



Universiteit
Leiden
The Netherlands

Mortality and other outcome measures in osteoarthritis

Liu, R.

Citation

Liu, R. (2018, December 11). *Mortality and other outcome measures in osteoarthritis*. Retrieved from <https://hdl.handle.net/1887/67392>

Version: Not Applicable (or Unknown)

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/67392>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The following handle holds various files of this Leiden University dissertation:

<http://hdl.handle.net/1887/67392>

Author: Liu, R.

Title: Mortality and other outcome measures in osteoarthritis

Issue Date: 2018-12-11

Chapter 2

Coping styles and disability in patients with hand osteoarthritis

Liu R, Damman W, Kaptein AA, Rosendaal FR, Kloppenburg M.

Rheumatology (Oxford). 2016 Mar;55(3):411-8.

ABSTRACT

OBJECTIVE

Coping responses have been shown to determine health outcomes in chronic diseases. We examined the role of joint-specific factors and coping styles on disability in patients with hand osteoarthritis (OA).

METHODS

Primary hand OA patients who consulted secondary care, underwent physical examination to assess number of joints with bony joint enlargements, pain upon palpation, soft tissue swelling, deformities and limitations in motion. Coping styles were assessed with Coping with Rheumatic Stressors (CORS). Disability (score ≥ 5) was assessed by Functional Index for Hand OA (possible score 0-30) cross-sectionally and after 1 year.

With multivariate logistic regression, joint-specific variables and coping styles were associated with disability cross-sectionally and after 1 year, adjusted for age, sex, and BMI.

RESULTS

314 patients (88% women, mean age 61.4yrs) were included in the cross-sectional analyses, 68% were considered as disabled. Longitudinal data after 1 year were available in 173 patients (71% disabled). In multivariate analysis including all joint-specific factors, only painful joints and joints with limitations in motion were associated with disability.

Disadvantageous scores for the coping scales "comforting cognitions", "decreasing activity" and "pacing" were positively associated with disability cross-sectionally. Disability after 1 year was only associated with the coping scales "decreasing activity" and "pacing". Joint-specific factors were also associated with disability, independently of coping styles.

CONCLUSION

In patients with hand OA, joint-specific factors and coping styles 'decreasing activity' and 'pacing' were both associated with disability. Our results suggest that interventions should aim at joint-specific complaints as well as changing coping styles to improve functional outcome.

INTRODUCTION

Hand osteoarthritis (OA) is a common disorder, characterized by nodes and deformities of typically the distal interphalangeal (DIP), proximal interphalangeal (PIP), and the first carpometacarpal (CMC-1) joints.^{1,2} Clinical burden of hand OA consists of pain and impaired functional ability.³ It is unclear which factors contribute to these functional limitations, but earlier studies in OA, especially in patients with knee OA, showed that not only disease specific factors but also psychosocial factors are of importance.⁴⁻⁶

According to Leventhal's common sense model (CSM), illness perceptions (cognitive and emotional) and coping responses are both determinants of health outcomes. Stimuli in the form of symptoms serve as a starting point in the CSM model, which are interpreted and elaborated upon to form representations or illness perceptions and subsequently act as a guide to coping responses, which finally leads to appraisal of outcomes.⁷ As coping can be modified, it is interesting to further elucidate this hypothesis.⁸

Studies investigating coping strategies of OA patients have been sparse⁹⁻¹³ while even fewer studies focused on hand OA in particular.^{10,14}

According to a semi-structured interview study by Hill et al, a variety of coping strategies are used by hand OA patients, particularly problem based coping, whereby patients adapt and find a different way of doing things.¹⁴ However, from this study it remains unclear how these coping mechanisms may in turn influence clinical outcome.

The Coping with Rheumatic Stressors (CORS) is a reliable and validated arthritis specific questionnaire, which measures coping strategies directed at the most prominent chronic stressors of rheumatoid arthritis: pain, limitations, and dependency.¹⁵ The questionnaire has also been used to investigate coping strategies in patients with other rheumatic diseases, such as ankylosing spondylitis, but has not been used in OA before.¹⁶

The aim of the present study was to examine the role of joint-specific factors and coping styles on disability in patients with hand OA.

METHODS

Study design

The present study is part of the Hand OSTeoArthritis in Secondary care (HOSTAS) study, an ongoing prospective follow-up study which has enrolled patients with hand OA consecutively since 2009. The HOSTAS aims to investigate determinants of outcome in patients with hand OA. Patients were included when they consulted

a rheumatologist at the outpatient clinic of the Leiden University Medical Center (LUMC) for hand complaints and when the treating rheumatologist diagnosed these hand complaints as primary hand OA. History, physical and radiographic examination were used to make the diagnosis. Patients with hand complaints due to other disease causes or secondary OA due to other rheumatic diseases were excluded. Written informed consent was obtained from all participants according to the declaration of Helsinki. The study was approved by the LUMC medical ethical committee.

In the present study, patients have been included that had filled in a coping questionnaire (henceforth referred to as 'baseline'). In the follow-up study, patients have been included of whom 1-year follow-up data were available.

Demographics and clinical characteristics

Standardized questionnaires, which are filled in every year, were used to collect demographics and clinical characteristics, which included age, sex, body mass index (BMI) and symptom duration.

At inclusion and once every two years thereafter, participants underwent standardized physical examination of their hands by a trained research nurse. The DIP joints, PIP joints, interphalangeal thumb (IP-1) joints, metacarpophalangeal (MCP) joints and CMC-1 joints were evaluated for the number of joints with bony joint enlargements (0-30), pain upon palpation (total range score 0-90, range 0-3 for each joint, higher score=more pain) and soft tissue swelling (0-30). Joints with deformities (0-22) and limitations in motion (total range 0-66, range 0-3 for each joint, higher score=more limitations) were also assessed in the DIP, PIP, IP-1, MCP-1 and CMC-1 joints.

Radiographs

At inclusion and once every two years thereafter conventional radiographs of the hands (dorso-volar) were obtained. The DIP joints, PIP joints, IP-1 joints, MCP joints and CMC-1 joints were scored by WD using the Kellgren-Lawrence grading scale 0-4 (maximum score 120). WD was blinded for clinical and demographic data. Intra-reader reproducibility was assessed on a randomly selected sample (n=31) of radiographs and was high (ICC 0.95, 95% confidence intervals (CI) 0.89-0.97).

Disability

Since January 2011, disability was assessed at inclusion and at annual follow-up visits by the Functional Index for Hand OA (FIHOA), a 10 item questionnaire with items rated in terms of difficulty on a four point Likert scale (0 = possible without difficulty and 3 = impossible).¹⁷ The scale ranges from 0 to 30. A FIHOA score of ≥ 5 was considered as disability.¹⁸

Coping

Coping was assessed with the Coping with Rheumatic Stressors (CORS), which measures eight coping strategies that are associated with pain (3 strategies), limitations (3 strategies) and dependence (2 strategies). Three scales measure strategies of coping with pain: comforting cognitions (9 items), decreasing activities (8 items) and diverting attention (8 items). Three coping scales refer to limitations: optimism (5 items), pacing (10 items) and creative solution seeking (8 items). Two scales measure dependency: making effort to accept one's dependence (6 items) and showing consideration (7 items). For each item the patients report how often they made use of that particular coping mechanism (range 1-4, higher score=more usage). Its metric properties for reliability are good (Cronbach's alfa 0.73-0.88, test-retest reliability 0.79-0.91 for all scales). Its correlation with variables such as sex, age, education and symptom duration was low.¹⁵

The assessment of the CORS occurred after January 2011 in all patients at the inclusion in the study and at biannual follow-up visits. In the current study the first CORS that was filled in was used.

For the analyses the CORS scales were divided into tertiles. The lowest tertile represented the most beneficial scores¹⁹ and was used as reference category.

Data analysis

To investigate the determinants of the disability, odds ratio (OR) with 95% confidence intervals (CI) were calculated using multivariate logistic regression as measures of relative risk, while adjusting for age, sex and BMI. In addition, multivariate analyses were performed adjusting for joint-specific variables when appropriate. In individual patients data from questionnaires, physical examination and radiographs were acquired or assessed at the same time point.

Multivariate analyses were also performed for reporting disability after 1 year, adjusting for age, sex, BMI, joint-specific variables and baseline FIHOA.

For the CORS missing data were imputed according to the user manuals. Imputation for the missing data in the FIHOA was performed if 2 or fewer items were unanswered, by replacing missing data by the mean of answered items. If more than 3 items were missing the FIHOA was considered as missing.

All analyses were done using SPSS version 20 (SPSS Inc, Chicago, IL)

RESULTS

Study population

Between May 2009 and April 2013, 354 patients were included in the HOSTAS study. 91% of the patients met the ACR criteria for hand OA. The FIHOA and

CORS were completed by 315 patients, of which one patient was excluded due to incomplete CORS data. Therefore 314 (89%) patients were included in the present study; of these 197 patients participated in the HOSTAS study from 2011 and 117 patients started participation between 2009 and 2011 (Figure 1). A standardized physical examination and radiographs of their hands were available at the time point that the questionnaire was filled in 303 and 301 patients, respectively. Longitudinal FIHOA data with 1 year follow-up were then obtained (range 0.8-1.6 years). Thirty-eight patients declined participation. The FIHOA was completed by 173 of the 211 (82%) patients eligible (follow-up after first available FIHOA was at least 1 year).

The patients' characteristics of those included in the cross-sectional study and of the subpopulation included in the longitudinal study are shown in Table 1.

Table 1. Baseline characteristics of 314 patients with clinical hand osteoarthritis (OA) consulting a Rheumatology outpatient clinic, of which 173 patients were followed prospectively

	Total population n=314	Population with follow-up n=173
Women, n (%)	275 (87.6)	149 (86.1)
Age, mean (SD), years	61.4 (8.9)	61.3 (8.6)
BMI, kg/m ²	26.4 (17.6-48.4)	26.4 (17.6-39.0)
Hand OA according to ACR criteria, no. (%)	91.1	92.5
Kellgren-Lawrence score (range 0-120)	21 (0-75)	21 (0-75)
Symptom duration, years	5.7 (0.1-58.7)	5.2 (0.1-58.7)
Time since diagnosis, years	2.0 (0.0-35.2)	2.0 (0.0-31.7)
FIHOA (range 0-30)	8 (0-24)	8 (0-24)
Patients with disability, no. (%)	212 (68)	118 (68)
CORS scales		
Pain-comforting cognitions (range 9-36)	27 (9-36)	26 (9-36)
Pain-decreasing activity (range 8-32)	17 (8-28)	17 (8-28)
Pain-diverting attention (range 8-32)	19 (8-32)	19 (8-31)
Limitations-optimism (range 5-20)	16 (7-20)	16 (7-20)
Limitations-pacing (range 10-40)	25 (10-40)	25 (10-40)
Limitations-creative solutions (range 8-32)	20 (8-32)	20 (8-32)
Dependency-accepting (range 6-24)	13 (6-24)	13 (6-24)
Dependency-consideration (range 7-28)	20 (7-28)	20 (7-28)

Median (range), unless otherwise stated

BMI= body mass index; FIHOA= Functional Index for Hand Osteoarthritis; CORS = Coping with Rheumatic Stressors; ACR=American College of Rheumatology

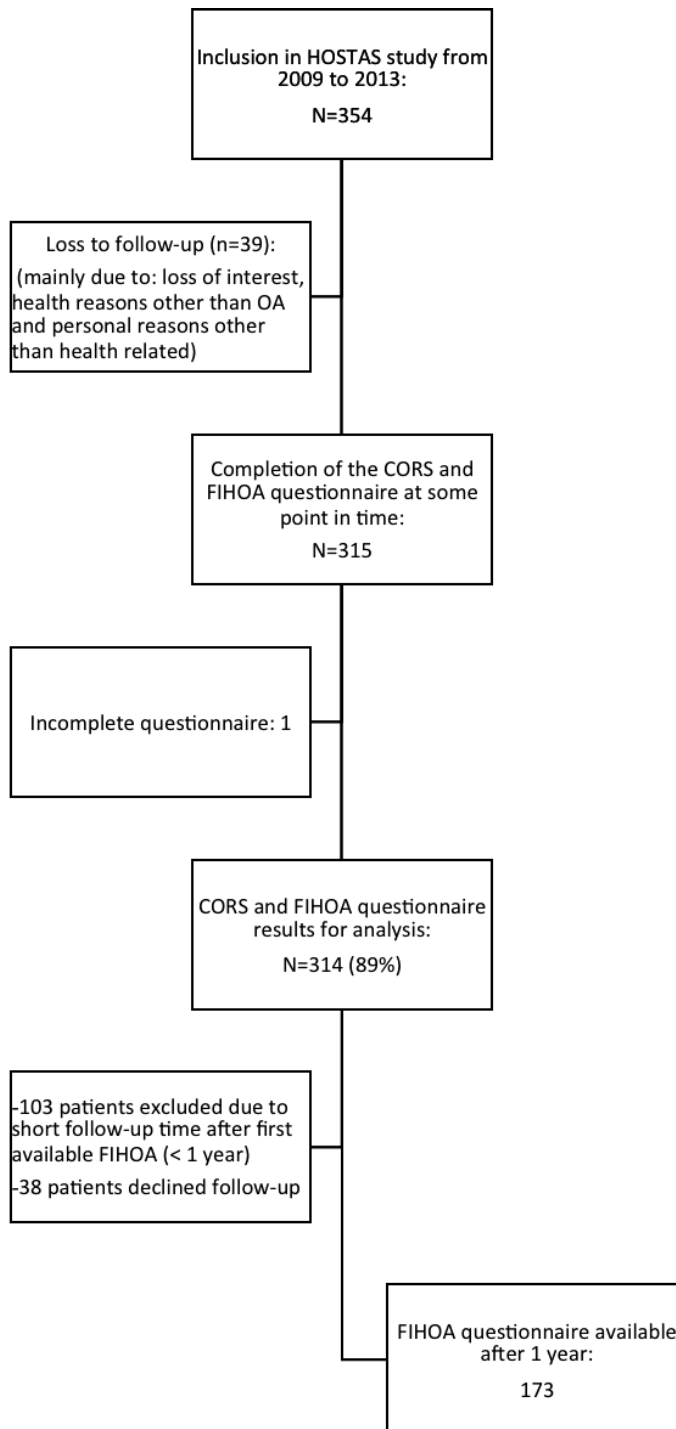


Figure 1.

The patients' characteristics of the subpopulation are similar to the characteristics of the total population.

The median FIHOA score was 8 (range 0-24) at baseline and 9 (range 0-28) at follow-up. At baseline, 68% of the patients could be considered as disabled as defined by a FIHOA score of ≥ 5 . After 1 year, 71% (122 of 173) of the patients had disability due to their hand OA.

Disease specific determinants and disability

We hypothesized that disease specific features of hand OA could play a role in disability. Multivariate analyses on cross-sectional data were used to investigate the association of these features with disability (Table 2). These analyses demonstrated that joints painful upon palpation, joints with deformity and limited in motion were independently positively associated with disability. The objective features joints with bony joint enlargement and soft tissue swelling were not associated with disability. KL score was also associated with disability, as was the elapsed time since diagnosis. In multivariate analysis including all joint-specific factors, only painful joints and joints with limitations in motion remained associated.

Table 2. Univariate and multivariate analyses for disease specific determinants of disability in hand osteoarthritis (OA) patients (n=314)

	Prevalence	Crude OR	Adjusted OR*	Adjusted OR ^a
Symptom duration	5.7 (0.1-58.7)	1.02 (0.99-1.05)	1.02 (0.99-1.05)	0.98 (0.94-1.02)
Time since diagnosis	2.0 (0.0-35.2)	1.11 (1.03-1.19)	1.11 (1.03-1.20)	1.08 (0.99-1.18)
Kellgren-Lawrence score (range 0-120)	21 (0-75)	1.02 (1.003-1.04)	1.02 (1.003-1.04)	1.00 (0.98-1.03)
Joints with bony enlargements, no. (range 0-30)	11 (0-24)	1.01 (0.96-1.05)	1.01 (0.96-1.06)	
Joints painful upon palpation, no. (range 0-90)	3 (0-53)	1.12 (1.06-1.18)	1.11 (1.05-1.18)	1.14 (1.06-1.23)
Joints with soft tissue swelling, no. (range 0-30)	0 (0-17)	1.08 (0.95-1.23)	1.09 (0.96-1.23)	
Deformed joints, no. (range 0-22)	5 (0-17)	1.09 (1.01-1.17)	1.10 (1.02-1.19)	1.00 (0.90-1.11)
Joints limited in motion, no. (range 0-22)	7 (0-48)	1.07 (1.04-1.11)	1.08 (1.04-1.11)	1.06 (1.01-1.11)

*Adjusted for sex, age, BMI

^aMultivariate analyses with sex, age, BMI, symptom duration, time since diagnosis, Kellgren-Lawrence score, painful joints upon palpation, deformed joints and joints limited in motion

BMI= body mass index

In further analyses on the association between coping strategies and disability, we adjusted for the determinants joints painful upon palpation and limited in motion. The joint-specific factors were also associated with disability, independently of coping styles.

Coping strategies and disability

Of the 'coping with pain' strategies, the strategy 'comforting cognitions' with a median of 27 (range 9-36) was the most frequently used strategy. The other pain strategies were employed less often. 'Optimism' was the most often used 'coping with limitations strategy', with a median of 16 (range 7-20). Patients used 'consideration' more as a 'coping with dependency' strategy than 'accepting' (Table 1).

Coping with pain' strategies and disability

Cross-sectional multivariate analyses investigating the association between coping styles and disability are shown in Table 3. The lowest tertiles represented the most beneficial scores.

In cross-sectional analysis, the highest tertiles for the coping with pain scales 'comforting cognitions' and 'decreasing activity' were positively associated with disability. Lower scores on the 'comforting cognitions' scale were more disadvantageous and associated with more disability. A positive dose-response association between the CORS pain coping strategy 'decreasing activity' and disability was also found (Table 3). The strategy 'diverting attention' was not associated with disability.

Longitudinal analyses showed that the strategy 'comforting cognitions' was not associated with disability, while a significant dose-response relation still existed between the coping with pain strategy 'decreasing activity' and disability after 1 year (Table 4).

'Coping with limitations' strategies and disability

The coping with limitations strategy 'optimism' was not associated with disability either cross-sectionally or longitudinally. 'Pacing' as a strategy of coping with limitations showed a dose-response relation with disability in both the cross-sectional and longitudinal analyses. Cross-sectional and longitudinal analyses showed that 'creative solutions' was also not associated with disability.

Table 3. Association between disability, defined as FIHOA ≥ 5 , and tertiles of coping strategies in hand OA patients (n=314)

CORS strategies tertiles*	No disability	Disability	Adjusted OR (95%CI)**
Pain-comforting cognitions			
>28	44	67	1.0
25-28	35	69	1.32 (0.71-2.43)
9-24	23	74	2.14 (1.08-4.22)
Pain-decreasing activity			
8-14	41	52	1.0
15-18	40	76	1.58 (0.85-2.95)
>18	21	83	2.59 (1.28-5.25)
Pain-diverting attention			
≥ 21	38	66	1.0
17-<21	32	80	1.57 (0.82-2.99)
8-16	32	64	1.38 (0.71-2.66)
Limitations-optimism			
>17	32	60	1.0
15-17	44	80	0.95 (0.51-1.79)
7-14	26	72	1.69 (0.86-3.36)
Limitations-pacing			
10-22	50	65	1.0
23-27	30	61	1.68 (0.88-3.21)
>27	22	86	3.07 (1.53-6.16)
Limitations-creative solutions			
>22	25	67	1.0
19-22	26	79	1.42 (0.70-2.88)
8-18	51	66	0.56 (0.29-1.06)
Dependency-accepting			
6-11	32	58	1.0
12-15	33	76	0.99 (0.51-1.90)
>15	33	78	1.10 (0.56-2.15)
Dependency-consideration			
>21	35	66	1.0
>18-21	24	69	1.93 (0.96-3.88)
7-18	39	76	1.16 (0.62-2.16)

#Adjusted for sex, age, body mass index, pain intensity score, joints limited in motion

*Lowest tertile represents the most helpful illness representation and serves as reference category

FIHOA= Functional Index for Hand Osteoarthritis

Table 4. Association between disability after 1 year, defined as Functional Index for Hand Osteoarthritis (FIHOA) ≥ 5 , and tertiles of coping strategies at baseline in hand OA patients (n=173)

CORS strategies tertiles*	No disability	Disability	Adjusted OR (95%CI)*
Pain-comforting cognitions			
>28	17	42	1.0
25-28	18	43	0.57 (0.19-1.76)
9-24	16	36	0.39 (0.11-1.34)
Pain-decreasing activity			
8-14	21	31	1.0
15-18	21	40	1.19 (0.40-3.56)
>18	9	50	5.68 (1.52-21.19)
Pain-diverting attention			
≥ 21	17	44	1.0
17-<21	15	45	0.77 (0.24-2.42)
8-16	19	32	0.47 (0.15-1.44)
Limitations-optimism			
>17	18	40	1.0
15-17	18	42	0.85 (0.28-2.57)
7-14	15	40	0.60 (0.19-1.92)
Limitations-pacing			
10-22	28	35	1.0
23-27	12	37	4.40 (1.32-14.65)
>27	11	50	5.00 (1.45-17.30)
Limitations-creative solutions			
>22	9	44	1.0
19-22	18	38	0.25 (0.07-0.90)
8-18	24	40	0.43 (0.13-1.37)
Dependency-accepting			
6-11	15	32	1.0
12-15	18	51	0.91 (0.29-2.85)
>15	16	38	0.64 (0.19-2.11)
Dependency-consideration			
>21	14	45	1.0
>18-21	12	35	0.52 (0.14-1.88)
7-18	22	41	0.34 (0.11-1.08)

*Adjusted sex, age, BMI, pain palpation, limited in motion, FIHOA baseline

*Lowest tertile represents the most beneficial illness representation and serves as reference category
FIHOA= Functional Index for Hand Osteoarthritis

'Coping with dependence' strategies and disability

The coping with dependency was measured using two scales: making effort to accept one's dependence and showing consideration. No association was seen between these coping strategies and disability in either cross-sectional or longitudinal analyses.

DISCUSSION

In the present study we investigated the association between coping strategies and disability in patients with hand OA using validated questionnaires and longitudinal data. We found that patients who cope with pain by employing the strategy 'comforting cognitions' less often, experienced more disability. More employment of the strategy 'decreasing activity' led to more disability. Patients who cope with the limitations due to their hand OA by 'pacing' also experience more disability. Disability after 1 year was only associated with the coping scales 'decreasing activity' and 'pacing', and provided further proof for a causal relationship between these factors and disability; these associations were independent from joint-specific factors. The joint-specific factors painful joints and joints with limitations in motion were also associated with disability, independently of coping styles.

'Comforting cognitions' was associated with disability in our cross-sectional data, but no longer associated after a year. This suggests that 'comforting cognitions' does not cause patients to experience disability. It is rather more likely that disability causes the use of this strategy.

'Decreasing activity' as a way of coping with pain and 'pacing' as a way of coping with limitations were both associated with disability, both in cross-sectional and longitudinal data, suggesting a causal relationship. We considered these coping scales to be passive coping scales. The results are in line with our expectations. Limitation of activity may result in deterioration of muscular strength and endurance.²⁰ It is thus likely that patients using 'limiting activity' as a way of coping with pain are at more risk of developing disability independent of disease status.

Though studies investigating coping strategies in hand OA have been rare, studies have been conducted in diseases such as rheumatoid arthritis (RA). Previous studies with RA patients reported that 'decreasing activity' was associated with psychological distress, a negative disease impact and decrease in dexterity, which is in line with our results.^{21,22}

However, in RA 'pacing' was not related to changes in dexterity, while we did find an association between 'pacing' and disability in our study. It is possible that differences in underlying disease mechanisms of RA and OA may explain this difference in results. Also in a study which investigated coping in knee and hip OA, the coping scores were different when comparing to patients with RA and other chronic painful conditions.⁹

In contrast to our findings, another cross-sectional study did not find an association between coping with pain strategies and disability in hand OA patients.¹⁰ In the study by Stukstette et al, the Pain Coping Inventory (PCI) questionnaire was used, which measured a patient's strategies for dealing with pain. Though the PCI is able to investigate an association between coping with pain strategies and daily activities, it does not measure a patient's strategies for dealing with limitations or dependency and our results could not be compared to theirs for these dimensions of coping. In their study, an univariate association was found between coping with pain strategies and limitations in daily activities, but no longer in the multivariate model which also included OA disease specific factors such as pain and joint stiffness. Whether these coping with pain strategies were also not associated with limitations in daily activities over time is unknown, due to a lack of longitudinal data. Aside from these differences in the measuring instrument, our findings may differ due to differences in patient inclusion criteria and subsequent differences in patient characteristics.

In Stukstette's study patients were only included if they scored at least 9 on the Australian Canadian Osteoarthritis Hand Index (AUSCAN) (range 0-36) and fulfilled the ACR hand OA criteria, while the HOSTAS included all patients who sought care in the LUMC. This suggest that though coping with pain strategies may independently be associated with joint-specific factors, though differences may still exist in the coping styles of more severely OA affected individuals versus the less severely affected patients.

Though studies in hand OA may be sparse, there have been studies investigating coping strategies and disability in OA located elsewhere. A study investigating the relationship between coping with pain strategies and functional impairment in knee and hip OA found a good correlation for passive pain coping dimensions and function, with more impaired patients using more passive coping.⁹ In another study investigating the use of various coping styles at baseline and pain and disability at follow-up in knee and hip OA patients, the passive coping style of 'resting' predicted a higher level of disability, supporting our own findings that passive coping strategies were associated with more disability.²³

If passive coping strategies are associated with more disability, one would hypothesize that active coping strategies are associated with less disability. However, as we have seen previously in a clinical study, active coping strategies are not associated with less disability.²⁴ It is therefore not surprising that we were also unable to find an association between active coping strategies such as creative solutions with less disability in our study. We suspect that the employment of creative solutions may be a result rather than a cause of disability. However, more research will be necessary to confirm this hypothesis.

Our study results also have their limitations. The HOSTAS study is an observational study which included both patients with recent diagnosis of OA and those who were diagnosed many years ago with also a wide variation in symptom duration. As patients did not all enter at the time when OA symptoms first began or when the diagnosis was made, we hypothesized that this may influence our results. Fortunately, our analyses showed that the duration of symptoms is not a determinant of disability. While the association between the elapsed time since diagnosis and disability may show a trend in multivariate analyses, its influence seemed to be very limited.

We have observed both a dose response relationship and a temporal relationship in longitudinal analyses, for the association between the coping strategies 'decreasing activity' and 'pacing' and disability. Causality is always difficult to investigate in an epidemiological study, but since these associations fulfill Hill's criteria for causality, it is likely that a causal relationship between these passive coping mechanisms and disability exists.²⁵ Therefore these negative coping skills could serve as a target for therapy.

In previous research it has been demonstrated that education on OA can improve clinical outcomes.^{26,27} Evidence for the efficacy of psychological interventions such as pain coping strategies skills training in OA patients is also growing.^{8,28,29}

By better understanding which coping strategies may influence physical limitations, psychological interventions such as psychoeducation and cognitive restructuring can be employed to improve clinical outcome by addressing coping strategies.^{8,28,29}

Since coping mechanisms are considered to be influenced by illness perceptions, as suggested by the CSM, further research to elucidate their relationship is warranted.

REFERENCES

- 1 Zhang Y, Niu J, Kelly-Hayes M, Chaisson CE, Aliabadi P, Felson DT. Prevalence of symptomatic hand osteoarthritis and its impact on functional status among the elderly: The Framingham Study. *Am J Epidemiol* 2002;156:1021-7.
- 2 Dahaghin S, Bierma-Zeinstra SM, Ginai AZ, Pols HA, Hazes JM, Koes BW. Prevalence and pattern of radiographic hand osteoarthritis and association with pain and disability (the Rotterdam study). *Ann Rheum Dis* 2005;64:682-7.
- 3 Kloppenburg M and Kwok WY. Hand osteoarthritis--a heterogeneous disorder. *Nat Rev Rheumatol* 2012;8:22-31.
- 4 Luger T, Cotter KA, Sherman AM. It's all in how you view it: pessimism, social relations, and life satisfaction in older adults with osteoarthritis. *Aging Ment Health* 2009;13:635-47.
- 5 Smith BW and Zautra AJ. The effects of anxiety and depression on weekly pain in women with arthritis. *Pain* 2008;138:354-61.
- 6 Marks R. Comorbid depression and anxiety impact hip osteoarthritis disability. *Disabil Health J* 2009;2:27-35.
- 7 Leventhal H, Diefenbach M, Leventhal E. Illness cognition: using common sense to understand treatment adherence and affect cognition interactions. *Cognit Ther Res* 1992;16:143-63.
- 8 Broderick JE, Keefe FJ, Bruckenthal P, Junghaenel DU, Schneider S, Schwartz JE et al. Nurse practitioners can effectively deliver pain coping skills training to osteoarthritis patients with chronic pain: A randomized, controlled trial. *Pain* 2014;
- 9 Perrot S, Poiraudeau S, Kabir M, Bertin P, Sichere P, Serrie A et al. Active or passive pain coping strategies in hip and knee osteoarthritis? Results of a national survey of 4,719 patients in a primary care setting. *Arthritis Rheum* 2008;59:1555-62.
- 10 Stukstette MJ. Understanding and treating hand osteoarthritis: a challenge. 2013;
- 11 Murphy SL, Kratz AL, Williams DA, Geisser ME. The Association between Symptoms, Pain Coping Strategies, and Physical Activity Among People with Symptomatic Knee and Hip Osteoarthritis. *Front Psychol* 2012;3:326.
- 12 Riddle DL and Jensen MP. Construct and criterion-based validity of brief pain coping scales in persons with chronic knee osteoarthritis pain. *Pain Med* 2013;14:265-75.
- 13 Benyon K, Hill S, Zadurian N, Mallen C. Coping strategies and self-efficacy as predictors of outcome in osteoarthritis: a systematic review. *Musculoskeletal Care* 2010;8:224-36.
- 14 Hill S, Dziedzic KS, Ong BN. The functional and psychological impact of hand osteoarthritis. *Chronic Illn* 2010;6:101-10.
- 15 Lankveld Wv, Naring G, Staak Cvd, Pad Bosch Pv', Putte Lvd. De ontwikkeling van de CORS: Coping met reuma stressoren. *Gedrag Gezondheid* 1993;21:40-8.
- 16 Boonen A, Van Der Heijde D, Landewe R, Chorus A, Van LW, Miedema H et al. Is avoidant coping independent of disease status and stable over time in patients with ankylosing spondylitis? *Ann Rheum Dis* 2004;63:1264-8.
- 17 Wittoek R, Cruyssen BV, Maheu E, Verbruggen G. Cross-cultural adaptation of the Dutch version of the Functional Index for Hand Osteoarthritis (FIHOA) and a study on its construct validity. *Osteoarthritis Cartilage* 2009;17:607-12.

- 18 Maheu E, Altman RD, Bloch DA, Doherty M, Hochberg M, Mannoni A et al. Design and conduct of clinical trials in patients with osteoarthritis of the hand: recommendations from a task force of the Osteoarthritis Research Society International. *Osteoarthritis Cartilage* 2006;14:303-22.
- 19 Van LW, van't Pad BP, van de Putte L, Naring G, van der Staak C. Disease-specific stressors in rheumatoid arthritis: coping and well-being. *Br J Rheumatol* 1994;33:1067-73.
- 20 Kottke FJ. The effects of limitation of activity upon the human body. *JAMA* 1966;196:825-30.
- 21 Van LW, Naring G, van't Pad BP, van de Putte L. The negative effect of decreasing the level of activity in coping with pain in rheumatoid arthritis: an increase in psychological distress and disease impact. *J Behav Med* 2000;23:377-91.
- 22 Van LW, Naring G, van 't Pad BP, van de Putte L. Behavioral coping and physical functioning: the effect of adjusting the level of activity on observed dexterity. *J Rheumatol* 1999;26:1058-64.
- 23 Steultjens MP, Dekker J, Bijlsma JW. Coping, pain, and disability in osteoarthritis: a longitudinal study. *J Rheumatol* 2001;28:1068-72.
- 24 Alschuler KN, Molton IR, Jensen MP, Riddle DL. Prognostic value of coping strategies in a community-based sample of persons with chronic symptomatic knee osteoarthritis. *Pain* 2013;
- 25 HILL AB. THE ENVIRONMENT AND DISEASE: ASSOCIATION OR CAUSATION? *Proc R Soc Med* 1965;58:295-300.
- 26 Hopman-Rock M and Westhoff MH. The effects of a health educational and exercise program for older adults with osteoarthritis for the hip or knee. *J Rheumatol* 2000;27:1947-54.
- 27 Kwok WY, Kloppenburg M, Beart-van de Voorde LJ, Huizinga TW, Vliet Vlieland TP. Role of rheumatology clinical nurse specialists in optimizing management of hand osteoarthritis during daily practice in secondary care: an observational study. *J Multidiscip Healthc* 2011;4:403-11.
- 28 Keefe FJ, Blumenthal J, Baucom D, Affleck G, Waugh R, Caldwell DS et al. Effects of spouse-assisted coping skills training and exercise training in patients with osteoarthritic knee pain: a randomized controlled study. *Pain* 2004;110:539-49.
- 29 Hunt MA, Keefe FJ, Bryant C, Metcalf BR, Ahamed Y, Nicholas MK et al. A physiotherapist-delivered, combined exercise and pain coping skills training intervention for individuals with knee osteoarthritis: a pilot study. *Knee* 2013;20:106-12.

