Coping with Pain in the Hip or Knee in Relation to Physical Disability in Community-Living Elderly People

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Objective. *To investigate the use of pain coping strategies by community-living older people with pain in the hip or knee and the mediating role of coping with pain in the relationship between the chronicity of pain and physical disability.*

Methods. *A group of 157 people with pain "in the last month" was identified. Coping with pain was assessed with the Pain Coping Inventory, physical disability with the Sickness Impact Profile, and household and sport activities with a validated structured interview method.*

Results. *People with chronic pain used relatively more "resting," and "reducing demands" as pain coping strategies. Pain chronicity made a significant contribution to physical disability; however, when corrected for other variables in a regression model, no significant partial correlation was found.*

Conclusion. *We conclude that pain coping has a mediating role in the relationship between pain chronicity and physical disability. Less use of "resting" and a physically active lifestyle are independently associated with less physical disability.*

Key words. *Coping; Pain; Disability; Osteoarthritis; Aged.*

INTRODUCTION

Pain in the hip or knee is a common problem in elderly people (1–3). Osteoarthritis (OA), a problem of many elderly people, is often associated with joint pain and locomotor disability (4–7). Thus, pain and disability can be regarded as stressors (8) with which these people have to cope. Coping can be defined as "the cognitive and behavioral efforts made to master, tolerate, or reduce external and internal demands and conflicts among them" (9). Downe-Wamboldt (10,11) has described the illness-related stressors and emotions experienced by elderly women with OA and the coping strategies they used. Palliative cognitive coping strategies (such as "accept the situation" and "resign self because it's fate") were used most frequently. Burke and Flaherty (12) reported that self-control (for example, "maintained my pride and kept a stiff upper lip" and "I tried to keep my feelings to myself") was the cognitive coping strategy used the most by elderly women with arthritis.

Coping with pain has recently been shown to be as important as cognitive coping with psychosocial consequences (such as a disability) of a chronic illness such as OA (13–18). Jensen et al (19) argue, in

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their review of the literature about coping with pain, that actual pain coping behavior, such as taking medications, taking a shower, resting in bed, etc., should be given more attention than cognitive coping alone. Jensen et al (20) examined the relationships between 8 behavioral pain coping strategies (aerobic exercise, stretching exercise, rest, medication, keeping busy with something interesting, muscle strength exercise, ignoring the pain, and relaxation exercise) and the level of disability (as measured by the Sickness Impact Profile [SIP]) in a group of patients with chronic pain. They found that resting was the only behavioral pain coping strategy that was positively associated with disability. Kraaimaat and Huiskes (13) investigated, in patients with rheumatoid arthritis (RA), the relationships between pain coping strategies and, as outcome variables, mobility and physical disability. They also found a significant contribution of the behavioral pain coping strategy "reducing physical effort" (comparable with "resting") to the outcome variables. They suggested that long-term use of this strategy may result in decreased mobility and physical ability.

Hopman-Rock et al (21) found that a physically active lifestyle in general, which included walking, cycling, and doing exercises, was a mediator in the relationship between the chronicity of arthritis pain and the occurrence of physical disability in a population of community-living subjects ages 55 to 75 years with pain in the hip or knee. Baron and Kenny (22) have defined a mediating variable as follows: "A given variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion." A mediator has to meet the following criteria: 1) variations in levels of the independent variable significantly account for variations in the presumed mediator, 2) variations in the mediator significantly account for variations in the dependent variable, and 3) when the mediator is controlled for, there is no longer a significant relationship between the dependent and independent variables (22). Relevant determinants of the outcome of a coping process that should be controlled for include: background variables (age, marital status, education) and illness-related variables such as pain severity (23).

The purpose of the present study was to investigate: 1) how community-living elderly people (aged 55 to 75 years) with pain in the hip or knee of varying chronicity cope with their current pain; and 2) the possible mediating role of coping with pain in the relationship between the chronicity of pain and physical disability.

SUBJECTS AND METHODS

This study was carried out as part of a large epidemiologic study among the general population ages 55 years and over of the district Ommoord in Rotterdam, The Netherlands, known as the Rotterdam Study (24). The aim of the Rotterdam Study is to investigate determinants of disease occurrence and progression in people older than 55 years (total n = 10,275; response 7,983 = 78%). In 1991 a substudy (on an age- and sex-representative sample: the first 2,895 respondents) was carried out on locomotor disability, joint pain, and radiologic OA (7). All subjects were asked the following two questions during an interview at home (response 83%) and during a medical examination at the research center (response 95%) several weeks later. "Did you have any pain or other complaints about your joints in the last month?" (answer possibilities "yes" or "no"), and "can you point out the painful joints?" In this substudy 2,895 subjects were included, 2,178 of whom were aged 55 to 74 years. Up to January 1993 radiographs of the hips and knees of 2,000 respondents had been classified according to the criteria of Kellgren and Lawrence (25).

In February 1993, a subsample (n = 831) from the last mentioned study was formed, and these respondents received a short questionnaire with questions about pain in their hips and knees in the last week and the last month. Inclusion criteria for this subsample were the availability of a radiograph of the hips and knees, age between 55 and 74 years, and participation in the interview at home and the medical examination in 1991. (Radiographs of the hips and knees were taken for every respondent who visited the medical research center. The scoring was done independently of the scoring for the presence of pain.) Criteria for exclusion were participation in one of the two other substudies of the Rotterdam Study (unrelated to musculoskeletal symptoms), the presence of cognitive impairments, and living in a home for elderly persons.

On the basis of scores for "self-reported pain in the hip or knee during the last month" at 3 different time points (twice in 1991 and once in February 1993), we classified the respondents (n = 691, response 83%) into groups with *chronic* pain (pain on 3 occasions, n = 72), *episodic* pain (pain on 2 occasions, n = 86), *sporadic* pain (pain on 1 occasion, n = 118), and no pain (n = 415). All the subjects with pain on at least 1 out of the 3 occasions (total n = 276) were asked to participate in the study. In the spring and summer of 1993 all respondents (n = 234, response 85%) received a written questionnaire and were interviewed

Table 1. Flow-scheme of the filtering process for the study population

Population 55+ Ommoord, Rotterdam	10,275
	↓
	7,983 (78% response) 1991–1993
	↓
Rotterdam Study 1991 (asked for self-reported pain in the hip or knee 2 times)*	2,895
	↓
January 1993	2,000 radiographs classified
	↓
February 1993 (asked for self-reported pain in the hip or knee)	831 (according to inclusion criteria), response n = 691†
	↓
Without any pain since 1991	415
With at least pain on one occasion	276
	↓
Response present study	234
	↓
With reported pain in February 1993	192
	↓
Who completed the Pain Coping Inventory	157

*Age- and sex-representative subsample: the first 2,895 respondents.
† See Subjects and Methods section.

2 weeks later. Further details of the sampling procedure are described elsewhere (26). In addition, a questionnaire about coping with pain was completed by a subgroup of 157 respondents with current pain. Current pain was defined as "pain in the last month." This questionnaire was only sent to respondents who reported experiencing pain in February 1993 (total n = 192; see Table 1). In Table 1 the filtering process for the study population is given.

Physical disability. Disability was assessed with a Dutch version of the SIP (27). This measure consists of 136 statements, each of which was judged by the respondents for its relevance to his or her situation (as related to health). All statements are classified in 12 different areas of daily living activities, varying from Walking to Communication, and have a weighted score. Scores (0–100%) are available for a physical dimension and a psychosocial dimension. Physical disability is defined as the sum score of Personal Care, Mobility, and Walking. A total SIP score was not determined because the area Work was omitted in the analyses (few respondents had a job). The reliability and validity of the SIP for use in a Dutch population is good: Cronbach's alpha of the SIP in Dutch research is > 0.90 (28).

Illness-related variables. The IRGL (Invloed van Reuma op Gezondheid en Leefwijze [Impact of Rheumatic Diseases on General Health and Lifestyle]) was developed in 1990 (29) as an instrument for measuring the impact of rheumatic diseases, especially in the Dutch population, and is partly based on the Arthritis Impact Measurement Scales (30). The several subscales show high reliability (Cronbach's alpha > 0.85). There are significant correlations between clinical and laboratory findings and physical status, as measured by the IRGL, indicating that this instrument has a good validity for use in patients with RA (29). Pain severity in the last month can be described by the respondent in 5 categories varying from "almost no pain" (= 1) to "very severe pain" (= 5). The respondents completed the full IRGL; however, in the analyses reported here, only "pain severity" was used as a variable. The body mass index (BMI; weight/[height]^2) is a measure for overweight and obesity, which is a known risk factor for OA of the knee. BMI was assessed for all respondents in the Rotterdam Study in 1991. According to well-known standard norms, acceptable ratios are in the 20–25 interval, with a ratio of 26–29 being considered to reflect overweight and a ratio higher than 30 being considered to reflect obesity.

Standardized weight-bearing anteroposterior pelvic radiographs and knee films were made with the patellae in central position. There was no indication of sex or age on the radiographs. The classification of radiographs of the hips and knees was based on the standard Kellgren criteria (0 = no signs, 1 = doubtful, 2 = mild, 3 = moderate, 4 = severe). Grade 2 or higher was regarded as radiologic OA. The radiographs were scored independently by two trained medical doctors who were blinded to all data of the respondents. After each set of 150 radiographs, the

scores of the two assessors were evaluated. Whenever the Kellgren score differed by more than 1, or was 0 or 1 for one assessor and 2 or more for the other, the two readers met to assess the radiograph together to reach consensus. The final score for the film was either the consensus score or the highest score of the two readers.

Fatigue in the last month was assessed with a 15-cm visual analog scale, and scores are presented as percentages. Some of the subjects also presented with other problems that affected mobility, most of which were other rheumatic symptoms (such as pain in the back and shoulders). This situation was defined as "comorbid mobility problems." Because this variable is a potential confounder in research on physical disability, we had to correct for this.

Physically active lifestyle. The interview included questions about physical activity. These questions were developed for use in an elderly population and have proven validity and reliability (31). Test–retest reliability was 0.89, the Spearman correlation with a 24-hour activity recall was 0.78 and with pedometer measurements 0.73. The questions cover 3 areas, namely, household activities, sport activities, and leisure-time activities (such as sewing and reading). In the present study, household activities and sport activities were regarded as relevant lifestyle variables, because the reported leisure-time activities included few physical activities. The sport activity scores were calculated by using a formula with weights for intensity, hours per week, and months per year. Quartiles were used to classify the sport activity scores of the elderly respondents in a regression model, as recommended by Voorrips et al (31).

Coping with pain. The Pain Coping Inventory (Inventarisatie Pijngedrag; IPG) was developed by Kraaimaat and van Schevikhoven (32) for use in patients with chronic pain. Respondents were asked to read the following instruction: "The questions in this list are about pain in the hip or knee and how you deal with it. Could you please indicate how often you show the described behavior and what influence it has?" and to answer the questions. Each item consists of two parts: a question about the frequency of use (4 categories from "seldom or never" to "very often") of the described strategy and its influence (4 categories from "no influence" to "very much influence"). An example of a described behavior is: "I take a rest by sitting down or lying down." Seven subscales about the *frequency* of the described behaviors were found for patients with RA: worrying about pain (12 items, maximum score 48), distraction by pleasant activities (7 items, maximum score 28), resting (6 items, maximum score 24), comforting/pain transformation (7 items, maximum score 28), withdrawal (4 items, maximum score 16), reducing demands (3 items, maximum score 12), and applying nonallopathic treatment (4 items, maximum score 16). In the present study, all items except the subscale "worrying" were used (this subscale was omitted because we regarded "worrying" as an appraisal rather than as a behavioral pain coping strategy). The reliability of the subscales from the IPG in our study was satisfactory (Cronbach's alpha: resting 0.75, comforting 0.73, distraction 0.73, applying nonallopathic treatment 0.69, reducing demands 0.69, withdrawal 0.64). The answers to the questions about the *influence* of a strategy were only used to gain extra information about the frequency a strategy was used. At the end of the questionnaire we added questions about the frequency and influence of alternative therapies and the person's own strategies to reduce pain; however, these items were not included in the subscales.

Statistical methods. Differences in numerical variables between groups with sporadic, episodic, and chronic pain were analyzed with analyses of variance and Duncan's multiple range test (33). Differences in nominal or ordinal variables were analyzed with chi-square tests. To test the hypothesis that pain coping acts as a mediating factor, a stepwise multiple regression analysis was carried out with all independent variables (background variables, pain chronicity, illness-related variables, lifestyle variables, and coping with pain) entered in blocks. In the first block, sex, age in years, education (3 ordinal categories), and marital status (2 categories) were introduced. In the second block, pain chronicity (ordinal scale from 1 to 3) was added (only controlled for background variables). In the third block, fatigue intensity (continuous), BMI (continuous), radiologic OA (3 ordinal categories; see Table 2), the existence of comorbid mobility problems (2 categories), and pain severity (5 ordinal categories) were included. Now, pain chronicity was both controlled for background variables and illness-related variables. To avoid too many independent variables (a rule of thumb is that the number of independent variables should not exceed 10% of the sample [34]), we introduced in block 4 and block 5 only those independent variables that had potential mediating characteristics (minimally a relationship with both pain chronicity and physical disability). The dependent variable, physical disability, was

Table 2. Stepwise regression of background variables, illness-related variables, lifestyle variables, and pain coping variables on physical disability (Sickness Impact Profile score [SIP]) of community-living subjects with current pain in the hip or knee (aged 55–74 years, n = 141)*

Independent variables	Correlation with dependent (physical disability)	Partial correlation with physical disability (SIP) after the last step	R^2 change
Background			
Sex	0.07	0.08	
Age in years	0.13	0.11	
Education	0.05	0.00	
Marital status	0.06	0.04	0.03
Pain chronicity	0.25†	0.07	0.08†
Illness-related			
Fatigue intensity	0.31†	0.13‡	
Body mass index	0.21†	0.08	
Radiologic osteoarthritis	0.28†	0.04	
Comorbid mobility problems	0.29†	0.08	
Pain severity	0.36†	0.09	0.20†
Lifestyle			
Sport	0.29†	−0.18†	0.04†
Coping with pain			
Resting	0.57†	0.32†	
Reducing demands	0.26†	−0.10	0.10†
Total R^2 (adjusted explained variance)			0.45 (0.40)†

* Sex 1 = male, 2 = female; marital status 1 = together, 2 = alone; radiologic osteoarthritis 1 = Kellgren score hip or knee < 2, 2 = Kellgren score 2, 3 = Kellgren score > 2; comorbid mobility problems 1 = no, 2 = yes. Sport activities in quarters. Correlation with dependent is the Pearson correlation. The partial correlation is the result of the total regression analysis.
† $P = < 0.01$.
‡ $P < 0.05$.

continuous. Partial correlations after the last step (introduction of the block with the two coping variables) and the change in the percentage of explained variance after each step (introduction of a block) are reported as outcomes of the regression analysis. Partial correlations give the relative importance of the independent variables when the linear effects of other independent variables have been eliminated after the last step in the model. The total explained variance of physical disability is R^2 (the adjusted R^2 is also given). Correlations were Pearson's correlations as given in the regression output files. Data analysis was performed with SPSSX (33).

RESULTS

Characteristics of groups. Table 3 presents the characteristics (background and illness-related variables) of the groups with sporadic, episodic, and chronic pain in the hip or knee. No differences between the 3 groups were found with regard to age, sex, marital status (predominantly married or living together), and education (mostly secondary). The group with chronic pain had relatively more comorbid mobility problems and more severe pain than the other groups.

Lifestyle, coping with pain, and physical disability in subjects with pain. The highest level of sport activities (predominantly recreational walking, biking, swimming, and doing physical exercises) was found in the group with chronic pain (Table 4). No differences in household activities were found between the 3 groups. The subjects with chronic pain used the pain coping strategies of resting and reducing demands significantly more often than the other subjects did. The coping strategies used the most frequently by all subjects (these are strategies with the highest ratio of mean subscale score:maximum score) were comforting (for example: "I think that the pain will decrease") and distraction (for example: "I start to do something that I like"). The least frequently used strategies were applying nonallopathic treatment and withdrawal.

For some items, more than one-half of the users reported that the described behavior had "a lot of influence." These items were: distraction by taking a

Table 3. Background and illness-related variables in community-living subjects aged 55–74 years with different chronicity of pain in the hip or knee (all with current pain); total n = 157*

	Sporadic pain	Episodic pain	Chronic pain
Number	53	55	49
Age in years, mean (SD)	65.1 (6.0)	66.1 (5.2)	63.9 (5.5)
Sex, % women	57	64	75
Marital status, % living together (married)	71	73	64
Education			
% primary	23	20	16
% secondary	62	67	75
% college/university	15	13	8
Body mass index, mean (SD)	26.2 (3.4)	27.2 (4.3)	27.3 (3.4)
% with comorbid mobility problems	55	71	78
Fatigue, mean (SD)	35.5 (22.9)	41.2 (21.4)	40.1 (19.4)
% severe pain in last month	4	14	22
% Kellgren score in the hip ≥ 2	6	20	26
% Kellgren score in the knee ≥ 2	26	29	41
Physical disability, mean (SD)	1.9 (3.0)	4.4 (6.5)	5.6 (6.0)

* Significant differences ($P < 0.05$) between the pain groups were found for comorbid mobility problems ($\chi^2 = 10.7$, degrees of freedom [df] = 4, $P = 0.03$), severe pain in last month ($\chi^2 = 16.1$, df = 8, $P = 0.04$), and physical disability ($F = 6.2$, $P < 0.01$).

bath or a shower (used by 77% of the subjects), distraction by reading, etc. (used by 72%), distraction by physical exercise or movement (used by 64%), alternative methods to reduce strain (used by 12%), and applying one's own strategy (used by 48%). The additional personal methods reported more than once included massage (mentioned 4 times), taking a painkiller (mentioned 9 times), certain physical exercises (mentioned 11 times), and yoga (mentioned 2 times). Additional alternative methods used to reduce pain that were mentioned more than once were: homeopathic medicine (mentioned 11 times), and chien-pu-wan (a specific homeopathic medicine, mentioned 3 times).

The highest level of physical disability was found in subjects with chronic pain (see Table 4). The most frequently reported problems in this group were walking slower, standing for short periods of time only, and inability to walk up or down hills.

Relationships between pain, coping with pain, lifestyle, and physical disability. Multiple regression analysis was used to examine the nature of the relationships between the independent variables (background variables, the chronicity of the pain and other illness-related variables, lifestyle variables, and coping with pain) and the outcome variable physical disability (Table 2). Because of missing val-

Table 4. Physically active lifestyle, pain coping (subscales), and physical disability in community-living subjects aged 55–74 years with pain in the hip or knee (and current pain, n = 157)

	Sporadic pain	Episodic pain	Chronic pain	Test statistic
Lifestyle				
Sport, mean (SD)*	4.3 (4.8)	3.4 (4.7)	6.1 (6.6)†	$F = 3.4$, $P = 0.04$
Household, mean (SD)*	1.7 (0.56)	1.7 (0.50)	1.7 (0.49)	$F = 0.14$, $P = 0.87$
Coping with pain, mean (SD) of subscales				
Resting (maximum 24)‡	10.1 (3.1)	10.7 (3.1)	11.6 (3.1)†	$F = 3.4$, $P = 0.03$
Comforting (maximum 28)	17.1 (5.3)	15.0 (4.3)	16.3 (4.1)	$F = 2.9$, $P = 0.06$
Distraction (maximum 28)	14.6 (4.1)	13.7 (4.0)	15.6 (4.6)	$F = 2.4$, $P = 0.09$
Applying nonallopathic treatment (maximum 16)	6.6 (2.6)	7.0 (3.1)	7.0 (2.2)	$F = 0.42$, $P = 0.66$
Withdrawal (maximum 16)	5.4 (1.9)	5.1 (1.6)	5.8 (2.3)	$F = 1.9$, $P = 0.16$
Reducing demands (maximum 12)	5.2 (1.7)	5.5 (1.8)	6.3 (1.9)§	$F = 9.0$, $P < 0.01$

* Raw scores.
† Different from sporadic group by Duncan's Multiple Range Test.
‡ The maximum scale score is the highest possible score (= more frequent use) for this particular pain coping subscale.
§ Different from episodic group and sporadic group by Duncan's Multiple Range Test.

ues, the group was reduced to n = 141. To reduce the number of independent variables, we used lifestyle variables and pain coping strategies that were significantly associated with pain chronicity as well as with physical disability (these are requirements of a mediator). Sport activities were significantly related to pain chronicity ($P = 0.04$, see Table 4) and to physical disability (Pearson correlation −0.29, see Table 2). Household activities were not associated with pain chronicity ($P = 0.87$, see Table 4). Resting was significantly related to pain chronicity ($P = 0.03$, see Table 4) and to physical disability (Pearson correlation 0.57, see Table 2). Comforting ($P = 0.06$), distraction ($P = 0.09$), applying nonallopathic treatment ($P = 0.66$), and withdrawal ($P = 0.16$) were not related to pain chronicity (see Table 4). Reducing demands was significantly related to pain chronicity ($P < 0.01$, see Table 4) and was correlated with physical disability (Pearson correlation 0.26, see Table 2). Thus, as potential mediators we added sport activities, resting, and reducing demands.

Table 2 gives the Pearson correlations for the independent variables and physical disability (dependent variable) before the regression analysis. The correlation between pain chronicity and physical disability was 0.25. Most of the other independent variables were also significantly associated with physical disability. After the first step (introduction of the background variables), no significant increase in the percentage of explained variance in physical disability was found ($R^2 = 0.03$). After the variable pain chronicity was added (in the model now corrected for background variables, but not yet for other illness-related variables), there was a significant increase in the percentage of explained variance (0.08). Addition of the illness-related variables further increased the explained variance by 0.20. The lifestyle variable sport activities also explained another significant 4% of the variance. Finally, coping variables were added to the equation, explaining an extra 10% of the variance. This full model explained 45% (adjusted R^2 40%) of the variance in physical disability. The column with partial correlations shows which variables—after the last step—still were significantly correlated with physical disability after correction for the influence of the other variables. After the introduction of illness-related, lifestyle, and coping variables to the model with background variables and pain chronicity, the chronicity of pain was no longer related to physical disability (partial correlation 0.07, see Table 2). Important independent predictors of physical disability that were responsible for the reduction of the variance in physical disability attributable to pain chronicity were doing relatively fewer sport activities and resting.

To detect the influence of the order of introduction of the possible mediating variables, we also checked what happened when the lifestyle variables were added after the block with coping variables was introduced. In this case coping variables explained 11% of the variance in physical disability (with resting as the predictor that contributed significantly). Addition of sport activities in the last block explained an extra 3% of the variance. If pain chronicity was introduced as the last block in the model, the change in R^2 was 0.006 (not significant), which indicates the validity of our findings (if the mediators are controlled for, no significant relationship should be seen between pain chronicity and physical disability, as given by the criteria of Baron and Kenny [22]). We inspected the total correlation matrix for high correlations (> 0.70) that could be the cause of possible multicollinearity. No such high correlations were found. The highest correlation was between resting and physical disability (0.57). The correlation between the severity of pain and sport activity, which could be expected to be a large negative one, was in fact low (−0.14, not significantly different from zero).

We also investigated the possible interaction between a physically active lifestyle and resting as a pain coping strategy. We thought that alternation of physical activity and resting (a strategy that is frequently recommended by doctors for patients with arthritis pain) would be associated with less physical disability. Therefore we added an interaction term (sport activity × resting) to the model, after the illness-related variables. This interaction variable varied from 0 to 68 (mean 25.3, SD 14.1) but did not make a significant contribution to the explained variance (partial correlation = −0.08, R^2 change = 0.006).

DISCUSSION

Distraction (taking a bath or shower, reading, or exercising) was the coping strategy most frequently used by people with current pain in the hip or knee and was also considered by these people to be the strategy with the most influence. The comforting strategy was also widely used, but was not considered very influential. Almost one-half of the subjects reported using their own strategies to cope with pain; taking painkillers and doing specific physical exercises were the most popular. People with chronic symptoms used resting and reducing de-

mands more frequently as pain coping strategies than people with less chronic pain did.

To investigate the mediating role of coping with pain, several relationships were compared to Baron and Kenny's criteria for mediation (22). Pain chronicity was positively related to physical disability, and both were associated with the pain coping strategies resting and reducing demands, and with sport activities. After correction for other variables in the prediction model, resting was still significantly associated with physical disability, while the relationship between pain chronicity and physical disability was no longer significant. These results support the notion that coping with pain (especially resting) is a mediator in the relationship between chronicity of pain and physical disability. Of the illness-related variables, such as BMI, radiologic OA, and pain severity, fatigue intensity was independently associated with physical disability. Almost one-half of the variance in physical disability in the study population could be explained by the factors studied.

No support was found for the hypothesis that the interaction between a physically active lifestyle and use of the pain coping strategy resting can predict physical disability. The absolute value of the partial correlation and the change in R^2 due to the addition of the interaction term was very low. Because the magnitude of the separate partial correlations of sport activities and resting with physical disability in the regression model was reasonable and significant, we conclude that the results concerning the absence of an interaction effect was not due to a lack of power. Both a physically active lifestyle and less resting were independently associated with less physical disability. It is noteworthy that neither resting nor sport activity can be regarded as a confounding variable, because confounding presupposes that the variable cannot be regarded as an intermediate step in the causal path between exposure (pain chronicity) and outcome (physical disability) (35). It is remarkable that the group with chronic pain also had the highest level of sport activities; however, these exercises or sports may have been prescribed by a doctor, which would partly explain this finding.

The problem with OA, as it normally occurs in elderly people, is that pain is intermittent. We handled this problem by using the information from the baseline measurements of the first 2,895 respondents of the Rotterdam Study in 1991 (self-reported pain in the hip or knee on two separate occasions) and by adding information about pain from a short questionnaire especially designed to select our study population administered in February 1993. In this way we created a new variable, "pain chronicity." This approach enabled us to study arthritis pain in the "normal" population and not just in patients. In fact, in the summer of 1993 pain could also be present or not. As can be seen from Table 3, more respondents with chronic pain had severe pain in the last month than did the respondents in the other groups. This supports our decision to devise 3 different groups in regard to pain. The results of the regression model showed that pain severity (if controlled for the influence of the other variables in the model) played a minor role in the prediction of physical disability.

Several limitations of the study should be mentioned. First, the available study sample for final analyses was rather small, which can be regarded as a threat to generalizability. Second, this was a cross-sectional study: almost all variables were measured only once. However, subjects with chronic pain probably had a longer history of using certain pain coping strategies, because they probably experienced pain on more occasions than did the other subjects. We cannot say anything about the direction of the relationships between the variables, but we assume that pain appears before physical disability occurs. This is the most plausible pathway and is consistent with the models of disability processes presented by the World Health Organization (36), Verbrugge (37), and Verbrugge and Jette (38). Longitudinal research will be necessary to investigate the nature and direction of these relationships. If the sample is large enough, it will be possible to use path analysis or structural equation models to evaluate the moderating role of pain coping strategies.

It is worthwhile noting that the subjects with chronic pain symptoms were not older than the subjects in the other pain groups and had slightly more radiologic evidence of OA. The role of fatigue in the etiology of physical disability remains unclear. It is possible that more fatigue is related to inflammatory processes that are periodically present in many patients with arthritis and that cause more severe pain and higher levels of physical disability. We used a visual analog scale to assess fatigue, but little is known about the validity of such a scale for this purpose. More research is needed to clarify the role of fatigue in predicting physical disability and the reliability and validity of its assessment.

Our study supports the earlier findings of Kraaimaat and Huiskes (13) in RA patients, because we also found that resting as a pain coping strategy was related to physical disability. Jensen et al (19) also found an association between the use of the coping strategy resting by 114 patients with chronic pain and the prevalence of disability measured with the SIP. It is remark-

able that we found the same phenonema in a community sample in which there is a much greater variation in the chronicity of pain than is seen in a relatively homogeneous group of patients.

To explain the relationship between exercise and physical disability, Dekker et al (39) suggested that muscle weakness had a mediating role, leading to destabilization of the joints. It was not possible to verify this hypothesis in our study, because we did not measure muscle weakness. We can only speculate that elderly people with pain have two (almost) independent ways to avoid muscle weakness and thereby physical disability: adopting a physically active lifestyle in general and making relatively little use of resting as a pain coping strategy.

It is known that elderly subjects with OA are inclined to use activity as a management method on a typical day and resting on worse days (40). This may be the reason why more chronic pain was associated with more physical disability as well as with more sport activity. Our results support the idea that a physically active lifestyle and relatively little use of the pain coping strategy resting both play a mediating role in the relationship between pain and physical disability.

We conclude from this and other studies that although the use of the pain coping strategy resting may be adequate to reduce pain severity in the short term, in the long term this strategy seems to promote physical disability. This conclusion is based on the finding that the pain coping strategy resting was used more often by people with chronic pain and had a positive correlation with physical disability. If our results are confirmed in longitudinal research, it will be important to pay attention to these aspects in educational programs and advice given by health professionals about coping with arthritis pain.

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