Effectiveness of individual resource-oriented joint protection education in people with rheumatoid arthritis. A randomized controlled trial

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Abstract

Objective: The modern joint protection (JP) concept for people with rheumatoid arthritis (RA) is an active coping strategy to improve daily tasks and role performance by changing working methods and using assistive devices. Effective group JP education includes psycho-educational interventions. The Pictorial Representation of Illness and Self Measure (PRISM) is an interactive hands-on-tool, assessing a) the individual's perceived burden of illness and b) relevant individual resources. Both issues are important for intrinsic motivation to take action and change behaviour. This study compared individual conventional JP education (C-JP) with PRISM-based JP education (PRISM-JP).

Methods: An assessor-blinded multicentre randomized controlled trial, including four JP education sessions over three weeks, with assessments at baseline and 3 months.

Results: In total 53 RA patients participated. At 3 months, the PRISM-JP (n=26) participants did significantly better compared to the C-JP participants (n=27) in JP behaviour (p=0.02 and p=0.008 when corrected for baseline values), arthritis self-efficacy (ASES p=0.015) and JP self-efficacy (JP-SES p=0.047). Within-group analysis also showed less hand pain (p<0.001) in PRISM-JP group.

Conclusion: PRISM-JP more effectively supported learning of JP methods, with meaningful occupations, resource activation and self-efficacy acting as important mediators.

Practice implications: PRISM improved patient-clinician communication and is feasible for occupational therapy.

Key words: rheumatoid arthritis, joint protection, patient education, self-efficacy, occupational therapy, randomized controlled trial

1. Introduction

Hand joint protection (JP) education is a standard occupational therapy intervention in the multidisciplinary management of people with rheumatoid arthritis (RA) (1). Hand involvement is one of the major problems from the patients' perspective (2) and limits them in relevant activities and social participation (3). The JP concept has developed to a self-management approach 'to improve daily tasks and role performance through the use of alternative working methods and assistive devices, which may thus enhance perceptions of control and improve psychological status' (4).

The development of JP aims also implied use of other teaching methods. Traditional teaching methods such as use of written information, demonstrations, supervised practice and visual aids were successful in providing knowledge and skills (5). However the aims of behavioural change and self-management require other strategies (6). Various studies demonstrated the effectiveness of JP as a self-management strategy, provided that psycho-educational interventions are applied as they facilitate behavioural change with respect to JP use more successfully (4, 7, 8). JP is often provided in a one-to-one setting, however it is currently unclear, whether the effects of psycho-educational JP education in group settings are applicable to an individual approach.

Self-management requires the patients' involvement and responsibility for the day-to-day management of their illness (9). There is evidence that individual beliefs and attitudes of patients are better predictors of patients' abilities to cope with the illness than disease severity, age or gender (10). Unsuccessful coping results in suffering that is thus determined less by the disease itself than by its meaning to the individual (11).

The Pictorial Representation of Illness and Self Measure (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 (12, 13). This perceived impact of disease is related to restrictions or losses in aspects of life that are most salient for that person (14). An extension of the tool (PRISM+ task) visually summarises relationships between illness and other important aspects of the patient's life (e.g. work, family, hobbies, friends) (15). This stimulates therapeutic focus shift from illness to the individual and his/her strengths and perception of important life aspects as resources. The PRISM+ task refers to Hobfoll's resource conservation model, which related the ability to cope with stress to the ability to conserve or substitute resources of one's life (16).

In this study, PRISM was used to guide an individualised JP intervention, as typical practice in Switzerland is one-on-one JP education. In routine clinical care PRISM has demonstrated high therapeutic potential. The PRISM tasks apply a client-centred approach and help to

identify meaningful occupations (3). It was assumed that this would have a strong effect on patients' learning motivation and on improving transfer of JP education to daily life (17).
The study aim was to evaluate whether individualised, resource-oriented JP education (PRISM-JP) in RA patients facilitates JP acquisition and adherence more successfully, compared to conventional JP education (C-JP).

2. Methods

Patients

Patients were recruited by rheumatologists of four rheumatology departments in German-speaking regions of Switzerland. They were eligible when: diagnosed with RA according to ACR (American College of Rheumatology) 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) associated with difficulties and/or pain in hands, justifying occupational therapy, and had sufficient German language skills. Severe finger, hand and shoulder joint deformities were exclusion criteria, as these can lead to difficulty performing common JP methods and require more idiosyncratic solutions.
Patients were asked to participate in a study aimed at evaluating two different educational approaches within occupational therapy, but they were not informed that focus was on JP behaviour. Ethic approval was obtained in the three regions involved and patients provided informed consent prior to participation. The study was registered in Clinical.Trials.gov.

Design and randomization

An assessor-blinded, multicentre randomized controlled trial was conducted.
After mailing the informed consent to the study centre, participants were randomly assigned to one-on-one JP education, either C-JP or PRISM-JP, by sequentially numbered, concealed treatment allocations prepared in advance. Randomization was stratified for each hospital and a four-block sequence (20) was performed to ensure balanced allocation of participants to the two groups.
After randomization, the study centre contacted the patients and explained the assessment procedure that involved video recording of performing a task, e.g. no recording of face and voices, to minimize the risk of refusal. The PRISM-JP participants were sent a letter to support adherence to program and JP behaviour (4).

Interventions

In each of the four centres, two experienced rheumatology occupational therapists (OTs) provided the C-JP or the PRISM-JP. When preparing this study, a consensus meeting with all OTs involved was held to standardise the JP education of the four participating

institutions. There was little disagreement on content and delivery, as representing typical practice in Switzerland. Both C-JP and PRISM-JP were defined as four 45-minute sessions within 3 weeks.

Conventional JP education

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

PRISM-based JP education

The PRISM-JP education also consisted of the standardised JP education, but was much more individualised, and based on the PRISM tasks (PRISM / PRISM+), the theories of social learning (22, 23) and self-management (24). The OTs providing PRISM-JP were trained by two researchers (KN, SB) to assess the perceived burden of illness, to elucidate important resources and to set personally relevant therapeutic goals by means of PRISM / PRISM+ and to understand the applied theories of social learning and self-management. While the study was ongoing, these OTs participated in three supervision meetings to ensure correct application of PRISM.

Application of PRISM (12) and PRISM+(15): When performing the *PRISM task*, the patient is shown a white A4-sized board with a fixed yellow disk (7cm in diameter) at the bottom right corner. S(he) is asked to imagine the board represents his/her life as it currently is, and the disk his/her "Self". The person is then handed a red disk, 5 cm in diameter, representing his/her "Illness" and asked where (s)he would put the Illness disk to reflect the burden of illness in his/her life at present. The quantitative measure is the "Self-Illness Separation" (SIS), the distance between the centres of the "Illness" and the "Self" disks (range 0-27 cm), with a smaller distance indicating higher impact of the illness (Figure 1a) (12). For the *PRISM+ task* further disks, similar to the illness disk but of different colours, can be used to represent a patients' resources (e.g. leisure activities, family/friends, work). The SRS (Self-Resource-Separation) is used accordingly, i.e. the distance between the centres of a "Resource" and the "Self" disks (range 0-27 cm). However, the SRS has to be interpreted differently than the SIS: larger distances indicate a less positive impact of the resource, while smaller distances indicate a more positive impact (Figure 1b). The sessions' contents below describe the application of the PRISM tasks in the PRISM-JP education in detail.

Application of theories of social learning and self-management: Self-efficacy, i.e. one's perceived ability to perform a behaviour, and outcome-efficacy, i.e. belief that a behaviour is

beneficial, are central concepts of social learning theory. Both are important mediators of performance (22). Self-efficacy enhancing methods such as direct experience (in individually meaningful tasks and resources) and positive feedback mechanisms were included to support internal motivation as a central trigger for behaviour change and better self-management.

The PRISM-JP education was allocated to sessions 1 to 4, whereas the C-JP education was not allocated to specific sessions.

In *session 1,* the PRISM task was used to assess perceived burden of illness caused by the RA or pain and identify individual JP education goals. After placing the illness disk SIS was measured and the patient was asked to describe in which activities and why problems occurred. By this, relevant tasks were identified and used to link the JP education to individually important tasks and activities. This client-centred approach helped to select individually meaningful rather than purposeful occupations in conventional JP education, such as household or self-care activities (3). Positive goal formulation (what to do) rather than negative (what to prevent) was emphasized.

In *session 2,* The PRISM+ task helped to find the most important individual resource. Patients were asked what activities were most important to them. They chose one single resource with a most positively perceived impact, which they wanted to foster during therapy such as listening/playing music or going to cinema and meeting friends. This resource was deliberately selected not to be in any connection to illness related problems and JP activities. By this, JP education usually related with the disease and its negative aspects, was linked with positive goals and memories to enhance patients' motivation for collaboration (15). The aim was to improve the positive impact of the selected activity which was expressed in a decrease of the SRS, i.e. the distance between the "Resource" and the "Self" disks.

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

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, the balance between activity and rest was addressed in session 4.

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).

Goal setting and self-monitoring were important integral parts of homework. After agreeing on homework tasks and setting goals for the next session, patients wrote them in their diary

and were encouraged to self-monitor their activities. Their perceived confidence to perform their homework was assessed on a 0-10 VAS; when confidence was graded below 7 points, reasons for this and possible solutions were immediately discussed. Homework and the experienced facilitators of and barriers to JP use were evaluated at the beginning of the subsequent session.

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

Assessment procedure

Two comprehensive assessments at baseline, i.e. before JP session 1 (T0) and at 3-month follow-up (T1) were administered. JP behaviour and pain was also monitored immediately after session 4 (T1).

Outcomes and outcome measures

Primary outcome measure

Joint protection behaviour: was evaluated using the German version of the Joint Protection Behaviour Assessment D-JPBA-S (25). It assesses use of JP methods while performing nine tasks required when preparing instant coffee (e.g. turning tap, carrying pan, opening coffee jar). Patients were kept blinded about the true purpose of the video recording to ensure habitual performance, light conversation was continued to distract from paying conscious attention to hand use.

Video recordings were transferred to Pinnacle Instant CD/DVD 11.0 software (Pinnacle systems, Mountain View, CA) and edited in unsorted sequence on CDs for assessment to ensure blinding to patients' treatment allocation and time-point of recording. One rheumatology OT rated all assessments following the instructions of the D-JPBA-S manual.

Secondary outcome measures

Psychological status. The Arthritis Self-efficacy Scale, German Version (A-SES-D), an 8-item self-administered questionnaire (26) and the JP self-efficacy scale (27), a 10-item self-administered questionnaire were used to assess arthritis and behaviour specific self-efficacy. The Hospital Anxiety and Depression Scale, German Version, (HADS-D) (28), was used to measure psychological distress. Scores of 8+ and 11+ have been suggested as indicative of a possible clinical state (e.g. suffering from emotional disorder) and a probable clinical state, respectively, for both anxiety and depression (29)

Hand status. Grip strength was measured using a Jamar hand dynamometer (30) at each video recording. Hand pain during moderate activity was assessed with a 0-10 VAS scale.

*Disease activity, u*sing the Disease Activity Score (DAS28), (31) and *drug therapy* were monitored.

Quality of life. The EUROHIS-QUOL 8, an 8-item WHO quality of life questionnaire assessing general quality of life (32) was used.

PRISM and PRISM+: Increasing SIS means less perceived burden of disease, decreasing SRS means better resource activation. As only the experimental intervention was based on the PRISM, these data are only available for this group.

Other data collected at baseline only

Patients' demographic and clinical characteristics were recorded.

Impairment of dominant hand: active Range Of Motion (ROM) was measured with goniometry; finger and wrist joint deformity were assessed using the Joint Alignment and Motion Scale (JAM) (33).

Physical functional ability: using the ACR functional classes (19) and the Health Assessment Questionnaire (HAQ) (34).

Self-perceived disease activity and typical RA symptoms such as pain and morning stiffness: using the Rheumatoid Arthritis Disease Activity Index (RADAI) (35).

Coping resources: Sense of Coherence (SOC), a 13-item self-administered questionnaire measuring the dimensions comprehensibility, manageability and meaningfulness regarded as stable person-related characteristics (36)

Statistics

Sample size calculations (37) were based on data from the D-JPBA-S validation study (25). A minimum of 22 participants per group was needed to detect a 20% difference in JP 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. To reach the same even number over the 4 centres, including a 20% drop out rate, 56 patients would be necessary.

Rasch analysis was performed on the D-JPBA-S and JP-SES data to convert the ordinal raw data to interval scaled data (25). For each questionnaire, the data of the different time points were transformed within the same frame of reference (38).

The interval scaled data obtained by this procedure, allowed for appropriate statistical procedures, i.e. unpaired t-tests for between-group comparisons, paired t-tests for within group comparisons at 3 months and linear regression analysis. Mann-Whitney U-tests and Wilcoxon signed ranks tests were applied for ordinal data to compare between-groups and within-groups, respectively.

The relationship between change of primary outcome variable and predictor variables was analyzed by linear regression analysis (analysis of absolute change). Additionally, absolute change was calculated, correcting for the initial value of the primary outcome variable.

Intention-to-treat analysis was applied; missing data of one patient were substituted with mean values of her group.

3. Results

A total of 54 participants were recruited over a period of approximately 2 years. The distribution over the hospitals was 14 (7 randomized to C-JP, 7 to PRISM-JP), 13 (6 C-JP, 7 PRISM-JP) and 26 (12 C-JP, 13 PRISM-JP). One hospital recruited only 1 patient (C-JP) within 6 months and stopped study participation when the trained OT changed job. As one patient (PRISM-JP) dropped out after randomization but before assessments, 53 patients remained available for analysis. 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 PRISM-JP patients were higher and thus the average professional work frequency, including weekly working time, was lower compared to the controls.

In both groups, the rate of patients on biologicals (anti-TNF, 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 were on a combination therapy of biologicals and DMARDs. All except one experimental patient attended all four JP sessions. This patient did not attend session 3, but filled out the questionnaires.

The primary and secondary outcome variables are presented in Table 2. Within-group analysis showed that both groups improved with respect to the use of JP methods ($p<0.001$) and pain ($p<0.001$) at session 4 (T1) and at the 3-months follow-up (T2) compared to their baseline values, except increased pain ($p \leq 0.01$) at T1 in the C-JP group.

After 4 sessions there were no differences between the treatment groups, however during the 2 months between therapy session 4 and the 3-months follow-up, the PRISM-JP group continued using JP methods, whereas the controls decreased the use of JP methods, resulting in a difference between groups at 3 months ($p=0.02$). When corrected for baseline JP behaviour (analysis of co-variance), group difference was more pronounced ($p=0.008$) (Table 3).

In the PRISM-JP group, 73% (19/26) increased D-JPBA-S scores by at least 20% (3.6 points) at T1 and 65% (17/26) did so at T2. In controls, 56% (15/27) improved 20% or more at T1 and 48% (13/27) at T2. Stepwise multiple linear regression analysis indicated that 74% of the larger improvement in the PRISM group could be explained by the (lower) baseline JP behaviour scores and the intervention (Table 3). The absolute changes in JP behaviour for $\Delta(T0 - T1)$ and $\Delta(T0 - T2)$ were 5.78 (SD 4.57) and 5.88 (SD 4.94) respectively, for the PRISM-JP group and 3.82 (SD 3.37) and 3.39 (SD 3.68) respectively, for the controls, resulting in a significantly larger absolute change in the PRISM-JP group ($p=0.04$, 95% CI -4.88 to -0.09). When taking the Smallest Detectable Difference (SDD) into account, as calculated in the D-JPBA-S validation study (25), substantially more participants of the PRISM-

JP group increased their JP behaviour scores by more than 5.5 points (>30% improvement) compared to the controls: 14 patients (56%) vs. 9 patients (33%) at T1 and 16 patients (62%) vs. 9 patients (33%) at T2.

By T2, the PRISM-JP group had significantly better Arthritis Self-Efficacy (ASES) (p=0.03) and JP self-efficacy (JP-SES) (p=0.05) scores. Within group analysis revealed that the PRISM-JP group increased ASES (p=0.006) and JP-SES (p<0.001) whereas in the controls ASES scores decreased (p = 0.018).

The PRISM-JP group had higher HADS anxiety scores at baseline, representing more patients with elevated scores of 8+ and 11+ in anxiety. There were no differences in all other outcome variables between and within the groups before and after intervention.

Sub-Analysis of PRISM-JP group

The perceived burden of disease did not decrease during the intervention and remained unchanged during the two months break, however the participants activated their selected resources constantly, resulting in a significant difference from baseline at T2 (p=0.03) (Table 4).

4. Discussion and conclusions

4.1. Discussion

This study demonstrated that individualised, resource-oriented psycho-educational JP education (PRISM-JP) supported the acquisition and maintenance of JP behaviour more successfully than C-JP. Both treatment groups increased the use of JP methods after only four OT sessions, however, more people improved in the experimental group within this time period and the data two months after the fourth session detected that their learning was more sustained, i.e. in contrast to the controls, they managed to keep JP adherence on the level achieved.

The PRISM-JP group also improved in pain and perception of self-efficacy. Perceived self-efficacy is seen by many as at least one important determinant of success arising from self-management interventions. Lorig et al. drew attention to the importance of self-efficacy as a mediator of better health outcomes in arthritis education, and as an explanation for the difficulty in directly linking education to change in health status (39).

The PRISM tasks apply a patient-centred approach and were used to identify individualised treatment goals and resources to support behaviour change. It is an interesting fact that PRISM-JP had no effect on the individual's perceived burden of disease, but on the patients' resources. This indicates that it is possible to activate individual resources without direct impact on the RA. It is reasonable to assume that it is an unrealistic aim to have a direct marked effect on ingrained perceptions of the impact of RA by means of time-limited occupational therapy, moreover when the aim is focused, as here, on JP education.

However, attaching the JP education to aspects of the individual's life, where a perceivable change is possible, may be meaningful, even indispensible.

RA is a disease that requires a bio-psychosocial approach, i.e. effective biomedical based management as well as psycho-social considerations that promote an orientation on strength and resources and not on impairment and disability (40). Focusing on resources, as the PRISM+ task did, had remarkable and powerful effects in a short time-frame. Successful resource activation may be explained by several facts. Firstly, it is a well-known fact in learning psychology, that focusing on resources and striving for attractive goals increases motivation (41), possibly by activating different neurotransmitter-systems and cerebral regions (42). Secondly, the patients were in the position of experts when talking about their resource, mainly favourite leisure activities (genealogy, motorbike riding, reading literature, grandchildren) which shifted the relationship between health professional/expert and patient/layperson to a balanced encounter between two equals. We assume that patients perceived these changes and were more open to learn JP 'from the OT expert' when having had the possibility to demonstrate own capacities and strengths.

Recruitment for this study was difficult. Besides language and travel barriers, the importance and potential of JP education may be questioned by some rheumatologists and patients, as a consequence of efficient biologic drug therapy. Importantly however, the PRISM assessment disclosed needs in many aspects of life, even in well-controlled patients. Thus there remains a need to support coping and self-management abilities.

Occupational therapy interventions, such as JP education, may well offer this to their clients provided that interventions are individually tailored (17) and a psycho-educational approach is adopted (4, 7, 8). After only a 2-day training, OTs were well prepared to provide this more powerful intervention within only four sessions, which corresponds to average time usually spent on conventional JP education in Switzerland. During the supervision sessions the OTs providing the PRISM-JP education reported that the use of PRISM enhanced patient-therapist communication and enriched the therapeutic process.

There are some limitations to this study: sample size and follow-up time do not allow conclusions about functional improvements, such as hand status. Secondly, although the D-JPBA-S assesses common everyday tasks, we do not know if patients generalised their JP behaviour. Thirdly, the participants were not restricted to either early or late RA. It is likely that, in the course of the disease, there is an ideal phase for functional improvements through JP interventions. New studies indicate that an educational-behavioural JP intervention in early RA maintains long-term functional ability (7, 8), but in our experience, patients usually are not referred to occupational therapy as long as there are no functional limitations.

4.2. Conclusions

This study demonstrated that individual JP education improved JP behaviour regardless from the teaching strategy. However, individualised, resource-activating JP education can increase behavioural and psychological benefits. In many countries JP education is provided in group settings, probably because of treating larger numbers of patients at lower costs and at the same time taking advantage of group interaction and peer-role modeling. Therefore, future studies in patient education should apply focused resource activation and assess its effects of on motivational processes and outcomes also in group settings.

4. 3. Practice implications

PRISM-JP more effectively supported learning of JP methods, with meaningful occupations, resource activation and self-efficacy acting as important mediators. PRISM improved patient-clinician communication and is feasible for occupational therapy.

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References

1. Backman C, Fairleigh A, Kuchta G. Occupational Therapy. In: St. Clair E, Pisetsky D, Haynes B, editors. Rheumatoid Arthritis. 1st ed. Philadelphia: Lippincott Williams & Wilkins; 2004. p. 431-9.
2. Heiberg T, Finset A, Uhlig T, Kvien TK. Seven year changes in health status and priorities for improvement of health in patients with rheumatoid arthritis. Ann Rheum Dis. 2005;64(2):191-5.
3. Hammell KW. Dimensions of meaning in the occupations of daily life. Can J Occup Ther. 2004;71(5):296-305.
4. Hammond A, Lincoln N, Sutcliff L. A crossover trial evaluating an educational-behavioural joint protection programme for people with rheumatoid arthritis. Patient Educ Couns. 1999;40:1044-51.
5. Hammond A, Lincoln N. The effect of a joint protection education programme for people with rheumatoid arthritis. Clin Rehabil. 1999;13:392-400.
6. Taal E, Rasker J, Wiegman O. Patient education and self-management in the rheumatic diseases: a self-efficacy approach. Arthritis Care Res. 1996;9:229-38.
7. Hammond A, Freeman K. One-year outcomes of a randomized controlled trial of an educational-behavioural joint protection programme for people with rheumatoid arthritis. Rheumatology (Oxdford). 2001;40:1044-51.
8. Hammond A, Freeman K. The long-term outcomes from a randomized controlled trial of an educational-behavioural joint protection programme for people with rheumatoid arthritis. Clin Rehabil. 2004;18:520-8.
9. Newman S. What is meant by self-management and how can its efficacy be established? Rheumatology (Oxford, England). 2001;40(1):1-4.
10. Carver C, Scheier M. Vigilant and avoidant coping in two patient samples. Attention and avoidance strategies in coping with aversiveness. Seattle WA: Hogrefe & Huber; 1993. p. 295-320.
11. Cassell E. The nature of suffering. N Engl J Med. 1982;306:639-45.
12. Buchi S, Buddeberg C, Klaghofer R, Russi E, Brandli O, Schlosser C, et al. Preliminary validation of PRISM (Pictorial Representation of Illness and Self Measure) - a brief method to assess suffering. Psychotherapy & Psychosomatics. 2002;71:333-41.
13. Buchi S, Sensky T, Sharpe L, Timberlake N. Graphic representation of illness: a novel method of measuring patients' perceptions of the impact of illness. Psychotherapy & Psychosomatics. 1998;67(4-5):222-25.
14. Kassardjian CD, Gardner-Nix J, Dupak K, Barbati J, Lam-McCullock J. Validating PRISM (Pictorial Representation of Illness and Self Measure) as a measure of suffering in chronic non-cancer pain patients. J Pain. 2008;9(12):1135-43.
15. Buchi S, Sensky T. PRISM: Pictorial Representation of Illness and Self Measure. A brief nonverbal measure of illness impact and therapeutic aid in psychosomatic medicine. Psychosomatics. 1999;40(4):314-20.
16. Hobfoll SE. Conservation of resources. A new attempt at conceptualizing stress. Am Psychol. 1989;44(3):513-24.
17. Richman W. examining the effects of post-training interventions on transfer of training [dissertation Sciences and Engineering]; 1999.
18. Arnett F, Edworthy S, Bloch D, McShane D, Fries J, Cooper N. The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. Arthritis Rheum. 1988;31:315-24.
19. Hochberg M, Chang R, Dwosh I, Lindsey S, Pincus T, Wolfe F. The American College of Rheumatology 1991 revised criteria for the classification of global functional status in rheumatoid arthritis. Arthritis Rheum. 1992;35:498-502.
20. Altman DG. Practical statistics for medical research. London: Chapman&Hall; 1991. p. 87-8.

21. Cordery J, Rocchi M. Joint Protection and Fatigue Management. Rheumatologic Rehabilitation: Assessment and Management. Bethesda: The American Occupational Therapy Association, Inc; 1998. p. 279-322.
22. Bandura A. Self-efficacy: towards a unifying theory of behaviour change. Psychol Rev. 1977;84:191-215.
23. Bandura A. Self-regulation of motivation through anticipatory and self-reactive mechanisms. Nebraska Symposium on Motivation. 1990;38:69-164.
24. Kanfer F, Gaelick L. Self-managment methods. helping people change: a textbook of methods. 3rd ed. New York: Pergamon Press; 1989.
25. Niedermann K, Forster A, Hammond A, Uebelhart D, de Bie R. Development and validation of a German version of the joint protection behavior assessment in patients with rheumatoid arthritis. Arthritis Rheum. 2007;57(2):249-55.
26. Mueller A, Hartmann M, Mueller K, Eich W. Validation of the arthritis self-efficacy short-form scale in German fibromyalgia patients. Europ J Pain. 2002;7(2):163-71.
27. Niedermann K, Forster A, Ciurea A, Hammond A, Uebelhart D, de Bie R. Development and Psychometric Properties of a Joint Protection Self-Efficacy Scale (JP-SES) using Rasch Analysis (submitted). 2008.
28. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand. 1983;67(6):361-70.
29. Pincus T, Griffith J, Pearce S, Isenberg D. Prevalence of self-reported depression in patients with rheumatoid arthritis. Br J Rheumatol. 1996;35(9):879-83.
30. Jones E, Hanly J, Mooney R, Rand L, Spurway P, Eastwood B. Strength and function in the normal and rheumatoid hand. J Rheumatol. 1991;18:1313-8.
31. Prevoo M, van 't Hof M, Kuper H, van Leeuwen M, van de Putte L, van Riel P. Modified disease activity scores that include twenty-eight-joint counts. Development and validation in a prospective longitudinal study of patients with rheumatoid arthritis. Arthritis Rheum. 1995;38:44-8.
32. Schmidt S, Mühlan H, Power M. The EUROHIS-QOL 8-item index: psychometric results of a cross-cultural field study. Eur J Public Health. 2005;16(4):420-8.
33. Spiegel T, Spiegel J, Paulus H. The joint alignment and motion scale: a simple measure of joint deformity in patients with rheumatoid arthritis. J Rheumatol. 1987;14:887-92.
34. Brühlmann P, Stucki G, Michel B. Evaluation of a German version of the physical dimension of the Health Assessment Questionnaire in patients with rheumatoid arthritis. J Rheumatol. 1994;21:1245-9.
35. Fransen J, Langenegger T, Michel B, Stucki G. Feasibility and validity of the RADAI, a self-administered rheumatoid arthritis disease activity index. J Rheumatol. 2000;39:321-27.
36. Antonovsky A. The structure and properties of the sense of coherence scale. Soc Sci Med. 1993;36(6):725-33.
37. Pocock J. Clinical Trials: A Practical Approach. Chichester: John Wiley and Sons; 1983. p. 129/30.
38. Wright BD. Rack and Stack: Time 1 vs. Time 2. . Rasch Measurement Transactions. 2003;17(1):905-6.
39. Lorig K, Chastain RL, Ung E, Shoor S, Holman HR. Development and evaluation of a scale to measure perceived self-efficacy in people with arthritis. Arthritis Rheum. 1989;32(1):37-44.
40. McSherry WC, Holm JE. Sense of coherence: its effects on psychological and physiological processes prior to, during, and after a stressful situation. J Clin Psychol. 1994;50(4):476-87.
41. Elliot AJ, Sheldon KM. Avoidance achievement motivation: a personal goals analysis. J Pers Soc Psychol 1997;73:171-85.
42. Hollerman JR, Tremblay L, Schultz W. Involvement of basal ganglia and orbitofrontal cortex in goal-directed behavior. Prog Brain Res. 2000;126:193-215.

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

	Conventional JP education (n= 27)	PRISM-based JP education (n=26)
Gender (m/f)	5, 22	4, 22
Age, years	53.44 (15.71)	62.08 (12.61)
Disease duration, years	8.30 (9.75)	10.23 (7.64)
Patients < 65 years / with work ability	22 / 14 (64%)	17 / 10 (59%)
Weekly working hours	31.5 (12.31)	22 (14.22)
Patients with former OT / years since	4 / 5.75 (5.74)	6 / 8.17 (4.62)
ACR functional class (median)	2 (2-4)	2 (2-4)
Rheumatoid nodules (%)	3 (11%)	2 (8%)
Rheumatoid factor (%)	18 (66%)	20 (77%)
ANA (%)	15 (56%)	16 (62%)
Erosions (%)	15 (56%)	18 (69%)
Biologicals (anti-TNF, Rituximab)	8 (30%)	9 (33%)
DMARDs (no. of patients and %)	22 (82%)	20 (77%)
Steroids (no. of patients)	11 (41%)	13 (50%)
NSAIDs (no. of patients)	9 (33%)	11 (42%)
Analgetics	7 (26%)	2 (8%)
ROM wrist FLEX #	56.67 (17.38)	54.42 (22.51)
ROM wrist EXT #	49.70 (20.78)	47.50 (22.46)
ROM MCP FLEX #	78.52 (8.30)	75.77 (16.95)
ROM MCP EXT #	2.60 (19.92)	5.96 (13.79)
JAM wrist #, median (IQR) #	2 (1-2)	2 (1-2)
JAM MCP #, median (IQR) #	1 (1-2)	1 (1-2)

HAQ	1.18 (0.61)	1.08 (0.69)
RADAI	3.95 (2.41)	3.23 (2.18)
SOC	4.91 (1.08)	5.31 (0.86)

Values are the mean (SD), unless stated otherwise; NA = not available

ACR = American College of Rheumatology; ANA = anti-nuclear antibodies; DMARDs = disease-modifying anti-rheumatic drugs; NSAIDs = non-steroidal anti-inflammatory drugs; ROM = Range of Motion; JAM = Joint Alignment and Motion Scale; HAQ = Health Assessment Questionnaire; RADAI = Rheumatoid Arthritis Disease Activity Index SOC = Sense of Coherence

# of dominant hand

Table 2. Assessments at baseline, session 4 and 3-months follow up (means and standard deviations (SD))

	Conventional joint protection education (C-JP)			**PRISM-based joint protection education (PRISM-JP)**			**Differences between groups (3-months follow up)**
	Baseline n=27	**At session 4 n=27**	**3-months follow up n=27**	**Baseline n=26**	**At session 4 n=26**	**3-months follow up n=26**	**P-values**
D-JPBA-S	4.37 (4.25)	8.18 (3.56)***[b)]	7.75 (3.56)***[b)]	4.12 (5.01)	9.90 (3.57)***[b)]	9.99 (3.07)***[b)]	0.022*[a)]
ASES-D	7.12 (1.59)		6.20 (6.13)*[b)]	6.51 (2.07)		7.49 (1.34)**[b)]	0.015*[a)]
JP-SES	17.71 (5.74)		19.32 (4.01)	18.02 (5.21)		21.64 (3.91)***[b)]	0.047*[a)]
HADS-A	4.33 (2.92)		4.92 (3.30)	6.92*[a)] (4.33)		6.79 (4.55)	0.09
HADS-D	4.33 (3.16)		4.24 (3.38)	5.27 (3.32)		4.81 (3.27)	0.53
Pain VAS	3.30 (2.90)	3.08 (3.01)***[b)]	3.50 (2.14)**[b)]	3.92 (3.12)	3.19 (3.09)***[b)]	3.12 (3.06)***[b]	0.76
Grip strength	15.50 (9.46)		17.93 (11.42)	14.88 (9.36)		15.68 (10.06)	0.46
EUROHIS-QOL-8 #	2.70 (0.67)		2.69 (0.70)	2.62 (0.49)		2.67 (0.53)	0.37
DAS28	3.72 (1.70)		3.29 (1.43)	3.70 (1.67)		3.30 (1.45)	0.99

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

Between-group analysis: *[a)] $p \leq 0.05$; **[a)] $p \leq 0.01$ ***[a)] $p < 0.001$

Within-group analysis: *[b)] $p \leq 0.05$; **[b)] $p \leq 0.01$ ***[b)] $p < 0.001$ (all compared to baseline)

All tests between groups are independent t-tests, except for EURO-Quol (Mann-Whitney-U test for ordinal data)

Table 3: Main factors explaining larger changes in JP behaviour for PRISM group

Variables	B	SE B	Beta	t	Sig
Constant	6.30	0.72		8.76	.000
Baseline JP behaviour	-0.67	0.09	-0.68	-7.16	.000
Intervention	2.32	0.85	0.26	2.74	.008

$R^2 = 0.74$

Table 4: PRISM measured perceived impact of illness (SIS) and impact of resource (SRS) (PRISM-JP group)

PRISM (measure)	**Session1**	**Session 2**	**Session 3**	**Session 4**	**3-months Follow up**
PRISM task (SIS)	12.60 (8.50)			11.78 (8.92)	13.60 (8.20)
PRISM+ task (SRS)		10.04 (7.19)	8.92 (5.65)	8.06 (5.14)	7.42 (3.99) p= 0.029* 95% CI = 0.29 to 5.03

SIS (“Self-Illness Separation”): an increasing SIS indicates lower impact of the illness

SRS (“Self-Resource-Separation”): a decreasing SRS indicates a more positive impact of the resource

Within group analysis (paired samples t-test) *p=≤ 0.05 (baseline (SIS) and session 2 (SRS) to 3-months follow up)

Figure 1: Application of PRISM task and PRISM+ task

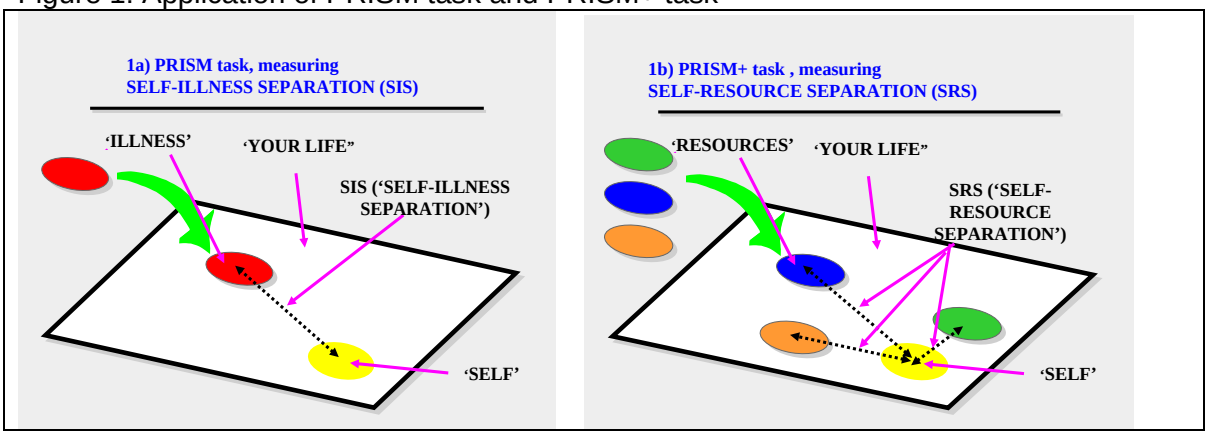

Fig. 1a) Self-Illness Separation (SIS) = measured distance between 'Self' and 'Illness' - a smaller SIS indicates a higher (negative) impact of the illness.

Fig. 1b) Self-Resource Separation (SRS) = measured distance between 'Self' and 'Resource'; a smaller SRS indicates a higher (positive) impact of the resource. In this example, the green resource (e.g. representing family/friends) is perceived as the resource with the highest positive impact, the blue resource (e.g. representing work) is perceived as the resource with the lowest positive impact.