

Six and 12 months' effects of individual joint protection education in people with rheumatoid arthritis: A randomized controlled trial

Abstract

Background: Joint protection (JP) education for people with rheumatoid arthritis (RA) is effective when applying psycho-educational teaching strategies. The Pictorial Representation of Illness and Self Measure (PRISM) was used to identify relevant JP education goals and life aspects, both supporting motivation and behaviour change. The objective of this study was to compare the effects of individual JP education, PRISM-based (PRISM-JP) vs. conventional (C-JP) in people with rheumatoid arthritis (RA).

Methods: An assessor-blinded randomized controlled trial was conducted in 4 rheumatology centres. Patients were randomized to PRISM-JP or C-JP, consisting of 5 JP education sessions over 3 months. Primary outcome was JP behaviour at 6 and 12 months.

Results: A total of 53 RA patients participated. The PRISM-JP group (n=26) demonstrated significantly more JP behaviour at 6 months (effect size ES=0.32; p=0.02) and 12 months (ES=0.28; p=0.04) than the C-JP (n=27). Within group analysis showed that the JP intervention was successful at 6 and 12 months in both groups (p<0.001). At 12 months the PRISM-JP group had better JP self-efficacy (p=0.02) and grip strength (p=0.04) compared to baseline.

Conclusion: PRISM-JP was more effective than C-JP in terms of long-term JP behaviour at six and 12 months.

Key words: joint protection behaviour, patient education, Pictorial Representation of Illness and Self Measure (PRISM), occupational therapy, self-efficacy, hand therapy.

Introduction

Joint protection (JP) education aims to teach ergonomic working methods which are based on JP principles such as reduce effort to do a job, distribute load over several joints, use joints in stable positions, use strongest, largest (proximal) joints, avoid positions of deformity, balance activity and rest [1]. Although effective drugs are available today, these principles are still valid, but the JP concept has developed from teaching 'how to protect joints' to a self-management approach 'to improve daily tasks and role performance through the use of alternative working methods (e.g. working bilaterally, ergonomic adaptations, assistive devices), which may thus enhance perceptions of control and improve psychological status' [2]. This current concept requires a psycho-educational approach to support behavioural changes.

There is evidence that psycho-educational group joint protection (JP) interventions for people with rheumatoid arthritis (RA) are effective on JP adherence and hand functional abilities in the short- and long-term [2-4]. These results support the importance of occupational therapy and hand JP education in the management of people with RA. In Switzerland JP education is usually provided in a one-on-one approach. It is currently unclear, whether the effects of psycho-educational JP education in group settings are applicable to an individual approach. Furthermore, despite the fact that JP research consistently has demonstrated the superiority of psycho-educational teaching strategies, the implementation of this approach requires special attention [5]. Also in Switzerland, occupational therapists predominantly apply an educational approach in JP education, providing knowledge and skills by use of conventional teaching methods. Conventional teaching methods include giving information, demonstrations and supervised practice of JP methods.

The challenge in JP education is not only to achieve short-time learning effects, but moreover behavioural changes and long-term adherence. However, conventional teaching strategies usually do not achieve these aims [6, 7]. Adherence, i.e. performing a behaviour sufficiently and long enough to be effective, may determine the outcome of an intervention. Several reasons were identified for not adhering to JP: perception of not being capable of implementing JP behaviour, lack of motivation, not perceiving benefit of adhering, insufficient or inconsistent advice from health professionals and lack of time [8].

The Pictorial Representation of Illness and Self Measure (PRISM) was used to guide an individual approach in JP education [9]. PRISM is a brief interactive hands-on tool, requiring simple instructions and little time. The standard PRISM task was developed to quantitatively and qualitatively assess a person's suffering caused by an illness and/or pain [10, 11]. This perceived impact of disease is related to restrictions or losses in aspects of life that are most salient for that person. An extension of the tool (PRISM+ task) visually summarizes relationships between illness and other important aspects of the patient's life (e.g. work, family, hobbies, friends). In routine [12] as well as specialized [13] clinical care for patients with physical illness PRISM has demonstrated high therapeutic potential in reinforcing a client-centred approach.

In this study we tested the hypothesis that individual, PRISM-facilitated and resource-oriented JP education (PRISM-JP) in RA patients would improve JP behaviour and adherence compared to conventional JP education (C-JP) up to twelve months after the JP-intervention. We assumed that that the client-centred approach applied by PRISM, with focus on meaningful tasks and attractive goals would enhance patients' motivation for collaboration and be an efficient way of improving transfer of JP education to daily life [14].

At 3-months follow up both groups improved in JP behaviour, the PRISM-JP group additionally improved in pain scores, arthritis self-efficacy and JP self-efficacy [15]. This publication reports on JP behaviour and other outcomes at the 6 and 12 months follow up.

Methods

Design and randomisation

A multicentre randomized controlled trial was conducted, according to the extended CONSORT statement to randomized trials of non-pharmacologic treatment [16].

Randomisation was stratified for each centre and a four-block sequence [17] was performed at each centre to ensure balanced allocation to the two groups. Patients were randomly assigned to C-JP or PRISM-JP using sequentially numbered, concealed treatment allocations prepared in advance. Blinding of treating occupational therapists (OTs) and patients was not feasible, but the assessor rating the primary outcome (JP behaviour) was blinded.

Patients

Eligible Patients had to be: diagnosed with RA according to ACR guidelines [18]; in ACR functional class II (limited in avocational activities), III (limited in vocational and avocational activities) or IV (limited in usual self-care, vocational, and avocational activities) [19]; perceiving difficulties and/or pain in hands that justified occupational therapy, and sufficient German language skills. Severe deformities of finger, hand and shoulder joints were exclusion criteria, as for these patients more idiosyncratic JP methods have to be found. Patients were included between July 2006 and February 2008. They were asked to participate in a study aiming to evaluate two different educational approaches within occupational therapy, but they were not informed that the focus was on JP behaviour. Ethical approval was obtained in all regions involved and patients provided informed consent prior to participation. The study was registered in Clinical.Trials.gov.

Participating centres and care providers

Four rheumatology centres, among them two university hospitals, one rheumatology-orthopaedic centre and one rheumatology rehabilitation clinic, in German-speaking regions of Switzerland participated. Two experienced rheumatology occupational therapists (OTs) in each centre participated and provided the C-JP or the PRISM-JP. The expertise in providing JP education to people with RA required from the participating occupational therapists (OTs) ought to minimize bias of possible treatment effect estimates due to different experience in treating such patients [20]. The OTs providing the experimental JP (PRISM-JP) were trained by two researchers (SB,

KN), an OT experienced in PRISM use and a research patient partner in a two-day course, and regular supervision meetings were held to ensure correct application of PRISM interventions during study. Furthermore, OTs were asked not to discuss treatment or participants among each other. The interventions consisted of five 45-minute sessions, four over a three-week period and one booster session two months later.

The C-JP

The C-JP consisted of JP education previously standardised over the four centres and summarised in a short manual: oral and written information about RA and JP-principles [1]; demonstrations and supervised practice of hand JP methods, mostly in kitchen activities, and demonstration of appropriate assistive devices. 'Preparing instant coffee' was the assessed primary outcome activity and therefore not allowed as a practicing example [21]. OTs further documented any additional intervention in written form (e.g. home exercise, final provision of assistive devices, splints).

The PRISM-JP

The PRISM-JP consisted of the same JP education content, but was based on the PRISM tasks (PRISM standard and PRISM+) as well as the theories of social learning [22] and self-management [23] to individualize the JP education and to support motivation for using JP methods. When performing the standard PRISM task, the patient is shown a white A4-sized board with a fixed yellow disk (7cm in diameter) at the bottom right corner and is asked to imagine that the board represents his/her life as it currently is, and the disk represents his/her "Self". The person is then handed a red disk, 5 cm in diameter, representing his/her "Illness" and asked to place this illness disk where it reflects the perceived burden of illness in his/her life at present. The distance, in centimetres, between the centres of the "Illness" and the "Self" disks (range 0-27 cm) is the "Self-Illness Separation" (SIS). A smaller distance indicates higher impact of the disease, i.e. more suffering (Figure 1) [10].

When performing the PRISM+ task, further disks, similar to the illness disk but of different colours, represent important aspects of the patient's life (e.g. leisure activities or social activities), summarising relationships between the illness and other aspects of the patient's life in visual form [12]. The "Self-Resource Separation" (SRS; range 0-27 cm) is used accordingly but its interpretation is different from the SIS: a larger distance indicates a less positive impact (of life aspects), thus possibly a resource/life aspect that should get more attention. By this, a smaller SRS indicates a more positive impact.

The contents of the PRISM-JP interventions were allocated to the sessions 1 to 5 and summarized in a short manual to guide the interventions. The contents of the C-JP were not allocated to specific sessions.

In session 1, the standard PRISM task was used to identify tasks where performance was difficult due to RA. After placing the illness disk SIS was measured and the patient was asked to describe in which activities and why problems occurred. JP education and JP practice were linked with these individually relevant tasks.

In *session 2*, The PRISM+ task helped find an individual resource to care for during the therapy process. After putting their resource disks (for study purposes previously framed as: 1) personal care, 2) work, 3) family/friends, 4) leisure activities) the patient was asked which resource (s)he considered the most important to pay attention to during the therapy process. SRS was measured. The resource was not to be related to illness related problems and JP activities but to perceived positive activities, e.g. listening music, going to cinema, activities with friends and family. The idea was to support motivation for JP behaviour by additional focus on a life aspect that represented positive memories for the patient.

In *sessions 3 and 4*, the selected resource was evaluated and reinforced.

In *session 5*, after the 3-months follow up assessment, the 2-month in-between period was evaluated by applying the PRISM tasks and, based on this, JP methods and key messages were repeated, including the patient's choice of activity, reinforcement of successful application and problem-solving for perceived barriers.

JP education and practice were part of every session. They became progressively complex, starting with self-monitoring of hand use and activities causing pain and difficulties; proceeding onto selecting one or several JP principle(s) to applying (referring to life areas defined in session 1) and practicing JP methods within individually selected complex activities and discussing and applying transfer of JP methods to other activities. Energy conservation was addressed in sessions 4 and 5.

Homework tasks consisted of reading booklets about RA and JP methods, edited by the Swiss League Against Rheumatism, practicing selected JP methods and the same complex JP activity, applying selected JP principles to various situations in short- and mid-term (between session 4 and follow up assessment). *Mutual goal agreement on homework tasks and self-monitoring* were important integral parts. Homework was evaluated at the beginning of the subsequent session, where facilitators, barriers and possible solutions were discussed. In session 5, patients were asked to define mid and long-term goals, i.e. at 6 and 12 months, with the idea of supporting adherence by directing the attention on a longer-term perspective.

Social support: participants were encouraged to discuss the reading material with their partners and invite them to participate in sessions 4 and 5.

Outcomes and outcome measures

Comprehensive assessments at baseline (T0) and 6 (T1) and 12-months (T2) follow ups were administered.

Primary outcome measure

Joint protection behaviour: was assessed using the German version of the Joint Protection Behavioural Assessment D-JPBA-S [21]. A research assistant videotaped nine tasks required for the activity 'preparing instant coffee' (e.g. turning tap, carrying pan, opening coffee jar), transferred the videorecordings to Pinnacle Instant CD/DVD 11.0 software (Pinnacle systems, Mountain View,

CA) and edited them in a mixed sequence on compact discs for assessment. One experienced rheumatology OT, blinded to the patients' treatment allocation and time point of recording, rated the use of JP methods in all nine tasks on a 0-2 point scale (2=correct, 1=partially correct, 0=incorrect; with a total score of 18), following the instructions of the manual.

Secondary outcome measures

Hand function: Grip strength for the dominant hand was measured using a Jamar hand dynamometer [24] and hand pain was assessed on a 0-10 VAS scale (0=no pain, 10=maximal pain) by the research assistant, before or after the videorecording.

A set of questionnaires, all validated in the German language was used. The total score of each scale is equal to the mean value of all subscores, unless otherwise stated.

Self-efficacy

- Arthritis self-efficacy scale, German Version A-SES-D, a 8-item self-administered questionnaire, assessing the perceived pain and ability to control the arthritis on a 0-10 VAS scale (0=very uncertain, 10=very certain) [25]
- JP-specific self-efficacy, a 10-item scale assessing perceived ability to perform JP across a variety of situations on a 0-3 point scale (0= not at all confident; 3 very confident), with a total score of 30 [26].

Quality of life

- EUROHIS-QUOL 8, an 8-item WHO quality of life questionnaire assessing general quality of life on a 0-4 Likert scale (0= not at all satisfied; 4 completely satisfied) [27].
- Hospital Anxiety and depression Scale, German Version, HADS-D, assessing anxiety and depression on two 7-item scales scoring 0-3 (0= no problem; 3 severe problems) [28].

Other data assessed

Patients' and disease characteristics were measured at baseline. *Drug treatment and disease activity* were assessed at baseline and 12 months follow up.

- *Disease activity:* using the Disease Activity Score (DAS28), calculated from the results of a 28 tender joint count, a 28 swollen joint count and erythrocyte sedimentation rate [29]. DAS28 was assessed by rheumatologists not aware of patients' treatment allocation.

PRISM-data (PRISM-JP group only)

Self-Illness Separation SIS, derived from the PRISM task (perceived burden of illness) and Self-Resource Separation SRS derived from the PRISM+ task (resource activation) were assessed for the intervention group.

Statistics

Sample size calculations [30] were based on data from the D-JPBA-S validation study [21]. A minimum of 22 participants in each group was needed to detect a 20% difference in joint protection behaviour scores, assuming a mean change of 5.5 points (SD 3.7) on a linear scale, power of 90% and significance level of 0.05. A 20% drop out rate was added and to reach the same even number over the 4 centres, inclusion of 56 patients was necessary.

Rasch analysis was performed on the D-JPBA-S and JP-SES data to convert the ordinal raw data to interval scaled data [21, 31]. For each assessment, the data of the different time points were transformed within the same frame of reference [32]. To evaluate real changes in clinical practice and research, a test–retest change determined by a specific measurement must be at least the smallest detectable difference (SDD) [33], which was 5.5 points for the D-JPBA-S [21]. For both groups, the number of patients above the SDD was calculated, the difference between the two groups was assessed by a Chi square test.

Intention to treat analysis was performed. Missing values at 6 months were imputed with the values of baseline (3 cases); missing values at 12 months were imputed with the values at 6 months where available (1 case), otherwise with baseline values (1 case) (see Figure 2). Effect sizes were calculated based on the standardized difference between two means [34]

To analyse the between-group differences of the JP interventions on JP behaviour, self-efficacy and hand function after 6 and 12 months, we performed an analysis of absolute change (follow up minus baseline values), using analysis of variance, correcting for baseline values (ANCOVA). The results are presented as a mean difference in change between the groups. Paired t-tests were applied for within group comparisons at 12 months where appropriate.

Results

Flow of participants through study is presented in Figure 2: the number of eligible patients is a retrospective estimation, as it was not feasible to establish a systematic reporting of eligible patients in all involved centres. Recruiting all patients took approximately 1.5 years. Distribution of treated patients was unequal over the 4 centres (14 / 15 / 24 / 1 patients), but equally distributed between C-JP and PRISM-JP within the centres. The rheumatology rehabilitation clinic recruited only one patient over 8 months and stopped participation when the OT trained for providing the PRISM-JP changed job.

The participants of the two groups were well matched in relation to demographic and clinical data (Table 1). The average age and disease duration of the experimental patients were higher and consequently the average professional work frequency was lower compared to the controls.

Drug treatment. In both groups, the initial rate of patients on biologicals (anti-TNF and Rituximab) disease-modifying anti-rheumatic drugs (DMARDs), non-steroidal anti-inflammatory drugs

(NSAIDs), glucocorticoids and analgetics was similar. About one third of the patients in both groups received combination therapy of biologicals and DMARDs initially and after one year (Table 2).

Adherence to treatment and follow up. One patient (PRISM-JP) did not attend all JP sessions (2 out of 4) and the follow up sessions, because travelling was too stressful; but she did fill out all questionnaires. Two other patients of the PRISM-JP group did not attend the follow up assessments at 6 months, but both accepted to participate at the 12-months follow up. At the 12 months follow up one patient from the C-JP group was unable to participate. One patient of the PRISM-JP group brought a relative (adult daughter) to session 4.

Additional treatment. Eight patients received additional OT after the intervention period, three in the PRISM-JP group and five in the C-JP group. Two patients received work place adaptation and counselling, two had static splints for night use, one finger splints; three patients (2 C-JP, 1 PRISM JP) underwent hand surgery (wrist arthrodesis), shortly after the 6-months follow up.

6 months follow up

Improvement of JP behaviour in the PRISM-JP group was significantly larger compared to the C-JP group (effect size (ES) 0.32, $p=0.02$) (Table 3). In the PRISM-JP group, 14 patients (53%) increased JP behaviour scores by more than 30% (i.e. by more than 5.4 points, which corresponds to the smallest detectable difference SDD of the D-JPBA-S), whereas in the C-JP group, 5 patients (19%) increased by more than 30%. This difference was significant ($p=0.008$).

However, JP behaviour increased significantly in both groups from baseline to 6 months follow up ($p<0.001$).

JP-self-efficacy was significantly increased in both groups. No further differences between or within the groups on any variables were present.

12-months follow up

At 12 months follow up, there was significantly better JP adherence in the PRISM group compared to the C-JP group (effect size 0.28, $p=0.04$) (Table 3). Considerably more PRISM-JP participants increased JP behaviour by more than 30% (i.e. above the SDD) from baseline, i.e. 14 patients, compared to 5 patients in the C-JP group ($p=0.008$).

However again both groups showed more use of JP methods ($p<0.001$) compared to baseline.

The C-JP group had significantly better quality of life scores at 12 months compared to the PRISM-JP group. Within group analysis showed improved JP specific self-efficacy ($p=0.02$) and improved grip strength ($p=0.04$) in the PRISM-JP group, whereas the C-JP group had improved scores in depression (HADS-D), quality of life (EUROHIS QUOL 8) and disease activity (DAS28). (Table 3).

Subanalysis of PRISM-JP group

No change in PRISM-measured perceived burden of disease and resource activation occurred at 6 and 12 months (Table 4).

Discussion

The study showed that individual JP education increased JP behaviour at 6 and 12 months. Overall, PRISM-JP was more effective than C-JP. Continued adherence was high in the PRISM-JP group. At 12 months, the PRISM group showed increased JP-self efficacy and grip strength, which may be directly linked with continuously performing JP methods in a possibly sufficient amount. This confirmed previous evidence that a psycho-educational teaching approach is more successful than a conventional one, and confirmed our hypothesis that this may apply also in individual JP education.

Interestingly, average use of JP methods was also significantly increased in the C-JP group at 6 and 12 months. This is remarkable and different to what was observed in another JP study, where there were no effects on JP behaviour in the conventional JP education group at 12-months follow up [4]. In contrast to that study, our participants had established RA and both interventions, PRISM-JP and C-JP, focused on JP behaviour and had the same duration. It may also be that a one-on-one approach has beneficial effects that outweigh the well-known advantages of group intervention i.e. group interaction and participants modelling [35]. Although the effect sizes were small in favour of the PRISM-JP education, it is remarkable that JP behaviour was sustained in both groups at 6 and 12 months.

However, although participants in both JP groups increased their JP behaviour significantly, only about 50% of the PRISM group and approximately 20% of the control group improved above the measurement error (SDD) of the D-JPBA-S scale.

Beyond the measurement error there is the minimal clinically significant difference, which is the '*smallest difference in a score in a domain of interest that patients perceive as beneficial*' [36]. In JP behaviour, perceived benefits are less pain or better function; however, we do not know which improvements in JP use in which tasks reflect these benefits. In the PRISM-JP group, the JP education tasks were linked to individually meaningful and relevant activities and most often leisure activities were selected [37]. By this, immediate benefit could be perceived which was considered a strong motivation. The C-JP used more 'purposeful' activities (kitchen household, self-care).

In contrast to comparable JP studies [2, 4], the D-JPBA-S assessment activity, preparing instant coffee, was not allowed as practice example in either group. Hammond stated that it was unknown to what degree patients were able to transfer the JP behaviour assessed by the JPBA to their individual daily activities [4]. In our study, transfer from a practice activity to the assessment activity seemed to have happened in both treatment groups, but more successfully in the PRISM-JP group. The increased JP self-efficacy in both groups at 6 months may indicate that the participants felt confident to perform JP across a variety of situations. Interestingly, JP self-efficacy was larger in the PRISM-JP group at 12 months compared to 6 months, although not significantly different to the C-JP group.

Improved grip strength in the PRISM-JP group at 12 months follow up was shown. Although JP behaviour is not considered to improve grip strength, but rather to facilitate tasks by working with

less stress and effort, strength did improve [1]. This is in accordance with findings in patients with early RA [4]. Possibly the more regularly JP methods are applied, the easier and possibly with less pain tasks are performed. As a consequence this may increase the amount of activity and thus grip strength.

Medication aims to decrease disease activity, however the PRISM group's disease activity (measured by DAS28) did not decrease. Increased grip strength and less perceived disease activity (measured by RADAI questionnaire) is thus more likely to be attributable to JP education than to the drug treatment. On the other hand, the C-JP group showed significant improvements in DAS28, depression and quality of life. The reduced disease activity in this group was more probably related to positive drug treatment response than to a direct consequence of JP education, even more when considering the decreased JP adherence in this group between 6 and 12 months. Participants of the C-JP group were younger and had shorter disease duration. When they presented at a specialized rheumatology clinic in a stage of exacerbated disease activity, they were likely to be successfully treated with biologicals, which may subsequently have lead to reduced depression and perceived better quality of life.

The study has its limitations. One was the recruiting of patients at rheumatology centres. It can be assumed that patients who are treated by early use of TNF and combination therapies are more present in specialised clinics than in general rheumatology practices, and therefore not represent the typical general RA population. Moreover, these clinics represent high volume centres, this may indicate that the generalisibility of our findings depend on the OTs' experience and routine [20]. Another limitation is that sample size was calculated for the primary outcome of JP behaviour, but not for hand function, self-efficacy and psychological health, and thus study size prevented detection of further differences.

However, the PRISM intervention demonstrated to be appropriate for occupational therapy interventions, meeting important OT concepts. Meaningful occupations [37] to practice JP methods were identified by the PRISM standard task assessing life areas where burden of illness was perceived and by PRISM+ task identifying the resource to support the therapy process. This ensured an individualized client-centred therapeutic approach. The aim of the PRISM intervention was to increase and support motivation and although there were no differences measured in the PRISM tasks, we assume that group differences may be explained by this approach. PRISM enhanced patient-therapist communication of individual aspects of illness, and enriched and improved the therapeutic process with salient information. After a two-day training, OTs were able to perform the PRISM tasks and to take advantage on this approach. We suggest the use of PRISM in routine clinical practice, not restricted to RA or rheumatology patients.

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Disclosures

None

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Table 1: Demographic and clinical baseline variables of study participants (n=53)

	Conventional JP	PRISM-based JP
	education (n= 27)	education (n=26)
Females, no. (%)	22 (82%)	22 (85%)
<u>Age</u> , years, mean (<u>SD</u>)	53.44 (15.71)	62.08 (12.61)
Disease duration, years, mean (SD)	8.30 (9.75)	10.23 (7.64)
Patients < 65 years / with work ability (%)	22 / 14 (64%)	17 / 10 (59%)
<u>Weekly</u> working hours, mean (SD)	31.5 (12.31)	22 (14.22)
Former OT/mean years since (<u>SD</u>)	4 / 5.75 (5.74)	6 / 8.17 (4.62)
Rheumatoid nodules (%)	3 (11%)	2 (8%)
Rheumatoid factor (%)	18 (66%)	20 (77%)
ANA (%)	15 (56%)	16 (62%)
Erosions (%)	15 (56%)	18 (69%)

All values represent the number of patients and proportions (%), unless stated otherwise.

ANA = anti-nuclear antibodies.

Table 2. Drug therapy at baseline and 12 months follow up

	Conventional joint protection education (C-JP)		PRISM-based joint protection education (PRISM-JP)	
	Baseline n=27	12 months n=27	Baseline n=26	12 months n=26
Biologicals	8 (30%)	9 (33%)	9 (33%)	11 (41%)
DMARDs	22 (82%)	21 (78%)	20 (77%)	22 (82%)
Steroids	11 (41%)	10 (37%)	13 (50%)	11 (41%)
NSAIDs	9 (33%)	6 (22%)	11 (42%)	9 (33%)
Analgetics	7 (26%)	2 (7%)	2 (8%)	2 (8%)

All numbers are number of patients and proportions

'Biologicals' encompass Anti-TNF and Rituximab drugs; DMARDs = disease-modifying anti-rheumatic drugs; NSAIDs = non-steroidal anti-inflammatory drugs.

Table 3. Primary and secondary outcome variables: at baseline and mean changes (standard deviation SD) at 6 and 12 months follow up

	Conventional joint protection education			PRISM-based joint protection education			Δ between groups 6 months p-value	Δ between groups 12 months p-value
	Baseline (n=27)	6 months change (n=27)	12 months change (n=27)	Baseline (n=26)	6 months change (n=26)	12 months Change (n=26)		
D-JPBA-S (0-18)	4.01 (3.89)	3.0 (3.4) ^{***b)}	2.8 (3.1) ^{***b)}	3.78 (4.59)	5.4 (3.8) ^{***b)}	4.8 (3.8) ^{***b)}	0.02	0.04
ASES-D (0-10)	7.12 (1.56)	-0.4 (1.8)	-0.5 (1.6)	6.51 (2.07)	0.1 (2.0)	-0.1 (1.9)	0.31	0.38
JP-SES (0-30)	16.24 (6.10)	3.1 (4.6) ^{**b)}	1.9 (5.2)	16.59 (5.21)	2.5 (5.7) ^{*b)}	3.3 (6.9) ^{*b)}	0.70	0.39
Hand pain# (0-10)	2.89 (2.98)	0.44 (2.22)	-0.44 (2.34)	3.08 (3.06)	-0.15 (2.68)	-0.28 (2.62)	0.38	0.82
Grip strength# (>0)	15.50 (9.46)	1.3 (4.3)	0.2 (6.0)	14.88 (9.36)	2.0 (6.0)	2.9 (6.8) ^{*b)}	0.62	0.13
HADS-A (0-21)	4.33 (2.92)	-0.1 (2.7)	0.0 (2.2)	6.92 (4.33)	-0.4 (3.0)	-0.1 (2.9)	0.73	0.89
HADS-D (0-21)	4.33 (3.16)	-0.3 (2.9)	-0.8 (2.2) ^{*b)}	5.27 (3.32)	-0.3 (2.4)	0.5 (3.0)	0.97	0.09
EUROHIS-QOL-8 (0-4)	2.71 (0.67)	0.05 (0.53)	0.18 (0.42) ^{*b)}	2.61 (0.49)	0.06 (0.51)	-0.09 (0.50)	0.94	0.04
DAS28 (>0)	3.72 (1.67)	NA	-0.67 (1.60) ^{*b)}	3.70 (1.67)	NA	-0.33 (1.23)	NA	0.39

D-JPBA-S = JP Behavioural Assessment; ASES-D = Arthritis Self-Efficacy Scale; JP-SES = JP Self-Efficacy Scale; hand pain and grip strength (in kg), # of dominant hand; HADS = Hospital Anxiety and Depressions Scale (-D = Depression; -A = Anxiety subscale); EUROHIS-QOL-8 = Quality of Life 8 Item Index; DAS28 = Disease Activity Score in 28 joints;

Significance level for between-group analysis: $p \leq 0.05$;

Significance level for within-group analysis: ^{*b)} $p \leq 0.05$; ^{**b)} $p \leq 0.01$ ^{***b)} $p < 0.001$ (all compared to baseline)

ANCOVA was applied for calculating between group changes from baseline to 6 and 12 months follow up, correcting for baseline values for all variables

Paired samples t-tests for calculating within group change from baseline to 6 and 12 months follow up for all variables

Table 4: PRISM perceived impact of illness (SIS) and impact of resource (SRS) (Intervention group)

	Baseline	6 months	12 months	Within group p (6 months)	Within group p (12 months)
PRISM task (SIS)	12.60 (8.5)	13.5 (7.5)	13.7 (7.1)	0.6	0.5
PRISM+ task (SRS)	10.0 (7.2)	8.0 (4.6)	8.1 (5.3)	0.1	0.2

SIS (Self - Illness Separation) = measured distance between 'Self' and 'Illness' (in PRISM task)

SRS (Self - Resource Separation) = measured distance between 'Self' and 'Resource' (in PRISM+ task)

SIS: an increasing SIS indicates lower impact of the illness (or perceived burden of illness)

SRS: a decreasing SRS indicates a more positive impact of the resource

Paired samples t-tests were applied for calculating change from baseline to follow up at 6 and 12 months