Coping, Pain, and Disability in Osteoarthritis: A Longitudinal Study

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ABSTRACT. ***Objective.*** To establish the role of coping styles as prospective determinants of pain and disability in patients with osteoarthritis (OA) of the knee or hip.

Methods. Data from 71 patients with OA of the hip and 119 patients with OA of the knee were used. Using regression analysis, relationships were established between the use of active and passive coping styles and the level of pain and disability 36 weeks later.

Results. In patients with knee OA, the passive coping style of resting was found to predict a higher level of disability 36 weeks later after controlling for the baseline level of disability. In the same manner in patients with knee OA, the active coping style of transforming pain was found to predict higher levels of pain 36 weeks later. In patients with hip OA, no significant relationship between coping styles and pain and disability was found.

Conclusion. The role of resting as a prospective determinant of disability, as reported in patients with other chronic disorders, could also be established for knee OA, but not hip OA. Transforming pain was found to be a risk factor for pain in knee OA. (J Rheumatol 2001;28:1068–72)

Key Indexing Terms:
COPING PAIN DISABILITY OSTEOARTHRITIS

Pain and physical disability are major symptoms in osteoarthritis (OA), profoundly affecting everyday life of patients. However, the level of articular degeneration, central to the syndrome of OA, is only weakly related to the level of pain and disability experienced by patients[1-3].

One factor that may influence the level of pain and disability is the way in which patients cope with their chronic condition. Studies in patients with various chronic disorders have shown that patients who use passive coping styles such as catastrophizing, worrying, and resting report higher levels of pain and disability[3-10]. In a longitudinal study in patients with rheumatoid arthritis (RA), Evers, *et al*[11] found that frequent use of passive coping styles predicted a higher level of disability one year later. Similar findings were reported by van Lankveld, *et al*[12] in patients with RA and Vlaeyen, *et al* in patients with chronic low back pain (LBP)[13]. The relationship between passive coping styles and pain and disability may be explained through the effect of avoidance of activity on the physical condition of the patient. Patients tend to avoid activity, fearing that activity will result in more pain. However, because of their inactivity, their physical condition deteriorates, resulting in muscle weakness and instability of joints. This, in turn, will lead to more pain and disability[14]. With pain and disability increasing, the patient will avoid activity even more, thus entering a downward spiral towards increasing pain and disability.

Less attention has been given to the influence of active coping styles on the level of pain and disability. Positive associations have been reported between the active coping style of transformation of pain (diverting attention from pain) and low levels of pain and disability in patients with RA[15]. However, in general, studies have focused on the importance of the use of passive coping styles rather than the use of active coping styles.

We investigated the role of coping styles as prospective determinants of pain and disability in patients with OA of the knee or hip. It was expected that resting (passivity) would determine pain and disability: frequent use of resting as a means to cope with OA was expected to result in higher levels of pain and disability.

MATERIALS AND METHODS

Subjects. We used data from a randomized clinical trial into the effectiveness of exercise therapy in patients with OA[16]. Patients were admissible for the trial if they were diagnosed with OA of the knee or hip according to the classification criteria of the American College of Rheumatology[17,18]. There were 200 patients participating in the trial. Of those patients, 10 were diagnosed with both knee OA and hip OA. These 10 patients were excluded from the analyses presented here. Data of all 190 remaining patients were used. This included patients from both the intervention and control group of the trial. Data used in the present study were obtained at the onset of the trial (baseline) and at the end of the followup period, 36 weeks later.

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Coping styles. To assess the deployment of different coping strategies by these patients, 3 subscales of the Pain Coping Inventory (PCI) were used[19]. These 3 subscales included: (1) PCI Resting. This subscale consists of 5 items that assess the level to which patients avoid physical activity when in pain ("I cease my activities," "I avoid physical exercise"). (2) PCI Pain Transformation. This subscale comprises 4 items that focus on distracting attention from pain, such as, "I pretend the pain is not there" and "I pretend the pain is less severe." (3) PCI Lowering Demands. The 3 items of this subscale assess the extent to which patients lower the demands of their activities ("I continue with less effort," "I continue at a slower pace," and "I continue with less precision").

The PCI Resting subscale determines the level to which this specific passive coping strategy is used, whereas both the Pain Transformation and Lowering Demands subscales assess the utilization of active coping strategies[19]. On all 3 subscales, a higher score means the coping strategy associated with the subscale is utilized more when in pain. The PCI has been shown to be a reliable and valid instrument in different groups of patients with chronic pain[19].

Next to the use of different coping strategies, the presence of fear avoidance beliefs about physical activity was determined, using the Fear Avoidance Beliefs Questionnaire (FABQ)[20]. The FABQ consists of 4 statements that can be rated on a 7 point Likert scale, such as "Physical exercise increases my pain," and "I should not be doing any exercise which can increase my pain." A higher score means a more pronounced presence of fear avoidance beliefs towards physical activity. The items of the FABQ, which was originally developed for patients with back pain, were adapted for use in patients with OA of the hip or knee[21].

All data of the instruments presented above were obtained at baseline.

Pain and disability. The levels of pain and physical disability were assessed at both baseline and the end of the followup period, 36 weeks later.

Pain was measured with a visual analog scale (VAS), range 0 to 100 mm. Patients were asked to rate their overall pain in the past week.

Physical disability was measured by an observational method[22]. The level of disability was determined by watching videotaped performances on a number of standardized tasks. These tasks included walking, sitting down into a chair, reclining onto a bed, and bending to pick up a weight from the floor. Trained observers assessed the performance of the patients. They scored 5 items: 3 movement times (5 m walking time, stand-to-sit time, stand-to-recline time) and 2 qualitative measures (the level of guarding and the level of rigidity during the performance). These 5 items were standardized (z scores) and then summed to obtain an overall score for observed disability. This overall score has been shown to be internally consistent and valid[22].

Statistical analyses. The role of coping as a determinant of pain and disability in OA was assessed using both bivariate and multivariate techniques. Pearson correlation coefficients were computed between the coping measures at baseline and then pain and disability at followup.

As well, multiple regression analyses were performed, in which pain and disability at followup served as dependent variables. These regression analyses were carried out in 3 steps. First, 2 control variables were entered into the regression equation: the baseline value of the dependent variable (either pain or disability) and intervention group. Intervention group was included in the equation to control for the influence of the treatment received within the framework of the trial in which the patients had participated. The baseline value of the dependent variables was taken into account to control for possible systematic differences in the baseline levels of pain and disability between patients utilizing different coping strategies.

In the second step, clinical and demographic variables were presented to the equation in a stepwise procedure. This included the radiological status of the patients (ROA: evidence of joint space narrowing and osteophytes visible on radiographs), using the grading scales of Altman, *et al*[23], the duration of complaints as reported by the patient's general practitioner, age, sex and body mass index (BMI; body weight divided by the square of the height). For this stepwise procedure, the inclusion criterion was $p < 0.05$ (p in = 0.05) and the exclusion criterion was $p > 0.10$ (p out = 0.10).

In the third and final step, the coping measures (the 3 subscales of the PCI and the FABQ) were presented to the equation, also in a stepwise procedure. The same inclusion and exclusion criteria were used as in the previous step (p in = 0.05, p out = 0.10).

All analyses were performed with 2 subgroups comprising patients with hip OA only or with knee OA only. For some patients data were missing on one or more of the variables described above. In the analyses, these missing values were excluded by means of pairwise deletion. Data on the dependent variables (pain and disability at followup) of the regression analyses were missing for 7 patients. These patients were excluded from the regression analyses. There was no clear difference between these 7 patients and the other 183 patients with regard to the level of pain and disability at baseline or use of coping styles.

RESULTS

Patient characteristics. Table 1 features the patient characteristics and gives mean scores for pain and disability and for coping styles for both the hip OA and knee OA patients. All measurements were taken at baseline, with pain and disability also assessed at followup, 36 weeks later.

In general, hip and knee patients were rather similar. There were only 3 significant differences between the patients with hip OA and those with knee OA: on average, patients with hip OA reported less pain at baseline, patients with hip OA had a shorter duration of complaints, and patients with hip OA were less obese (significantly lower BMI).

The mean scores on the PCI were near midrange for all 3

Table 1. Patient characteristics.

	Hip OA, n = 71	Knee OA, n = 119
Sex, n (%)		
Male	21 (29.6)	19 (16.0)
Female	50 (70.4)	100 (84.0)
Age, yrs	68.1 ± 8.5	68.5 ± 8.9
Body mass index, kg/m^2	27.5 ± 4.0*	28.6 ± 3.9*
Duration of complaints, weeks	74.4 ± 124.7*	118.6 ± 200.6*
Radiological OA, n (%)		
Joint space narrowing	44 (62.0)	75 (63.0)
Osteophytes	56 (78.9)	77 (64.7)
Trial intervention group, n (%)		
Experimental	40 (49.4)	62 (48.1)
Control	41 (50.6)	67 (51.9)
Observed disability		
Baseline, t 0	0.0 ± 1.0	0.0 ± 1.0
Week 36, t 1	–0.2 ± 0.8	–0.1 ± 1.1
Pain last week, VAS in mm		
Baseline	40.0 ± 24.6*	48.5 ± 28.1*
Week 36	33.7 ± 25.5	31.9 ± 30.5
Coping styles from PCI		
Resting, range 5–20	11.4 ± 3.3	11.3 ± 3.1
Pain transformation, range 4–16	9.1 ± 2.4	9.0 ± 2.8
Lowering demands, range 3–12`	6.3 ± 2.0	6.6 ± 2.0
Fear Avoidance Beliefs Questionnaire, range 0–24	13.2 ± 6.2	14.3 ± 6.5

*Significant difference between hip OA and knee OA ($p < 0.05$).

subscales of the PCI presented here, indicating that these coping styles were on average commonly, but not excessively, used by these patients.

Correlations between coping styles and pain and disability. Pearson correlation coefficients between the 3 coping styles and fear avoidance beliefs at baseline on one hand and pain and disability at followup on the other hand are given in Table 2. Two significant relationships were identified, both in the knee OA group: resting was associated with higher levels of disability 36 weeks later, and pain transformation was associated with higher levels of pain 36 weeks later.

Coping as a determinant of pain and disability. The same 2 relationships that were found in the univariate analyses were also identified in the multiple regression analyses: in patients with knee OA, resting predicted a higher level of disability 36 weeks later, and pain transformation predicted a higher level of pain 36 weeks later (Tables 3 and 4). No other variables reached significance in the regression analyses, apart from pain and disability at baseline. These variables were entered first into the regression model to control for the baseline level of pain and disability.

For the hip OA group, no relationship between coping and pain and disability could be established. In regression analysis where pain was the dependent variable, however, the active coping style of pain transformation had a p value of 0.066, which was just outside the inclusion criterion of p = 0.05.

Table 2. Pearson correlation coefficients between coping measures (at baseline) and pain and disability (at followup).

	Hip OA		Knee OA	
	Pain	Disability	Pain	Disability
PCI				
Resting	0.02	0.24	0.22	0.42*
Pain transformation	0.21	–0.02	0.34*	0.20
Lowering demands	0.05	0.18	0.11	0.04
Fear Avoidance Beliefs Questionnaire	0.04	0.24	–0.08	0.16

Table 3. Coping styles (at baseline) as determinants of pain (at followup) in OA.

	Hip OA		Knee OA	
Variance accounted for	$r^2 = 0.039$		$r^2 = 0.249$	
Block 1: Enter method	ß	p	ß	p
Control variables				
Pain at baseline	0.132	0.281	0.352	0.000
Trial intervention group	–0.172	0.162	–0.139	0.096
Block 2: Stepwise method	ß	p	ß	p
Demographic variables				
Radiological OA	—*	—	—	—
Duration of complaints	—	—	—	—
Age	—	—	—	—
Sex	—	—	—	—
Body mass index	—	—	—	—
Block 3: Stepwise method	ß	p	ß	p
Coping styles from PCI				
Resting	—	—	—	—
Pain transformation	—	—	0.206	0.003
Lowering demands	—	—	—	—
Fear avoidance beliefs Questionnaire	—	—	—	—

*Variable did not meet the inclusion criterion in the stepwise procedure.

Table 4. Coping styles (at baseline) as determinants of disability (at followup) in OA.

	Hip OA		Knee OA	
Variance accounted for	$r^2 = 0.329$		$r^2 = 0.292$	
Block 1: Enter method	ß	p	ß	p
Control variables				
Disability at baseline	0.570	0.000	0.381	0.000
Trial intervention group	0.230	0.820	0.116	0.163
Block 2: Stepwise method	ß	p	ß	p
Demographic variables				
Radiological OA	—*	—	—	—
Duration of complaints	—	—	—	—
Age	—	—	—	—
Sex	—	—	—	—
Body mass index	—	—	—	—
Block 3: Stepwise method	ß	p	ß	p
Coping styles from PCI				
Resting	—	—	0.219	0.024
Pain transformation	—	—	—	—
Lowering demands	—	—	—	—
Fear Avoidance Beliefs Questionnaire	—	—	—	—

*Variable did not meet the inclusion criterion in the stepwise procedure.

DISCUSSION

We investigated the role of coping as a determinant of pain and disability in patients with OA of the knee or hip. Relationships were determined between the use of various coping styles at baseline and the level of pain and disability at followup, 36 weeks later. The present study is the first to test these relationships in OA patients in a longitudinal design. It was expected that the passive coping style of resting would predict pain and disability in these patients. This expectation was fulfilled by the results in knee OA. In patients with knee OA, after controlling for the radiological severity of OA and clinical and demographic variables, resting was a predictor for the level of disability (but not pain) 36 weeks later. The level of pain on followup was also found to be dependent on another coping style, pain transformation (diverting attention from pain). In patients with hip OA, no coping style could be identified that predicted future levels of pain or disability.

The finding that frequent use of resting (avoidance of activity) as a coping strategy is a risk factor for high levels of disability in patients with knee OA is consistent with studies among patients with other chronic disorders[11-13].

This relationship, previously found in patients with RA and chronic low back pain, has now also been established for patients with knee OA. The effect of avoidance of activity on physical disability can be explained by the effect it has on the physical condition of patients. Avoidance of activity is supposed to lead to muscle weakness, which means that there is less potential for muscular control of joints. This results in instability of joints, affecting their ability to carry a load. Instability thus induces physical disability.

It is well known that the level of articular degeneration of joints is not a prominent factor in explaining the level of physical disability in knee OA. This study confirms this observation. Thus other factors need to be taken into account to explain the level of disability. Our study demonstrates that the level of disability depends — to a certain extent — on resting: patients who cope with OA by avoiding physical activity (resting) frequently tend to develop a higher level of disability.

In the group with knee OA, pain transformation was identified as a risk factor for higher future levels of pain. Other studies on the association between active coping and pain, on other groups of chronic pain patients (such as RA or LBP), have mostly reported a beneficial effect of the use of active coping strategies on pain levels[15,24]. An explanation for these contradictory results may be that seeking distraction from pain in itself is beneficial, but that excessive use of this strategy is more detrimental. Excessive use of pain transformation as a coping style may mean ignoring warning signs that the patient is doing too much for the affected joint to bear, thus leading to more serious injury and pain.

Coping could not be established as a determinant of pain or disability in the hip OA group. Partly, this appears to be caused by insufficient statistical power due to the smaller size of this group (71 patients compared to 119 in the knee OA group). In the regression analysis with pain as the dependent variable using data from the hip OA patients, pain transformation did not meet the inclusion criterion by a rather small margin ($p = 0.066$, with the inclusion criterion $p = 0.05$). It is likely that with a slightly larger group (i.e., higher statistical power), the same relationship between the use of pain transformation and pain would have been found as in the patients with knee OA. However, the absence in the hip OA group of the relationship between resting at baseline and disability at followup as found in the knee OA group could not be attributed to insufficient statistical power. It has been stressed that determinants of pain and disability in OA, including psychosocial determinants, need not be the same for different types of OA, such as knee OA and hip OA[25,26]. It is notable that at baseline the patients with hip OA reported less pain than the patients with knee OA. Also, the hip OA group was on average less obese and had had OA linked complaints for a shorter period than the knee OA patients. This may indicate that the patients with hip OA were in better physical condition, on average, than the knee OA patients. Better physical condition is a protection against the theoretical pathway through which passivity leads to more disability[14].

The patients featured in this study had participated in a trial into the effectiveness of exercise therapy in OA[16]. In this trial, the patients in the experimental group received exercise therapy aimed at diminishing pain and disability during a 12 week period. Theoretically, this intervention could be a confounder, explaining the present results. However, previously it was shown that the effect of exercise therapy does not depend on coping styles used by the patients[27]. Further, in our regression analyses (Tables 3 and 4) a possible systematic influence of exercise therapy on pain and disability was controlled for by including the trial intervention group in the analyses. It is thus unlikely that the intervention patients received in the trial affected the outcome of this study.

Generally, the patients who participated were recently diagnosed with OA, with an average duration of OA linked complaints of one year. In this first year, adapting to these complaints through the use of coping styles may provoke relatively large changes in pain and disability, compared to patients with a longer history of OA. It should therefore be noted that the relationships between coping and pain and disability presented here may differ for patients who have had OA for a longer period.

An important question is whether the deployment of coping styles by patients can be therapeutically improved, i.e., is it possible to teach patients not to rely on passive coping strategies. In a longitudinal study, Keefe, *et al* showed that patients with knee OA who had taken part in coping skills training had less disability and pain than other patients, up to 6 months of followup[28,29]. Thus, it appears that intervention aimed at improving coping skills can indeed be effective; such an intervention is able to improve a patient's functional status.

We conclude that the use of specific coping styles predicts future pain and disability in patients with OA. Frequent use of resting (passivity) as a coping style was found to predict higher levels of disability 36 weeks later in patients with knee OA. Pain transformation was found to predict more pain in knee OA patients. The latter relationship is likely to exist in patients with hip OA as well.

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