr>
<td></td>
<td>rs = 0.05</td>
<td>rs = -0.04</td>
<td>rp = -0.00</td>
<td>rs = -0.13</td>
<td>rs = -0.14</td>
<td>rs = -0.16</td>
</tr>
<tr>
<td>Meeting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150mins of MVPA a week</td>
<td>Man-Whit</td>
<td>Man-Whit</td>
<td>Man-Whit</td>
<td>Man-Whit</td>
<td>Man-Whit</td>
<td>Man-Whit</td>
</tr>
<tr>
<td></td>
<td>p = 0.39</td>
<td>p = 0.51</td>
<td>p = 0.36</td>
<td>p = 0.44</td>
<td>p = 0.18</td>
<td>p = 0.03</td>
</tr>
</tbody>
</table>

DAS-28 - Disease Activity Score 28, VAS - Visual Analogue Scale for pain and the level of fatigue were measured in the same way using the 0-100mm line.

Disease specific factors.

Table 5: Possible determinants of physical activity and sedentary behaviour: bivariate analysis.

Personal, physical-condition and environmental factors.
<table>
<thead>
<tr>
<th></th>
<th>ASES</th>
<th>RA-EAQ</th>
<th>HADs</th>
<th>SIMD</th>
<th>BMI</th>
<th>MWT6</th>
<th>Grip Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>95% C.I.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>41.98</td>
<td>32.55</td>
<td>13.50</td>
<td>2.65</td>
<td>30.31</td>
<td>298.51</td>
<td>15.38</td>
</tr>
<tr>
<td>Upper</td>
<td>47.42</td>
<td>34.67</td>
<td>16.35</td>
<td>3.17</td>
<td>32.81</td>
<td>330.92</td>
<td>18.53</td>
</tr>
</tbody>
</table>

|          |      |        |      |      |     |      |               |
| Time in SB | p = 0.09 | p = 0.29 | p = 0.751 | p = 0.97 | p = 0.46 | p = 0.02 | p = 0.79 | Man-Whit |
| rs= -0.10 | rs= 0.03 | rs= 0.01 | rs= 0.07 | rp= -0.22 | rs= 0.03 | p = 0.1 |

|          |      |        |      |      |     |      |               |
| Time in LPA | p = 0.01 | p = 0.04 | p = 0.12 | p = 0.36 | p = 0.16 | p = 0.26 | p = 0.35 | Man-Whit |
| rs= 0.18 | rs= -0.14 | rs= 0.08 | rs= -0.13 | rp= 0.10 | rs= -0.09 | p = 0.05 |

|          |      |        |      |      |     |      |               |
| Meeting MVPA | Man-Whit | Man-Whit | Man-Whit | Chi-Square | Man-Whit | Man-Whit | Man-Whit | Chi-Square |
| of 150mins  | p=0.1 | p<0.01 | p= 0.03 | p= 0.76 | p = 0.02 | p<0.01 | p = 0.98 | p = 0.05 |

ASES – Arthritis Self-efficacy Scale, RA-EAQ - Exercise Attitudes and Beliefs Questionnaire for patients with Rheumatoid Arthritis, HADs – Hospital Anxiety and Depression scale, SIMD – Scottish Index of Multiple Deprivation, BMI – Body Mass Index, MWT6 – 6min walk test to measure fitness and Enviro 1 - Attending an exercise facility in the community (yes/no)

Table 6: Model for participants meeting 150minutes of moderate-vigorous physical activity a week

<p>| | | | | | | | |
|          |      |        |      |      |     |      |               |
| B        | S.E  | Wald  | df | Sig  | Exp(B) | Lower | Upper |
| SF-36_EP | 0.011| 0.005 | 4.679 | 1 | 0.031 | 1.011 | 1.001 | 1.022 |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MWT6</td>
<td>0.009</td>
<td>0.003</td>
<td>9.903</td>
<td>1</td>
<td>0.002</td>
<td>1.009</td>
<td>1.003</td>
</tr>
<tr>
<td>RAEAQ</td>
<td>0.108</td>
<td>0.047</td>
<td>5.334</td>
<td>1</td>
<td>0.021</td>
<td>1.114</td>
<td>1.017</td>
</tr>
</tbody>
</table>

SF-36_EP – Short Form-36: role limitations due to emotional problems, MWT6 – 6 min walk test to measure fitness, RAEAQ - Exercise Attitudes and Beliefs Questionnaire for patients with Rheumatoid Arthritis