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One-year outcomes of a randomized controlled trial of an educational–behavioural joint protection programme for people with rheumatoid arthritis

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Abstract

Objective. Joint protection aims to reduce pain and local inflammation, preserve the integrity of joint structures and improve function. There is evidence that it can improve pain and function in the short term, but the long-term effects are uncertain. This study evaluated the effects of joint protection in early rheumatoid arthritis (RA).

Methods. A randomized, controlled, assessor-blinded trial of duration 1 yr was conducted. Two interventions (both 8 h) were compared: standard arthritis education, including 2.5 h of joint protection education based on typical UK practice; and a joint protection arthritis education programme, using educational–behavioural teaching methods. Assessments were made at entry and 6 and 12 months.

Results. Sixty-five people with RA attended the joint protection programme and 62 the standard programme. The groups were matched for age (51 and 49 yr), disease duration (21 and 17.5 months) and use of non-steroidal anti-inflammatory drugs and disease-modifying anti-rheumatic drugs. In comparison with the standard group, the joint protection group significantly improved with respect to adherence to the joint protection programme ($P = 0.001$), hand pain ($P = 0.02$), general pain ($P = 0.05$), early morning stiffness ($P = 0.01$), self-reported number of disease flare-ups ($P = 0.004$), visits to the doctor for arthritis ($P < 0.01$), and the AIMS2 (Arthritis Impact Measurement Scales) activities of daily living scale ($P = 0.04$). A trend to improved swollen joint counts was identified ($P = 0.07$). Within-group analyses also showed improvements in arthritis self-efficacy and perceived control. Hand deformity scores continued to increase in both groups.

Conclusion. We found significant improvements in adherence, pain, disease status and functional ability amongst those attending the joint protection programme. Benefits became more apparent with time, suggesting that joint protection can help slow the progression of the effects of RA over and above the effects of drug therapy.

KEY WORDS: Rheumatoid arthritis, Joint protection, Patient education, Occupational therapy.

Joint protection is widely provided as part of the management of people with rheumatoid arthritis (RA). Altering working methods, energy conservation (balancing rest and activity) and using assistive devices should place less strain on joint structures weakened by the disease process. Theoretically, reducing load and the effort required to do everyday tasks should lead to less pressure on pain receptors, less irritation of the synovium and reduction of localized inflammation. This should help preserve the integrity of joint structures for longer, helping to limit the development of deformities. Therefore, function should be easier and functional status maintained for longer [1–5].

Previous research has demonstrated that using assistive devices reduces pain during task performance in comparison with normal methods [6], and altering working methods significantly reduces difficulties with activities of daily living (ADL) [7]. Both these cross-sectional studies recruited people with established RA (on average 8 yr since diagnosis) and moderate functional problems (Health Assessment Questionnaire median score 1.5), demonstrating that joint protection has beneficial short-term effects on pain and function for those with established disease. Joint protection is taught increasingly to people with early-stage disease as

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a preventative intervention. However, whether people with RA increase their use of joint protection sufficiently to affect pain, inflammation, the integrity of joint structures and function in the longer term is unknown.

People with RA are generally very positive about receiving such advice. However, typical joint protection education (i.e. with a duration of up to 2.5 h, including information about RA, joint protection, demonstrations and short supervised practice) has been shown to improve knowledge of joint protection methods but not to result in significant behavioural change [8–10]. These studies evaluated joint protection as part of arthritis education programmes using a standard recommended format [11] and the education provided was comparable with typical UK practice [12]. In comparison, studies of programmes using educational–behavioural methods have objectively observed significantly increased use of joint protection in people with early RA (<5 yr since diagnosis) [13, 14]. Nordenskiold [6] and Lindroth *et al.* [15–17] recruited people with established RA (>8 yr on average), and found that self-reported use of joint protection methods increased. However, of these studies, four taught joint protection as part of a multi-intervention arthritis education programme [13, 15–17], so it is difficult to decide whether improvements in pain and function were attributable to joint protection. Only Nordenskiold's [6] study of a 13-h joint protection programme has reported improvements in pain and function. However, this was a retrospective study with no control group.

Educational–behavioural programmes are more effective in facilitating behavioural change with respect to joint protection. The aim of this study was to evaluate whether joint protection can reduce pain and local inflammation and maintain the integrity of joint structures and functional ability of people with RA 1 yr after attending an educational–behavioural joint protection programme.

Method

Patients

People diagnosed with RA by rheumatology consultants were recruited from two hospitals. Out-patients were normally referred to the arthritis education programmes organized by the occupational therapy units at both hospitals. Following assessment by an occupational therapist, all patients were given or mailed a letter inviting them to attend an arthritis education programme, and asked if they would be willing to participate in a study comparing two types of programme, of similar content but differing teaching styles, to investigate which approach was the more effective. The invitation included a checklist to find out if the patient met the entry criteria. The patients were given the option of bringing a partner or significant other, and an information sheet about the study was provided. Patients were not informed that the main aim of the study was to investigate the use and outcomes of joint protection or about the differences between the two styles of teaching. Ethics approval was obtained at both hospitals.

Patients were eligible to participate if they were aged 18–65 yr, had been diagnosed with RA within the last 5 yr, were experiencing hand pain on activity, had no other medical condition affecting hand function, and had a history of wrist and/or metacarpophalangeal (MCP) joint pain and inflammation.

Interventions

Participants were allocated randomly to attend either a standard education programme (control group) run by the two rheumatology departments or an educational–behavioural joint protection programme (experimental group). Before the trial started, the content and delivery of the two rheumatology departments' standard programmes were compared and found to be very similar. Several meetings were held with staff to ensure the two standard programmes were standardized as much as possible between the two sites and a short manual was developed to facilitate this. Between six and 10 participants usually attended the standard programmes and, with partners included, group size ranged from six to 12 people.

The standard programme included short talks from nursing, medical, occupational therapy and physiotherapy staff on the following: RA; drug treatments; alternative therapies, diet; exercise, rest and positioning; energy conservation; joint protection; assistive devices; splinting; pain and relaxation; and other methods of controlling pain (e.g. heat and ice). Some demonstration and practise of exercise, joint protection and relaxation was included (15–45 min for each). Meetings allowed time for discussion and information leaflets were provided. The joint protection component lasted 2.5 h during meetings 3 and 4. This programme was designed to be typical of that provided in the UK [12]. Part 1 included the following: information about RA pathophysiology; principles of joint protection and energy conservation; demonstration of some hand-joint protection methods; and a homework task to identify problem activities and to find solutions using the principles taught. Part 2 included the following: discussion of the homework task and finding solutions to other common household, gardening and work difficulties; repetition of principles; a demonstration of hand-joint protection methods applied to making a cup of tea; and group practice of these with the opportunity to try assistive kitchen devices (for 30–40 min).

The joint protection programme was based on the health belief model [18] and the theories of social learning [19] and self-management [20] and was conducted by an experienced rheumatology occupational therapist. Between three and six participants usually attended and, with partners included, numbers were between four and eight. Participants were provided with an information pack and workbook detailing the principles of joint protection, with photographs of a range of joint protection methods. The programme applied educational, behavioural, motor learning and

self-efficacy enhancing strategies to increase adherence to the joint protection programme, as well as a range of educational methods to match different group members' learning styles.

Two-thirds of the programme was spent practising hand-joint protection methods in small groups with feedback on performance from each other and the group leader. People were shown a range of options for task performance, so that they could select which methods worked best for them. Practise started with blocked repetition of single actions and progressed to sequences of activities requiring multiple joint protection methods. Mental rehearsal of actions was also included. Contracting and goal-setting were used to promote the practice of joint protection at home between meetings. People were encouraged to write goals in their workbook and feedback was given on progress and problems at the beginning of each meeting. Individuals' practical problems were also discussed and group members used problem-solving methods to generate solutions. Information was also provided on the disease process, possible outcomes of RA, and drug therapy. (Further details of the programme are available [14].)

Both education programmes were of 8 h duration over four afternoon or evening sessions of 2 h each.

Trial design

A randomized, controlled trial was conducted. After agreement, participants were allocated randomly to an experimental or control group using sealed envelopes prepared in advance, each containing the allocation for one patient, using a four-block sequence as described by Altman [21]. Block randomization was used to ensure a balanced sequential allocation of participants to the two groups, as at least three participants were needed in each education programme to facilitate group discussion, practical participation and feedback. Participants were then telephoned and offered a range of starting dates for the education programmes (within their group) to enable them to attend at their convenience.

Outcome measures

Primary outcome measures

Hand pain experienced during moderate activity. Hand pain experienced during moderate activity (e.g. cooking a family meal, gardening or housework) within the last week was measured using a 100 mm visual analogue scale (VAS) with end points of 'no pain' and 'pain as bad as it can be'.

Adherence with joint protection. This was evaluated using a reliable, valid observational measure, the Joint Protection Behaviour Assessment [22]. This evaluates joint protection methods when performing 20 tasks required in making a hot drink and snack meal (e.g. turning a tap, filling a kettle and lifting a saucepan). Light conversation is continued throughout this to avoid conscious attention to hand actions and evaluate habitual movements more readily. The score ranges from 0 to 40 (if all 20 tasks are performed correctly) and the score is converted to a percentage. Assessments were video-recorded to enable detailed analysis of hand movements.

Secondary outcome measures

Indicators of disease activity. These comprised the EULAR 28 tender and swollen joint count (0–84) [23], the patient's and assessor's global ratings of disease severity (using a five-point Likert scale [23]), and the duration of early morning stiffness (in minutes). In addition, a 100 mm pain VAS for overall pain in the last week and the number of disease flare-ups reported in the last 6 months were recorded.

Functional assessment. The AIMS2 (Arthritis Impact Measurement Scales) was used to assess ADL (self-care and household activities subscales), upper limb function (hand and arm subscales) and lower limb function (mobility and walking subscales). All AIMS2 scale scores range from 0 to 10, with 0 representing good function [24].

Hand status. Grip strength was measured using a Jamar dynamometer. The Joint Alignment and Motion scale was used to record range of movement and deformity. This scale records percentage limitations in the range of movement and the degree of deformity at the wrist, MCP and proximal interphalangeal (PIP) joints on a scale from 0 to 4 (bilateral score range 0–88) [25]. Measurements were conducted using a goniometer, following standard protocols. The presence of deformities was also recorded (wrist radial deviation of more than $10^\circ = 1$; wrist palmar subluxation = 1; second to fifth MCPs with ulnar deviation of more than $15^\circ = 1$; second to fifth MCPs with palmar subluxation = 1; second to fifth IPs with early deformity (boutonniere/swan-neck) = 1; second to fifth IPs with fixed deformity = 2; thumb Z deformity = 1, bilateral score range 0–38).

Psychological status. This was measured with the Self-efficacy Pain and Other Symptoms subscales (score range 10–100; higher scores indicate better self-efficacy) [26] and the Rheumatoid Attitudes Index (Helplessness subscale, score range 0–30; Internality subscale, score range 0–36; higher scores indicate worse learned helplessness and poorer sense of internal control) [27].

Other data

Demographic data were collected at baseline (gender, age, disease duration, education and marital status) and a record of drugs prescribed and drug changes in the previous 6 months were obtained at each assessment. (Radiographic analysis was not included because of short trial duration.)

An independent assessor conducted assessments in the participants' own homes at baseline and 6 and 12 months. A questionnaire including the AIMS2, Self-efficacy Scales and Rheumatoid Attitudes Index was mailed 1 week before and collected at each assessment. The assessor was provided with a schedule of

completion deadlines for participants' assessments but not informed of group allocation or timing. The assessor was asked to avoid discussing the education programmes with the participants, in order to maintain blinding. Discussion about participants with treatment staff was also avoided.

Statistics

Sample size was analysed using hand pain VAS data from a previous study [9]. A minimum of 63 participants in each group was needed to detect a 20% difference in hand pain scores (based on a mean hand pain VAS score of 46.90 (S.D. 18.65), power of 0.8 and a significance level of 0.05).

Comparisons between groups to identify differences in outcomes were conducted at 0, 6 and 12 months using the unpaired *t*-test for interval data, the Mann–Whitney *U*-test for ordinal data and the χ^2 test for categorical data. Comparisons within groups were also conducted to establish if changes over time occurred between 0 and 6 months and between 0 and 12 months using the paired *t*-test for interval data and the Wilcoxon matched pairs signed ranks test for ordinal data.

Results

Recruitment occurred over a 2-yr period, during which 403 people were referred to attend an education programme at the two hospitals. Of these, 165 (41%) did not meet the trial entry criteria but were still offered the opportunity to attend a standard programme, and 86 (52%) chose to do so. Of the 238 meeting the entry criteria, 58 (24%) did not wish to attend education and a further 41 (17%) attended but did not wish to participate in the study. Twelve (4%) dropped out after randomization (but before assessment) and were unable to participate due to ill health (five in the standard group and seven in the joint protection group), resulting in 127 (55%) subjects: 62 in the standard group and 65 in the joint protection group.

The two groups were well matched in terms of demographic and baseline variables (Table 1). A similar percentage in both groups was taking non-steroidal anti-inflammatory drugs (NSAIDs), disease-modifying anti-rheumatic drugs (DMARDs) and/or steroids. In the standard group, 29 (47%) were taking sulphasalazine and 20 (32%) methotrexate. In the joint protection group the corresponding numbers were 28 (43%) and 20 (31%). Some patients were on combination therapy. There were no significant differences in drugs taken or drug changes between the two groups at 6 and 12 months (three in the standard group and nine in the joint protection group stopped DMARDs at 12 months). There was no significant difference in the number of education sessions attended between the two groups [joint protection group, 3.55 (S.D. 0.95) sessions; standard group, 3.31 (S.D. 1.08) sessions; $P = 0.17$]. Some data were missing at follow-up because of participants' ill health (four in the standard group and two in the joint protection group at 6 months; two in the standard group and two in the joint protection group at 12 months).

TABLE 1. Baseline variables (mean and S.D.) for the two programmes

	Educational programme	
	Standard ($n = 62$)	Joint protection ($n = 65$)
Sex (M, F)	18, 44	12, 53
Age (yr)	51.56 (9.73)	49.49 (11.43)
Disease duration (months)	21.34 (18.68)	17.52 (14.79)
Education [*n* (%)]		
No formal education	29 (45%)	28 (43%)
Up to GCSE	9 (15%)	12 (18%)
Up to A level	12 (19%)	15 (23%)
Degree	12 (19%)	10 (16%)
Socioeconomic group [*n* (%)]		
II	21 (34%)	19 (31%)
III	21 (34%)	23 (36%)
IV	16 (26%)	17 (25%)
V	4 (6%)	6 (8%)
Drug therapy [*n* (%)]		
NSAID use	46 (74%)	48 (74%)
DMARD use	54 (87%)	53 (82%)
Steroid use	4 (6%)	13 (20%)
Assessor's disease rating [*n* (%)]		
Mild	34 (55%)	34 (52%)
Moderate	22 (35%)	23 (36%)
Severe	6 (10%)	7 (11%)
Very severe	0 (0%)	1 (1%)

There were no statistically significant differences between the two groups.

The primary and secondary outcome variables are compared in Table 2. Use of joint protection increased significantly in the joint protection group. Not all participants agreed to be video-recorded. In the joint protection group, 60% (34/57) increased scores (by more than 10%), 40% (22 participants) doing so by 20% or more. In the standard group, 22% (11/50) increased scores (by more than 10%), but only 10% (five participants) did so by more than 20%. There were no differences between the two groups on any of the other measures at 6 months. Generally, scores in the standard group remained similar at 6 months, but there was a trend to improvement across a number of measures in the joint protection group. Within-group analyses showed that tender and swollen 28-joint counts, grip strength, Hand Joint Alignment and Motion and Assessor Global Disease Status scores improved significantly.

By 12 months, the pattern was for the standard group to have similar scores to baseline or have worsened on some measures (pain, early morning stiffness and assessor's global disease status). The joint protection group had significantly better hand and general pain, patient's and assessor's global disease status scores, AIMS2 ADL scores and less early morning stiffness. The joint protection group also reported significantly fewer disease flare-ups in the last 6 months [joint protection group, 1.05 (S.D. 1.76); standard group, 2.38 (S.D. 3.15); $P = 0.004$]. Within-group analyses showed that, at 12 months, the joint protection group had

TABLE 2. Baseline, 6 and 12 month scores for primary and secondary outcome variables (mean and standard deviation)

	Standard programme (months)			Joint protection programme (months)			
	0 $n = 62$	6 $n = 58$	12 $n = 60$	0 $n = 65$	6 $n = 63$	12 $n = 63$	Between groups P (12 months)
JPBA	14.97 (12.91)	18.00 (14.81)	17.88 (15.09)	16.16 (12.48)	35.54**[b] (20.05)	30.72**[b] (18.75)	0.001**[a]
Hand pain VAS	42.71 (28.95)	39.45 (29.05)	46.61 (34.15)	39.29 (24.69)	34.74 (28.39)	33.63 (27.21)	0.02*[a]
Pain VAS	40.02 (25.98)	42.91 (28.41)	46.83 (29.13)	38.48 (23.81)	37.74 (28.03)	37.19 (26.46)	0.05*[a]
Tender 28 joint count	20.00 (20.37)	18.52 (22.40)	21.46 (24.06)	18.86 (18.72)	12.71**[b] (15.46)	15.60 (20.27)	0.15
Swollen 28 joint count	9.69 (8.92)	9.36 (11.38)	11.16 (13.61)	10.18 (13.32)	6.74*[b] (8.38)	7.33 (9.72)	0.07
Early morning stiffness	73.87 (83.54)	70.79 (66.09)	81.93 (93.17)	68.98 (87.56)	56.10 (78.68)	45.43 (70.60)	0.01**[a]
Grip strength (dominant hand: kg)	17.00 (11.60)	17.01 (11.42)	17.65 (13.49)	14.54¶ (8.82)	15.62*[b] (8.66)	17.18**[b] (10.72)	0.83
Hand JAM (0–80)	37.85 (10.83)	34.49 (9.85)	36.74 (11.28)	37.14 (8.56)	33.79**[b] (8.82)	33.32**[b] (9.27)	0.07
Assessor's global disease status (median, IQR)	2 (2–3)	3 (2–3)	3 (2–3)	2 (2–3)	2*[b] (2–3)	2**[b] (2–3)	0.003**[a]
Patient's global disease status (median, IQR)	3 (2–3)	3 (2–4)	3 (2–4)	3 (2–3)	2.5 (2–3)	2 (2–3)	0.03*[a]
AIMS2: ADL (0–10)	2.13 (2.40)	1.90 (2.18)	2.13 (2.46)	1.62 (2.01)	1.43 (1.80)	1.33 (1.82)	0.04*[a]
AIMS2: upper limb	3.08 (2.37)	2.63 (2.13)	3.05 (2.38)	2.61 (1.81)	2.51 (1.88)	2.5 (1.92)	0.17
AIMS2: lower limb	3.96 (2.39)	3.73 (2.31)	3.87 (2.60)	3.55 (2.22)	3.43 (2.30)	3.26 (2.27)	0.17
ASE—pain	51.42 (20.76)	55.27 (20.16)	54.15 (22.89)	50.67 (19.82)	54.87 (21/35)	58.41**[b] (21.90)	0.31
ASE—other symptoms	58.76 (20.88)	62.01 (20.59)	61.64 (22.62)	59.99 (20.20)	61.36 (22.98)	65.08*[b] (19.36)	0.31
RAI helplessness	16.28 (5.95)	16.12 (5.43)	16.02 (6.05)	16.66 (5.73)	16.40 (5.77)	15.38 (5.83)	0.56
RAI internality	18.27 (6.39)	18.12 (5.14)	17.80 (5.63)	17.97 (4.57)	17.67 (4.88)	15.98**[b] (5.00)	0.06
AIMS2: current health status (0–10)	2.67 (0.7)	2.68 (0.69)	2.67 (0.61)	2.72 (0.79)	2.62 (0.76)	2.53*[b] (0.78)	0.30
AIMS2: satisfaction with health (0–10)	3.36 (1.14)	3.11 (1.22)	3.28 (1.14)	3.38 (1.25)	3.15 (2.24)	2.89**[b] (1.62)	0.08

JPBA, joint protection behaviour assessment; VAS, visual analogue scale; JAM, joint alignment and motion scale; AIMS2, arthritis impact measurement scale 2; ASE: arthritis self-efficacy scale; RAI: rheumatoid attitudes index.

Between group analysis: *[a]$P \leqslant 0.05$; **[a]$P \leqslant 0.01$.

Within group analysis: ¶$P \leqslant 0.05$ (at baseline); *[b]$P \leqslant 0.05$; **[b]$P \leqslant 0.01$.

significantly improved in grip strength, Hand Joint Alignment and Motion, assessor's global disease status, Arthritis Self-efficacy for Pain and Other Symptoms and Rheumatoid Attitudes Index (Internality) scores, and had also improved perceptions of Current Health Status and Satisfaction with Health (AIMS2).

Further within-group analyses of the Hand Joint Alignment and Motion scores showed that significant improvements occurred in range of joint movement in the joint protection group: on average, the improvement was 7° at the wrist (from 102 to 109°) and 5° at the MCP (from 77 to 82°) and PIP joints (from 94 to 99°) ($P < 0.05$). However, analysis of the deformity scores showed that these significantly increased in both groups from 4.14 (S.D. 4.56) in the standard group at baseline to 5.98 (S.D. 6.21) at 12 months ($P < 0.01$) and from 2.40 (S.D. 3.32) in the joint protection group at baseline to 5.16 (S.D. 5.65) at 12 months ($P < 0.01$). There was no difference between the two groups in numbers of deformities at 12 months ($P = 0.45$).

Participants continued to receive the usual care provided by the rheumatology departments during the trial. At 12 months, the joint protection group had visited a doctor for their arthritis on average 1.14 (S.D. 1.62) times in the previous 6 months, in comparison with 1.98 visits (S.D. 2.02) in the standard group ($P < 0.01$). During the study, 22 participants in the standard group and nine in the joint protection group participated in physiotherapy ($\chi^2 = 7.84$; $P = 0.005$), and 13 in the standard and 11 in the joint protection group participated in occupational therapy ($P > 0.1$). Two patients in the standard group and one in the joint

protection group had hand operations (two extensor tendon repairs and a carpal tunnel release respectively).

Discussion

This study has demonstrated that joint protection is effective once people with RA are enabled to use it sufficiently. Most participants were diagnosed recently (i.e. within 2 yr) and over half were rated as having mild disease at the start of the trial, with relatively few physical and functional problems. As RA is a progressive disease and joint protection aims to be preventative, benefits became more apparent with time. The findings indicate that joint protection does help slow progression of the effects of RA over a period of 1 yr.

The general trend was for the joint protection group's scores to be improved or maintained, whilst the standard group's scores were maintained or slowly worsened. In the joint protection group, increased use of joint protection led to improvements in hand pain and the maintenance of general levels of pain compared with worsening pain in the standard group. Differences were probably greater in hand pain because the joint protection programme focused primarily on hand joint protection. There was some evidence that local inflammation can also be reduced, as within-group analysis showed that the joint protection group had improved swollen hand joint counts at 6 months and there was a strong trend to a significant difference between the groups at 12 months. Failure to reach significance may be because the joint protection group tailed off in their use of joint protection to some extent at 12 months, suggesting that booster sessions might be of benefit. The joint protection group also reduced their duration of early morning stiffness by a third, reported significantly fewer disease flare-ups and visited their doctor less often, indicating that their need for medical care was reduced because they were better able to control symptoms through joint protection.

The effects on physical and functional status were less obvious, although there were differences in ADL and improvements in grip strength and range of movement of the hands. As the subjects were an early-diagnosed group with low AIMS2 scores initially, it may be that the scale had a floor effect and did not easily identify the smaller functional improvements that result from tasks being less difficult when hand joint protection methods were used. The sample size may also have been too small to detect differences because of low (good) initial scores. Follow-up studies of people with early RA indicate that functional capacity is well preserved in early RA over a 2-yr period and even after 5 or 6 yr [28, 29]. If joint protection does slow physical and functional deterioration, then differences in AIMS2 scores may become more obvious at a longer-term follow-up. Deformity scores continued to increase in both groups, suggesting that joint protection was not helping to slow progression of deformity as claimed. However, the deformity scoring method was simplistic, and a more detailed evaluation of deformity would provide a more definitive answer as to whether joint protection can help slow deformity. Both groups had similar drug therapy regimes and changes, indicating that the benefits obtained were over and above those resulting from drug therapy.

The findings confirmed previous studies [8–10] showing that typical joint protection education (the standard programme) does not result in significant behavioural change for most participants, as only 22% improved their scores. In comparison, 60% did so in the joint protection programme, demonstrating that educational–behavioural teaching methods are more effective when teaching joint protection. Changing health behaviour is difficult [30] and changing everyday automatic behaviours (such as turning a tap and lifting a kettle) is even more so, because we all perform such actions at an unconscious level. The joint protection programme focused on helping people become more aware of their movement patterns and pain levels during activity through self-monitoring. This helped participants to become more conscious of these habitual activities and to alter their working methods progressively in 'bite-sized' steps through the use of graded practice, goal-setting and homework programmes. Educational–behavioural and cognitive–behavioural approaches have similarly been shown to be more effective in achieving health behaviour change in exercise, relaxation and cognitive pain management methods [31–33].

Occupational therapy is a scarce resource and teaching joint protection takes about 25% of a rheumatology occupational therapist's working week [12]. As it has been proven beneficial, it should be provided efficiently and cost-effectively. A suggested option is to provide initially a brief individual introduction to joint protection, supported by an educational booklet. Maggs *et al.* [34] have demonstrated that providing a booklet is just as effective in improving knowledge of arthritis management and joint protection as providing this plus 1 h of individual education from an occupational therapist. This could be further supported by the loan (or purchase) of educational videotapes. The joint protection programme could be offered to those interested in learning more and attending such a programme, in order to focus scarce resources on achieving maximum benefits. Further research is needed to help identify factors that indicate when people with RA are more likely to adhere to joint protection in order to select people, as 40% did not change, even though motivated to attend.

Two-thirds of those referred for the education programmes attended, highlighting their popularity. The standard programme was considered both beneficial and informative by participants. As this design did not include a no-treatment control group, it cannot be inferred that the standard programme was of no benefit. Whether the condition of participants would have declined further without this programme is unknown. There are other limitations to the study. Some measures may have been insufficiently sensitive to detect change (the AIMS2) in early RA with this sample size. The sample group was inevitably self-selected from

those referred and consisted of those willing to attend an education group. They were thus probably a more motivated group. However, this is reflective of clinical practice as it is inevitably those who are more motivated, have fewer family/work responsibilities and can travel easily who attend for out-patient therapy.

In summary, those attending the educational–behavioural joint protection programme gained significant benefits in terms of reduced pain, early morning stiffness and improved ADL ability and assessor and patient ratings of disease status. There was a strong tendency to having fewer swollen joints and better range of movement of the hand joints. Within-group analyses also showed significant improvements in the sense of control of arthritis, self-efficacy and satisfaction with health. These findings indicate that this teaching approach should be more widely adopted to enable more people with RA to gain the benefits of joint protection.

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