LIVING WITH ARTHRITIC PAIN IN THE HIP OR KNEE

Disability, health status, physical activity, coping with pain, quality of life, and health care utilization of community-living elderly people

M. Hopman-Rock

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Disability, health status, physical activity, coping with pain, quality of life, and health care utilization of community-living elderly people

(met een samenvatting in het Nederlands)

Proefschrift

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Beproeft alle dingen en behoudt het goede
(1 Thess. V:21)

Aan mijn ouders
Aan Piet, Mark en Janneke

CONTENTS

GENERAL INTRODUCTION

Background and aim of the study

1.1 Introduction

Osteoarthritis (OA) is a chronic disabling disorder that affects many older people. Because of the rapid increase in the percentage of people older than 55 years in Western countries, OA is a growing public health problem. The actual extent of the problem has recently been documented in a report[1] about the future health status of the Dutch population. In 1990, OA was the disorder with the highest prevalence in the Netherlands. OA of the hip or knee is the most frequently found form, especially in women. OA of the knee -as documented by radiographs- is present in 15% of women aged 50 and in 60% of women aged 70; the prevalence of OA in men increases from 10% at 50 years to 30% at 70 years[2]. The prevalence of OA of the hip varies from 5 to 30% in women and from 5 to 10% in men[2]. OA is the most common locomotor disorder encountered in general practice in the Netherlands. Most patients are 60 or older; and pain and disability are common complaints. Most patients are told by their general practitioners (GPs) that they are suffering from 'wear-and-tear' of their joints, an evil that they will have to learn to live with. How people actually live with the consequences of OA of the hip or* knee is the principal theme of the studies described in this dissertation.

In this first chapter the theoretical background and aim of the study will be delineated, and the research questions including the themes of the following chapters are introduced.

1.2 Osteoarthritis: an incremental chronic disease**?

There is no consensus on a definition of OA. Hough and Sokoloff[3] prefer the following definition: "Osteoarthritis is an inherently non-inflammatory disorder of movable joints characterized by deterioration and abrasion of articular cartilage, as well by formation of new bone at the joint surfaces". The term *osteoarthritis* is frequently used in English-speaking countries, because symptomatic OA is often associated with secondary inflammation. The terms *degenerative joint disease* and *osteoarthrosis* are more related to the anatomical changes seen on radiographs. In the present study, we conformed to current usage and used the term 'osteoarthritis'.

Fries and Crapo[4] claim in their book on 'compression of morbidity' that there will be a

*we used hip *or* knee to indicate that people can have pain in the hip, knee, or in both joints.

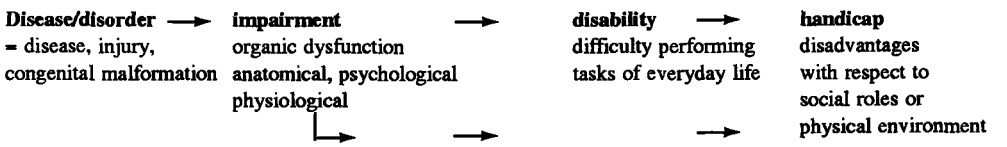
**the terms 'disease' and 'disorder' are interchangeable.

rapid increase in chronic universal diseases in developed countries, due to the ageing of the population. These authors stated that osteoarthritis, atherosclerosis, cancer, diabetes, emphysema, and cirrhosis together cause 80% of all deaths and over 90% of all disability. These disorders tend to be incremental and universal, with a clinical threshold and are characterized by a progressive loss of organ reserve. Fries and Crapo suggest that changing behaviourial and lifestyle factors when people are relatively young can offer an opportunity to delay the development of a chronic disabling condition and loss of quality of life later on. These ideas were used to design the present study. We focused our attention on the behaviourial and lifestyle factors that may change outcome factors, such as disability and quality of life, of people with OA in a positive direction.
Table 1.1 shows the theoretical increments of (symptomatic) OA with age, according to Fries and Crapo.

Table 1.1 The increments of osteoarthritis (Fries and Crapo, 1981)

Age	Stage	Osteoarthritis (OA)
20	start	abnormal cartilage staining
30	discernible	slight joint space narrowing
40	subclinical	bone spurs
50	threshold	mild articular pain
60	severe	moderate articular pain
70	end	disabled

OA is a non-fatal condition, but once it crosses a symptomatic threshold it may become bothersome and *disabling* over a long period or even for the rest of life. *Disability* in this context refers to the consequences that health problems have for an individual's activities. Disability is defined by the World Health Organization (WHO) as: "in the context of health experience, disability is any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being". Figure 1.1 presents a conceptual scheme used by the WHO[5].



Note: 'in the context of health experience...
impairment= any loss or abnormality of psychological, physiological or anatomical structure or function';
disability= any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being'
handicap= a disadvantage for a given individual, resulting from an impairment or disability, that limits or prevents the fulfilment of a role (depending on age, sex and social and cultural factors) for that individual'.

Figure 1.1 Conceptual scheme for disability (WHO, 1980).

In our research we had to take in account that although OA may be one of the causes of disability, other causes can have an aggravating role, increasing the likelihood of disability, for example, the presence of *additional mobility restricting conditions* (diseases as well as impairments) such as OA in other joints, other musculoskeletal diseases, heart disease, pulmonary disease, and obesity[6].
Quality of life can be regarded as an outcome variable that extends beyond the concepts of disability and handicap, and represents well-being, happiness, and contentment in general[7]. This view is congruent with the concept of 'global' quality of life as defined by Szalai[8]: "Quality of life is the subjective evaluation of the good or satisfactory character of life as a whole". Quality of life in this sense is not confused with impairments (such as depression and anxiety), disability (such as walking and dressing problems), and handicap (such as mobility and independence problems), as it is in the concept and many measurements of 'health-related' quality of life[9].

The natural history of OA is not always an inevitable progression of pain and disability, as suggested by Fries and Crapo. Little or no correlation exists between joint symptoms and the extent or degree of abnormalities seen on radiographs. Only about 30% to 45% of people with radiological evidence of OA, such as narrowing of the joint space, develop related symptoms[10,11,12]. Patients with OA may even not show radiological progression over the years[13]. Osteoarthritic pain comes and goes. These features make it difficult to investigate the consequences, such as disability, in a population-based study. In the next section these problems are discussed in more detail.

1.3 A population-based study on OA

The study of OA in the general population is quite different from the study of OA in

patients who have found their way to the GP or the medical specialist. First of all, there is the problem of diagnosis. When is a patient diagnosed as having OA and what is the significance of this diagnosis? Kellgren and Lawrence laid the foundation for the epidemiology of OA, and the most widely used epidemiological criteria for radiological OA (ROA) are those that they proposed[14]. Their grading system for ROA is given in table 1.2. In most epidemiological studies, ROA is defined as grade 2 or higher changes.

Table 1.2 Grading scheme for radiological osteoarthritis (Kellgren and Lawrence, 1963)

Grade	Criteria
0	Normal
1	Doubtful narrowing of joint space, possible osteophytes
2	Definite osteophytes, absent or questionable narrowing of joint space
3	Moderate osteophytes, definite narrowing, some sclerosis, possible deformity
4	Large osteophytes, marked narrowing, severe sclerosis, definite deformity

The more severe ROA is in the hip or knee, the more likely the patients experience symptoms, which are often disabling[15]. In 1986 the Subcommittee on Classification Criteria of Osteoarthritis of the American College of Rheumatology (ACR) developed classification criteria for OA of the knee[16], in order to make the differential diagnosis from rheumatoid arthritis (RA) more standardized. Schouten[17] performed a 12-year follow-up study of OA in the knee in the general population and paid specific attention to the classification criteria. He concluded that there are probably no perfect criteria and that sensitivity and specificity are different in the general population and in a clinical population. He recommends that the clinical ACR criteria should not be used in epidemiological research in the general population of older people, because almost all subjects with knee pain will be classified as having OA.

In our population-based study, we decided to regard pain complaints as the most important feature of OA. We reasoned that people are not concerned about their radiographs but they are concerned about their pain symptoms. We used a special sampling procedure to detect the frequency with which people experienced pain symptoms (in 3 categories, see chapter 2). In this way, we introduced the chronicity of pain as a variable to classify the increments of OA in the population. Kellgren scores were only used for description. Moreover, we identified a group of older people without pain symptoms and without radiographic changes that could be regarded as a reference group of 'healthy' people.

1.4 The role of behaviourial and lifestyle factors

Till now, most studies on the consequences of OA and the relationship with behaviourial and lifestyle factors were carried out on patient populations. A review of the studies on OA, psychological variables, pain, and disability is given by Dekker et al.[18].

Coping

Among the reviewed studies is the study of Keefe[19] about coping with arthritic pain by patients with OA of the knee. Some pain coping strategies were found to be negatively associated with 'physical' disability. Bury[20] defines coping 'strategies' and coping 'styles': a coping strategy is what people say they actually *do* to handle their pain and problems rather than the attitude they develop, coping style refers to the *way* people respond and the attitude they develop. Summers et al.[21] also studied coping with OA (OA defined as radiographic ratings of disease severity) of the hip or knee. They operationalized one of the coping styles as: "the degree of learned resourcefulness", which they regarded as a psychological variable. Outcome measures in this last mentioned research were pain and "functional impairment" (in fact disability according to the WHO definition). Summers et al. concluded that psychological processes deserve greater attention as potential mediators between disease severity and clinical outcome. In their review of research into coping with arthritis, Manne and Zautra[22] commented on the problems of conceptualizing and measuring coping in this area. They distinguished two foci of empirical investigations of coping with arthritis: stress and coping paradigms (represented by the theories of Lazarus and Folkman[23]), and pain management strategies (see next sections).

A well-known definition of coping with stressors is that given by Folkman and Lazarus[24]: "coping is the cognitive and behavioral efforts made to master, tolerate, or reduce external and internal demands and conflicts among them". This view of coping refers to coping with all kind of "stressors", varying from life events such as job loss and divorce, to health problems such as cancer and cardiovascular disease. The cognitive appraisal of these stressors is supposed to lead to an individual coping process. According to Lazarus and Folkman[23], coping is a transactional process to be studied in an individual at different times and under different circumstances. In practice, however, most coping lists based on their paradigms treat coping as a trait instead of a process.

Moos and Schaeffer[25] developed a specific theory concerning coping with physical illness as a stress factor. They described a set of adaptive illness-related and general tasks people have to deal with when they have a physical illness. One of the illness-related tasks of interest with respect to OA is "dealing with pain and other symptoms and physical disability". In fact, pain and disability can be regarded as threats that start the cognitive

appraisal that lead to a coping process. Determinants of the outcome of a coping process are, according to Moos and Schaefer, *background and personal factors*, for example age, marital status, education; *illness-related factors*, for example radiological OA, body mass index, pain severity; and *physical and social environmental factors*, for example stairs in the house and social support.

Studies on pain management strategies usually focus on 'active' and passive' coping. Active coping involves efforts to function in spite of pain or to chose distraction strategies (such as reading or playing sport). Passive coping refers to dependence on others for pain control, wishful thinking, and activity restriction[22]. Other studies on coping with pain focus on cognitive strategies to cope with pain such as re-interpretation of pain sensations, praying, and catastrophing.

In the studies described in this dissertation we used Folkman and Lazarus's[24] definition of coping, as far as coping with stressors in general was investigated. The second approach that we used concerned 'coping with pain' and was operationalized as the use of certain pain management strategies.

Lifestyle

According to Fries and Crapo[4], lifestyle changes are required for postponement of chronic diseases. The most important reversible lifestyle factors they mention are alcohol abuse, cigarette smoking, diet, and exercise. In the Framingham study, Felson et al.[26] found that loss of weight reduces the risk of symptomatic knee OA in women. Also, Hochberg et al.[27] reported that in the Baltimore longitudinal study of ageing, body weight was a risk factor associated with ROA of the knee. In their review of research in the area of OA and habitual physical activity, Panush and Inzinna[28] concluded that selected physical activities such as walking and swimming are beneficial for patients with OA and that recreational exercise need not inevitably lead to accelerated joint injury. Dekker et al.[29] concluded in their review on exercise therapy in patients with OA that "beneficial effects of exercising can be specifically expected in patients with reduced range of joint motion, reduced muscle strength, or reduced aerobic fitness". These results suggested that physical activity and diet (c.q. weight loss) are relevant lifestyle aspects in OA.

1.5 Conceptual models used in the present study

The studies described in this dissertation focused on an individual's ability to handle the chronic disorder OA of the hip or knee, a disorder in which pain and disability are the

cardinal symptoms[18]. Two specific conceptual models were used: one concerning coping with pain (pain management strategies), and one concerning coping with stressors in general, including pain and disability***.
Figure 1.2 shows the conceptual model that we choose to use for coping with pain.

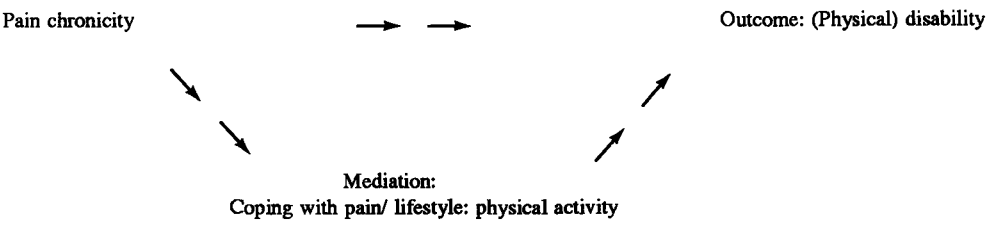


Figure 1.2 Theoretical model for coping with pain used in the present study

We assumed that older people who suffer from more chronic arthritic pain, often have more disability as a consequence. We hypothesized that effective pain coping strategies and a physically active lifestyle can mediate the relationship between pain chronicity and 'physical' disability. Mediation refers to the place a factor has in the causal pathway between an independent variable (pain chronicity) and a dependent variable ('physical disability'). If mediation is present, the association between pain and disability will be significantly lower if controlled for mediating variables[31]. Also, moderation can be present if the disability interacts significantly with the predictor (pain) and the potential moderator (coping).
The question whether coping is a relatively stable trait or a constantly changing process is a difficult one. Lazarus and Folkman[24] regarded coping as a process. However, people undoubtedly develop habits for coping with stressors (such as pain or disability). Most available coping lists in the Dutch language regard coping as a trait[32,33]. Also, distinction is made between coping with stressors in general (as in the Utrecht Coping List[32]) and coping with pain as in the Pain Coping Inventory[34]. For our model of coping with (current) pain, we chose for pain coping as operationalized in the Pain Coping Inventory. As a relevant lifestyle variable we chose habitual physical activity. The body mass index (weight/(height)^2), as an index of dietary lifestyle, was used as a relevant illness-related variable which could be controlled for.

Figure 1.3 shows our conceptual model for coping with stressors in general, including pain

***An extended report of the analyses of data of this study including physical and social environmental factors and diet as a lifestyle factor can be found in a separate report[30].

and disability which are frequently occurring problems in an older population. More frequent pain and the occurrence of disability are regarded as predictors of quality of life, and pain and disability are regarded as stressors which older people have to cope with. The dependent variable is quality of life. In the same way as in the model of figure 1.2, coping is hypothesized as a mediating factor.

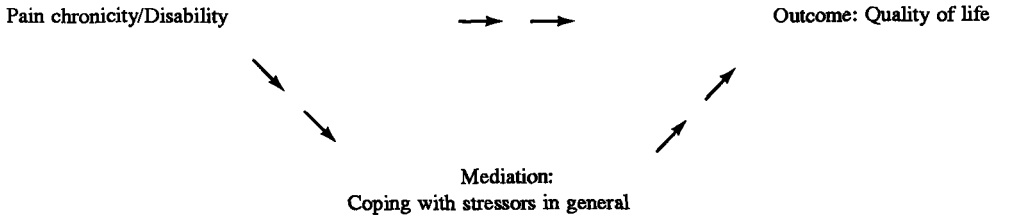


Figure 1.3 Theoretical model for coping with stressors in general used in the present study

Coping with stressors in general -including pain and disability- was operationalized with the Utrecht Coping List (see also chapter 2). The advantage of this model is that people without current pain or any pain could also complete the coping questionnaire.

1.6 Treatment of OA and health care utilization

GPs in Dutch health centres are not used to questioning a patient thoroughly about arthritic pain and its consequences, or discussing coping strategies[35]. The most common policy of GPs (in 83% of the patients) is to prescribe non-steroidal anti-inflammatory drugs (NSAIDs)[36]. However, the use of NSAIDs is associated with side effects such as gastrointestinal problems (of a sample of 327 patients, 36% reported such problems at their primary care visit in Indianapolis USA[37]). Treatment can consist of medication, physiotherapy and occupational therapy, health education and psychological interventions, and -in an end stage- surgery[38]. Paracetamol, aspirin, and anti-inflammatory drugs are prescribed for pain relief and suppression of secondary inflammation. In addition, physical measures are useful to prevent and correct muscle weakness or loss of joint motion. Patients are advised to avoid excessive loading of affected joints. Rest periods (up to 60 minutes during the day) are thought to help reduce pain. As obesity contributes to undesirable loading of knees and hips, a weight reduction diet is often prescribed. Heat (hot and cold) treatments and a tailored exercise programme can also be helpful. For some patients with lower extremity involvement an ambulatory aid (cane, crutches, walker) is desirable. Swimming and cycling are recommended for OA of the knee and hip. The patient should

avoid stairs and use a high chair. Knee cages or elastic supports may increase stability. Patients with a mild form of OA need reassurance that the disorder is not likely to become generalized or crippling. Surgery may be indicated in advanced cases of OA, and total replacement of damaged joints (especially hips and knees) is a common procedure. Orthopaedic surgery, often involving osteotomy or arthroplasty (a new joint), is extremely helpful nowadays for patients with advanced OA with serious pain and loss of mobility.

Not much is known about the pattern of health care utilization of older people with arthritic pain. In the Netherlands, general practice patients with repeated complaints of pain in the hip or knee, irrespective of their origin, are referred to an orthopaedic surgeon (28%) or rheumatologist (1%)[39].

In the context of the question how people live with OA, we considered it relevant to know how many people with pain actually attended their GP or a medical specialist. Furthermore, we wanted to know the characteristics of these people: have they more severe pain or disability or can an association be found with other illness-related or background variables? We were also interested in the difference in pain and disability between our community-living group of older people with pain symptoms and patients of the GP or medical specialist. This last group is the most often studied group in other research on OA.
We adapted the filter model of Goldberg and Huxley[40] to structure our research in this area. This model has been used in the field of mental illness to investigate the pathway to care of people with chronic mental disorders. The adapted model describes GP consultation by people with pain symptoms (the first filter), the detection of people with OA by a GP (the second filter), and referral to a specialist (the third filter). For validation of the results, a sub-group of general practice patients was compared with a reference group of patients from another study[41].

1.7 Aim and research questions

The aim of the studies described in this dissertation is to gain insight into the health status, quality of life, and coping behaviour of independent community-living people aged 55 to 74 years with pain in the knee or hip. Besides the hip and knee, OA can affect other joints, such as the cervical and lumbar spine, distal interphalangeal joints of the hands, etc. We chose to study the hip or knee, because problems in these joints often affect the mobility and physical activity of older people. We restricted our study to people younger than 75 years, because we anticipated a poorer response rate and more comorbidity in people older than 75. We also thought that relatively younger people would be more likely to change

their lifestyle and coping behaviour, if necessary.

Research questions are:

1- What are the problems (in terms of disability) in the daily functioning of people**** with pain in the knee or hip? How serious are these problems and what is the relationship with demographic and illness-related variables? This in relation to the problems of 'healthy' older people.

2- What is the specific health status of people with pain in the hip or knee only, compared to that of people with additional mobility-restricting conditions?

3- In which specific habitual physical activities do people with pain in the hip or knee participate? Can a physically active lifestyle mediate in the relationship between pain and disability?

4- What pain coping strategies are used by people with pain in the hip or knee? Can coping with pain mediate the relationship between pain and disability?

5- How does the quality of life of people with pain in the knee or hip compare with that of 'healthy' people? What is the relationship between pain in the hip or knee, the occurrence of disability, coping with stressors in general, and quality of life?

6- Which people with pain in the hip or knee attend a general practitioner or a medical specialist. What are the differences between attenders and non-attenders?

These questions are addressed and answered in chapters 3 to 8. The present study was designed and carried out in cooperation with the Department of Epidemiology & Biostatistics of the Rotterdam Erasmus University. It was a part of the so-called '*Rotterdam Study*', described by Hofman et al.[42]. Chapter 2 provides a brief description of the Rotterdam Study and the steps that were made to identify the research groups that we used in the present study and the methods that were used.

**** in all research questions 'people' means community-living people aged 55 to 74 years.

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2. POPULATION AND METHODS

2.1 The Rotterdam Study

In 1990 the *Rotterdam Study* started as a population survey of people aged 55 years and older living in one district of the city of Rotterdam, and was carried out by the Departments of Epidemiology & Biostatistics and Ophthalmology of Erasmus University Rotterdam Medical School in the Netherlands[1]. This study was primarily designed as a prospective follow-up study on the occurrence and risk factors of chronic disease and disability in a cohort of 10,275 people. All participants were extensively examined and re-examined 3 years later. One of the research topics was the investigation of musculoskeletal signs and symptoms and locomotor disability[2]. This latter study included the first 5,034 participants of the *Rotterdam Study.*

The Ommoord district of Rotterdam consists of a great number of apartment buildings, as well as single-family houses. There are also six homes for the elderly with 890 female and 224 male residents. Table 2.1 gives an overview of the demographic data for independently living elderly people in the Ommoord district. The data for the residents of a home for the elderly were omitted because there were only 17 male and 31 female residents in the age categories of 55 to 74 years.

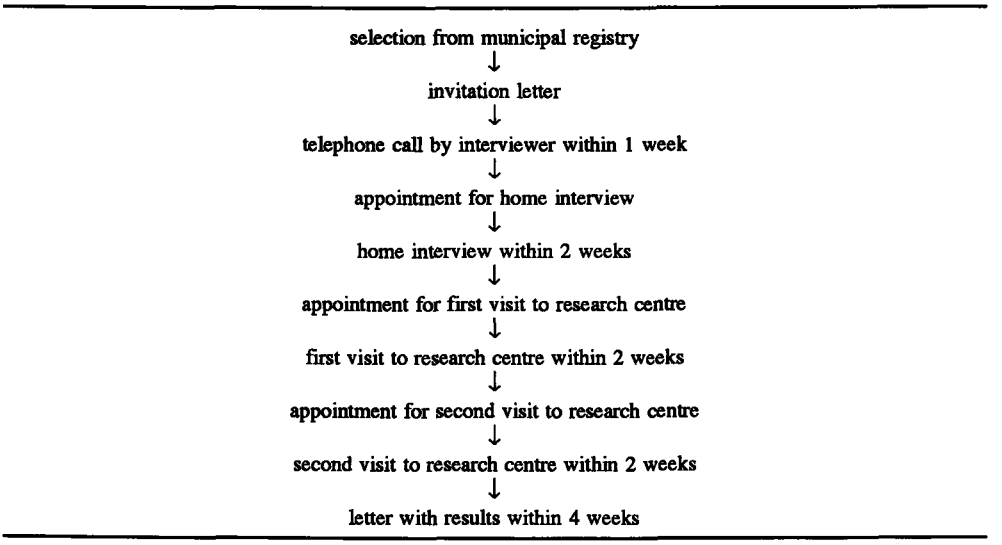
Table 2.1 Demographic data for independently living people in the Ommoord district of Rotterdam

	Men		Women		Total	
Age (yrs)	n	%	n	%	n	%
55-59	643	17.3	837	15.4	1480	16.1
60-64	779	20.9	982	18.1	1761	19.2
65-69	777	20.9	960	17.7	1737	19.0
70-74	650	17.4	956	17.6	1606	17.5
75-79	500	13.4	786	14.5	1286	14.0
80-84	253	6.8	546	10.0	799	8.7
85-89	98	2.6	306	5.6	404	4.4
90+	26	0.7	62	1.1	88	1.1
Total	3,726	100	5,435	100	9,161	100

Source: Municipal Registry of Rotterdam, January 1, 1988

Every month a random sample of people aged 55 years and older were selected from the municipal registry and sent an invitation letter. Within 1 week the potential participant was contacted by telephone and asked to participate in the Rotterdam Study. An appointment for

an interview at home was made for within 2 weeks. A few weeks after the interview at home, participants were asked to attend the special research centre of the Rotterdam Study 2 times. In practice, the time between the home interview and the visits to the research centre was longer than 2 weeks. The next figure offers a flow sheet of the Rotterdam Study.



source: Odding, 1994

Figure 2.1 Flow sheet Rotterdam Study

The interview data were directly entered on a portable personal computer by a trained interviewer. During the interview participants were asked, among others, questions about joint pain: "did you have any pain or other complaints about your joints in the last month?" If the answer was affirmative, questions about site, duration, and treatment followed. The questions about pain in or around the joints in the last month were repeated by a medical doctor during the following (first) visit of the participant to the research centre (mostly after a month).

During the first visit to the research centre, radiographs were taken of several joints, including the hips and knees. The radiographs of hips and knees were scored independently by two trained assessors, who were blinded to all data of the participant. There was no indication of sex or age on the radiographs. The scores of the two assessors were evaluated every 150 radiographs. Further details are given by Odding[2]. In total, radiographs were made of the joints of 3000 people. During the first visit data about comorbidity (lower extremity arterial disease, hypertension, thrombosis, myocardial infarction, stroke, chronic respiratory

disease, diabetes, Parkinson, and poor vision) were also collected. Data of the second visit were not used in our study.

2.2 Start of the present study

When the present study started in January 1993, 2000 radiographs had already been classified. This group of people was eligible for our study. The following exclusion and inclusion criteria were applied:
- age between 55 and 75 years;
- no occurrence of senile dementia or other cognitive problems;
- living independently;
- no participation in two other sub-studies. These studies were unrelated to musculoskeletal complaints and included volunteers who underwent magnetic resonance scanning (MRI) or who took part in a study into glucose intolerance.

A subsample of 831 respondents remained. Respondents who reported pain in hip or knee on two occasions (during the interview and during the medical examination in the research centre) were classified in group A, respondents who reported pain on one occasion were classified as group B, and respondents who did not report pain were classified as group C. The ages and sex of the participants in these groups are given in Table 2.2.

Table 2.2 Demographic data for three groups (subsample Rotterdam Study, n=831)

Pain group	Age (years)	Men	Women	Total
Group A (+ +)	55-64	21	46	67
	65-74	12	51	63
Group B (+ -)(- +)	55-64	17	44	61
	65-74	36	60	96
Group C (- -)	55-64	117	123	240
	65-74	149	155	304
Total		352	479	831

note: ++= pain on two occasions, +- or -+ =pain on one occasion, --= no pain.

In February 1993, the people in the subsample were asked to complete a short questionnaire about pain in the hip or knee during the last week, month, and year. The overall response

to this questionnaire was 83% (N=691). Chi-square testing showed no significant differences between the age and sex of the people who completed the questionnaire (responders) and those who did not (non-responders) (Age-group χ^2 =.095, df=1, p > .05; Sex χ^2=1.18, df=1, p > .05).

Eight groups were formed on the basis of the answers to the short questionnaire about 'pain in the last month' (asked in February 1993) and the answers given before on this question (table 2.3). Some respondents only answered the question about pain in the last *year* (N=107), and this group is termed group ? in table 2.3. Eleven answer forms were returned late and were not used in this study.

Table 2.3 Demographic data for responses to the short questionnaire (February 1993)

Pain group	Age (years)	Men	Women	Total
Group 1 (+ + +)	55-64	11	25	63
	65-74	4	23	
Group 2 (+ + -)	55-64	4	5	15
	65-74	2	4	
Group 3 (+ - +)	55-64	5	11	34
	65-74	6	12	
Group 4 (- + +)	55-64	3	8	29
	65-74	7	11	
Group 5 (+ - -)	55-64	3	3	15
	65-74	4	5	
Group 6 (- + -)	55-64	3	6	12
	65-74	1	2	
Group 7 (- - +)	55-64	16	19	81
	65-74	14	32	
Group 8 (- - -)	55-64	75	75	324
	65-74	101	73	
Group ?	55-64	14	21	107
	65-74	21	51	
Total		294	386	680

note: + = reported pain in the hip or knee; - = no reported pain in the hip or knee; + or - was reported on three occasions.

It was decided to involve all people with pain (group 1 to group 7) and people with no pain (group 8) in further research. We defined 'chronic pain' as pain reported on three occasions, 'episodic pain' as pain reported on two occasions, and 'sporadic pain' as pain reported on

one occasion.

In order to gain enough power for statistical testing between groups, a reference group was needed of about 75 respondents without pain. These respondents also had no evidence of radiological OA (ROA) as determined from the radiographs. A sample (n=94) without ROA of the knee or hip from group 8 (see table 2.3) was taken in proportion to group 1 (+ + +) and group 2 (+ + -).

All people were approached by telephone by an interviewer in the period from March to June 1993. The no-response rate was 16% in the sporadic pain group, 15% in the episodic pain group, 21% in the chronic pain group, and 29% in the reference group. Where possible, these people were replaced by respondents from group ? (after oral verification of pain in the last month) or (in case of the reference group) by other 'healthy' people of the same age and sex (from group 8). In total the following numbers of people were approached:

Chronic pain (Group 1 and ?)	N=72
Episodic pain (Group 2,3,4 and ?)	N=86
Sporadic pain (group 5,6,7 and ?)	N=118
Reference group	N=94

Chi-square tests on response and no-response rates showed no significant differences in the age and sex distribution between responders and non-responders (Age-group χ^2=0.30, df=1, p >.05; Sex χ^2=0.36, df=1, p >.05). Table 2.4 gives an overview of the age and sex distribution of the final response group.

Table 2.4 Demographic data for final response (July 1993)

Pain group	Age (years)	Men	Women	Total
Chronic pain	55-64	12	23	59
	65-74	3	21	
Episodic pain	55-64	9	24	74
	65-74	17	24	
Sporadic pain	55-64	18	26	101
	65-74	20	37	
Reference	55-64	14	29	72
	65-74	6	23	
Total		99	207	306

Sex distribution: χ^2=3.53, df=3, p=.32

In the group with episodic pain, 15 subjects had pain on the first and second occasions, 32 on the first and third occasions, and 27 on the second and third occasions. In the group with sporadic pain, 15 subjects reported pain on the first occasion, 12 on the second occasion, and 74 on the third occasion. The statistical power for detecting medium-sized effects

(differences between groups) in analyses of variance (effect size 0.25, alpha=0.05) with these four groups was > 0.90[3]. The flow sheet of the present study is given in figure 2.2.

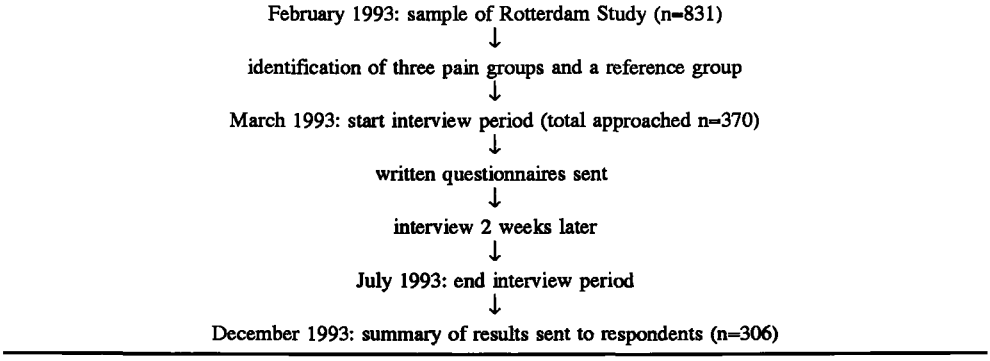


Figure 2.2 Flow sheet of the present study

2.3 Methods

All respondents were approached by telephone to make an appointment for an interview within 2 weeks. To avoid the impression that this study was about osteoarthritis, which might give rise to biased responses, the study was presented as dealing with 'health and physical functioning in elderly people'. A written questionnaire containing questions about background variables and quality of life and some standardized measures of health problems and coping (Impact of Rheumatic diseases on General health and Lifestyle, IRGL[4]; Utrecht Coping List[5], and Sickness Impact Profile[6]) was sent to the respondents before the interview. People who reported recent pain in February 1993 (n=192) also received a second written questionnaire which contained, among others the Pain Coping Inventory[7]. The interview also included a physical activity measure[8], and if respondent reported current pain and problems (n=186), they were asked questions about health care utilization and diagnoses. The legal owners or authors of all measures gave us permission to use their measures. The study design and procedures were approved by the TNO Medical Ethics Committee.
In the next section the questionnaires used are described in more detail.

2.4 Questionnaires

The several variables and standardized measures that were used are presented in order of appearance in the two questionnaires.

The **first questionnaire** included:

- *Background and health variables*

The first section of the questionnaire asked about information on background variables (sex, marital status). Some health-related questions were about fatigue, pain frequency in hip or knee, and pain severity. There were a few questions about medical matters and respondents were explicitly told that this study was not a medical study. Information about other background variables (change in marital status, removal, housing accommodation) was obtained in the interview. Body mass index (BMI), ROA of the knee and hip, comorbidity, and level of education were known from the Rotterdam Study.

- *Quality of life*

People were asked about their own judgement of quality of life (QOL); a 15-cm Visual Analogue Scale (VAS) was used, ranging from low QOL to high QOL. Seven more specific questions about subjective physical health, psychological functioning, image of the future, happiness in the last month, and satisfaction in the last month were included and used for validation of the VAS scale.

- *Impact of rheumatic diseases on health and lifestyle*

The IRGL[4] (Impact of Rheumatic diseases on General health and Lifestyle) was developed as an instrument for measuring the impact of rheumatoid arthritis, especially in the Dutch situation, and is partly based on the Arthritis Impact Measurement Scale[9] (AIMS). The IRGL consists of 68 items and takes about 20 minutes to complete. 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 a good validity for use in patients with rheumatoid arthritis.

Subscales of the IRGL are:

Physical functioning (in last month)

- mobility (ability to walk, shop, bicycle etc), 7 items;
- self-care (focus on hand function), 8 items;
- pain and stiffness, 6 items, asked only if the participant reported pain in the last month;

Psychological distress

- anxiety, 10 items, situation in last month;
- depressiveness, 6 items, situation in last week;

- cheerfulness, 6 items, situation in last week;

Social support and network (situation in last 6 months)

- number of friends, number of neighbours, 2 items;
- potential confidentiality, 5 items;
- actual confidentiality, 3 items;
- mutual visits, 2 items;

Impact

- impact of joint symptoms on daily life (work, hobbies, sexuality, etc), 12 items.

- *Coping styles: Utrecht Coping List*

The respondent was asked to imagine 'problems in general'. The UCL[5] consists of 47 items describing a specific coping behaviour. Answers are on a 4-point scale from 'seldom or never' to 'very frequently'. According to the authors, the UCL consists of seven coping scales:

- active problem solving (7 items);
- palliative reaction (8 items), this means looking for distraction, doing other things such as smoking, drinking etc.;
- avoidance (8 items);
- seeking social support (6 items);
- passive reaction (7 items), especially worrying;
- expression of emotions (3 items);
- reassuring thoughts (5 items).

Three items of the UCL are not included in these coping scales. According to the authors of the UCL, the internal consistency of the UCL for use in an older population is reasonable (Cronbach's alpha ± 0.67).

- *Sickness Impact Profile*

The Sickness Impact Profile[6] is a questionnaire for measuring dysfunctioning due to health problems. The SIP is applicable for everyone with health-related problems. The SIP has been translated into Dutch and consists of 136 statements, ordered in 12 categories. Each statement describes a certain dysfunctioning in a daily activity. Respondents only have to mark statements that are appropriate for their situation. Each marked statement has a weighted score. Besides a total score, scores for physical and psychosocial dysfunctioning are calculated. The reliability and validity of this questionnaire for use in a Dutch population is good. It takes about 20 minutes to complete this list.

Subscales are:

- sleeping/resting (7 items);
- emotions (9 items);

- personal care (23 items)
- household activities, both inside and outside the home (10 items);
- mobility (10 items);
- social interactions (20 items);
- walking (12 items);
- cognitive functioning (10 items);
- communication (9 items);
- work (9 items);
- recreation (8 items);
- eating (9 items).

Physical disability was defined as the weighted sum scores on the subscales personal care, mobility, and walking. Psychosocial disability was defined as the weighted sum scores on the subscales emotions, social interactions, cognitive function, and communication.

The **second questionnaire** included questions that were only relevant to people with current pain. This questionnaire was only sent to respondents who reported pain in the hip or knee on the third occasion (February 1993, n=192, response 82% n=157).

- *Coping strategies: Pain behaviour*

The list 'Pain Coping Inventory' (= Inventarisatie Pijngedrag[7], IPG*) was developed in 1984 by Kraaimaat and van Schevikhoven for use in patients with chronic pain. In 1993 the IPG was still in an experimental phase. In patients with rheumatoid arthritis, seven factors were found:

- worrying about pain (12 items);
- distraction by pleasant activities (7 items);
- reducing physical effort (6 items);
- comforting / pain transformation (7 items);
- withdrawal (4 items);
- reducing demands (3 items);
- applying non-allopathic treatment (4 items).

The reliability of the subscales is satisfactory (Cronbach's alpha ± 0.70). All items except the subscale 'worrying' were used. A question on the use of an own way to diminish pain was added. Each item consists of two parts: a question about the frequency of use (four categories from 'seldom or never' to 'very often') of the described strategy and its influence (five categories: 'not applicable', 'no influence' to 'very much influence').

* This list is revised and now available as 'Pain Coping Inventarization list, PCI '

2.5 The interview

Two weeks after the questionnaires were sent, the respondents were interviewed in their homes. This strategy improved the response: most people liked to talk with an interviewer about the lists. There was no need to send the questionnaires back as the interviewers could take them with them. The interviewers were instructed to ask if respondents had difficulties completing the questionnaires. Seven trained interviewers (six women, one man) made appointments in the period from March to July 1993. They all made use of a notebook computer, which contained all the interview questions. The entire interview lasted no more than 1 hour.
The interview had two parts: questions about physical activity and questions for people with current knee or hip pain or problems.

- *Physical activity*

In the first part of the interview, a special questionnaire[8] about physical activity in the elderly was used. Validity was checked with two independent methods to assess physical activity: repeated 24-hour physical activity recall (Spearman correlation=0.78) and measurements with a pedometer (Spearman Correlation= 0.72). Reliability was tested by a test-retest design (Spearman correlation= 0.89). The questions cover three areas:

- household activities (mean score of 10 items);
- sport activities (intensity, hours per week, and months a year for two sports maximum);
- leisure-time activities (see sport activities, maximum 6 activities).

The sport and leisure activity scores were calculated by using a formula with weights for intensity, hours per week, and months a year.

- *Specific problems*

The first part of the interview ended with a key question: "have you regularly (in the last month) had problems with your mobility because of (pain in) the knee or hip?" Respondents answering **no** to this question and who did not experience any problems in February 1993 were thanked for their participation (n=120). The interview was ended. For those with problems (n=186), the second part of the interview contained specific questions about these problems. Examples of questions are:

- what do you think is the cause of your problems with your hip or knee?
- have you consulted a general practitioner, a specialist, a physiotherapist, or somebody else?
- what diagnosis was made and by whom?

Other subjects were:

- operations of hip or knee;
- other diseases or symptoms affecting daily functioning and mobility;
- use of medicines;
- fear of falling;
- use of a walking aid in- or outside the house;
- problems with getting a walking aid;
- special adaptations in the house;
- contact with caregivers;
- information about problems;
- body weight, diet;
- desires about future physical exercise and contact with companions in distress.

An extended report with all results of the interview is given by Hopman-Rock[10].

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3. PHYSICAL AND PSYCHOSOCIAL DISABILITY IN ELDERLY SUBJECTS IN RELATION TO PAIN IN THE HIP OR KNEE.

M. Hopman-Rock, E. Odding, A. Hofman, F.W. Kraaimaat and J.W.J. Bijlsma

Published in the *Journal of Rheumalogy* 1996; 23: pp 1037-1044.

Introduction

Pain in the knee or hip is very common in elderly persons[1,2,3,4]. Osteoarthritis (OA) is a common cause of joint pain and physical and psychosocial disabilities[5,6,7,8], but is difficult to assess in the general population. Radiological osteoarthritis (ROA) of the knee and hip is also very prevalent in the elderly population[9], and about 30 to 45% of persons with ROA develop symptoms such as pain and stiffness[10,11,12]. Obesity is the most pronounced risk factor for ROA of the knee, especially in women[13]. In the Rotterdam Study[14,15,16] it was found that ROA of the hip and knee was an independent predictor of lower limb disability in women (not in men), but that hip or knee pain and morning stiffness were of greater importance in predicting lower limb disability.

Little empirical work has been done so far to explore the relationship between joint pain in the lower limbs in the general population and the occurrence of specific types of self-reported disabilities and to identify groups with relatively high levels of disability. To get a better understanding of the consequences of joint pain on the daily life of elderly people in the community, it is necessary to determine self-reported physical as well as psychosocial disability. Because pain in the hip or knee seems the most bothersome symptom associated with disability, we chose this as a criterion in our study. This condition may or may not be related to ROA.

The present study analyses physical and psychosocial disability in 306 independently living people aged 55 to 74 years with varying chronicity of pain in the hip or knee. It aims to explore the level of disability in subjects with pain symptoms in relation to several background variables (such as age, sex, body mass index and ROA).

Population and methods

Participants in the present study were members of a cohort of the *Rotterdam Study*[14]. The aim of the *Rotterdam Study* is to investigate determinants of disease occurrence and progression in people aged over 55 years (total N=10,275; response: N=7,983) living in the Ommoord district in Rotterdam. In 1991 a sub-study (on a representative sample) was carried out into locomotor disability, joint pain and ROA[15]. All subjects were asked the following two questions during an interview at home (response 83%) and during a medical examination at the research centre (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". During the physical examination by a doctor, special attention was paid to the origine of the pain (pain in the hip may be biased by pain originating in the lumbar spine or elsewhere). There were

2895 subjects in this sub-study, 2178 of whom were aged 55 to 74 years. Details of the physical examination procedure and the non-response rate (only due to serious illness) are described elsewhere[15,16].

In 1993 a sub-sample from the last mentioned study was formed. Inclusion criteria were the availability of an X-ray of the hips and knees that was scored independently by two assessors according to the criteria of Kellgren and Lawrence[17], age between 55 and 74 years and participation in 1991 in the interview at home and the medical examination. Criteria for exclusion were participation in one of the other sub-studies of the Rotterdam Study (these studies were unrelated to musculoskeletal complaints), the presence of cognitive impairments and living in a home for the elderly. In February 1993 the 831 selected subjects were asked to complete a short questionnaire with the same (first) question as asked in 1991, but specifically for pain in the hip or knee. The overall response for this questionnaire was 83% (N=691). Chi-square testing showed no significant differences in age and sex between the people who completed this short questionnaire and those who did not. Subjects who reported 'pain in the hip or knee in the last month' on three occasions, two times in 1991 and one time in February 1993, were classified as having '*chronic pain*' (N=72). Subjects who reported pain on two occasions were classified as having '*episodic pain*' (N=86). Subjects who reported pain on one occasion were classified as having '*sporadic pain*' (N=118). A reference group without pain and without ROA (N=94) was selected and matched for age and sex to the subjects with chronic and episodic pain.

In the period March to June 1993 all selected people (N=370) were approached by telephone to ask whether they would participate in the study. The characteristics of the final response (83%) are shown in Table 3.1. In the group with episodic pain, 15 subjects had pain on the first and second occasions, 32 on the first and third occasions and 27 on the second and third occasions. All subjects (N=306) completed a series of self-administered questionnaires (see below) and had an interview at home in the spring and summer of 1993.

Definition of osteoarthritis and classification of radiographs

There is no consensus on the definition of osteoarthritis in a general population in epidemiological studies[18,19]. According to the classification criteria of Altman *et al.*[20,21], osteoarthritis of the knee and the hip is diagnosed if pain and ROA are present. Persons without ROA may be diagnosed as having osteoarthritis of the knee if pain is present, if they are older than 40, if morning stiffness lasts less than 30 minutes and if crepitus is present[18,20]. The last two symptoms can be reliably assessed in a clinical situation, but are difficult to assess in a general population (low inter-rater reliability).

The classification of the radiographs of the knees and hips was based on the standard Kellgren criteria[17] (Grade 0=absence of any sign of ROA, 1=doubtful narrowing of joint space and possible osteophytic lipping; 2=definite osteophytes and (possible) narrowing of joint space; 3=moderate multiple osteophytes, definite narrowing of joint space and some sclerosis and possible deformity of bone ends; 4=large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone ends). ROA is defined as a score higher than 2, severe ROA as a score higher than 3 in the left or right joint.

- *Assessment of pain*

Because the origin of pain (in hip or knee) is difficult to determine on self-report, we studied hip and knee pain together. Pain severity was assessed in two ways:

- A 15-cm Visual Analogue Scale was used by the respondents to indicate pain severity in the week before they completed the questionnaire. Results are presented as a score from 0 ('no pain present') to 100 per cent ('unbearable pain').
- An ordinal scale was used to assess 'pain severity on times when pain is present' (not every subject had recent pain). Scores ranged from 1 to 5, 1='hardly any serious pain', 2='not so bad', 3= 'pretty severe' 4= 'severe', 5= 'unbearable pain'.

The respondents were asked whether they had regularly used painkillers in the past months (answer: 'yes' or 'no') if they complained of current pain. If the respondents had other complaints that affected their mobility and physical functioning besides the complaints about the hip or knee, we classified them as having 'additional mobility problems'.

Body mass index

In 1991 the body mass index (weight/(height)^2) was assessed for all subjects. According to standard norms, acceptable values are in the range 20-25, from 26 to 29 is overweight and over 30 reflects obesity.

Assessment of disability

In accordance with the ICIDH[22] we defined disability as 'any restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being'. Disability was assessed with the Sickness Impact Profile (SIP). The SIP is a standardized list of 136 statements, ordered in 12 areas, aimed at measuring changes of conduct in everyday activities due to sickness[23]. Examples of statements are: " I sleep or doze more during the day" (Sleep/rest), "I do not do any of the shopping that I would usually do" (Household), "I stay in one room" (Mobility), "my sexual activity is decreased" (Social interaction), "I do not walk at all" (Walking). Each statement

describes a certain dysfunction in a daily activity in one of the 12 areas. Respondents only have to mark statements that are appropriate to their situation and which are related to their health. Each marked statement has a weighted score. Besides a total score (percentage of the maximum possible sum score), percentages for a 'physical' and 'psychosocial' dimension of the SIP can be calculated (the theoretical maximum is 100%). ' Physical' disability is defined as a weighted sum score of dysfunction in the areas 'Personal Care', 'Mobility' and 'Walking'. The 'psychosocial' disability score is defined as the weighted sum of dysfunction in the areas 'Emotions', 'Social Interactions', 'Cognitive function' and 'Communication'. Other areas are 'Sleep/rest', 'Household', 'Work', 'Recreation' and 'Eating'. Because 'Work' is not a relevant area in this particular population, a total SIP score was not calculated. Results of the SIP for the remaining 11 different daily activities are presented in a so-called SIP profile (see Figure 3.1).
The reliability and validity of the SIP for use in a Dutch population is good[24].

Data analyses
To assess the SIP disability scores we used the weighted scores of statements valid for use in the Netherlands (made available by Dr. Jacobs, Department of General Practice, Utrecht University, The Netherlands). The SIP scores and other continuous variables were analysed with an analysis of variance (ANOVA), multivariate analysis of covariance (MANCOVA) and t-tests (tests on differences between two means). Duncan multiple range tests were used to trace differences between groups in ANOVA. Ordinal data were analysed using Kruskal-Wallis tests and nominal data with chi-square tests. Data analysis was performed with SPSSX[25]. The statistical power for detecting medium-sized effects (difference between groups) in analyses of variance (effects size 0.25, alpha=0.05) with the four particular groups is > 0.90[26]. Exact p-values were rounded off to two decimals. Multiple regression analysis was used to investigate the best predictors of disability in subjects with pain. Partial correlations (comparable with Beta) are reported. A partial correlation is the correlation of the independent variable with the dependent variable (disability) after correction for all the other independent variables.

Results

Demographics. No differences were found between subjects younger and older than 65 years (χ^2=0.30, df=1, p=.58) or in the sex (χ^2=0.36, df=1, p=.55) and the chronicity of pain (χ^2=0.86, df=2, p=.65) distribution between the responders and non-responders in this study. The characteristics of the groups with pain and the reference group are

presented in Table 3.1. Mean age varied between 63.7 and 65.5 years. No age differences between groups were found (F=1.84, p=.14). All groups consisted predominantly of women (62-75%). Most subjects were married or lived together (61-75%) and had completed secondary education (67-79%). The mean body mass index (25.6-27.4) indicated that all the groups were overweight, although the groups with pain (especially with chronic pain) were significantly more overweight (F=2.9, p=.03). People with additional mobility problems (N=185) were more frequently found in the group with chronic pain (73%, χ^2= 31.3, df=4, p<.01). ROA was present in a substantial number of the subjects with pain (38-54%). The prevalence of ROA of the hip was about 20% in all pain groups. Severe ROA was found in a small number of the subjects with episodic pain (15%) and chronic pain (17%).

Table 3.1 Characteristics of reference group and three groups of community living subjects (55-74 years, N=306) with pain in the hip or knee.

	reference (no pain)	sporadic pain	episodic pain	chronic pain
Number	72	101	74	59
Age[1] in years (Mean and SD)	64.1 (5.5)	65.5 (5.8)	65.5 (5.4)	63.7 (5.6)
Sex[1] (% women)	72	62	65	75
Marital status				
% living together (married)	75	70	73	61
% living alone	25	30	27	39
Education				
% primary	15	20	19	19
% secondary	79	67	69	75
% college/university	6	13	12	7
Body mass index (mean and SD)	25.6 (3.4)	26.3 (3.2)	26.7 (4.2)	27.4 (3.5)
% with additional mobility problems	-	37	59	73
% Kellgren score in hip or knee[2] ≥ 2	0	38	38	54
% Kellgren score in hip or knee ≥ 3	0	2	15	17

[1]= Reference group matched on age and sex distribution with the episodic and chronic pain groups.
[2]= prevalence ROA of the right and/or left hip in all pain groups ± 20%

Additional mobility problems mostly involved other joints and muscles, such as those of the hands, shoulders and back (rheumatic problems), although other relatively frequently mentioned problems were lung diseases (N=7) and cardiovascular disease (N=17).

Pain. Table 3.2 shows the mean scores for pain severity in the last week and pain severity when pain was present and the prevalence of regular use of painkillers in the past months. The pain in the groups with sporadic and episodic pain was in general best described as 'not so bad' (score 2) and in the group with chronic symptoms as 'pretty severe' (score 3). The highest regular usage of painkillers (in last months) was found in the group with chronic pain: 34.5% (χ^2=23.5, df=2, p<.01).

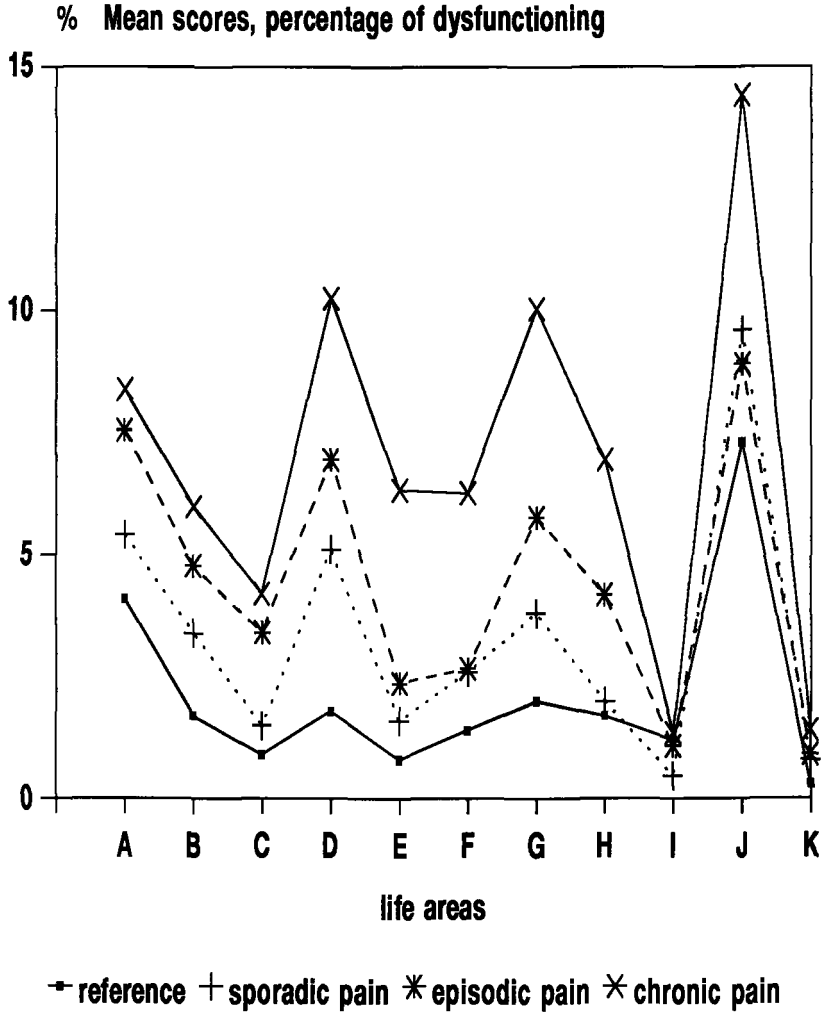
Table 3.2 Pain severity (in last week and in general) and use of painkillers in three groups of community living subjects (55-74 years) with pain in the hip or knee.

	sporadic pain	episodic pain	chronic pain
Pain severity in last week[1] (VAS, 0-100%; Mean and SD)	14.5 (17.7)	27.4[a] (21.8)	37.6[a,e] (23.1)
Pain severity if pain is present[2] (ordinal 1-5, 5=unbearable; Mean and SD)	2.1 (.52)	2.4 (.71)	2.7 (.71)
Regular use of painkillers in last months[3] (% yes)	9	14.5	34.5

[1]= ANOVA F=23.05, p<.01
[2]= K-W test 20.85 p<.01
Duncan Multiple Range Test: [e]=different from episodic group [a]= different from sporadic group
[3]= Only measured in subjects with current pain (N=186); χ^2= 14.15, df=2, p<.01

To test the hypothesis that regular use of painkillers is associated with less disability, we examined possible interactions between pain and the use of painkillers. No interaction effects of pain and painkillers on physical disability (2-way ANOVA: F=2.1, p=.12) or psychosocial disability (2-way ANOVA: F=.95, p=.39) were found.

Disabilities. A multiple analysis of covariance on all subscales of the SIP together with covariate BMI showed a significant multivariate effect of the pain group (F=1.95, p<.01). Figure 3.1 presents the SIP profiles for the different groups. The profile shows higher levels of dysfunction in groups with more chronic pain. Most problems in functioning were reported by the group with chronic pain. Univariate analyses were performed to test for differences between the four groups (Table 3.3). Significant differences were found in all areas except 'Communication', 'Recreation' and 'Eating'. No statistically significant differences in the occurrence of dysfunction were found between the group with sporadic pain and the reference group. The group with episodic pain had significantly more dysfunction in the areas 'Sleep', 'Emotion', 'Personal Care' and 'Walking' than the reference group did. The group with chronic pain had significantly more dysfunction than the other groups in every area except 'Communication', 'Recreation' and 'Eating'.



*=p ≤ .05 **= p ≤ .01

A= sleep*
B= emotion*
C= personal care**
D=household**
E= mobility**
F=social interaction**
G= walking**
H= cognitive functioning**
I= communication
J= recreation
K= eating

Figure 3.1 SIP profile for 11 areas of daily function (the area Work was excluded) for the reference group and three groups of community living subjects (55-74 years, N=304) with pain in the hip or knee.

Table 3.3 Scores on the SIP (0-100%); reference group and three groups of community living subjects (55-74 years) with pain in the hip or knee

	Mean score (SD) reference (N=72)	Mean score (SD) sporadic pain (N=100)	Mean score (SD) episodic pain (N=74)	Mean score (SD) chronic pain (N=58)	test statistics (ANOVA)
Sleep	4.1 (6.8)	5.4 (8.6)	7.5^{r} (9.2)	8.4^{r,s} (10.1)	F=3.5 p<.05
Emotion	1.7 (5.9)	3.4 (6.9)	4.8^{r} (10.6)	6.0^{r} (10.2)	F=3.2 p<.05
Personal care	.9 (4.4)	1.5 (3.9)	3.4^{r,s} (6.1)	4.2^{r,s} (6.0)	F=6.6 p<.01
Household	1.8 (5.9)	5.1 (12.1)	6.9^{r} (12.4)	10.2^{r,s} (12.9)	F=6.6 p<.01
Mobility	.77 (4.8)	1.6 (6.2)	2.4 (7.7)	6.3^{r,s,e} (12.9)	F=5.9 p<.01
Social interact.	1.4 (4.4)	2.7 (6.9)	2.7 (6.3)	6.3^{r,s,e} (10.9)	F=5.2 p<.01
Walking	2.0 (6.7)	3.8 (8.5)	5.8^{r} (10.0)	10.0^{r,s,e} (12.8)	F=8.4 p<.01
Cognitive funct.	1.7 (6.6)	2.0 (6.7)	4.2 (9.1)	6.9^{r,s} (13.6)	F=4.9 p<.01
Communica-tion	1.2 (4.7)	.5 (2.1)	1.1 (4.4)	1.3 (3.9)	F=.92 p=.43
Recreation	7.3 (15.6)	9.6 (17.0)	8.9 (13.7)	14.4 (18.3)	F=2.2 p=.09
Eating	.3 (1.3)	.8 (2.0)	.9 (3.1)	1.4 (4.1)	F=1.8 p=.14
Total physical disability	1.0 (4.1)	1.9 (4.3)	3.5^{r} (6.0)	5.4^{r,s,e} (6.7)	F=8.9 p<.01
Total psychosocial disability	1.5 (3.8)	2.2 (4.3)	3.1 (5.7)	5.4^{r,s,e} (8.5)	F=5.9 p<.01

Duncan Multiple Range Test: ^{e}=different from episodic group ^{s}= different from sporadic group ^{r}= different from reference group. Total physical disability calculated from Personal care, Mobility and Walking. Total psychosocial disability calculated from Emotions, Social interactions, Cognitive function and Communication. No total SIP score was calculated because the area Work was omitted. SIP-scores were not available for two respondents.

Total physical and total psychosocial disability (see Table 3.3) was significantly higher in the group with chronic pain than in the reference group or in the groups with less chronic pain. The Pearson-correlation coefficient between physical and psychosocial disabilities in the total group with pain was 0.51 (N=234; $p<.01$).

Table 3.4 gives an overview of the SIP statements that were marked the most often by subjects in the group with chronic pain. The most frequently rated problems (related to health problems) were sleep (sleep is often disturbed), going out (less than before) and walking (more slowly). Highly rated problems (from 24 to 30%) were, apart from the three mentioned above, performing heavy household tasks, standing, kneeling, stooping, bending and walking hills. The three most often rated psychosocial problems were 'shows less affection', 'takes part in fewer social activities' and 'sexual activity is decreased'.

Table 3.4 Highest rated problems and item weights for community living subjects (55-74 years) with chronic pain in the hip or knee; raw percentage on SIP with positive answer. Percentage in reference (ref.) group between brackets.

General disability and physical disability	% (% ref.)	Weight	Psychosocial disability	% (% ref.)	Weight
I sleep less at night (sleep/rest)	35.6 (20.8)	61	I show less affection (social interaction)	18.6 (4.2)	52
I go out less often to enjoy myself (recreation)	33.9 (19.4)	36	I take part in fewer social activities than I used to (social interaction)	18.6 (4.2)	36
I walk more slowly (walking)	33.9 (11.1)	35	my sexual activity is decreased (social interaction)	18.6 (9.7)	51
I do not do any heavy work around the house (household)	30.5 (5.6)	44	I laugh or cry suddenly (emotion)	13.6 (4.2)	68
I am cutting down on some of my usual physical recreation or more active pastimes (recreation)	28.8 (8.3)	43	I go out less often to visit people (social interaction)	13.6 (2.8)	44
I only do housework or work around the house for short periods of time, or I rest often (household)	28.8 (6.9)	54	I forget a lot (alertness)	13.6 (5.6)	78
I only stand for short periods of time (personal care)	27.1 (2.8)	72	I often moan or groan because of pain and discomfort (emotion)	11.9 (2.8)	69
I do less of the daily household chores than I would usually do	27.1 (0.0)	44	I behave nervously or restlessly (emotion)	11.9 (1.4)	46
I kneel stoop or bend down only by holding on to something (personal care)	25.4 (5.6)	64	I stay alone much of the time (social interaction)	11.9 (2.8)	86
I do not walk up or down hills (walking)	25.4 (5.6)	56	I have more minor accidents (alertness)	11.9 (1.4)	75

note: weights are valid for use in the Netherlands

Physical and psychosocial disabilities in relation to the characteristics of the subjects with pain.

Table 3.5 gives an overview of the relationship between physical and psychosocial disabilities and some background variables for the subjects with pain. The highest physical disability scores were found in subjects with obesity (5.5%), in subjects with additional mobility problems besides pain in the hip or knee (4.8%) and in subjects with ROA (4.5%) or severe ROA (6.8%). Men had a higher psychosocial disability score than women (4.6% compared to 2.6%). Subjects with additional mobility problems had also a significantly higher psychosocial disability score (5.0%) than subjects without current complaints (1.0%) or with hip or knee problems only (1.5%). A relatively low (1.9%) psychosocial disability score was found in the respondents with ROA grade ≥ 3 (severe ROA). The group that regularly used painkillers had a relatively high level of physical disability (6.1%), but (although relatively high) no significantly increased psychosocial disability. No relationship was found between physical or psychosocial disability and age group, marital status and education.

Table 3.5 Means and SD of physical and psychosocial disability (SIP scores) for community living subjects (55-74 years, N=232) with pain in the hip or knee.

	Numbers	Mean physical disability (SD)	Test statistic	Mean psychosocial disability (SD)	Test statistic
Age					
≤ 65	110	3.0 (5.9)	t=-.57 p=.57	4.0 (7.1)	t=1.79 p=.07
> 65	122	3.5 (5.5)		2.6 (4.9)	
Sex					
men	78	3.4 (5.0)	t=.19 p=.85	4.6 (7.5)	t=2.0 p<.05
women	154	3.2 (6.0)		2.6 (5.2)	
Marital status					
living together	151	3.1 (5.0)	t=-.59 p=.56	3.0 (5.2)	t=-.12 p=.21
living alone	69	3.7 (7.1)		4.3 (8.0)	
Education					
primary	45	2.1 (4.0)	F=1.37	2.1 (3.2)	F=1.38 p=.25
secondary	161	3.7 (6.2)	p=.26	3.7 (6.9)	
college/university	26	2.8 (4.7)		2.7 (4.0)	
Body mass index					
normal (≤ 25)	85	2.9 (5.6)	F=3.6 p<.05	3.8 (6.9)	F=.77 p=.46
overweight (> 25)	108	2.7 (4.3)		2.8 (4.7)	
obesity (> 30)	39	5.5 (8.3)		3.5 (7.5)	
current problems					
no	47	.8 (2.7)	F=10.9	1.0 (2.9)	F=11.5 p<.01
yes (only hip/knee)	61	2.1 (5.3)	p<.01	1.5 (2.6)	
yes (add. mobility problems)	124	4.8 (6.2)		5.0 (7.6)	
Kellgren score (ROA)					
< 2	135	2.4 (4.4)	t=-2.5 p=.01	2.7 (5.4)	t=-1.69 p=.09
≥ 2	97	4.5 (7.0)		4.1 (6.9)	
Kellgren score (severe ROA)					
< 3	209	2.9 (5.5)	t=-3.2 p<.01	3.4 (6.4)	t=2.2 p<.05
≥ 3	23	6.8 (6.6)		1.9 (2.6)	
Regular use of painkillers[1]					
yes	35	6.1 (6.2)	t=-2.4 p<.05	5.5 (7.8)	t=-1.7 p=.10
no	150	3.4 (5.9)		3.5 (6.2)	

[1]= only measured in subjects with current pain and problems

To investigate the multivariate relationships, a regression analysis was carried out on physical and psychosocial disability in subjects with pain. Independent variables were the chronicity of pain, age (in years), sex, marital status, education, BMI (as a continuous variable), the existence of current problems, moderate ROA (ROA=2 in contrast with other values) and severe ROA (≥3 in contrast to <3). The results are given in Table 3.6. The most important predictors of physical disability were the body mass index, the presence of current (extra) mobility problems and severe ROA. The most important predictors of psychosocial disability were the chronicity of pain, male sex, current (extra) mobility problems and the presence of moderate ROA in contrast to severe ROA or no ROA.

Table 3.6 Multiple regression analysis on physical and psychosocial disability in community living subjects (55-74 years, N=220) with pain in the hip or knee.

	Partial correlation with Physical disability (SIP)	Partial correlation with Psychosocial disability (SIP)
Pain chronicity	.10	.12*
Age in years	.07	-.06
Sex	-.05	-.18**
Marital status	.05	.12
Education	.07	.03
Body mass index	.13*	.01
Current (additional) problems	.20**	.22**
Moderate ROA	.06	.18**
Severe ROA	.14*	-.04
F-value	4.95**	5.11**
Total explained proportion of variance	17%	18%

Pain sporadic=1 episodic=2 chronic=3; sex men=1 women=2; marital status living together=1 living alone=2; primary education=1 secondary education=2 college/university=3; no current problems=1 only problems in hip/knee=2 additional problems=3; contrasts moderate ROA 0: ROA<2 or >2, 1: ROA=2; severe ROA 0: ROA<3, 1: ROA ≥3. *=p≤.05 **=p≤.01

Discussion

In the present study self-reported physical and psychosocial disabilities in elderly persons were studied in relation to the chronicity of pain in the hip or knee. Physical as well as psychosocial disability scores gradually increased as the chronicity (and severity) of pain increased. However, pain chronicity had no longer a significant contribution to physical disability if corrected for other factors such as BMI, other problems than pain in the hip or knee alone, and the presence of severe ROA. Significant differences in disability between groups with pain and an age- and sex-matched reference group without any signs of osteoarthritis were found in almost every area of daily life. Specific dysfunctions, such as sleep disturbance and decreased sexual activity, were frequently reported. The mean physical and psychosocial disabilities in the group with chronic pain were 5.4 and 3.6 times higher than in the reference group, respectively. The highest physical disability scores of subjects with pain were reported by people with obesity, people with additional mobility problems and people with (severe) ROA of the knee or hip. An important finding is that men with pain had higher psychosocial disability scores than women with pain. The reason for this is as yet unclear, but it may have something to do with the loss of a paid job. Additional mobility problems were also related to greater psychosocial disability. The association of ROA with psychosocial disability was smaller than the association of ROA with physical disability: people with severe ROA had an even lower psychosocial disability score than people without severe ROA. This finding may suggest that elderly people with severe radiological signs in hip or knee have over the years learned to live with the accompanying physical disability and pain.

There are some limitations to the investigation of osteoarthritis of the knee or hip in a general population. Most problems are concerned with definition: people with ROA sometimes have no pain symptoms at all[11], whereas other people are regularly in pain without having any (as yet) radiological signs. In this study we handled this problem by choosing pain chronicity as the main classification and contrasting these groups with a reference group without pain and ROA (the exclusion of ROA was chosen because of the risk of including subjects with sporadic pain in this group). In this way, the study design assessed the severity of symptomatic osteoarthritis of the hip or knee in an elderly population.

Most other studies on pain, disability and osteoarthritis have used the Health Assessment Questionnaire[27]. This is a short questionnaire especially suited for use in patient populations to detect the negative consequences of rheumatic disease. The SIP is a more general health questionnaire and is applicable to people who do not have rheumatic complaints, which is an advantage in a study in the general population. Moreover, the SIP covers a broad range of possible disabilities. Longitudinal studies have shown that

arthritic pain and symptomatic arthritis in general are risk factors[28] for future physical disability. Our study had a cross-sectional design, and therefore it is difficult to say how the process of disability changes with age and which people are at risk.

That patients with osteoarthritis have sleep disturbances and sexual problems has been already reported in other studies[29,30]. The disability scores of our subjects are comparable with the disability scores found in people (in the total general population) with cardiovascular diseases (physical disability 4.9; psychosocial disability 5.7)[24]. Davis *et al.*[31], McAlindon *et al.*[32] and Odding[15] concluded in their community based studies that knee pain is an important determinant of locomotor disability. Our results are consistent with this finding. In contrast, Rigby *et al.*[33] found, in a population of hospital patients, only a marginal relationship between pain in the knee and disability, which they considered to be due to the use of specific medicines. In our study a relatively small proportion (34.5%) of the respondents with chronic pain used painkillers on a regular basis. These subjects had not less but rather more physical and psychosocial disabilities. We found no relationship between age group and physical and psychosocial disability in the selected subjects with pain, whereas De Bock[34] and Odding[16] found a positive relationship between age and physical disability. This inconsistency with other studies could be due in part to the ages that were chosen. The two other studies included people aged 75 years and older. This age group is likely to have higher levels of disability. It is important to note that we selected subjects on the basis of the presence of pain, because the relationship between age and disability is less strong in groups of subjects with pain than in subjects without pain[4]. Although the non-response group was not age-selected, it is possible that the three-stage sampling procedure introduced some bias against the inclusion of older, more disabled subjects in the study.

We conclude that subjects with more chronic (and severe) pain in the hip or knee have, compared to a reference group, relatively high levels of physical as well as psychosocial disability. The physical disability was most pronounced in overweight subjects, in subjects with severe ROA and in subjects with problems other than pain in the hip or knee alone. Psychosocial disability was most pronounced in men, in subjects with moderate ROA and in subjects with additional mobility problems. Both physical and psychosocial disability were better predicted by ROA and the existence of additional mobility problems than by the chronicity of the pain. More insight is needed into the causal processes leading to physical as well as psychosocial disability in elderly people with pain in the lower extremity joints and into the possibilities for prevention.

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4. DIFFERENCES IN HEALTH STATUS OF OLDER ADULTS WITH PAIN IN THE HIP OR KNEE ONLY AND WITH ADDITIONAL MOBILITY RESTRICTING CONDITIONS

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Introduction

Pain in the hip or knee is a frequently occurring complaint of community living elderly people[1,2]. This pain is often caused by osteoarthritis (OA), a joint disorder characterized by pain, stiffness, disability, and radiological deviations[3,4,5]. OA of the joints is most prevalent in the hands, knees, hips and spine and is less prevalent in the wrist, elbow, shoulder, and ankle[6,7]. OA may occur as a joint-specific disorder or as a generalized one. In the literature the consequences of OA are described as physical and psychosocial disability[8,9,10], decreased quality of life[11,12,13,14], and decreased well-being[15]. According to other authors, pain and decreased mobility caused by OA can lead to alterations of psychological status[16], and social functioning[17,18]. All these terms can be regarded as aspects of 'health'.

The incidence and the impact of OA and other musculoskeletal disorders (MSDs) are expected to increase rapidly in the coming years, because of the aging of the population in Western countries[19,20]. Only a few of the studies involving older populations that investigated the relationship between OA of the hip or knee and aspects of health controlled for MSDs or other comorbidity[8,10,21]. Ettinger *et al.*[22] found that arthritis and other MSDs, in particular followed by heart disease, were given as the primary causes of difficulty in performing physical tasks by community living older people. From our own research[10], we know that the existence of other current mobility problems besides pain in the hip or knee is associated with more physical and psychosocial disability. Knowledge about the impact of OA of the hip or knee on health status when there are additional disabling conditions is important for health professionals who counsel and treat patients with these complaints. Besides this, specific knowledge is needed for the benefit of the interpretation of study results.

In line with the statement by Guralnik[23] about the effect of co-occurring conditions on the relationship between disease and disability, the purpose of the present study is to explore the differences in health status and comorbidity (other than MSDs) between a group older adults with pain in the hip or knee only and a group of older adults with self-reported additional mobility restricting conditions.

Health status, functional status, and quality of life are often used interchangeably to refer to "health" [24]. In our study we used a specific health status instrument (an adapted Dutch version of the Arthritic Impact Measurement Scale) with questions in the domains of physical functioning, psychological distress, social support, and impact of joint impairments on daily life, to assess health status. We also assessed a reference group without pain in the hip or knee and without radiological signs of OA (ROA). For all respondents the most important comorbidity (besides mobility restricting conditions) was known.

Population and methods

This study was part of a large epidemiologic study of the general population aged 55 years and older living in the district Ommoord in Rotterdam, known as the *Rotterdam Study*[25]. 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 sub-study (on a representative sample with respect to age and sex) was carried out into locomotor disability, joint pain, and ROA[2]. All subjects were asked the following two questions during an interview at home (response 83%) and during a medical examination by a doctor at the research center of the Rotterdam Study (response 95%) several weeks later: "Did you have any pain or other complaints about your joints in the last month?" ('yes' or 'no') and "Can you point out the painful joints". This sub-study included 2,895 subjects, 2,178 of whom were aged 55 to 74 years. Radiographs of the hips and knees (weight-bearing anteroposterior) were scored independently by two trained assessors (blinded for all subjects data including pain symptoms) and classified according to the criteria of Kellgren and Lawrence[26].

In February 1993 a sub-sample (N=831) from the last mentioned sub-study was formed (see below). These people received a short questionnaire with questions about pain in their hips and knees in the last week and in the last month. Inclusion criteria for this sub-sample were the availability of a radiograph of the hips and knees, age between 55 and 75 years, and participation in 1991 in the interview at home and the medical examination. Criteria for exclusion were participation in one of the two other sub-studies of the Rotterdam Study (these studies were unrelated to musculoskeletal complaints), the presence of cognitive conditions, and living in a home for the elderly.

On the basis of scores for 'self-reported pain in the hip or knee during the last month' at three 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 three occasions, n=72), *episodic* pain (pain on two occasions, n=86; 15 subjects had pain on the first and second occasions, 32 on the first and third occasions and 27 on the second and third occasions), *sporadic* pain (pain on one occasion, n=118; 15 subjects had pain on the first occasion, 12 on the second, and 74 on the third occasion), and no pain (n=415). All subjects with pain on at least one occasion (total n=276) were asked to participate in the present study. The responders were comparable with the non-responders with respect to age, sex, and pain chronicity. In the spring and summer of 1993 all respondents (n=234, response 85%) received a written questionnaire and were interviewed at home 2 weeks later. Of these respondents, 186 people had current pain (pain in the hip or knee during the month before the interview), 124 of whom reported additional mobility restricting conditions. In addition, a sample without pain and without

ROA (n=94) was taken in proportion to the age and sex of the groups with episodic and chronic pain; 72 of these subjects participated in the study (the reference group).

Background and illness-related variables

Age is given in years. Education was recoded in three categories: 1=primary education, 2=secondary education, and 3=higher education (college/university). Marital status was recoded in two categories: 1=living together, 2=living alone. The classification of radiographs of the hips and knees was based on the standard Kellgren[26] criteria (0=no signs, 1=doubtful, 2=mild, 3=moderate, 4=severe). The body mass index (BMI= weight/(height)^2) was used to assess overweight, which is a known risk factor for OA of the knee. BMI was estimated for all respondents in the Rotterdam Study in 1991. According to standard norms, 'acceptable ratios' are in the range 20-25, with a ratio of 26-29 being considered to reflect overweight, and a ratio higher than 30 being considered to reflect obesity.

Assessment of health status

The IRGL[27] (Impact of Rheumatic diseases on General health and Lifestyle) was developed as an instrument for measuring the impact of rheumatic diseases, especially in the Dutch situation, and is based on the theoretical notions of the AIMS (Arthritis Impact Measurement Scale[28]). The IRGL consists of 68 items. The reliability in a population of patients with rheumatoid arthritis is given good. Physical functioning is measured by the mobility scale (especially problems involving the lower extremities; 7 items; score ranging from 7 to 28), self-care scale (especially dexterity in hand functions, 8 items; 8-32), and the pain scale (6 items; 6-25). The pain scale includes the existence of swollen joints, the frequency of pain, the severity of pain in the last month, the frequency of severe pain in the last month, the improvement of pain in the last month, and the duration of morning stiffness. Psychological distress is measured by the anxiety scale (10 items; 10-40), and the depressive (6 items; 0-24) and cheerful mood (6 items; 0-24) scales. Social support is measured by scales that reflect the perceived quality of the social network: potential confidentiality 5 items; (5-20), actual confidentiality 3 items (3-12), and mutual visits 2 items (2-8). The impact scale assesses the perceived influence ('almost never', 'sometimes', 'often' or 'almost always') of joint complaints on various domains of daily life (work, household, hobbies, holidays, leisure, sexuality, eating, sleep, friends and family) 12 items totally (10-40). Ten items were included in the scale; impact on relationship with spouse/partner and relationship with children were excluded in accordance with the IRGL manual.

The pain scale of the IRGL was only completed by respondents with current pain (pain in the hip or knee in the month before completion of the questionnaire).

Additional mobility restricting conditions and comorbidity

Respondents with current pain (=pain in the hip and or knee during the last month, n=186) were asked in an open question during the interview: "do you have any other disease or disorder besides your knee or hip pain that restricts your daily movements or your daily functioning?" ('yes' or 'no'). If the respondents answered 'yes', they were asked: "which diseases or disorders"? Respondents were also asked which disease or disorder (including pain in the hip or knee) had the most influence on daily life.

The prevalences of *comorbidity* were used that were collected for all subjects during the examination in 1991 in the research centre of the Rotterdam Study. These were the following scores:

(1) the presence of lower extremity arterial disease. This was defined by the ratio of the systolic blood pressure at the ankles (SBP-ankle) to the systolic blood pressure at the right upper arm (SBP-arm), i.e. ankle-arm-index=SBP-ankle/SBP-arm. The systolic blood pressure in the posterior tibial artery on both sides was measured using an 8 MHz continuous wave Doppler probe (Huntleigh 500 D, Huntleigh Technology, Bedfordshire, UK) and a random sphygmomanometer. Lower extremity arterial disease was considered present when the ankle-arm-index measured at the left and/or right ankle was lower than 0.90;

(2) the presence of hypertension (systolic blood pressure ≥ 160 mm Hg or over or a diastolic blood pressure ≥ 95 mm Hg or over, or physician-confirmed current use of antihypertensive drugs);

(3) thrombosis of the legs (now or ever);

(4) myocardial infarction (now or ever, mentioned by the respondent and confirmed by own general practitioner);

(5) stroke, now or ever, mentioned by the respondent and confirmed by own general practitioner;

(6) chronic respiratory disease defined as having at least one of the following symptoms: (a) coughing regularly almost daily for more than 3 months a year, (b) bringing up phlegm almost daily at least 3 months a year, (c) wheezing (usually in daytime, or at night or almost every day or night), (d) sometimes attacks of shortness of breath accompanied by wheezing (asthmatic attacks);

(7) presence of diabetes symptoms and signs (mentioned in interview and current antidiabetic medication or positive glucose intolerance test);

(8) presence of Parkinson disease (current anti-Parkinson medication);

(9) poor vision, as assessed by a ophthalmologist. Poor vision was defined as a visual acuity, best corrected on a reading chart at 3 meters, of less than 0.50 Dioptre for the left and right eyes.

The total comorbidity score was the sum of the comorbidity conditions (not present=0, present=1). This score ranged from 0 to 9.

Statistical methods

Differences in numerical variables between groups with and without additional self-reported mobility restricting conditions were analyzed with a multivariate analysis of variance (MANOVA) on psychological functioning, psychological distress, and social support, and a t-test (on the impact scores and for the comparison with the reference group). Differences in nominal or ordinal variables were analyzed with chi-square tests. To test the best discriminating variables between the groups with and without additional conditions in a multivariate way, a step-wise logistic regression analysis was used with p-in .05 and p-out 0.10. Odds ratios (OR) and 95% confidence intervals (CI) are given. Data analysis was performed with SPSSX[29]. The power (alpha=0.05) to detect differences between the groups with and without additional mobility restricting conditions was 0.81. To determine the reliability of the different IRGL scales in our sample, we used Cronbach's alpha (measure for internal consistence of the items).

Results

Characteristics of groups. Table 4.1 presents the characteristics (demographic and illness-related variables and comorbidity) of the groups with and without self-reported additional mobility restricting conditions and the reference group without pain and ROA. The group with additional mobility restricting conditions seemed relatively young (mean 64.5 years), with a higher percentage of men (37%), and had less sporadic pain than the group with pain in the hip or knee only, although these differences were not statistically significant (age t=1.83, p=.07; sex χ^2=3.1, df=1,p=.08; pain chronicity χ^2=5.3, df=2, p=.07, respectively).

Table 4.1 Characteristics of groups of community living people (aged 55 to 74 years) with current pain in the hip or knee with and without additional mobility restricting conditions (n=186), and a reference group without pain and radiological evidence of osteoarthritis (ROA) (n=72).

	pain in the hip or knee only	additional mobility restricting conditions	reference group without pain and ROA
Number	62	124	72
Age in years (mean and SD)	66.1 (5.8)	64.5 (5.5)	64.1 (5.5)
Sex (% women)	76	63	72
Marital status			
% living together (married)	73	68	75
Education			
% primary	19	19	15
% secondary	69	70	79
% college/university	11	11	6
Body mass index (mean and SD)	27.2 (4.0)	26.7 (3.4)	25.6 (3.4)
Comorbidity			
% lower extremity arterial dis.	13	10	17
% hypertension	23	26	26
% thrombosis	6	7	3
% myocardial infarction	6	8	3
% stroke	0	2	1
% chronic respiratory disease	18	27	12
% diabetes mellitus	8	9	11
% Parkinson	0	0	2
% poor vision	0	1	0
Total comorbidity conditions (mean and SD)	0.74 (1.02)	0.89 (1.02)	0.76 (0.85)
Pain chronicity in hip/knee			
% sporadic pain	47	30	-
% episodic pain	29	35	-
% chronic pain	24	35	-
% Kellgren score in the hip ≥ 2	21	19	-
% Kellgren score in the knee ≥ 2	36	31	-

note: current pain= reported pain in last month; comorbidity scores were measured two years before the start of the present study. No statistically significant differences between the groups were found ($p < 0.05$).

Figure 4.1 shows the age distribution (four categories) of the respondents in the two groups with pain in the hip or knee. Chi-square statistics showed that most people with pain in the hip or knee only were aged 65 to 69 years and 70 to 74 years and that most people with additional mobility restricting conditions were aged 60 to 64 years (χ^2=7.9, df=3, p=.048). People in this last age category were higher educated than people in the

other age groups (χ^2=22.4, df=6, p=.001). No differences between the age groups were found for other background variables (sex, marital status, pain chronicity).

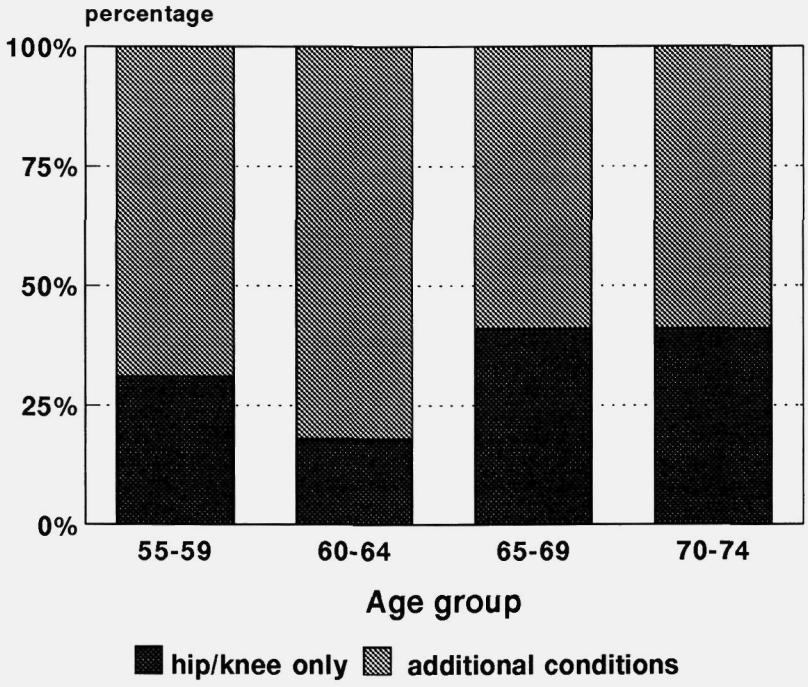

Figure 4.1 Distribution of current pain in the hip or knee only and additional mobility restricting conditions in four age groups (aged 55 to 74 years, n=186)

Most people lived together (Table 4.1 continued), had a secondary education, and were slightly overweight. The data showed that hypertension was the most prevalent comorbidity, followed by chronic respiratory disease and lower extremity artery disease. No differences in comorbidity between the two groups and the reference group were found. Three subjects had a comorbidity score higher than 3 (6 was a maximum), one in the group with knee or hip pain only, and two in the group with additional mobility restricting conditions. No statistically significant differences were found in the chronicity of pain and the prevalence of ROA (Kellgren score $\geq$ 2) between the two groups.

Table 4.2 gives an overview of all reported additional mobility restricting conditions in the group with current pain in the hip or knee (n=124), divided into additional MSDs (n=91) and other conditions (n=33).

Table 4.2 Overview of self-reported additional mobility restricting conditions in community living people (aged 55 to 74 years) with current pain in the hip or knee.

Reported conditions	Number
Musculoskeletal conditions	(total n=91)
More generalized osteoarthritis	46
(Low) back pain	10
Hernia nuclei pulposi	8
Dislocated vertebra	4
Rheumatoid arthritis	2
Inflammation of muscles	2
Others	19
Other conditions	(total n=33)
Cardiovascular	17
Respiratory	5
Eye	3
Bladder/Bowel	2
Ear problems	1
Stomach	1
Chronic fatigue	1
Impotence/kidney insufficiency	1
Ménière's disease	1
Sickly	1

Note: The reported cardiovascular and respiratory problems were all confirmed by the comorbidity scores. Poor vision was not detected in the people who complained of eye problems; current pain= reported pain in last month; 26 respondents reported more than one additional condition: the second or third conditions are not mentioned here.

More generalized OA was the most mentioned MSD (n=46). Also, low back pain and hernia nuclei pulposi were frequently reported. Other relatively frequently reported mobility restricting conditions concerned the cardiovascular (there were as many men as women in this specific group) and the respiratory systems. Twenty-six respondents reported more than one additional condition (three maximum). Self-reported cardiovascular and respiratory conditions as mobility restricting problems were all confirmed by the comorbidity scores. Twenty-nine percent (n=36) of the people with additional mobility restricting conditions stated that their hip or knee problems were the most bothersome of all their complaints.

Five people (7%) in the reference group mentioned mobility restricting problems (caused by: cold, stiffness (3x) and legs of unequal lengths).

Reliability of the IRGL scales

In our study, the alpha for the mobility scale was 0.89, for the self-care scale 0.92, for the pain scale 0.81, for depression 0.93, cheerfulness 0.91, anxiety 0.86, potentially confidentiality 0.87, actual confidentiality 0.72, mutual visits 0.78, and the impact scale 0.76. These results indicated a reasonable-to-good reliability of this health measure.

Differences in health status

Table 4.3 shows the results of the multivariate analyses of variance (MANOVA) on the several sub-scales of the IRGL. Physical functioning and psychological distress were different in the groups with pain in the hip or knee with and without additional mobility restricting conditions. Physical functioning (especially mobility and the presence of pain symptoms) was relatively higher in the group with pain in the hip or knee only, and psychological distress (especially anxiety and cheerfulness) was lower in this group. Although the two groups did not differ with regard to social support, the actual confidentiality was higher in people with pain in the hip or knee only than in the group with additional conditions. The impact of the joint problems on several aspects of daily life was far less in people with pain in the hip or knee only. When we compared the group with reported generalized OA (n=46) with the group with pain in the hip or knee only (n=62), similar results as reported above were found. There were no differences on the IRGL variables between the sub-groups with additional MSDs (n=91) and with additional other conditions (n=33). The mean scores on the self-care, anxiety, cheerfulness, and social support scales of the group with pain in the hip or knee only, were comparable to those of the reference group without pain in the hip or knee, with the exception of a significant difference in mobility ($p < 0.05$).

Table 4.3 Health status variables (IRGL, mean and standard deviation) of two groups of community living people (aged 55 to 74 years) with current pain in the hip or knee and a reference group without pain and radiological evidence of osteoarthritis (ROA).

	Max	**pain in the hip or knee only (n=62)** mean (SD)	**additional mobility restricting conditions (n=124)** mean (SD)	Test statistics (MANOVA and t-test) comparison between group with and without additional conditions	Reference group without pain and ROA (n=72), comparison with group with pain in the hip or knee only; mean (SD)
Physical functioning				**F=6.3 p=<0.001**	
Mobility	28	21.6 (5.8)	19.1 (6.0)	F=6.2 p=0.02	*23.4* (5.8)*
Self-care	32	30.0 (5.5)	29.2 (4.8)	F=.52 p=0.47	*29.9 (6.3)*
Pain IRGL	25	10.4 (4.3)	13.7 (4.9)	F=17.4 p<0.001	-
Psychological distress				**F=5.2 p=0.002**	
Anxiety	40	16.9 (5.2)	19.2 (5.3)	F=7.5 p=0.007	*16.4 (5.2)*
Depression	24	2.6 (3.5)	3.0 (3.9)	F=.42 p=0.52	*1.8 (3.3)*
Cheerfulness	24	12.9 (4.9)	10.6 (4.4)	F=10.1 p=0.002	*12.3 (3.7)*
Social support				**F=1.7 p=0.16**	
Potential confidentiality	20	13.5 (3.8)	12.5 (4.1)	F=2.3 p=0.13	*13.9 (4.5)*
Mutual visits	8	5.5 (1.4)	5.1 (1.5)	F=2.8 p=0.09	*5.6 (1 3)*
Actual conf.	12	6.6 (1.7)	6.0 (1.9)	F=4.0 p=0.05	*6.1 (1.7)*
Impact	40	12.3 (4.0)	15.4 (4.9)	**t=-3.93 p=<0.001**	-

*= reference group different from group with pain in the hip or knee only (t=-1.99, p=0.047). Comparable results were found when we compared the group with reported generalized OA (n=46) with the group with pain in the hip or knee only (n=62). There were no differences on the IRGL variables between the sub-groups with additional MSDs (n=91) and with additional other conditions (n=33). The mean scores on the self-care, anxiety, cheerfulness, and social support scales of the group with pain in the hip or knee only, were comparable to those of the reference group without pain in the hip or knee, with the exception of a significant difference in mobility ($p < 0.05$).

Figure 4.2 shows the cumulative percentage of respondents who reported that their joint symptoms 'often' and 'almost always' had an impact on several aspects of daily life. Significant differences were found in the areas of work, household, leisure-time activities, and sleep, with the group with pain in the hip or knee only being clearly less affected in their daily life functioning than the group with additional conditions.

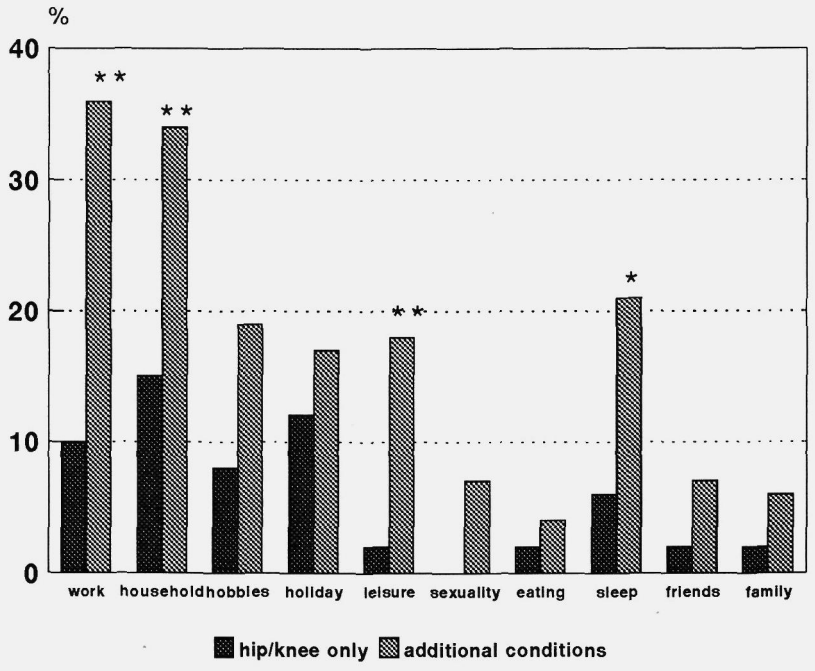

Figure 4.2 Cumulative percentage of respondents reporting that their joint problems 'often' or 'almost always' had an impact on specific aspects of daily life. Groups with current pain in the hip or knee only and with additional mobility restricting conditions (community living people, aged 55 to 74 years, n=186).

Logistic regression

The results of the step-wise multivariate logistic regression analysis are shown in Table 4.4. As potential discriminating (independent) variables we used background variables, and the IRGL variables which were significantly different between the two groups. The dependent variable (grouping) was 0 if only pain in the hip or knee was present, and 1 if additional conditions were present. The pain scale of the IRGL was included in the model after step 1, followed by cheerfulness, and impact. No variables could be

removed. If the odds ratio does not include 1 in the 95% reliability interval (=a significant dependent variable), it means that this variable contributes to the change that the respondent belongs to the group with additional mobility restricting conditions.

Table 4.4 Results of a step-wise logistic regression analysis (after three steps forward). Group with pain in the hip or knee only versus group with additional mobility restricting conditions.

dependent: 0=group hip/knee only 1=group with additional conditions Variables in the model:	Odds ratio and 95% confidence interval
sex	
education	
age in years	
marital status	
pain chronicity	
pain IRGL	1.18 (1.11-1.24)
mobility	
anxiety	
cheerfulness	0.89 (0.86-0.94)
actual confidentiality	
impact	1.11 (1.05-1.17)

note: sex 1=male 2=female; education 1=primary 2=secondary 3=college/university; marital status 1=together 2=alone; pain chronicity 1=sporadic pain, 2=episodic pain, 3=chronic pain; pain IRGL=pain scale of the IRGL. No variables could be removed of the model.

Discussion

In this study, we investigated the differences in health status between a group of elderly community living people with current pain in the hip or knee only and a group with additional mobility restricting conditions. The group with current pain in the hip or knee only, had a significantly better physical functioning, including better mobility and less pain, less psychological distress, and less impact of their joint symptoms on daily life, than the group with additional conditions. No differences were found in comorbidity as measured two years before the start of the present study. The health problems of people with pain in the hip or knee only were very much comparable to those of a reference group without pain and ROA, with the same amount of comorbidity. In a multivariate analysis, we found that -after correction for all other variables in the model- pain, cheerfulness, and impact were the best independent discriminators between the group with pain in the hip or knee only, and the group with additional mobility restricting conditions.

These findings suggest that pain in the hip or knee, which is a common complaint of elderly people, does not affect health more than the above described conditions do. The health status is lower however, when pain in the hip or knee occurs in combination with other mobility restricting conditions. These conditions were usually OA in other joints and other musculoskeletal problems, such as back pain. Other prevalent causes of mobility restriction were the presence of problems with the cardiovascular and respiratory systems. We have to emphasize that the presence of comorbidity didn't have to be congruent with the reporting of a certain disease as a cause of mobility restriction.

Intentionally, we used the statement 'other mobility restricting conditions' in the interview, because we were interested in conditions that cause health problems similar to those caused by pain in the hip and knee. Because it would have been impossible to include all conditions which could cause mobility problems in one pre-printed list, we used an 'open answer' question. In this way we avoided the problem faced by Ettinger *et al.*[23], the majority of whose respondents chose for 'other' as an answer to the question which disease or disorder was a cause of their disability. Ettinger *et al.* found in the same study a good agreement (85% in men and 71% in women) between self-reported disease and an independent confirmation of the diagnosis. In the present study, additional mobility restricting conditions were self-reported and not confirmed by a doctor. However, Hughes *et al.*[31] reported that older people (especially up to the age of 75 years and those with joint pain) give accurate self-report information about their musculoskeletal conditions. Besides the self-reported mobility restricting conditions, we used the comorbidity scores sampled in the Rotterdam Study for all respondents two years before the start of our study. These scores were more objective and mostly confirmed by a doctor. Unfortunately, these comorbidity scores did not include any MSD.

A problem that we encountered was that the participants with other mobility restricting conditions besides pain in the hip or knee were slightly younger than the other participants. It is possible that, because of the stepwise sampling of the research population, bias was introduced against the inclusion of older and more disabled persons in our study. Another possibility is that the group with additional mobility restricting conditions had a higher mortality rate, perhaps because of the presence of a life-threatening disease. However, we found no signs that this group had a higher comorbidity. Dexter & Brandt[16] reported a negative correlation between age and impact of OA, which is not yet well explained. In fact, we found that the relatively younger respondents reported higher impact of joint pain on activities of daily life than did the older respondents. An explanation is that older people regard their diminished physical functioning as quite normal for their age and are less likely to attribute these problems to their joint pain. As an alternative explanation, we can think of a cohort effect. This

means that a certain age cohort is more vulnerable to mobility restricting conditions due to certain events in the past, such as a poor health status in the Second World War, when members of a certain cohort were on a age that cartilage was still being made (personal communication of P. Okma-Keulen and J. te Koppele, 1996).

Krick *et al.*[17] found that social functioning in patients with OA is very stable, even in a group with more pain and limitations in activities of daily living. We found the same phenomenon. However, we also found more psychological distress in the group with relatively more pain and lower physical functioning (the group with additional problems), as have other authors[15]. In their study using the AIMS in women with symptomatic knee OA, Salaffi *et al.*[32] hypothesized that psychological status is of utmost relevance to the impact of OA on physical performance and the experience of pain. However, it is difficult to say how the disablement process develops because available data are derived from cross-sectional studies. As our study was also cross-sectional in design, we cannot draw conclusions about causal relationships between variables such as pain, disability, and anxiety.

We were in the unique position of having radiographic scores available for of the hips and knees of every respondent. Only a minority of the people with current pain symptoms actually had damage of the cartilage of one or more of the hip or knee joints, and there was no difference in the presence of ROA between the group with pain in the hip or knee only and the group with additional conditions. It is recognized that ROA is one of the predictors of physical disability, pain, and psychological distress[10,32,33,34], even though the diagnosis of symptomatic OA does not depend on the presence of ROA[35].

In future research on knee or hip OA and disability, it would be wise to correct for the self-reported presence of other mobility restricting conditions that can affect the health status of people with signs and symptoms of OA. For the clinician, the important implication of our findings is that older people with self-reported additional mobility restricting conditions besides their arthritic pain in the hip or knee are at greater risk of suffering from psychological distress, and physical dysfunctioning. The group under 65 years is especially at risk of a diminished health status, because people in this age group are relatively active in society (paid employments, household duties, etc) and are rather unlikely to think of their complaints as being a normal phenomenon of aging. These people require extra care and guidance.

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5. PHYSICAL ACTIVITY, PHYSICAL DISABILITY AND OSTEOARTHRITIC PAIN IN OLDER ADULTS.

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Introduction

Osteoarthritis (OA) is a common cause of pain in the hip and knee and is related to aging. Since the proportion of people older than 55 years is increasing in western countries, OA is the cause of increasing morbidity (Davis, 1988; Valkenburg, 1988). There is no consensus on the definition of OA. Hough & Sokoloff (1989, p. 1571) prefer the definition "Osteoarthritis is an inherently non-inflammatory disorder of movable joints characterized by deterioration and abrasion of articular cartilage, as well as by formation of new bone at the joint surfaces". OA is usually a slowly evolving articular disorder characterized by the gradual development of joint pain, stiffness, and limitation of motion (Moskowitz, 1989). Little or no correlation exists between joint symptoms and the extent or degree of abnormalities seen on radiographs. Only about 30 to 45% of people with radiological evidence of osteoarthritis (ROA), such as narrowing of the joint space, develop related symptoms (Cobb, Merchant & Rubin, 1957; Hochberg, Lawrence, Everett & Cornoni-Huntley, 1989; Lawrence, Bremmer & Bier, 1966). Known risk factors for ROA are obesity (especially for OA of the knee) and previous (major) knee injury (Felson, 1990; Schouten, 1990).

Pain and disability are the primary symptoms of OA (Dekker, Boot, van der Woude & Bijlsma, 1992). Pain is often caused by local granulation of the bone surface, although other origins of pain are the synovium or soft-tissue changes around the joints (Dekker et al., 1992; Hutton, 1990). Inflammation can occur periodically. Disability is defined by the World Health Organization (1980, p. 28) as "any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being". Pain in the hip or knee has been shown to be a strong determinant of locomotor disability in community dwelling older adults (McAlindon, Cooper, Kirwan & Dieppe, 1992; Odding, 1994).

Only a few studies have investigated the relationship between OA and physical activity. Hannan, Felson, Anderson & Naimark (1993) examined the relationship between OA of the knee and habitual physical activity in the Framingham cohort. They found that habitual physical activity does not increase the risk of knee OA. White, Wright & Hudson (1993), found in a longitudinal study that middle aged women who were specialist teachers of physical education had less joint pain and joint stiffness than less active controls. In clinical practice it has long been known that moderate exercise (walking, swimming, cycling) has a beneficial effect on pain and disability in patients with non inflammatory OA (Brandt, 1989). A supervised walking program has positive effects on the functional status, pain, and medicine use of patients with OA of the knee (Allegrante, Kovar, Mackenzie, Peterson, & Gutin, 1993; Kovar et al., 1992). Dekker, Mulder, Bijlsma & Oostendorp (1993), in a review of the physical therapy literature,

concluded that available evidence is in favor of exercise therapy for patients with OA. Similarly, in a recent review, Panush & Inzinna (1994) concluded that selected physical activities are beneficial for patients with OA and that recreational exercise (such as distance running) need not inevitably lead to or accelerate joint injury.

Surprisingly, little is known about how physically active lifestyles might mediate in the relationship between arthritic pain and the occurrence of disabilities in elderly, community-living people. According to Baron and Kenny (1986, p. 1176), "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". Also according to Baron and Kenny (1986, p. 1176) a mediator has to meet the following criteria: (a) variations in levels of the independent variable should significantly account for variations in the presumed mediator, (b) variations in the mediator should significantly account for variations in the dependent variable, and (c) there should be no significant relationship between the dependent and independent variable if the mediator is controlled for.

In this study we examined the interrelationships among pain and other illness-related variables, such as fatigue and ROA, physical disability, and habitual physical activity, in people (55 to 74 years of age, living in the community) with chronic, episodic, or sporadic pain in the hip or knee and in a reference group of people without pain. First, we investigated the specific physical activities in which these people participated. Second, we tested the hypothesis that a physically active lifestyle is a mediator in the relationship between frequency of arthritic pain and physical disability.

Population and Methods

This study was carried out as a part of a large epidemiological study of the general population aged 55 years and over of the district Ommoord in Rotterdam, known as the *Rotterdam Study* (Hofman, Grobbee, De Jong & Van den Ouweland, 1991; Odding, 1994; Odding et al., 1995). The aim of the Rotterdam Study is to investigate determinants of disease occurrence and progression in people older than 55 years (N = 10,275; response: N = 7,983). In 1991 a sub-study (on a representative sample) was carried out to examine pain, ROA, and locomotor disability. All subjects were asked the following two questions during an interview at home (response 83%) and during a medical examination at the research centre (response 95%) several weeks later: "Have you had any pain or other complaints about your joints in the last month?" (*yes* or *no*) and "Can you point out the painful joints". There were 2,895 subjects in this substudy, 2,178 of whom were aged 55 to 74 years. Details of the physical examination and the

nonresponse rate (only due to serious illness) were described by Odding (1994) and Odding et al. (1995).

In 1993, a subsample from the last-mentioned study was formed. Inclusion criteria were the availability of an X-ray of the hips and knees, age between 55 and 75 years, and participation in 1991 in the medical examination and the interview at home. Criteria for exclusion were participation in one of the other substudies of the Rotterdam Study (these studies were unrelated to musculoskeletal complaints), the presence of cognitive impairments, and living in a home for the elderly. In February 1993, the 831 selected subjects were asked to complete a short questionnaire which included the question "Have you had any pain or other complaints about your joints in the last month?" (yes or no), but specifically for pain in the hip or knee. The overall response for this questionnaire was 83% (N = 691). Chi-square testing showed no significant differences in age and sex between the people who completed this short questionnaire and those who did not. Using the scores for self-reported pain in the hip or knee during the last month for three different moments in time (twice in 1991 and once in 1993), we classified this representative sample into groups with *chronic* pain (pain on three occasions, n=72), *episodic* pain (pain on two occasions, n=86), and *sporadic* pain (pain on one occasion, n=118). A *reference* group without pain and without ROA (n=94) was selected and matched for age and sex to the subjects with chronic and episodic pain.

From March to June 1993 all selected people (N = 370) were approached by telephone and asked whether they would participate in the present study. All respondents completed a series of self-administered questionnaires and had an interview at home in which physical activity was assessed. The nonresponders were about equally distributed in the four groups. The characteristics of the people who responded (83%, N = 306) are shown in Table 5.1. There were no differences between the groups with respect to age, sex, marital status, and education. The respondents were predominantly women. The mean age in all groups was 65 years. There were no age differences between the men and women of the different groups (ANOVA, age of women in years: F=0.51 p=0.68; age of men in years: F=2.42, p=0.07). Most respondents lived with a partner and most had a secondary school education.

Table 5.1 Demographic variables in Community-Living Subjects Aged 55-74 Years with Pain in the Hip or Knee and a Reference Group (total N=306)

Group		n	Age		Married	Primary education	Secondary education	Higher education
			M	SD	%	%	%	%
Chronic pain	Women	44	64.4	(5.5)	52	16	79	5
	Men	15	61.9	(5.6)	86	27	60	13
Episodic pain	Women	48	64.9	(5.3)	67	21	66	13
	Men	26	66.5	(5.6)	84	15	73	12
Sporadic pain	Women	63	65.4	(5.7)	57	21	68	11
	Men	38	65.5	(6.2)	90	18	66	16
Reference	Women	52	64.3	(5.9)	71	15	71	4
	Men	20	63.6	(5.9)	85	15	75	10

Disability

Disability was assessed with a Dutch version of the Sickness Impact Profile (SIP)(Bergner, Bobbitt, Carter, & Gilson, 1981), which is a reliable and extensively validated instrument (McDowell & Newell, 1987; Bruin, Witte, Stevens, & Diederiks, 1992). Cronbach's alpha for the total SIP score in Dutch research is > 0.90, and the correlation with clinical parameters is high: 0.84 for the physical dimension of the SIP with a clinical index of hip functioning and 0.66 with a clinical arthritis index (König-Zahn, Furer & Tax, 1993). The Dutch version of the SIP has been validated against the American version and "the SIP scores of open populations of the two countries are in agreement" (Jacobs, Luttik, Touw-Otten, & De Melker, 1990, p. 1954). The SIP consists of 136 statements, each of which was judged by the respondents for its relevance to his or her situation (due to sickness). All statements are classified in 12 different areas of daily living activities, varying from 'sleep/rest' to 'social interaction' 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 from the questionnaire (only 9% of the respondents had a job).

Illness-related variables

Fatigue in the last month was assessed with a 15-cm Visual Analogue Scale, and scores are presented as percentages. The body mass index (BMI; weight/(height)^2) is a measure for overweight and obesity, which are known risk factors for osteoarthritis. BMI was assessed in the Rotterdam Study in 1991. According to standard norms 'acceptable weights' are in the range 20-25, with a score of 26-29 reflecting overweight and a score

higher than 30 reflecting obesity. Radiographs of the knees and hips were classified by two trained assessors according to the criteria of Kellgren and Lawrence (1963), with scores varying from 0 to 4 (Grade 0=absence of any sign of ROA, 1=doubtful narrowing of joint space and possible osteophytic lipping; 2=definite osteophytes and (possible) narrowing of joint space; 3=moderate multiple osteophytes, definite narrowing of joint space and some sclerosis and possible deformity of bone ends; 4=large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone ends), with this scale ROA is indicated by a Kellgren score ≥ 2. The following illness-related variables were measured only in subjects with pain (in the last month before the questionnaire was completed). The frequency of swollen joints (in general) was assessed on a 4-point scale from 1= almost never to 4= always. Morning stiffness in the last month was measured with a 5-point scale varying from 1= 2 hours or more to 5= no stiffness present. Pain severity in the last month was assessed by a question with five possible answers varying from 1= almost no pain to 5= very severe pain. Some of the subjects also suffered from other problems that affected mobility, most of which were other rheumatic symptoms (such as pain in the back and shoulders). We defined this situation as *additional mobility problems.*

Physical activity

The interview included a questionnaire about physical activity in the elderly (Voorrips, Ravelli, Dongelmans, Deurenberg & van Staveren, 1990). This questionnaire is based on a list designed by Baecke, Burema & Frijters (1982) and has been adapted for use in an elderly population. Its validity was determined by Voorrips, who used two independent methods to assess physical activity, namely, a repeated 24-hr physical activity recall (Spearman correlation = 0.78) and measurements with a pedometer (Spearman correlation=0.72). Reliability was tested in a test-retest design (Spearman correlation=0.89). The questions cover three areas: household activities (mean score of 10 items), sport activities (intensity, hours per week, and period of the year for two sports maximum), and leisure-time activities (intensity, hours per week, and period of the year, for six activities maximum). The sport and leisure activity scores were calculated using a formula with weights for intensity, hours per week and months a year. The interviewers explained to the respondents the difference between a sport activity (e.g., swimming, doing exercises, biking for sport) and a leisure-time activity (e.g., gardening, playing cards). Voorrips recommended using tertiles or quartiles to classify the physical activity of elderly respondents. The raw scores were used for the comparison between the four groups.

Statistical methods

An alpha level of 0.05 was used for all statistical tests. The statistical power for detecting medium-sized effects (differences between groups) in analyses of variance (effect size 0.25, alpha=0.05) with the four groups under study was > 0.90 (Cohen, 1988). Numerical variables were analyzed with ANOVA or ANCOVA (with covariate BMI or age), and nominal variables with chi-square tests. Multiple comparisons between groups were made with Duncan's multiple-range test. To test the mediating role of physical activity, a stepwise multiple-regression analysis on physical disability (SIP score, a continuous variable) was carried out with the independent variables entered in blocks. The first block was demographic data, namely sex, age (in years), education (primary, secondary or, higher education), and marital status (living together or living alone). The second block was pain frequency, with 1=sporadic, 2=episodic, and 3=chronic pain. The third block involved illness-related variables: fatigue intensity, BMI, ROA (1= Kellgren score < 2; 2= Kellgren score=2, 3= Kellgren score >2), additional mobility problems (1=no, 2=yes), swollen joints in five categories (see specific Method section), morning stiffness in five categories, and pain severity in five categories. The fourth block was lifestyle variables, namely, household, sport, and leisure-time activities in quartiles. Partial correlations (comparable to beta) are reported as outcome of the regression analysis. This indicates the relative importance of the independent variables when the linear effects of other independent variables after the last step have been eliminated. For each step the increase in the percentage of explained variance (R^2) is given. Pearson's correlations are reported, as given in the statistical output files of the regression analysis (the matrix of correlations). Data analysis was performed with SPSSx (1990).

Results

Subjects in the reference group were slightly overweight, but those in the chronic pain group were more overweight (significantly different from the reference group, F=2.9, p=0.03; Table 5.2). Fatigue in the last month was relatively less severe in the reference group (ANOVA groups with covariate BMI, F=4.9, p=0.003) than in the other groups. The highest percentage of ROA was found in the group with chronic pain (42% of the respondents had ROA of the knee and 23% had ROA of the hip). Women had significantly more ROA than men, χ^2 (1, N=306)=3.9, p=0.047. In the month before they completed the questionnaire, 20% of the subjects in the group with sporadic pain had one or more swollen joints often or very often, as did 35% in the group with episodic pain and 45% in the group with chronic pain. This difference in the frequency of swollen

joints between the groups with pain was statistically significant, χ^2 (6, n=221)=18.2, p=0.006. Some of the subjects with pain had additional mobility problems (37% in the group with sporadic pain, 59% in the episodic group, and 73% in the chronic group). Morning stiffness lasting more than 30 min. was reported by 17% of the subjects in the sporadic pain group, by 26% of the subjects in the episodic pain group, and by 40% of the subjects in the chronic pain group, χ^2 (8, n=187)=21.6, p=0.006. Pain was considered severe or very severe by 6% of the subjects in the sporadic pain group, 12% of the subjects in the episodic pain group, and 24% of the subjects in the chronic pain group. Current pain (in the last month) was experienced by 55% of the sporadic pain group, 76% of the episodic pain group, and 83% of the chronic pain group.

Table 5.3 gives the total physical disability scores for the three groups with different pain frequencies and for a reference group without pain. The physical disability score of the group with chronic pain was more than five times higher than that of the reference group. The physical disability score of the groups with episodic and chronic pain was significantly different from the score of the reference group.

Table 5.2 Illness-related Variables in Community-Living Subjects Aged 55-74 Years with Pain in the Hip or Knee and in a Reference Group

	BMI M (SD)	Fatigue intensity M (SD)	ROA knee %	ROA hip %	Often swollen joints %	Additional mobility problems %	Morning stiffness >30 min. %	Severe pain %	Current pain (in last month) %
Chronic pain	27.4 (3.5)	38.0 (22.1)	42	23	45	73	40	24	83
Episodic pain	26.7 (4.2)	38.6 (21.6)	23	22	35	59	26	12	76
Sporadic pain	26.3 (3.2)	32.5 (22.0)	26	16	20	37	17	6	55
Reference	25.6[c] (3.4)	26.0[c,e] (19.8)	0	0	-	-	-	-	-

Note: BMI= body mass index, ROA= Kellgren-score ≥ 2.
Additional mobility problems, morning stiffness, and pain severity only for respondents with current pain.
Duncan's multiple range test: [c]= different from chronic pain group, [e]= different from episodic pain group

Table 5.3 Physical Disability (SIP score) and Physical Activity: Groups with Pain in the Hip or Knee and a Reference Group (Community-Living Subjects Aged 55-74 Years)

	Chronic pain n=59 M (SD)	Episodic pain n=74 M (SD)	Sporadic pain n=101 M (SD)	Reference n=72 M (SD)	Test statistics (ANOVA)
Physical disability	5.4[r,s,e](6.7)	3.5[r] (6.0)	1.9 (4.3)	1.0 (4.1)	F=8.9, p< 0.001
Household activities[1]	1.7 (.49)	1.7 (.50)	1.7 (.54)	1.9[s,e,c] (.46)	F=2.7, p=0.04
Sport activities[1]	6.0[e] (6.6)	3.7 (4.8)	5.1 (5.7)	6.4[e] (7.2)	F=2.6, p=0.05
Leisure-time activities[1]	4.1 (4.6)	4.7 (6.8)	4.7 (5.1)	4.4 (5.5)	F=0.20, p=0.90

Note: Total 'physical' disability= sum of subscales personal care, mobility, and walking (SIP). From 2 subjects, SIP data were not available.
Duncan's multiple range test: [c]=different from chronic pain group, [e]=different from episodic pain group, [s]=different from sporadic pain group.
[1]= raw scores.

The most often mentioned sport activities were walking (49%), cycling (42%), doing physical exercises (20%), and swimming (16%) (more than one answer was possible). For leisure-time activities, many people (mostly women) mentioned sewing and needlework (23%), and reading (23%). Other favorite leisure-time activities were solving puzzles (12%), gardening (13%), and playing cards (11%). There were significant differences between the household and sport activity scores of the groups (Table 5.3). The reference group was more involved in household activities than were the groups with pain. However, the group with chronic pain had a relatively high score for sport activities (higher than that of the episodic pain group and comparable with that of the reference group).

To investigate the possible mediating role of a physically active lifestyle in the relationship between pain frequency and physical disability, we first conducted a stepwise multiple-regression analysis with data for subjects with current pain (because in this group all relevant illness-related variables were known). The results are summarized in Table 5.4. The zero-order Pearson correlations, given in the first column, indicate that there was a relationship between physical disability and age, pain frequency, all the illness-related variables, and all lifestyle variables. As a first step we entered demographic variables. This explained 4% of the variance in physical disability. Secondly we added pain frequency. The explained variance now increased with a significant 10%. In a third block we entered illness-related predictors such as frequency of swollen joints, fatigue intensity, body mass index, ROA of the hip or knee, the presence of other problems in mobility, morning stiffness, and pain severity, which explained another 25% of the variance. After introduction of this block, pain frequency no longer made a significant contribution to physical disability. Finally, in the last block we entered variables concerning a physically active lifestyle. These included household activities, sport activities, and leisure-time activities in quartiles, which together explained 7% of the variance in physical disability.

To detect possible multicollinearity, we studied the correlations between the independent variables. The highest correlations were 0.54 (household activities and sex) and -0.48 (pain severity and morning stiffness). Almost half (45%) of the total variance in physical disability was explained by the model. After correction for all other variables (see second column), we found that the only significant predictors of physical disability were fatigue intensity (partial correlation 0.20), the level of household activities (-0.19), and the level of sport activities (-0.15). To test the illness-uncorrected effect of lifestyle, we repeated the analyses by entering the lifestyle variables before the illness-related variables. The lifestyle variables then explained 16% of the variance in physical disability (with significant contributions of sport and household activities). Pain frequency still made a significant contribution (partial correlation 0.27) to the explained

variance. Of the three independent predictors (fatigue intensity, household, and sport activities), only sport activities met all the conditions of a mediating variable. After correction for illness-related variables and lifestyle variables, the relationship (correlation) between pain frequency and physical disability was no longer significant (the correlation coefficient went from 0.30 to 0.11).

Table 5.4 Stepwise Regression of Demographic Variables, Illness-related Variables, and Lifestyle Variables on Physical Disability (SIP) of Community-Living Subjects with current Pain in the Hip or Knee (Aged 55-74 Years; n=161).

	Correlation with dependent (physical disability)	Partial correlation with dependent	R^2 change
Demographic			
Sex	-.04	.04	
Age in years	.14*	.07	
Education	.05	.02	
Marital status	.12	.04	.04
Pain frequency	.30**	.11	.10**
Illness-related			
Swollen joints	.27**	.01	
Fatigue intensity	.36**	.20**	
Body mass index	.28**	.11	
ROA knee	.32**	.11	
ROA hip	.24**	.06	
Additional problems	.33**	.08	
Morning stiffness	-.36**	-.07	
Pain severity	.40**	.04	.25**
Lifestyle			
Household	-.33**	-.19**	
Sport	-.27**	-.15**	
Leisure-time	-.13*	-.07	.07**
TOTAL R^2			.45**

Note: Household, sport, and leisure scores in quartiles.
Correlation with dependent is the bivariate Pearson-correlation. The partial correlation (comparable with beta) is the result of the total regression analysis.
sex 1=male, 2=female; marital status 1=together, 2=alone; ROA 1=score < 2, 2=score 2, 3= score > 2; additional problems 1=no 2=yes.
*p < 0.05. **p < 0.01.

The relationships between pain frequency, physical disability, and sport activity in the total group (n=304, the SIP scores from 2 subjects were missing) are shown in Figure 5.1. Subjects with a relatively high level of sport activity (> median) had far less

physical disability than subjects who were less active. The biggest difference was seen in the group with episodic pain. The mean physical disability of subjects with chronic pain and a relatively high level of sport activity (> median) is shown separately on the right side of the figure for subjects with a low (< median) and a high intensity (>median) of fatigue. As can be seen from this figure, the physical disability of subjects with chronic pain, a relatively high sport activity, and relatively less fatigue is comparable to that of subjects with sporadic or episodic pain. The main effect of pain was still significant (F=3.4, p=0.035) when sport activity (in quartiles) was taken as a covariate in an analysis of variance on physical disability between the reference group, the group with sporadic pain, and the group with episodic pain. When sport activity and fatigue intensity were both controlled for in an analysis of covariance, the results (F=2.2, p=0.11) indicated that the frequency of pain was no longer of significance in the prediction of physical disability (since the relationship between pain and sport activity was nonlinear when the chronic pain group was involved, we omitted this group from this analysis).

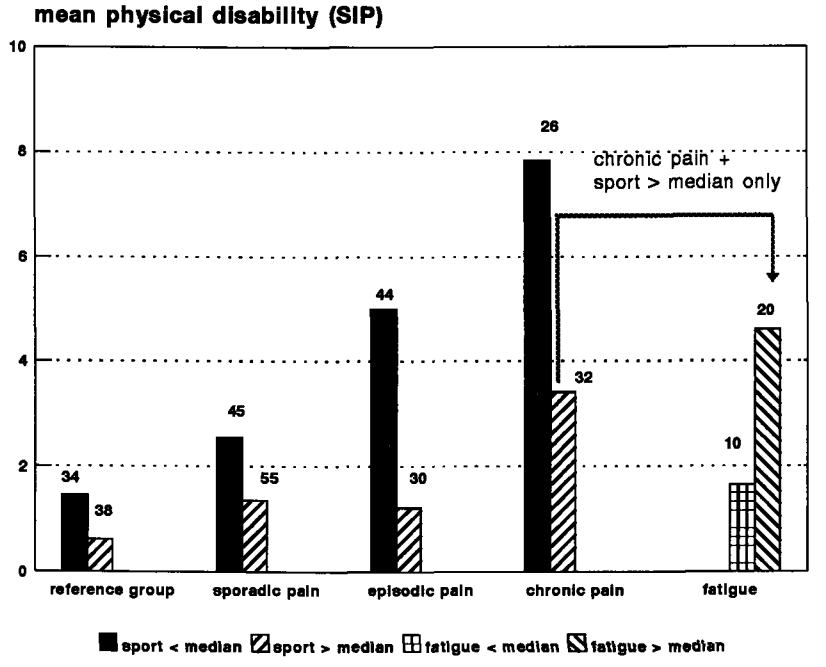

Figure 5.1 Physical disability and sport activity in groups with different pain frequency (community-living subjects aged 55 to 74 years; n=304); relationship of high sport activity with fatigue intensity in the group with chronic pain.

Discussion

The results of this study support the conclusion that the level of sport activity is a mediator of the relation between frequency of pain and occurrence of physical disability. However, this conclusion is only justified when other illness-related variables, especially intensity of fatigue are controlled for. It is possible that subjects with higher levels of fatigue suffer more from inflammation processes and from more severe pain, causing higher levels of disability. Variables such as ROA and pain severity seem to be less important for predicting physical disability. Sport activity meets all the criteria for a mediator: it is related to pain frequency and to physical disability and, when sport activity controlled for, the relationship between pain frequency and physical disability is no longer significant. That the partial correlation is not equal to zero means that sport activity is not a very strong mediator and that other mediating variables (not yet included) are possibly active. The main sport activities reported were walking, cycling, doing exercises, and swimming. These activities were reported relatively frequently by subjects with chronic pain. It is possible that some of the exercises or sports were prescribed by a doctor, which would explain the relatively higher levels of sport activities in this group. Dexter (1992) found that, in a midwestern city in the USA, 63% of the elderly persons with OA of the hip or knee who had received medical advice to exercise attempted to do so. This phenomenon was a problem in our analyses. The relationship between pain frequency and sport activity in the total group was nonlinear: The episodic pain group had the lowest level of sport activity, while the chronic group had a sport activity level as high as that of the reference group.

Baron & Kenny (1986) recommended that analyses that check for mediation should be as simple as possible. However, we chose to perform a stepwise regression analysis to investigate the relative importance of other groups of variables and to get an impression of the most important independent predictors of physical disability. In this way we found that the intensity of fatigue is an important predictor of physical disability.

Although this was not a longitudinal study, we can speculate about the causal relationships between the several variables. Our results suggest that regular habitual sport activities can counteract the development or worsening of physical disability in subjects with chronic pain in the hip or knee. A possible explanation for this phenonema is that the leg muscles are strengthened by exercise, which produces more stable joints. This explanation is supported by other research on the muscular determinants of pain and disability (Lankhorst, van de Stadt & van der Korst, 1985; Dekker et al., 1992; Dekker, Tola, Aufdemkampe & Winckers, 1993). Our analysis also indicated that sporadic and episodic pain precedes chronic pain, because this variable reflects pain experienced over a period of three years. The subjects with current pain in fact represent a group with pain

on a fourth occasion. As expected, these subjects were most frequently found in the chronic pain group.

We compared our results for level of physical activity with those from other studies. Voorrips et al. (1991) reported a mean total physical activity score (the sum of scores on household, sport, and leisure activities) of 11.0 (SD 4.6) in a group of 29 men and women aged 60-83 years. This result is comparable with the scores of our study, indicating a certain validity of the results. We could not find other comparable studies at the population level in the field of arthritic pain, disability, and habitual physical activity. Other studies include only patients with OA or rheumatoid arthritis (Lane & Buckwalter, 1993).

More attention should be given to the role of fatigue in the association between pain frequency and physical disability and the possible relationship with periods of inflammation. Future research should also focus on the effect of health promotion activities that try to stimulate elderly people with arthritic pain in the hip or knee to adopt a physically active lifestyle, and whether this is an effective intervention. Emphasis should be on people with sporadic and episodic pain symptoms. It is known that a physically active lifestyle in older age also protects against other chronic diseases and can enhance the quality of life (Bokovoy & Blair, 1994).

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6. COPING WITH PAIN IN THE HIP OR KNEE IN RELATION TO PHYSICAL DISABILITY IN COMMUNITY LIVING ELDERLY PEOPLE

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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 osteoarthritis and the coping strategies they used. Palliative cognitive coping strategies (such as 'accept the situation' and 'resign self because it's fate') were used the most frequently. Burke & 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 arthritic women.

Coping with pain has recently been recognized as being as equally important as cognitive coping with the psychosocial consequences (such as disability) of a chronic illness such as osteoarthritis[13-18]. Jensen *et al.*[19] argue, in 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 eight 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) 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 & Huiskes[13] investigated, in patients with rheumatoid arthritis, the relationships between pain coping strategies with mobility and physical disability as outcome variables. They also found a significant contribution of the behavioral pain coping strategy 'reducing physical effort' (comparable to '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 arthritic pain and the occurrence of physical disability in a population of community living subjects aged 55 to 74 years with pain in the hip or knee. Baron & Kenny[22] have defined a mediating variable as: "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].

The purpose of the present study was to investigate: (a) how community living elderly people (aged 55 to 74 years) with pain in the hip or knee of varying chronicity, cope with their current pain; (b) the possible mediating role of coping with pain in the relationship between the chronicity of pain and physical disability.

Population and methods

This study was carried out as a part of a large epidemiologic study among the general population aged 55 years and over of the district Ommoord in Rotterdam, known as the *Rotterdam Study*[23]. 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 sub-study (on an age and sex representative sample) was carried out into locomotor disability, joint pain, and radiological OA (ROA)[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 sub-study 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 already been classified according to the criteria of Kellgren and Lawrence[24].

In February 1993 a sub-sample (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 sub-sample were the availability* of a radiograph of the hips and knees, age between 55 and 75 years, and participation in 1991 in the interview at home and the medical examination. Criteria for exclusion were participation in one of the two other sub-studies of the Rotterdam Study (these studies were unrelated to musculoskeletal complaints), the presence of cognitive impairments, and living in a home for the elderly.

On the basis of scores for 'self-reported pain in the hip or knee during the last month' at three different time points (twice in 1991 and once in February 1993), we

*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.

classified the respondents (n=691, response 83%) into groups with *chronic* pain (pain on three occasions, n=72), *episodic* pain (pain on two occasions, n=86), *sporadic* pain (pain on one occasion, n=118), and no pain (n=415). All the subjects with pain on at least one out of the three occasions (total n=276) were asked to participate in the present study. In the spring and summer of 1993 all respondents (n=234, response 85%) received a written questionnaire and were interviewed 2 weeks later. Further details of the sampling procedure are described elsewhere[25]. In addition, a questionnaire about coping with pain was completed by a sub-group of 157 respondents with current pain. Current pain was defined as 'pain in last month', as reported in February 1993. Also, a reference group without pain (on either of the three occasions) and without ROA (n=94) was randomly selected from the response on the questionnaire in February, and matched for age and sex to the subjects with chronic and episodic pain. From this last group, 72 (77%) people participated in the study as a reference group. The responders (total group n=306) were comparable with the non-responders (n=64) with respect to age-group (< or ≥ 65 years; χ^2=0.30, df=1, p>0.05) and sex (χ^2=0.36, df=1, p>0.05).

Physical disability

Disability was assessed with a Dutch version of the Sickness Impact Profile[26]. This measure consists of 136 statements, each of which was judged by the respondents for its relevance to his or her situation (as far 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 from the questionnaire (few respondents had a job). The reliability and validity of the SIP for use in a Dutch population is good[27].

Illness-related variables

The IRGL (Invloed van Reuma op Gezondheid en Leefwijze=Impact of Rheumatic Diseases on Health and Lifestyle) was developed in 1990[28] as an instrument for measuring the impact of rheumatic diseases, especially in the Dutch situation, and is partly based on the AIMS (Arthritic Impact Measurement Scale[29]. Pain severity in the last month can be described by the respondent in five categories varying from 'almost no pain' (=1) to 'very severe pain' (=5).

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 standard norms 'acceptable ratios' are in

the interval 20-25, with a ratio of 26-29 being considered to reflect overweight and a ratio higher than 30 being considered to reflect obesity. 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 radiological osteoarthritis (ROA). The radiographs were scored by two trained medical doctors.

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 suffered from 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 'additional mobility problems'.

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[30]. Test-retest reliability was 0.89, the Spearman correlation with a 24-h activity recall was 0.78 and with pedometer measurements 0.73. The questions cover three 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 a year. Quartiles were used to classify the sport activity scores of the elderly respondents in a regressionmodel, as recommended by Voorrips[30].

Coping with pain

The list 'Pain Coping Inventory' (= Inventarisatie Pijngedrag, IPG) was developed by Kraaimaat & van Schevikhoven[31] for use in patients with chronic pain. Respondents had 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?". Each item consists of two parts: a question about the frequency of use (four categories from 'seldom or never' to 'very often') of the described strategy and its influence (five categories; 'not applicable', 'no influence' to 'very much influence'). An example of a described behaviour is: "I take a rest by sitting down or lying down". We added questions about the specific use of alternative therapies and own strategies to reduce pain. Seven factors in frequency of the described behaviors were found for patients with reumatoid arthritis: 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 non-allopathic treatment (4 items, maximum score 16). All items except the subscale 'worrying' were used (this subscale was omitted because we regarded 'worrying' as an appraisal rather than as a pain coping strategy). The reliability of the subscales from the IPG was satisfactory (Cronbach's alpha; 'resting' 0.75, 'comforting' 0.73, 'distraction' 0.73, 'applying non-allopathic treatment' 0.69, 'reducing demands' 0.69, 'withdrawal' 0.64). The answers on the questions about the influence of a strategy were only used as extra information.

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[32]. In the now reported part of our study, the reference group was only used for comparison of lifestyle variables (see Table 6.1 and 2). 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 multiple regression analysis was carried out with all independent variables (demographic data, pain chronicity, illness-related variables, lifestyle variables, and coping with pain) entered in blocks. In the first block sex, age in years, education (ordinal three categories) and marital status (two categories) were introduced. In the second block pain chronicity (ordinal scale from 1 to 3) was added. In the third block fatigue intensity (continuous), body mass index (continuous), ROA (ordinal three categories, see table 6.3), the existence of additional mobility problems (two categories) and pain severity (ordinal five categories) were included. We then introduced 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 continuous. Partial correlations after the last step and the change in the percentage of explained variance after each step 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 after the last step in the model have been eliminated. 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[32].

Results

Characteristics of groups. Table 6.1 presents the characteristics (demographic and illness-related variables) of the groups with sporadic, episodic, and chronic pain in the hip or knee. No differences between the three 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 additional mobility problems and more severe pain than the other groups.

Table 6.1 Demographic 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 additional 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

note 1: significant differences ($p < .05$) between the pain groups were found for additional mobility problems (χ^2=10.7, df=4, p=.03) and severe pain in last month (χ^2=16.1, df=8, p=0.04).
note 2: a reference group without pain (n=72) was not significantly different from the groups with pain, with respect to age, sex, marital status, and education (power >0.90).

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), comparable to that of the reference group

without pain, was found in the group with chronic pain (see Table 6.2). No differences in household activities were found between the three groups. The subjects with chronic pain used the pain coping strategies 'resting', and 'reducing demands' significantly more often than the other subjects did. The coping strategies used the most by all subjects (these are strategies with the highest ratio of mean score/maximum score) were: 'comforting' (for example: 'I think that the pain will decrease') and 'distraction' (example: 'I start to do something that I like'). The least used strategies were 'applying non-allopathic treatment' and 'withdrawal'.

Table 6.2 Physically active lifestyle, pain coping, 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[1] (Mean, SD)	4.3 (4.8)	3.4 (4.7)	6.1[a] (6.6)	F=3.4, p=.04
household[1] (Mean, SD)	1.7 (.56)	1.7 (.50)	1.7 (.49)	F=.14, p=.87
Coping with pain (Mean, SD)				
resting (max. 24)	10.1 (3.1)	10.7 (3.1)	11.6[a] (3.1)	F=3.4, p=.03
comforting (max. 28)	17.1 (5.3)	15.0 (4.3)	16.3 (4.1)	F=2.9, p=.06
distraction (max. 28)	14.6 (4.1)	13.7 (4.0)	15.6 (4.6)	F=2.4, p=.09
applying non-allopathic treatment (max. 16)	6.6 (2.6)	7.0 (3.1)	7.0 (2.2)	F=.42, p=.66
withdrawal (max. 16)	5.4 (1.9)	5.1 (1.6)	5.8 (2.3)	F=1.9, p=.16
reducing demands (max. 12)	5.2 (1.7)	5.5 (1.8)	6.3[a,c](1.9)	F=9.0, p<.01
Physical disability (Mean, SD)	1.9 (3.0)	4.4[a] (6.5)	5.6[a](6.0)	F=6.2, p<.01

[1]= raw scores
note: in a reference group without pain (n=72), the mean raw scores for sport activities was 6.4 (SD 7.2), for household activities 1.9 (SD 0.46), and for physical disability 1.0 (SD 4.1).
Duncan's Multiple Range Test: [c]=different from episodic group [a]= different from sporadic group
The maximum scale score is the highest possible score (= more use) on this particular pain coping scale

For some strategies more than half of the users reported that the strategy had 'a lot of effect'. These strategies were: distraction by taking a 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 an own strategy (used by 48%). The additional own strategies reported more than once included 'massage' (mentioned four times), 'take a painkiller' (mentioned nine times), 'certain physical exercises' (mentioned eleven times), and 'yoga' (mentioned two times). Additional alternative methods used to reduce pain and mentioned more than once were: 'homeopathic medicine' (mentioned eleven times), and 'Chien-pu-wan' (a specific homeopathic medicine, mentioned three times).

The highest level of physical disability was found in subjects with chronic pain (see Table 6.2). The most frequently reported problems in this group were 'walking more slowly', '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 (demographic variables, the chronicity of the pain and other illness related variables, lifestyle variables, and coping with pain) and the outcome variable physical disability (Table 6.3). To reduce the number of independent variables, we used the pain coping strategies and lifestyle variables that were significantly associated with pain chronicity as well as with physical disability (these are requirements of a mediator). 'Comforting', 'distraction', and 'applying non-allopathic treatment' were not significantly correlated with physical disability (respectively -.04, .10, and .10), and household activities and the coping strategy 'withdrawal' were not correlated with pain chronicity (Table 6.2).

The first column of table 6.3 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 demographic 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 demographic 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 demographic variables and pain chronicity, the chronicity of pain was no longer related to physical disability (partial correlation 0.07, see Table 6.3). 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'. 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 variable in the model, the change in R^2 was 0.006 (not significant), which indicates the validity of our findings. We inspected the total correlation matrix on 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 was low (-0.14, not significant different from zero).

Table 6.3 Stepwise regression of demographic variables, illness-related variables, lifestyle variables, and pain coping variables on physical disability (SIP score) 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)	R^2 change
Demographic			
sex	-.07	.08	
age in years	.13	.11	
education	.05	.00	
marital status	.06	.04	.03
Pain chronicity	.25**	.07	.08**
Illness-related			
fatigue intensity	.31**	.13*	
body mass index	.21**	.08	
ROA	.28**	.04	
additional problems	.29**	.08	
pain severity	.36**	.09	.20**
Lifestyle			
sport	-.29**	-.18**	.04**
Coping with pain			
resting	.57**	.32**	
reducing demands	.26**	-.10	.10**
TOTAL R^2 (adjusted explained variance)			.45** (.40**)

Note: sex 1=male, 2=female; marital status 1=together, 2=alone; ROA 1=Kellgren score hip or knee < 2, 2=Kellgren score 2, 3= Kellgren score > 2; additional 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.

* $p< 0.05$ ** $p < 0.01$.

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 arthritic pain) would be associated with less physical disability. Therefore we added an interaction term (sport activity X '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 most effective strategy to cope with pain. The 'comforting' strategy was also widely used, but was not considered very effective. Almost half of the subjects reported using an own strategy to cope with pain: taking painkillers and doing specific physical exercises were the most popular. People with chronic symptoms used 'resting', and 'reducing demands' 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 the criteria for mediation of Baron & Kenny[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, ROA, and pain severity, fatigue intensity was independently associated with physical disability. Almost 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 result 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 supposes that the variable cannot be regarded as an intermediate step in the causal path between exposure (pain chronicity) and outcome (physical disability)[33]. It is remarkable that the group with chronic pain also had the highest level of sport activities —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 comes and goes. We handled this problem by asking the respondents about pain on several occasions (twice in 1991 and once in 1993). Thus, creating a new variable that we defined as 'pain chronicity'. This approach enabled us to study arthitic pain in the 'normal' population and not restricted to patients. In fact, in the summer of 1993 pain could also be present or not. As can be seen from Table 6.1, 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 use three different groups with pain and a reference group. 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.

This was a cross-sectional study: almost all variables were measured once only. However, subjects with chronic pain probably had a longer history of using certain pain coping strategies. 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 WHO[34], Verbrugge[35], and Verbrugge & Jette[36]. Longitudinal research will be necessary to investigate the nature and direction of these relationships. 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 radiological evidence of osteoarthritis. The role of fatigue in the etiology of physical disability remains unclear. It is possible that more fatigue is related to inflammatory processes periodically present in many patients with arthritis, causing more severe pain and higher levels of physical disability. We used a VAS 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 & Huiskes[13] in RA patients as 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 remarkable 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.*[37] suggested that muscle weakness had a mediating role, leading to destabilization of the joints. Our results show that elderly people with pain have two (almost) independent ways to avoid muscle weakness and thereby physical disability: having a physically active lifestyle in general and relatively low levels of resting. 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[38]. 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 low 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 there is evidence to support the idea that the use of the pain coping strategy 'resting' is adequate to reduce pain in the short term, but that in the long term this strategy seems to promote physical disability, perhaps by increasing muscle weakness. If our results are confirmed in longitudinal research, it will be important to pay attention to these aspects in educational programs and advices by health professionals about coping with arthritic pain.

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7. QUALITY OF LIFE IN ELDERLY SUBJECTS WITH PAIN IN THE HIP OR KNEE.

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Introduction

Pain in the hip or knee and locomotor disability are common phenomena in elderly community living populations.[1-5] A significant part of these problems is caused by osteoarthritis (OA) in one of the large joints of the lower extremities.[6,7] OA is usually "a slowly evolving articular disorder characterized by the gradual development of joint pain, stiffness, and limitation of motion".[8] A useful indicator of the progression of this disorder is the chronicity of pain. Another indicator is the presence of abnormalities seen on radiographs (radiological OA = ROA). However, little or no assocation exists between the presence of joint symptoms and the existence of ROA.[9-11] OA is not curable and most elderly people with symptoms are told by their doctor that they have to learn to live with it. Major and permanent changes in behaviour that are often inevitable in long-term illness and disability are conceptualized as 'coping'. Coping may be defined as "the cognitive and behavioral efforts made to master, tolerate, or reduce external and internal demands and conflicts among them".[12]

Chronic pain and disability and the way people cope with these problems can affect the 'quality of life' (QOL) of elderly people in a negative way. From studies of patients with OA[13-16] it is known that OA negatively affects health-related QOL*. In QOL research among patients there is a lack of consensus about theoretical approaches[17], and there are several definitions of QOL in the literature.[18,19] Because we wanted to compare the QOL of people with pain with a reference group without pain, we chose to use an assessment of global QOL instead of health-related QOL. We defined QOL according to Szalaï as "the subjective *evaluation* of the good or satisfactory character of life as a whole".[20] We used a Visual Analogue Scale to assess this global form of QOL.

Research was carried out in 306 community living people aged 55 to 74 years with chronic, episodic, and sporadic pain in the hip or knee and in a reference group without pain. Firstly, we hypothesized that elderly people with relatively more chronic pain in the hip or knee, would experience a lower QOL. Secondly, we examined the presence of disabilities and the style of coping with problems as potential mediating and moderating variables in the relationship between pain chronicity and QOL. The definitions of mediation and moderation by Baron & Kenny[21] were used (see also method section). A variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor (pain chronicity) and the criterion (QOL).

*In fact, health-related QOL mostly involves the determination by the individual of certain problems in physical and psychosocial functioning. We regarded these problems as forms of disability, rather than as QOL.

A moderator affects the direction or strength of the relation between the predictor and the criterion.

Methods

Study population

Participants in the present study were members of a cohort of the *Rotterdam Study*.[22] 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: N=7,983) living in the Ommoord district in Rotterdam. In 1991 a sub-study (on a randomized sample, representative with respect to age and sex) was carried out on the relationship between locomotor disability, joint pain, and ROA.[23] All subjects were asked the following two questions during an interview at home (occasion 1; response 83%) and during a medical examination at the research centre (occasion 2; response 95%) several weeks later: "Did you have any pain or other complaints about your joints in the past month?" (answer possibilities 'yes' or 'no') and "can you point out the painful joints". There were 2,895 subjects in this sub-study, 2,178 of whom were aged 55 to 74 years.

In 1993 a sample from the last mentioned sub-study was formed. Inclusion criteria were the availability of a radiograph (note: during the medical examination in 1991 radiographs were made for every respondent) of the hips and knees that had been already scored independently by two assessors according to the criteria of Kellgren and Lawrence[24], age between 55 and 74 years, and participation in 1991 in the interview at home and the medical examination. Criteria for exclusion were participation in one of the other sub-studies of the Rotterdam Study (these studies were unrelated to musculoskeletal complaints), the presence of cognitive impairments, and living in a home for the elderly. In February 1993 the 831 selected subjects were asked to complete a short questionnaire with the question: "Did you have any pain in your hip or knee in the last month?" The overall response to this questionnaire was 83% (N=691). Chi-square testing showed no significant differences in age and sex between the people who completed this short questionnaire and those who did not. Subjects who reported 'pain in the hip or knee in last month' on three occasions, twice in 1991 (during the interview and during the medical examination) and once in February 1993, were classified as having '*chronic pain*' (N=72). Subjects who reported pain on two occasions were classified as having '*episodic pain*' (N=86). Subjects who reported pain on one occasion were classified as having '*sporadic pain*' (N=118). A group of 415 subjects reported no pain at all. From this last group a reference group without pain and without ROA (N=94) was selected and matched for age and sex to the groups with chronic and episodic pain.

In the period March to June 1993 all selected people (N=370) were approached by telephone to ask whether they would participate in the present study (the study was presented as dealing with 'Health and physical functioning in elderly people'). The characteristics of the subjects who took part in the study are shown in Table 7.1. All subjects (N=306, response 83%) completed a series of self-administered questionnaires (see below) and were interviewed at home in the Spring and Summer of 1993.

Assessment of disability

In accordance with the International Classification of Impairments, Disabilities, and Handicaps (ICIDH), we defined disability as "any restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being".[25] Disability was assessed with the Sickness Impact Profile (SIP).[26] The SIP is a standardized list of 136 statements, ordered in 12 areas, aimed at measuring changes of conduct in everyday activities due to sickness. Examples of statements are: "I do not do any of the shopping that I would usually do" (Household), " I stay in one room" (Mobility), "I take part in fewer social activities than I used to" (Social interaction), " I do not walk at all" (Walking). Each statement describes a certain dysfunction in a daily activity in 1 of the 12 areas. Respondents were asked to tick statements that were appropriate for their situation and which were related to their health. Each marked statement had a weighted score. Besides a total score (percentage of the maximum possible sum score), percentages for a 'physical' and 'psychosocial' dimension of the SIP were calculated (the theoretical maximum is 100%). 'Physical' disability was defined as a weighted sum score of dysfunction in the areas 'Personal Care', 'Mobility', and 'Walking'. The 'psychosocial' disability score was defined as the weighted sum of dysfunction in the areas 'Emotions', 'Social Interactions', 'Cognitive function', and 'Communication'. Other areas were 'Sleep/rest', 'Household', 'Work', 'Recreation', and 'Eating'. Because 'Work' was not a relevant area in this particular population, a total SIP score was not calculated. The reliability and validity of the SIP for use in a Dutch population is good.[27] Some authors consider the SIP a generalistic health-related QOL measure.[13,19]

Assessment of coping

In the Utrecht Coping List[28] (UCL), coping is regarded as a personal disposition. The respondent is asked to imagine 'problems in general'. The UCL consists of 47 items describing a specific coping behaviour. Answers are on a 4-point scale from 'seldom or never' to 'very frequently'. The reliability (Cronbach's alpha) for use of the UCL in a Dutch population is reasonable.[28] The UCL consists of seven coping scales considered as coping styles: active problem solving (7 items, such as "putting things in a row",

"seeking a way to solve the problem"; alpha .79), palliative reaction (8 items, examples are "looking for distraction", and "looking for good company"; alpha .71), avoidance (8 items; such as "avoiding difficult situations" and "letting things go"; alpha .74), seeking social support (6 items, examples are "discussing the problem with friends or family" and "asking somebody for help"; alpha .79), passive reaction (7 items, such as "worrying about the past", "isolating self from others"; alpha .74), expression of emotions (3 items, such as "showing anger to the person who is responsible for the problem"; alpha .55), and reassuring thoughts (5 items, "imaging that things could be worse"; alpha .60). Three of the 47 items of the UCL are outside the factors just mentioned.

Assessment of QOL and validation

In this study, we followed the recommendation of de Haes[29] and asked people about their own judgement and evaluation of QOL. A Visual Analogue Scale (VAS) of 15 cm was used to assess global QOL and recoded as a score between 0 and 100%. To get an insight into the relationship of this QOL-VAS measure with (in our opinion) some important aspects of the life of older people (an aspect of validation of global QOL) we used questions based on De Witte et al,[30] namely, judgement of physical functioning (5-point item), judgement of psychological functioning (5-point item), judgement of own health (5-point item), expectations about future (in 2 years time) functioning (5-point item), image of the future (5-point item), happiness in the last month (7-point item), and satisfaction in the last month (7-point item). The QOL-VAS and the other questions were not introduced to the respondents in relation to eventually existing pain in the hip or knee. The QOL-VAS and the questions used for validation are included in the appendix.

Assessment of ROA

The classification of radiographs of the hips and knees was based on the standard Kellgren criteria[23] (0= no signs, 1= doubtful, 2=mild, 3=moderate, 4=severe). Grade 2 or higher was regarded as ROA.

Mediation and moderation

According to Baron & Kenny[21], there is evidence of mediation if pain chronicity has a significant relationship with QOL, which is reduced to zero if controlled for mediating variables. Another condition a mediator has to meet is that it is significantly related to the independent variable (pain chronicity) as well as to the dependent variable (QOL). A moderator effect of a variable is present if a significant interaction effect exists between the moderator and the predictor (pain chronicity) on QOL.

Data analyses

The UCL and SIP scores and other continuous variables were analysed with an analysis of variance (ANOVA). Duncan multiple range tests were used to trace differences between the groups with pain and the reference group. Data analysis was performed with SPSSx.[31] The statistical power for detecting medium-sized effects (differences between groups) in analyses of variance (effect size 0.25, alpha=0.05) with the four particular groups is > 0.90.[32] Pearson correlation coefficients are given. Chi-square tests were used for nominal data. Multiple regression analysis was used to investigate mediation and moderation of variables on the relationship between pain chronicity and QOL. We chose for a stepwise introduction of blocks of variables to test for mediation. Demographic variables (sex, age in years, education, and marital status) were introduced in the model first, followed by the pain variable (four groups), followed by the two disability variables of the SIP, followed by the coping styles of the UCL. In this way we were able to investigate the contribution of disability and coping to the relationship between pain and QOL. The changes in R^2 after the successive steps and the partial correlations (comparable with beta) are reported. A partial correlation is the correlation of the independent variable with the dependent variable (QOL) after correction for all the other independent variables in the model. The total R^2 and the adjusted R^2 for the total model are reported. We tested for moderator effects of coping by using a multiple regression analysis on QOL to determine possible significant interaction terms (pain chronicity X a specific coping style) between pain chronicity and the coping style.

Results

The characteristics of the groups with pain and the reference group are presented in Table 7.1. No age differences between the groups were found (F=1.84, p=.14), nor were differences in sex, marital status, and education (non-significant χ^2 tests). Most subjects were women (62-75%), had completed a secondary education (67-79%), and were married or living together (61-75%). A substantial number of subjects with pain had ROA (38-54%). No significant differences (χ^2 tests) between responders and non-responders in this study were found with respect to age, sex, or chronicity of the pain.

Table 7.1 Characteristics of the reference group and three groups of community living subjects (55-74 years, N=306) with pain in the hip or knee.

	reference (no pain)	sporadic pain	episodic pain	chronic pain
Number	72	101	74	59
Age[1] in years (Mean and SD)	64.1 (5.5)	65.5 (5.8)	65.5 (5.4)	63.7 (5.6)
Sex[1] (% women)	72	62	65	75
Marital status				
% living together (married)	75	70	73	61
% living alone	25	30	27	39
Education				
% primary	15	20	19	19
% secondary	79	67	69	75
% college/university	6	13	12	7
% with ROA in hip or knee	0[2]	38	38	54

[1]= Reference group matched on age and sex distribution with the episodic and chronic pain groups; no statistical significant differences between groups were found for marital status and education.
[2]= Reference group selected on absence of ROA

Internal consistency of the UCL

The internal consistency of the subscales of the UCL used in the present study was satisfactory, with Cronbach's alpha being: 0.82 (active problem solving), 0.77 (palliative reaction), 0.66 (avoidance), 0.78 (seeking social support), 0.70 (passive reaction), 0.69 (expression of emotions), and 0.75 (reassuring thoughts).

Validity aspects of the QOL-VAS

The correlations and partial correlations between the QOL-VAS scores and seven relevant aspects of life in the total group (n=272, due to missing values) are shown in Table 7.2. The highest correlation was between the QOL-VAS scores and "Happiness in the last month" (0.55) and "Satisfaction in the last month" (0.52). Because the seven life aspects were correlated with each other we also determined partial correlations. The partial correlations are shown after correction for all the other life aspects in a regression model. "Happiness in last month", "Satisfaction in last month" and "Image of the future" all contributed, independently of each other, significantly to the variance in the QOL-VAS scores. These three life aspects explained 35% of the total variance in QOL-VAS scores.

Table 7.2 Correlations and partial correlations after regression analysis, of the QOL-VAS scores with seven relevant aspects of life. Community living people age 55 to 74 years (n=272).

Life aspects	correlation with QOL-VAS	partial correlations with QOL-VAS
judgement physical functioning	.30**	.04
judgement psychosocial functioning	.30**	.07
judgement own health	.35**	.09
expectations in two years	.14*	-.05
image of the future	.36**	.14**
happiness in last month	.55**	.17**
satisfaction in last month	.52**	.12*
R^2		.36**
(Adjusted R^2)		(.35**)

*=p < 0.05, **=p < 0.01

Disabilities, QOL, and coping

Table 7.3 presents the results of the ANOVA tests on differences between pain groups with respect to disabilities (SIP), QOL, and coping styles. Statistically significant differences were found for both forms of disability (more chronic pain was related to more disability) and for QOL (chronic pain was related to lower QOL). There was less difference between the four groups with respect to coping style, with the exception of 'passive reaction' and 'reassuring thoughts' (both coping styles were reported the most often by people with chronic pain).

Table 7.3 Physical disability (n=304), psychosocial disability (n=304), QOL-VAS (n=292), and coping styles (n=299) in community living subjects aged 55-74 years with pain in the hip or knee and a reference group without pain (N=306). Mean (Standard Deviation).

	reference group	sporadic pain	episodic pain	chronic pain	test statistic (ANOVA)
Physical disability (SIP)	1.0 (4.1)^{s,e}	1.9 (4.3)	3.5 (6.0)	5.4 (6.7)^{s,e}	F=8.9, p<.01
Psychosocial disability (SIP)	1.5 (3.8)^{c}	2.2 (4.3)	3.1 (5.7)	5.4 (8.5)^{s,e}	F=5.9, p<.01
QOL-VAS (0-100%)	65.5 (23.8)^{c}	63.5 (22.1)^{c}	60.8 (20.4)	54.4 (25.7)	F=2.72, p=.045
UCL Coping styles:					
active problem solving (max. 28)	15.7 (4.2)	16.5 (3.8)	15.5 (3.8)	16.4 (4.2)	F=1.16, p=.32
palliative reaction (max. 32)	15.0 (4.2)	16.0 (3.6)	16.2 (4.1)	16.8^{r} (3.9)	F=2.39, p=.07
avoidance (max. 32)	15.5 (3.4)	15.3 (3.6)	15.1 (3.2)	16.0 (3.1)	F=.85, p=.47
seeking social support (max. 24)	10.3 (2.7)	10.1 (3,0)	10.1 (3.1)	10.2 (2.9)	F=.07, p=.97
passive reaction (max. 28)	10.1 (2.7)	10.3 (2.6)	10.8 (2.6)	11.7^{r,s} (3.8)	F=3.83, p=.01
expression of emotions (max. 12)	5.4 (1.4)	5.7 (1.8)	5.6 (1.7)	5.3 (1.7)	F=1.14, p=.33
reassuring thoughts (max. 20)	11.8 (2.7)	12.2 (3.1)	12.3 (2.8)	13.3^{r,s} (3.2)	F=2.84, p=.04

Duncan Multiple Range Test: ^{r}= different from reference group ^{s}= different from sporadic group ^{e}=different from episodic group, ^{c}= different from chronic group.

The group means (in percentages from the maximum score) of the QOL for the three pain groups and the reference group are shown in Figure 7.1.

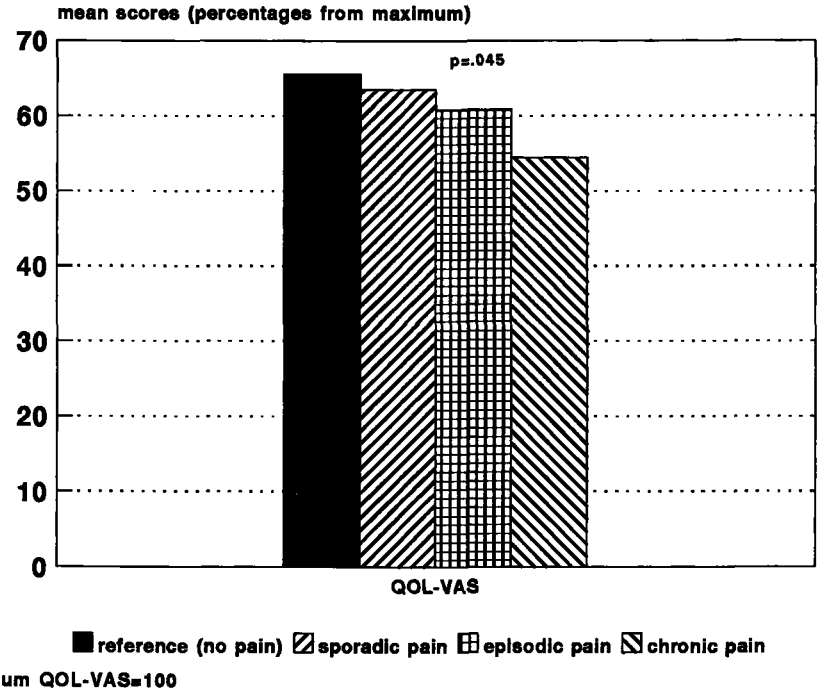

Figure 7.1 Group means (percentages from maximum scores) on the QOL-VAS of a reference group without pain and three groups with sporadic, episodic, and chronic pain in the hip or knee (community living elderly, aged 55-74, N=306).

The correlation of the QOL-VAS scores with the scores on the physical and psychosocial dimensions of the SIP was -0.14 and -0.29, respectively. Both correlations were significantly different from zero.

Moderate correlations were found between the coping style 'passive reaction' and the QOL-VAS scores (-0.30). Other low but significant correlations between coping style and QOL were found for 'active problem solving' (0.16), 'seeking social support' (0.18), and 'reassuring thoughts' (0.13).

Mediators of the relationship between pain chronicity and QOL

To check for possible multicollinearity problems, we screened the correlation matrix for correlations higher than 0.70 before performing the regression analyses. No such

correlations were found. Correlations higher than 0.50 were found between 'passive reaction' and psychosocial disability (0.52), between 'reassuring thoughts' and 'active problem solving' (0.52), and between 'reassuring thoughts' and 'palliative reaction' (0.55). Table 7.4 presents the results of the stepwise multiple regression analysis. The demographic variables explained 4% of the variance in QOL, with marital status as the only significant predictor (people living together had a higher QOL). Addition of pain chronicity to the model significantly increased the explained variance in QOL (0.02; $p<0.05$). Addition of physical disability increased the explained variance significantly by 0.02. After psychosocial disability was added, this last mentioned variable appeared to be the best predictor of QOL (partial correlation -0.24). Introduction of the coping styles explained another 9% of the variance. After this last step, the coping style 'seeking social support' was clearly the best predictor of QOL (people who sought more social support had a higher QOL); the second best predictor was psychosocial disability as measured with the SIP. In the multivariate model, the relationship between pain chronicity and QOL and between physical disability and QOL was no longer significant.

Table 7.4 Stepwise multiple regression analysis of demographic variables, pain, disability, and coping styles on the score of the QOL-VAS (community living subjects aged 55-74 years; n=278).

Independent variables	Step 1 PC	R^2 change	Step 2 PC	R^2 change	Step 3 PC	R^2 change	Step 4 PC	R^2 change	Step 5 PC	R^2 change
1-Demographic										
sex	0.11		0.11		0.11		0.06		0.05	
age in years	0.10		0.09		0.12*		0.07		0.09	
education	0.07		0.07		0.08		0.07		0.06	
marital status	-0.16**	0.04*	-0.15**		-0.15		-0.11*		-0.10	
2-Pain chronicity			-0.13*	0.02*	-0.08		-0.05		-0.03	
3-Physical disability					-0.15**	0.02**	-0.02		-0.04	
4-Psychosocial disability							-0.24***	0.06***	-0.15**	
5-Coping style										
active problem solving									0.11*	
palliative reaction									-0.06	
avoidance									0.12*	
seeking social support									0.20***	
passive reaction									-0.06	
expression of emotions									-0.10	
reassuring thoughts									0.002	0.09***
TOTAL R^2										0.23***
(adjusted R^2)										0.19***

Note: PC=partial correlation of the independent variables with the dependent variable after correction for the other independent variables in the model. sex 1=male, 2=female; education 1=lower, 2=secondary 3=higher; marital status 1=together, 2=alone; pain chronicity 0=no pain, 1=sporadic pain, 2=episodic pain, 3=chronic pain. *=$p < 0.05$, **=$p < 0.01$, ***=$p < 0.001$

Moderating effects of coping

To test whether coping with problems had a moderating effect on the relationship between pain chronicity and QOL, we performed a separate multiple regression analysis. Pain chronicity, the coping styles, and all the specific interaction terms of the coping styles with pain chronicity were introduced. Pain chronicity explained 2% of the variance in the QOL, the coping styles 16% (passive reaction, partial correlation -0.26; seeking social support, partial correlation 0.21). The interaction terms did not significantly contribute to the variance in the QOL-VAS scores.

Discussion

As expected, a relatively low QOL was found in elderly people with more chronic pain symptoms in the hip or knee. The difference in QOL between the group with chronic pain and the reference group without pain was 10%. The QOL-VAS scores of the group with chronic pain was comparable with the QOL-VAS scores of a group patients with rheumatoid arthritis (N=179, mean 52%, SD 24,0) from another study.[30] Also, physical disability and psychosocial disability (problems in areas such as communication and social interactions as far as these problems are related to health) were negatively associated with QOL. In fact, physical and psychosocial disability were mediating variables in the relationship between the chronicity of pain and the experienced QOL. We consider that these variables meet the criteria of a mediator (after correction with this variable the relationship between pain chronicity and QOL was reduced to zero; and a significant relationship with pain chronicity as well as with QOL). After correction for both forms of disability, psychosocial disability seemed to play the most important mediating role. These results may suggest that more chronic pain caused more physical and psychosocial disability, resulting in a lower QOL. It is in the nature of a mediator that the causal pathway can also shift from the outcome to the independent variable depending on the focus of the analysis (Baron & Kenny, p. 1174). In other words, a lower QOL may cause more psychosocial disability, resulting in more (self-reported) pain symptoms. The nature of these processes can only be studied in a longitudinal research design.

People with more chronic pain used a coping style such as 'a passive reaction' and 'reassuring thoughts' more often than other people did. The first behaviour can be regarded as a predominantly negative way of coping and means that people are 'worrying', perhaps resulting in more health care utilization. The second behaviour may regarded as a more positive way of coping with people reassuring themselves 'that things can always be worse'. Also, people with chronic pain used a palliative coping style more

than the reference group without pain did. This finding is in agreement with the results of the study of Downe-Wamboldt[33] in osteoarthritic women.

Psychosocial disability and 'seeking social support' were the variables with the highest partial correlation coefficients contributing to QOL, meaning that the people who had problems communicating about their health and people who did not ask other people for help had the relatively lowest QOL. No evidence was found for mediating or moderating effects of coping with problems on the QOL.

We conclude that there is evidence that more chronic pain in the hip or knee (especially as it is related to psychosocial disability) is associated with a lower QOL. Because this was not a longitudinal study, we cannot know for certain the direction of this relationship.

In the analyses we used ROA only to describe our study population. We previously reported[34] that in people with pain symptoms in the hip or knee a moderate form of ROA (Kellgren score=2) is related to more psychosocial disability (especially in men), while severe forms of ROA (Kellgren scores > 2) are related to more physical disability. Moreover, the existence of additional mobility problems (related with other rheumatic complaints, lung diseases, diabetes, etc) is of more importance than pain in the hip or knee alone in predicting physical and psychosocial disability in elderly people[34].

We chose to use the SIP as a measure of disability rather than as a health-related QOL instrument. This is consistent with the opinion of Wade[35], who discussed the QOL concept as far as it is used to assess health-related QOL. In the context of a certain impairment, he argued that it is better to regard the consequences in relationship to the ICIDH[24,36], and to speak about 'disability' and 'handicap' instead of QOL. The concept 'handicap' regards an individual's problems in fulfilling social roles as a consequence of certain underlying impairments and (physical) disabilities. Because some parts of the SIP can be regarded as measures of disability and others as measures of handicap, we assessed QOL by using a QOL-VAS. This measure was not introduced to the respondents as bearing a relationship to the pain they had in the knee or in the hip. A problem with the QOL-VAS is the large standard deviation in the scores. It is known that respondents sometimes have difficulty completing a VAS scale correctly, leading to a higher non-response.[37] In our study, the respondents had used VAS scales before. Relevant domains of life that contributed significantly to the QOL-VAS scores were well-being variables such as happiness and satisfaction. This result indicated that the respondents weighted well-being as more important in the concept of Quality of Life than physical or psychosocial functioning in general. This is in agreement with the view of Tennant and McKenna[38], who with regard to rheumatology, considered QOL as a concept of well-being at the end of the continuum of disease, impairment, disability, and handicap.

The multiple regression analyses showed that the independent variables were only partly able to predict QOL (23%). Well-being variables that would probably have had more predictive value on the QOL-VAS scores are the recent loss of a partner or the loss of a paid job. Browne et al.[39] recently showed that healthy elderly people (≥ 65 years) consider 'family', 'social and leisure activities', and 'health' as being important for their quality of life. Laborde and Powers[40] found that subjects with OA viewed their past life as more satisfying than their present lives, but their degree of pain did not seem to have a dramatic impact on their overall satisfaction with life.

The most relevant finding of our study is that in a multivariate model corrected for all other relevant variables, neither pain chronicity nor physical disability predict a relatively lower QOL, but that in fact psychosocial problems do. This finding can be explained by the mediating role of psychosocial disability that we found. People who isolate themselves with their (health) problems are particularly vulnerable. The challenge to health professionals is to reach these people, because they tend to avoid asking others for help (seeking no social support). Future research could focus on the needs of this group and on factors such as the loss of a partner or a paid job at the age of retirement, and the presence of depressive feelings about these life events in relation to the QOL experienced by people with arthritic pain.

Acknowledgements

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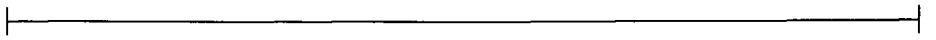
Appendix

Global QOL

"In the same way as people can have ideas about the quality of, for instance, fruit or wine, they can also have ideas about their quality of life. This can be high, low, or in between. Can you please indicate on this line the quality of your life in the past month? You can do this by putting a cross (X) on a place on the line that best represents your feeling about the quality of your life."

lowest quality — highest quality



Questions about for QOL relevant aspects of life

1. How do you judge your physical functioning (ability to move)?
(1) very bad (2) bad (3) moderate (4) good (5) very good
2. How do you judge your psychological functioning?
(1) very bad (2) bad (3) moderate (4) good (5) very good
3. How do you judge your own health?
(1) very bad (2) bad (3) moderate (4) good (5) very good
4. How do you expect you will feel in two years' time, all things considered?
(1) much worse (2) worse (3) the same as now (4) better (5) much better
5. How do you see the future, all things considered?
(1) very sad (2) sad (3) neutral (4) optimistic (5) very optimistic
6. How happy did you feel in the last month, all things considered?
(1) very happy (2) happy (3) moderately happy (4) not happy/not unhappy (5) moderately unhappy (6) unhappy (7) very unhappy
7. How satisfied were you in the last month, all things considered?
(1) very satisfied (2) satisfied (3) moderaty satisfied (4) not satisfied/not unstatisfied (5) moderately satisfied (6) unsatisfied (7) very unsatisfied

Note: questions 6 and 7 were recoded (1=7, etc).

8. THE PATTERN OF HEALTH CARE UTILIZATION OF ELDERLY PEOPLE WITH ARTHRITIC PAIN IN THE HIP OR KNEE.

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Introduction

Osteoarthritis (OA) is a frequent cause of pain in the hip or knee and of locomotor disability in an elderly population[1-4]. The total prevalence of osteoarthritis is high[5]. In 1990 in the Netherlands (total population approximately 15 million), an estimated 773,900 people suffered from arthritis, as determined on the basis of there being radiological evidence of arthritis (ROA)[6]. About 30 to 45% of people with ROA complain of symptoms such as pain and stiffness ('symptomatic OA')[7-9]. There are people who have symptomatic OA without radiological evidence, and vice versa.

OA is also the most common locomotor disorder encountered in general practice in the Netherlands[10]. In the United States (US), OA is the most common arthritic disease, affecting more than 12% of the adult population. It is managed largely by primary care physicians[11]. Usually, OA patients in the Netherlands are aged 60 or older, and in most age categories more women than men visit their GP for OA-related complaints. Fifty-seven percent of people with arthritis contact their GP two or three times a year for their arthritis, irrespective of their age[12]. About 30% of patients with repeated complaints of pain in the hip or knee (mostly caused by OA) are referred to an orthopedic surgeon or rheumatologist[13]. Only a few patients with OA will ultimately have joint replacements. In the US, people with OA visit their physician 3.5 times (SD 5.3) times a year for their condition[14]. The economic impact of arthritic diseases (including OA) in the US, as assessed by expenditure for health care and lost wages, has been estimated at 1% of the gross national product, and direct and medical costs were estimated to represent about 8% of all costs for all diseases[15]. A study in family practice in Canada indicated that arthritis patients consumed health care services at costs 78% higher than the average expenditures in the same community[16]. No studies were found which examined the pattern of health care utilization of older people with pain symptoms at different levels of the health care system.

This article describes the characteristics of a group of people aged 55 to 74 years with current pain in the hip or knee (symptoms of possible OA) in a population-based study. The aim was to get insight into the differences and similarities in background variables and illness-related variables, such as pain and disability, of the people with current pain attending or not attending health care facilities. To structure the description of the pattern of care, we have adapted the filter model of Goldberg and Huxley[17], which was developed for the field of mental illness (Figure 8.1). The first level is the prevalence in the community of current pain in the hip or knee (level 1). A number of these people shows 'illness behavior' (in this context 'illness behavior' refers to "forms of personal behaviour that emerge when the reality of having a disease is internalized and experienced by an individual" [18]) and attend their GP (level 2). These

people have passed the first 'filter'. Some of these people are diagnosed as suffering from arthritis (level 3) and pass the second filter. Patients with arthritis who are referred by the GP to a specialist are in level 4, having passed the third filter. We assumed that relatively older people with more severe pain and serious disabilities would have passed the filters more easily than people with less severe complaints.

In an age and sex representative sample, 186 people with current pain were identified (the study population) and asked about their pain and disabilities, their attendance of GP, physiotherapist, and specialist, and the diagnosis given them. People who passed a filter were compared with people who did not. Because the diagnoses of the study population were based on self-report, the data of level 3 were validated and tested for generalizability by comparison with data for a reference group which was diagnosed by GPs[19].

The study setting

The study was carried out in collaboration with the 'Rotterdam Study' in the district of Ommoord in Rotterdam[20]. 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 in a 3- year period). In 1991 a sub-study[21] was carried out on locomotor disability, joint pain, and ROA (on an age and sex representative sub-sample of 2895; 2178 of whom were aged 55 to 74 years). Radiographs of hips and knees were taken for all respondents. In 1993 an age and sex representative sub-sample (thus including subjects with and without pain) of the last study was formed (N=831). Most of the people in the district of Ommoord are patients of one of the 13 GPs (working in four primary health care units) in that area.

Methods

Inclusion criteria were the presence of an X-ray of the hips and knees (from the earlier study) that had been scored independently by two trained assessors (note: the assessors were blind to all respondents' variables) according to the criteria of Kellgren and Lawrence[22], and age from 55 to 74 years. Exclusion criteria were participation in one of the other sub-studies of the Rotterdam Study in 1993 (these studies were not related to musculoskeletal complaints), the occurrence of severe cognitive problems, and living in a home for the elderly. From the earlier study in Rotterdam, the number of subjects with 'pain in the hip or knee in last month' was known for two distinct occasions in 1991:

during an interview at home (response 83%) and during a medical examination at the special research center of the Rotterdam Study (response 95%) several weeks later. In February 1993 all 831 respondents were asked to complete a short questionnaire about pain in the hip or knee in the last month (response 83%, N=691). Combination of the three answers made it possible to identify groups of subjects who reported pain on one, two, or three occasions (defined as sporadic, episodic, and chronic pain, respectively, total n=276). All these subjects were invited to participate in the present study. The respondents (response=85%; n=234) completed a series of self-administered questionnaires and were interviewed at home 2 weeks later. Of this group, 186 people had pain in the last month before the interview. These people were included in the present study.

Definition and diagnosis of OA

According to the classification criteria of Altman et al. (mostly used by rheumatologists), OA of the knee and the hip is defined if pain and ROA are present[23,24]. OA of the knee without the availability of a radiograph can also be defined if pain is present and at least three of the six following criteria are met: age ≥ 50 years, morning stiffness ≤ 30 minutes, crepitus, bony tenderness, bony enlargement, and no palpable warmth. During the interview, the respondents were asked about the clinical diagnoses they had received from their GP or specialist (if they had attended for these complaints). Their self-reported diagnoses: 'arthrosis', 'arthritis', 'rheumatism', 'wear-and-tear', and 'aging' were recoded as 'reported arthritis diagnosis present'. Besides a self-reported diagnosis, a question about the possible cause of the complaints was included. Furthermore, questions were included about whether the subject had ever attended alternative therapists or physiotherapists for these complaints.

Measurements

-*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 ROA.

-*Use of painkillers*: regular use of painkillers (unspecified) in the last months (answer: 'yes' or 'no') was asked during the interview.

-*Assessment of pain chronicity and pain severity*: the classification of the subjects into groups with sporadic, episodic, and chronic pain (as mentioned above) was used to get an indication of the chronicity of the pain symptoms. A 15-cm Visual Analog Scale was used to indicate pain severity in the hip or knee in the week before the subjects completed the questionnaire. Results are presented as scores ranging from 0 (no pain present) to 100 percent (unbearable pain). Because pain in the hip or knee is sometimes difficult to distinguish, we took the scores for the two joints together.

-*Assessment of disability*: disability was assessed by the Sickness Impact Profile (SIP), a standardized questionnaire of 136 statements, ordered in 12 areas of daily living and designed as a measure of dysfunction in everyday activities due to sickness[25]. Each statement describes a certain dysfunction in a daily activity in one of the twelve areas. Respondents only have to mark statements that are appropriate to their situation and related to their health. Each marked statement has a weighted score. Indices of a 'physical' and 'psychosocial' dimension can be calculated (the theoretical maximum is 100%). The reliability and validity of the SIP for use in a Dutch population is good[26]. Examples of statements are: " I sleep or doze more during the day" (Sleep/rest), "I do not do any of the shopping that I would usually do" (Household), " I stay in one room" (Mobility), " my sexual activity is decreased" (Social interaction), " I do not walk at all" (Walking). 'Physical' disability is defined as a weighted sum score of the areas 'Personal Care', 'Mobility', and 'Walking'. The 'psychosocial' disability score is defined as the weighted sum of 'Emotions', 'Social Interactions', 'Cognitive function', and 'Communication'.

- *Additional mobility problems*: If respondents had other complaints affecting mobility and physical function besides current pain in the hip or knee, the term 'additional mobility problems' was used.

The reference group

Patients attending GPs in other parts of the Netherlands (N=109, age 55 to 74 years) for OA were used as a reference group. This group is a subset of a larger group of patients with OA that was recruited from 40 Dutch general practices for a randomized clinical trial in which two non-steroidal anti-inflammatory drugs (NSAIDs) were compared. Inclusion criteria were a diagnosis of OA that led to the prescription of NSAIDs, exclusion of other possible arthritic diagnoses by blood tests (Erythrocyte Sedimentation Rate (ESR), rheumatoid factor and uric acid), and no current attendance of a physiotherapist. Details of the total study group are described elsewhere[27,28]. OA was defined according to the criteria of the International Classification of Health Problems in Primary Care[29]. These criteria are very similar to those of Altman[23,24]. The diagnosis of OA in the reference group is based on at least one of the following: - characteristic radiological appearance, - Heberden's nodes (on the hands), - joint disorder of at least 3 months' duration, with no constitutional symptoms and at least three of the following: (1) irregular swelling, (2) crepitation, (3) stiffness or limitation of movement, (4) normal ESR, rheumatoid tests, and uric acid, and (5) patient over 40 years of age. Information on pain severity, use of painkillers, and assessment of disability with the SIP was gathered by the same procedure as for the study population. In fact, this was the only available study on a group of patients with OA in the Netherlands that included the same

pain and disability measurements as the present study. We have to emphasize that in the present study only self-reported diagnoses and radiographic scores were available.

Statistical methods

To assess the disability scores we used the weighted scores valid for use in the Netherlands. Chi-square tests were used to compare nominal variables and an analysis of (co)variance (ANOVA) was used to compare numerical variables. For multivariate comparisons stepwise logistic regression analyses were used (p-in 0.05, p-out 0.10). Odds ratios with their 95% confidence intervals (CI) are given. Data were analyzed with SPSSx[30]. The level of statistical significance was 0.05 (alpha). Because 13 tests were carried out simultaneously to compare two groups, a Bonferroni correction[31] was made. Only differences with a p value < 0.004 were considered not to be due to chance.

Results

A considerable proportion (80%, n=186) of respondents with pain symptoms (n=234) reported pain in the month before the interview and were asked about their use of health care services. This group formed the first level of the filter model (Figure 8.1).

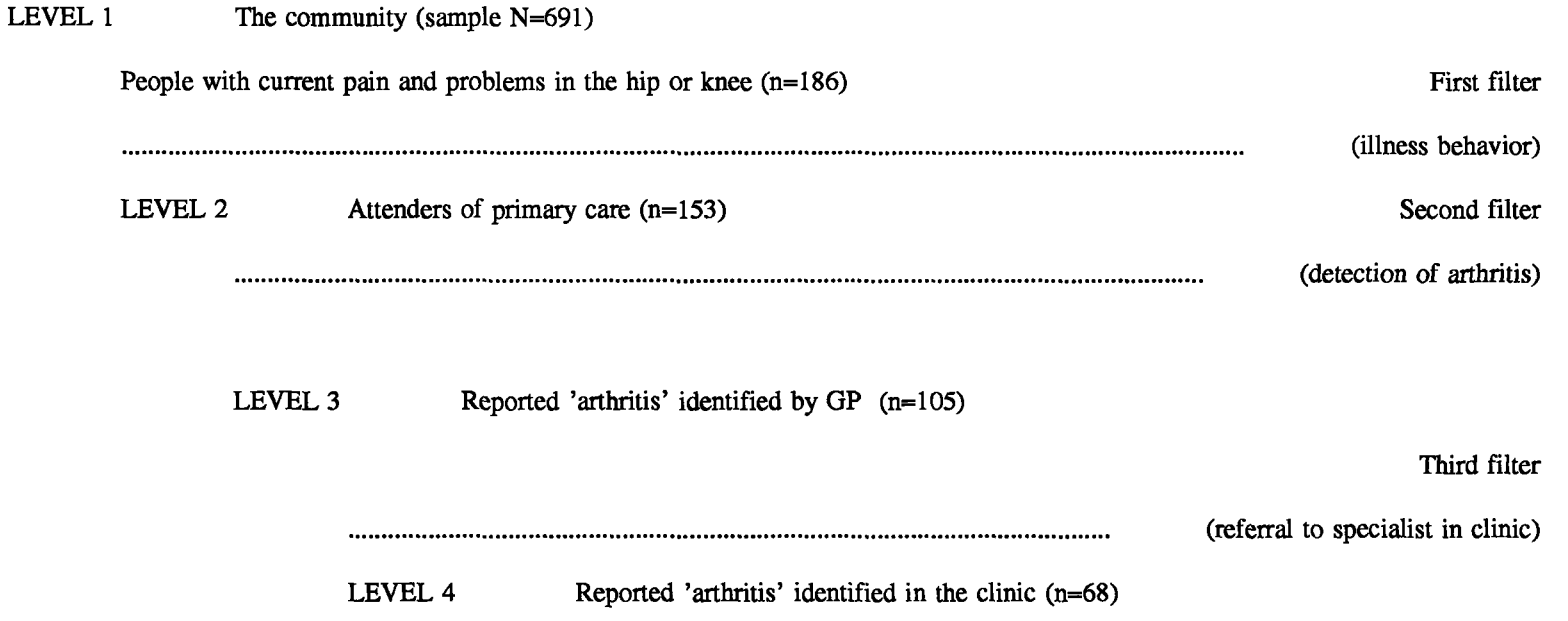

Figure 8.1 The filter model (Goldberg and Huxley[17]) for the pattern in health care utilization applied to arthritis of the hip or knee in community living people aged 55 to 74 years with current pain in the hip or knee.

Level 1: current pain in the hip or knee in the community

The features of this group are given in Table 8.1. Mean age was 65 years. Most patients were women, had a secondary education, and lived together with a partner. About half of the group reported additional mobility problems and a quarter had chronic pain (pain on three separate occasions in the last three years). Eighty-two people (44%) had ROA in one of the knees or hips. Ninety-seven people (52%) had attended a physiotherapist for these complaints. Thirty-five people (19%) took painkillers on a regular basis.

Twenty-nine people (16%) did not consult a doctor or anyone else about their pain and problems with the hip or knee, 2 people (1%) consulted 'someone else' (alternative therapist) and 2 people (1%) consulted a specialist without referral by a GP. Non-attenders (see Table 8.2) had a lower body mass index (BMI) than attenders ($F=9.7$, $p=0.002$). Also, indications were found for a lower usage of painkillers ($\chi^2=4.3$, $df=1$, $p=0.04$) and a higher education ($\chi^2=6.7$, $df=2$, $p=0.03$) in non-attending women but not in men. A stepwise logistic regression analysis with attendance of the GP as dependent variable and age, sex, marital status, education, BMI, additional mobility problems, ROA, use of painkillers, pain chronicity, and physical and psychosocial disability as independent variables was carried out (because none of the non-attenders had physiotherapy, we omitted this variable in the analysis). BMI was the only significant predictor with an odds ratio of 1.24 (CI 1.15-1.33).

Table 8.1 Demographics and characteristics of groups in the filter model (community living subjects aged 55-74 years with current pain in the hip or knee)

	Level 1 current pain	Level 2 visit GP	Level 3 reported diagnosis 'arthritis'	Level 4 visit specialist
Number	186	153	105	68
Age in years (Mean and SD)	65.0 (5.6)	65.0 (5.6)	65.3 (5.3)	65.6 (5.6)
Sex (% women)	67	69	69	72
Marital status % living together	66	64	72	76
Education % primary % secondary % high	 19 70 11	 20 72 8	 21 70 9	 19 72 9
Body mass index (Mean and SD)	26.9 (3.6)	27.2 (3.8)	27.7 (3.7)	27.9 (3.9)
% with additional mobility problems	67	69	71	72
% Kellgren score in hip or knee[1] ≥ 2	44	46	51	57
% had attended physiotherapist	52	63	64	78
% regular use of painkillers	19	22	27	34
% chronic pain	31	34	42	47
VAS pain (Mean and SD)	29.9 (22.1)	31.1 (22.6)	32.7 (23.7)	32.5 (22.8)
SIP physical disability (Mean and SD)	3.9 (6.1)	4.2 (6.4)	4.2 (6.3)	4.5 (6.4)
SIP psychosocial disability (Mean and SD)	3.8 (6.6)	4.0 (6.8)	4.0 (7.0)	3.1 (4.9)

[1]= prevalence ROA of the hip was ± 20%

Table 8.2 Demographics and characteristics of groups (community living subjects aged 55 to 74 years, with current pain in the hip or knee) that did not pass the filters

	Did not pass level 1 (no visit to GP)	Did not pass level 2 (no reported diagnosis 'arthritis')	Did not pass level 2, but with ROA	Did not pass level 3 (no visit to specialist)
Number	33	48	16	37
Age in years (Mean and SD)	65.4 (5.6)	64.1 (6.3)	67.3 (5.9)	64.8 (4.7)
Sex (% women)	58	69	81	65
Marital status				
% living together	73	63	64	65
Education				
% primary	15	17	19	24
% secondary	61	75	81	68
% high	24*	8	0	8
Body mass index (Mean and SD)	25.1 (2.3)**	26.1 (3.6)*	27.2 (3.6)	27.4 (3.4)
% with additional mobility problems	58	65	50	68
% Kellgren score in hip or knee[1] ≥ 2	36	33*	100	40
% had attended physiotherapist	0	63	44	38**
% regular use of painkillers	6*	10*	19	13*
% chronic pain	18	17**	19**	32
VAS pain (Mean and SD)	24.2 (18)	27.5 (19.8)	25.7 (20.4)	33.1 (25.7)
SIP physical disability (Mean and SD)	2.5 (3.6)	4.1 (6.8)	5.4 (8.9)	3.7 (6.1)
SIP psychosocial disability (Mean and SD)	3.0 (5.3)	4.2 (6.4)	6.2 (7.2)	5.6 (9.7)

comparison with persons that passed the level (see Table 8.1) *= $p \leq .05$ **=$p \leq .004$ (Bonferroni correction)

Level 2: respondents attending the GP

Of the total group of 186 respondents with current pain, 153 respondents (82%) had consulted a GP for these complaints. The characteristics of this group are also given in Table 8.1. Thirty-three people (22%) used painkillers on a regular basis. Ninety-six people (63%) attended a physiotherapist, 92 people (60%) said that they were referred to a specialist, 3 people (2%) reported visiting an acupuncturist, and 1 person visited a homoeopathist. Forty-eight people (31%) who did not pass the level 2 filter (no reported diagnosis of 'arthritis') had significantly less chronic pain than did the people who passed the filter (χ^2=12.6, df=2, p=0.002). Also, indications were found for less ROA (χ^2=4.3, df=1, p=0.04), a lower BMI (F=5.9, p=0.02), and a lower usage of painkillers (χ^2= 5.1, df=1, p=0.02). A stepwise logistic regression analysis with diagnosis of OA as dependent variable and the same variables as on level 1 as independent variables (now including attendance of a physiotherapist) was carried out. Pain chronicity was the only significant predictor with odds ratios of 4.87 (contrast chronic pain vs sporadic pain; CI 2.98-7.97) and 1.93 (contrast episodic pain vs sporadic pain; CI 1.25-3.00).

Level 3: attenders of GP with a (self-)reported diagnosis of 'arthritis'

Of the people who attended the GP, 105 persons (69%) reported that their complaints were diagnosed by the GP as 'arthrosis', 'arthritis', 'rheumatism', 'wear-and-tear' or 'aging'. The most mentioned reported *cause* of their complaints was 'wear-and tear' of the joints. About half of the group with a reported diagnosis of 'arthritis' actually had ROA. A substantial number of the subjects (n=44, 42%) had chronic pain symptoms and one third used painkillers on a regular basis. Sixty-seven people (64%) had attended a physiotherapist for these complaints. Twelve people (11%) had also consulted an alternative therapist. The mean pain severity was moderate (VAS pain 33%).

However, there was a subgroup of 16 patients (33%) who were not diagnosed as having arthritis but who were in pain and who actually had ROA (in combination these were positive criteria for the diagnosis OA according to the criteria of Altman et al.[23,24]. This group is described in Table 8.2. Compared to the people who passed the level 2 filter, the people in this group had less chronic pain symptoms (χ^2=12.7, df=2, p=0.002). Eight people (50%) had visited a specialist (four people reported 'meniscus injury' as a diagnosis). This small group had a relatively high mean level of psychosocial disability. One person reported having visited an alternative therapist. Logistic regression with the (missed) diagnosis of OA as dependent variable showed that significant predictors were pain chronicity (odds ratio episodic pain vs sporadic pain 0.14, CI 0.06-0.34; chronic pain vs sporadic pain 0.11, CI 0.05-0.26), and psychosocial disability (OR 1.07, CI 0.97-1.11).

Level 4: attenders of the specialist

Most people with a reported 'arthritis' diagnosis made by the GP were referred to a specialist (68 subjects, 65%). The characteristics of this group are given in the last column of Table 8.1. The group as a whole was characterized by moderate levels of pain and disability. All people reported that the specialist (usually an orthopedic surgeon or a rheumatologist) had made a diagnosis of arthritis. One person had an arthroplasty of the right knee, five people had a new left hip, and three a new right hip. Fifty-three people (78%) had attended a physiotherapist for their complaints. Ten patients (15%) also visited an alternative therapist for help.

The characteristics of the group that did not pass the level 3 filter (diagnosis 'arthritis' but no referral to a specialist) are given in Table 8.2. This group attended a physiotherapist less often than people who passed the filter (χ^2=16.7, df=1, p=0.00). This group also made less regular use of painkillers (χ^2=5.0, df=1, p=0.02). Although not significantly different, a relatively high level of psychosocial disability was found compared to that of the group that was referred to a specialist (compare Table 8.1). Two people (5%) reported visiting an alternative therapist. A stepwise logistic regression analysis with referral to a specialist as dependent variable showed that attendance of a physiotherapist was the only significant predictor with an odds ratio of 5.60 (CI 3.45-9.09).

Comparison of the study population with a reference group

A small group of people who visited the GP had a reported diagnosis of 'arthritis' and a regular usage of painkillers and was therefore more or less comparable to the reference group. This special group (n=28) contained many people with 'additional mobility problems' (22, 79%) who received physiotherapy (20, 71%) and who had chronic pain symptoms (17, 61%), severe pain (mean VAS pain; 12, 43%), and relatively high disability levels (on the physical as well as the psychosocial dimension). The group differed from the reference group with respect to demographic characteristics: sex (68% women versus 88% in the reference group) and education (23% primary education versus 42% in the reference group) (Table 8.3). Disability and age were related in the reference group. A two-way ANOVA (main effects group and sex with covariate age) on the levels of pain severity and disability showed no significant differences between the two groups (effect group: pain severity F=3.1, p=0.08; physical disability F=.002, p=0.96; psychosocial disability F=.05, p=0.82).

Table 8.3 Demographics and illness-related variables of community living subjects aged 55 to 74 years with current pain in the hip or knee attending the GP, with regular usage of painkillers and a reported diagnosis of 'arthritis'; comparison with a reference group

	Level 3 reported diagnosis 'arthritis' + regular usage of painkillers	Level 3 reference group
Number	28	109
Age in years (Mean and SD)	64.5 (5.6)	64.8 (5.9)
Sex (% women)	68	88
Marital status		
% living together	65	66
Education		
% primary	23	42
% secondary	71	52
% high	6	6
Body mass index (Mean and SD)	27.5 (3.4)	26.5 (3.6)
% with additional mobility problems	79	77
% Kellgren score in hip or knee[1] ≥ 2	54	75[1]
% had attended physiotherapist	71	0[2]
% regular use of painkillers	100	100
% chronic pain	61	-
VAS pain (Mean and SD)	43.4 (23.0)	53.2[3] (21.0)
SIP physical disability (Mean and SD)	6.0 (6.1)	6.7 (7.6)
SIP psychosocial disability (Mean and SD)	5.5 (7.8)	5.4 (7.1)

-= unknown [1]= n=82 with ROA, no X-rays available from 27 respondents; [2]= selected on no recent attendance; [3]= n=96

Discussion

The Rotterdam Study offered us a unique possibility to study the health care utilization of elderly people with current pain in the hip or knee. From the results it can be concluded that a substantial proportion of these people find their way to a GP or specialist. Most people who visited their GP or a specialist were diagnosed as having a form of 'arthritis'. People who did not pass the different levels of the filter model for health care utilization were different from those who did with respect to the body mass index (lower), the chronicity of pain (less chronic and episodic pain), and attendance of a

physiotherapist (lower). Against our expectation, no statistically significant differences were found in pain severity or the level of disabilities or age. ROA was only important for the diagnosis of 'arthritis' by the GP. However, relatively high levels of psychosocial disability were found in a group of subjects with ROA but without a self-reported 'arthritis' diagnosis and in the group that was not referred to a specialist. It is possible that these people had difficulties communicating (problems in 'Communication' are an important part of the psychosocial SIP score) with their GP about their -often only 'sporadically' occurring- complaints. The findings suggest that the chronicity of pain is the most important determinant of health care utilization by people with arthritis of the hip or knee. The chance of passing the second filter was almost 5 times higher for people with chronic pain (OR 4.87) and 2 times higher for people with episodic pain (OR 1.93). Obviously, sporadically occurring complaints are not a reason to think of arthritis, while repeated complaints -although often not severe and without radiological evidence- lead to help seeking behavior and identification of arthritis. The odds ratio of 1.24 for people with a relatively higher BMI attending the GP is a significant but not very relevant finding. Perhaps this result is due to the fact that obesity is related to other chronic diseases such as diabetes and leads to relatively more visits to the GP, where arthritis is treated as a secondary complaint. The relatively high odds ratio of attendance of a physiotherapist in the prediction of passing level 3 of the model can be due to differences in referral habits between GPs. It is known that in the Netherlands referrals to physiotherapists and specialists can vary between 11% and 27% of patients with OA[10].

There is sometimes disagreement about the diagnosis of OA made by a GP and by a rheumatologist[32]. Unfortunately, there is also little consensus on the definitions and criteria for OA[33]. In the Netherlands no standards for diagnoses and treatment are available. We tried to correct for a possible overdiagnosis of inflammatory arthritis by taking the reported diagnoses 'arthritis' and 'rheumatism' into account in addition to the diagnosis 'arthrosis'. The reported diagnosis had little to do with OA as defined by the ROA criterion (objectively measured cartilage damage): only half of the patients with reported arthritis actually had ROA.

The proportion of GP patients with arthritis who used painkillers on a regular basis (only a small group) was compared with that of a reference group of patients with a clinical diagnosis of OA who used NSAIDs. The reference group included more relatively poorly educated women and more ROA was present. The mean pain severity was higher (although not significantly so, p=0.08). This is probably because the people with OA in the reference group were selected to participate in a drug trial. The levels of physical and psychosocial disability and the percentage of patients with additional mobility problems were very much the same. These findings support the validity of the results of the present population-based study in which self-reported diagnoses were used.

The power to detect between group differences in variables which had large standard deviations, such as pain severity and disability, was low, due to the relatively small numbers. Although statistically significant with an alpha less than 0.05, some results (such as differences in education and use of painkillers) should be treated with care because a large number of tests were carried out. We solved this problem by making a Bonferroni correction and logistic regression analyses. Another limitation of the study was that the diagnoses were reported by the respondents and were not verified by their doctors. It was also not clear which criteria (Altman or WONCA) the doctor had used to come to a diagnosis. For this reason we included the reference group of diagnosed patients. The results of the comparison with this group showed that our results are in all probability generalizable to patients in the Netherlands.

The prevalence of current pain in our study was comparable with that of the study on knee pain by McAlindon et al.[34] (males 22%, 95% confidence intervals 10-41; females 26%, 95% confidence intervals 16-38). In the Netherlands, the most commonly prescribed therapies for peripheral OA are painkillers (especially NSAIDs, 83%) and referral to a physiotherapist (63%) or specialist (46%)[35]. Referrals to physiotherapists and specialists in our study were comparable with these findings. However, in our study there was less regular use of painkillers. It is possible that painkillers were prescribed by a doctor, but not used by the patient. The indication that women with a relatively high education visit their doctor less for their complaints than do other women is consistent with the results of the study by Dexter and Brandt[36]. Perhaps this group is more able to cope with their complaints or have a better accessibility to other resources that affect health (higher income, better housing situation, and a more balanced diet). It should be noted that the Dutch health care insurance system enables people with lower incomes to use health care services without extra payment.

The group with 'arthritis' that was referred to the specialist was approximately 10% of the total group in our representative sample of elderly subjects (N=691). This percentage may be an underestimation due to selection-bias against older and more disabled individuals in the sampling procedure. People with arthritis visit their GP several times a year, and a physiotherapist almost ten times. This study was not designed as a cost-effectiveness study, in that case we should have pay attention to costs of medication, transportation and loss of jobs. In the Netherlands the costs of a visit to a GP are approximately Dfl 32 ($19), a visit to a physiotherapist Dfl 30 ($18), and a visit to a specialist Dfl 52 ($30). Thus in terms of costs and time, and generalizing to this age group in the general population (a group which is growing rapidly), this means that a huge amount of money is spent on the care of people with (pain)symptoms caused by arthritis. This is in agreement with the results of a study by Badley et al. on musculoskeletal disorders and health care utilization[37]. In fact, GPs and specialists have

relatively few instruments (for example, prescribing painkillers and referral to a physiotherapist) to relieve pain and the impact of pain. The same result was reported by Cronan et al.[38] in the US: "many of our participants reported being told by doctors and other health care providers that there is not much treatment available for OA patients besides prescribing antiinflammatory drugs" (pg 71). Cronan et al. also found that the best predictor of health care utilization was the prior use of the system. This suggests that if patients pass the threshold to the GP, they keep coming even though no cure is available.

Some patients may also have problems communicating their complaints to their doctor. The GP should be aware of this problem. Freeman et al.[11] state that "the ability of the physician to communicate with a patient who has a chronic disease is important to improving the quality of health services" (pg 144).

As we have shown in this paper, patients with OA are using a lot of health care services. These services have associated costs as we mentioned, and as was reported by others[15,16]. Recent work of Mazzuca et al.[39] showed that self-care education can reduce health care utilization and costs for patients with OA of the knee. We advocate to look at possibilities in the field of health promotion interventions by professionals to increase a patient's self-management ability and efficacy of coping with pain. In this way, it may be possible to decrease the utilization of health care resources by patients with arthritic pain in the hip or knee, especially of those with chronic symptoms, but without severe disability or severe pain.

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9. GENERAL DISCUSSION

9.1 The challenge of an ageing society

The proportion of people aged 55 years and over in the total population of the Netherlands and other Western countries will increase sharply in the coming years[1]. This increase is partly due to the improvement in health care and living conditions, and partly to the reduction in birth rate and infant mortality. The ageing of the population, however, will be accompanied by higher prevalences of chronic disabling diseases and disorders and higher utilization of the health care system. Fries and Crapo[2] were among the first to recognize these phenomena and to bring the consequences to the attention of the general public. They developed a positive view and launched their concept of the "compression of morbidity"[3]. In this concept, the consequences of chronic disabling diseases and disorders of the ageing population can be postponed by making personal decisions to change behaviour and lifestyle. This postponement can ultimately lead to an improved quality of life, an extended active life expectancy, and a "compressed" morbidity.
In the case of osteoarthritis (OA) as a chronic disabling condition of older people, coping behaviour, a physically active lifestyle, and a healthy diet were identified as important aspects that are sensitive to change (see chapter 1 of this study).
In this dissertation we used the conceptual scheme of the WHO regarding the consequences of diseases[4]. According to this scheme, the occurrence of a disease or disorder can lead to impairment, disability, and handicap. Tennant and McKenna[5] extended this scheme with an ultimate loss of quality of life. The challenge for ageing people is to learn how to live with a chronic disorder such as OA and to postpone its negative consequences (disability and loss of quality of life). The aim of this dissertation is to gain insight into the problems of older people with pain in the hip or knee (symptoms of OA) and how they actually live with this problems. These insights can be used to develop useful health promotion interventions in the future.

9.2 Methodological considerations

The most important choices we made in our studies concern the choice of OA of the hip or knee, the choice of pain chronicity as an operationalization of OA, the choice of self-reported measures of disability and health problems, the definition of additional mobility restricting conditions and comorbidity, the choice of two different approaches of coping, and finally, the cross-sectional design of the study.
Because 'mobility' is a principal theme in the research of TNO Prevention and Health, we chose to focus on problems concerning the lower extremities. By approaching the problems from the aspect of 'mobility' and with a special interest in behaviour and lifestyle, we did

not need to distinguish between problems with the hip and knee. Moreover, people often find it difficult to identify the origin of pain in the lower extremities.

We choose to use pain chronicity as an operationalization of OA in a community-living older population. We knew that many people with radiological evidence of OA (ROA, as used in many epidemiological studies) often do not have any symptoms at all[6]. Moreover, because there is no consensus on the diagnosis of osteoarthritis at the general practitioner (GP) level in the Netherlands, we could not use the actual diagnoses made by GPs. We also expected that not all people with OA would visit a doctor with these complaints, because many people consider these symptoms to be inevitable in older age. We assessed the possibility of using the classification criteria for OA of the hip and the knee of the American College of Rheumatology[7,8]. These criteria are mainly used by rheumatologists, to distinguish OA from other joint diseases. Important features are the presence of morning stiffness and crepitus, symptoms that are known to be very unreliable in population-based studies (personal communication April 1992, Dr. E. Odding and Prof. dr H.A. Valkenburg). Another problem was the unpredictability of the pain. In patients with OA, periods of pain alternate with periods without pain. Therefore, after carefully weighing the advantages and disadvantages of the various criteria, we decided to use pain chronicity as a criterion for OA. The chronicity of pain was operationalized by a new variable that was based on the occurrence of pain in the hip or knee on three different occasions in time. In this way, we identified a population with more-or-less chronic pain. One of the problems that we had to face was that after we had determined the pain chronicity of our participants, there was still a delay before the actual research was started. By the time that people were asked to complete the questionnaires and were interviewed, pain could have started or, in contrast, disappeared. As it is probably difficult for people to answer questions about pain that they have not experienced for months, the number of respondents who actually answered questions about pain varied. Specific questionnaires about pain in the hip or knee were only sent to people who reported pain on the third occasion (in February 1993). This decision was made because we wanted to avoid people seeing our research as illness specific, which could discourage people with less frequent pain from completing the questionnaires.

The impact of bias due to misclassification of determinants and outcome is an important issue in every study. It is recognized that there are differences between the assessment of pain and disability by the patient and the physician[9,10]. The percentage agreement between self-assessed disability and tests is 83% for men and 78% for women[9]. In our study, we deliberately chose for the opinion of the respondents instead of more 'objective' measures because the focus of the research is on how people actually live with their (subjective) pain and disability. From this point of view, the perceptions of people are the most important.

The same considerations partly apply to our definition of 'additional mobility restricting conditions'. We asked people to report other restricting conditions, as far as they perceived these problems as bothersome. A recent study by Kriegsman[11] indicated that self-reported presence of mobility limitations is associated with 'over-reporting' (compared to information of the GP) of all chronic diseases (with the exception of diabetes mellitus). As discussed by Kriegsman, over-reporting of the existence of chronic diseases may be explained by the tendency of patients to label symptoms or by inaccuracy of medical records.
To obtain a better insight into the comorbidity of the respondents, we combined our data with data collected in the Rotterdam Study for the same respondents in the context of other sub-studies. These last data were in most cases validated by a GP or by information about medication that patients used. We are aware that it is possible to study comorbidity in more detail (such as concurrent and complicating comorbidity[12]), but we decided to use only a global measure of comorbidity in our study (see chapter 4). These comorbidity data partly overlapped with reported mobility restricting conditions. The difference was that the comorbidity data were collected at the disease level (is a disease present?) and the mobility restricting conditions at the disability level (which disease leads to mobility problems?).

In the present study, we assessed two different approaches of coping (coping with pain and coping with stressors in general). We looked for possibilities to study coping in two different groups of people: people with current pain symptoms and people who had not recently experienced pain. One of our purposes was to study coping as a possible mediator between pain and disability in the people with current pain. The only available Dutch questionnaire that was useful for this purpose was the Pain Coping Inventory.
Our results supported that coping with pain, and physical activity are both mediators in the relationship between pain chronicity and physical disability, as predicted by the model of figure 1.2 (see chapter 1).
We also considered pain and disability -irrespective of their specific cause- to be 'problems' (=stressors) that older people have to cope with. Therefore, we used a generalistic coping list to assess certain coping styles and to study the association with quality of life in general. The Utrecht Coping List was the best choice when the study started.
The model of figure 1.3 predicted a mediating role of coping with stressors in the relationship between pain/disability and quality of life. In this case however, mediation was not supported. In fact, psychosocial disability was a mediator between pain chronicity and quality of life, whereas coping with stressors (especially 'seeking social support') was an independent predictor of the quality of life.

Although the present study had a cross-sectional design, a certain time aspect was present. The composed variable 'pain chronicity' was in fact an approximation of the pain pattern

over a longer period. Most people had just started noticing pain in the hip or knee: people with sporadically occurring symptoms mainly reported these on the third occasion (see chapter 2 of this dissertation). This means that people with episodic and chronic pain presumably had a longer history of coping with pain. If this is so, it can be assumed that these people were also more likely to have disability and loss of quality of life because they had already experienced pain. This phenomenon is also known from other studies concerning the impact of joint pain on longitudinal disability[13,14]. Our assumption was that people have certain established coping styles and strategies to handle pain and disability. This view is not congruent with the opinion of some researchers in the area of coping: Lazarus and Folkman[13] regard coping as a transactional process which can change in time. Our starting point was that, without a deliberate intervention, it is difficult for people to change their coping styles and strategies. In the future, we might try to influence coping styles and strategies by designing evidence-based health promotional interventions.

9.3 The present study in the context of other studies

In this section, the present study is discussed in the context of other studies concerning aspects of OA. First, we discuss the relation to studies concerning the role of psychological variables such as anxiety and depression. We also discuss recent studies concerning the role of lifestyle factors such as exercise and sports. Finally, we discuss our study in relation with studies on health care for patients with OA.

In 1986 Summers et al.[16] studied coping with OA among hospital out-patients with OA. In their study disability (defined as 'functional impairment') was measured with the Sickness Impact Profile (SIP)[17]. 'Objective disease severity' (ODS) was measured by assessing radiographic evidence of OA (according to the standard criteria). Summers et al. hypothesized that high levels of depression and anxiety were related to increased reports of pain and functional impairment, when ODS was controlled for. In addition, they hypothesized that high levels of a specific coping style ('learned resourcefulness') were inversely related to pain and functional impairment. In contrast with our study, they chose to study the relationship between the disease level (ODS=ROA) and the impairment level in the model of the International Classification of Impairment, Disability, and Handicap (ICIDH)[4]. Not surprisingly, they found hardly any relationship between ODS and pain reports. It was concluded by them that psychological variables such as depression, anxiety and coping were the best predictors of pain and functional impairments. In fact, their study results support our choice for taking pain as the basic determinant instead of radiological changes. Although we cannot exclude that pain symptoms are influenced by psychological

variables, we think that the most plausible pathway is the other way around: the existence of pain influences the levels of psychological distress and coping behaviour, resulting in less or more disability and poor or good quality of life (see chapters 5, 6, and 7).
Salaffi et al.[18] used the Arthritic Impact Measurement Scale (AIMS) to study 61 Italian women with symptomatic OA. They found that the disability scores were correlated with psychological variables and with age. As in the study by Summers et al., Salaffi et al. also discussed the influence of anxiety and depression on the pain experience. In our study, we found that the level of anxiety and depression in people with no mobility restricting problems other than pain in the hip or knee was not different from that of a reference group without pain or ROA (chapter 4). In our opinion, the relationship between the several variables is much more complex than is suggested by Summers et al. or Salaffi et al. In a more recent study, Dexter and Brandt[19] state that the relationship between pain and psychological variables such as depression can be reciprocal. We think that these processes, start much earlier in life than was presumed till now.

In chapter 3 we reported that people with chronic pain symptoms (= a longer history of OA) suffer from more psychosocial disability. In their longitudinal study among 300 adults with OA of the knee (confirmed by their GP), Blalock et al.[20] suggested that the way people cope with arthritis-related problems influences subsequent psychological health status. Dekker et al.[21] proposed an interesting hypothesis in this respect. They concluded that negative affect (variables such as anxiety and depression) when pain and disability are present leads to lower activity levels (an aspect of coping and lifestyle), decreased muscle weakness, and instability of joints, which finally leads to more pain and disability. Their study indicated that muscle weakness was indeed a mediating factor between negative affect and disability in patients with OA. In chapters 5 and 6 we described the role of physical activity in the relationship between the chronicity of pain and physical disability. We found that 'fatigue' also plays an important role. In fact, 'fatigue' was one of the negative mood states assessed by Dekker et al.[21] Their results show that fatigue is the most important correlate of pain. We also found that 'resting' as a pain coping strategy should be used with caution because if it leads to a sedentary lifestyle, this strategy will probably cause more physical disability. It is important to distinguish habitual physical activity and therapeutic exercise, and sports activities. It has recently been reported that ex-athletes (middle- and long-distance runners and tennis players) have higher rates of ROA than controls of the same age[22]. Especially weight-bearing sports activity in women is associated with a 2-3-fold increased risk of ROA. It is, however, not evaluated whether these radiological findings result in the same disability that would occur in the more sedentary population later in life. It is also still unclear what types of therapeutic exercise are the most beneficial for patients with OA[23]. In our study, we found that habitual physical activity, such as walking, cycling and swimming, plays a

mediating role in the relationship between pain chronicity and physical disability. Presumably, these types of physical activity have no harmful effects.
In the present study, we did not focus on another important lifestyle factor: a healthy diet. Other studies have shown that this is an important factor[24]. A recent study with twins indicated that the risk of radiological damage of the joints increased 9 to 13% per kilogram increase in body weight[25]. Almost all multivariate analyses in the present study were corrected for body weight (body mass index=weight/(height)^2). In an earlier report on some of the data of this study[26], 48% of the people with current pain symptoms regarded themselves as overweight and 21% were on a diet, mostly prescribed by a doctor (57%) or by themselves (30%).

New insights into the medical management of OA of the knee[27] and hip[28] have recently been published. The goals of management of patients with OA are to control pain and other symptoms, minimize disability, and educate the patient and his or her family. The prescription of non-steroidal anti-inflammatory drugs (NSAIDs) to patients with OA is a matter of debate. It is now recommended to encourage patients to participate in self-management programmes. A study by Weinberger et al.[29] showed that compliance with NSAIDs was associated with gastrointestinal complaints and that treatment of these complaints could add 45% to the costs of arthritis. Dexter found that medical encouragement of exercise was very successful[30]. Nine of eleven patients who received exercise recommendations and printed materials actually started to exercise. Primary care physicians regularly promote the benefits of a healthy lifestyle: in 60% of the discussions with a GP counselling or encouraging behaviourial change in patients was reported[31]. However, the mean time GPs spend discussing lifestyle with their patients is only 6 minutes for stress counselling and 1.5 minutes for exercise counselling[31]. As we described in chapter 8, health promotion activities are necessary to stimulate adequate use of health care services and to lower costs.

9.4 Recommendations for future research

It is easy to state that longitudinal studies are needed. Such studies may provide more insight into the causality of the associations that were found and in the validity of a variable such as 'pain chronicity'. One of the features of mediation is that mediating events can shift roles from effects to causes, depending on the focus of the analysis[32]. These problems can be overcome with a longitudinal study design. However, our first recommendation is not that more longitudinal studies should be performed. We think that there is enough support to warrant the design of a lifestyle intervention for people with arthritic pain in the hip or

knee. In fact, in 1995 TNO Prevention and Health started an intervention study with the financial support of the "Praeventiefonds" in the Netherlands. Insights gained from the present study and from the work of Kate Lorig[33] in the USA, were used to design a self-management course for people with arthritic pain. The results of this related research will soon be published.

Further research is necessary to investigate the role of fatigue as a correlate of pain and disability. In chapter 5, fatigue appeared to be related to periods of inflammation. Until the end of 1996 there were hardly studies on this topic. In their recent study, Wolfe et al.[34] found that the major predictors of fatigue are pain, sleep disturbance, and depression, and that fatigue does not appear to be related with inflammation. We think that it is worthwhile to give more attention to the measurement of fatigue.

Another aspect that deserves research attention is the existence of several mobility restricting conditions in one person. It seemed that localized OA in the hip or knee is less bothersome than the co-existence of OA in other joints or other additional mobility restricting conditions. Further research into the background of these problems and the relationship with earlier life events such as a periodically low health status or a chronic overload of joints is necessary.

Our approach, in which we took 'pain chronicity' as the key variable of our study, was obviously fruitful. We recommend that radiological OA should not be used as a variable to select subjects in a population study, but that it should be used as a background variable.

9.5 Some implications for clinical practice

What are the implications of the findings of our study for clinical practice? It is important to remember that the study dealed with people with pain in the hip or knee, and not with patients suffering from OA. Of course we found (see chapter 8) an overlap between these two groups. In The Netherlands for the GP no standard for diagnosis and treatment is available. Also, till recently OA was given not much attention in the educational programme of the GP. These last mentioned facts increase the probability that GPs see OA of the hip or knee and the consequences such as pain and disability as inevitable in older age and almost untreatable, without making distinction between groups of patients.

We suggest that extra attention should be paid to people with pain in the hip or knee with additional mobility restricting conditions. These people are especially vulnerable to pain, a greater impact of joint symptoms on daily life, and psychosocial problems, which together lead to a lower quality of life. It is plausible that this group of patients started much younger with their complaints than the well-known older overweighed female patient with radiological damage of the hip or knee joints.

Health educational interventions should start as soon as arthritic pain in the hip or knee occurs, to avoid the developing and maintenance of undesired habits. Patients of GPs and specialist should be told of the beneficial effects of a physically active lifestyle and be warned about the use of 'resting' as a pain coping strategy.

9.6 Implications for prevention

The term 'prevention' is often used as a synonymous for 'primary prevention', without being aware of 'secondary' and 'tertiary' prevention. In case of OA, yet little is known of the possibilities for primary prevention. Colleagues in the area of biomedical and genetical research are at work unravelling the primary processes in the cartilage of the joint surfaces. In the future, these scientific efforts may lead to new primary prevention possibilities. Secondary prevention includes the screening of the population at risk. In this area research focuses on the existence of biomedical markers of a disturbed cartilage metabolism. This seems a promising research area, however till now no practical useful techniques were developed.

For the time being, tertiary prevention is the most possible form of prevention in case of arthritic pain. This means that the consequences such as disability, handicap and loss of quality of life have to be prevented. A helpful tool for tertiary prevention is the use of Health Promotion techniques:

-in order to prevent unnecessary disability and other consequences of arthritic pain, people with starting arthritic complaints (with sporadically occurring pain) should be told about the benefits of a physically active lifestyle, a healthy diet to prevent overweight, and the use of appropriate coping styles and strategies;

-increase self-management ability of people with arthritic pain.

Health promotion is a special area of scientific research and practice[35]. Carefully planned health educational interventions in the community can help to prevent the consequences of arthritic pain in the hip or knee and possibly lower the costs of health care. The implementation and evaluation of these types of interventions is a next step that has to be undertaken.

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10. SUMMARY AND CONCLUSIONS

This final chapter gives a summary and the conclusions of Chapters 1 to 9.

Introduction (Chapter 1)

The aim of this dissertation is to gain insight into the health problems, quality of life, and coping behaviour of independent community-living people aged 55 to 74 years with pain in the hip or knee. In this age group pain in the hip or knee is mostly a sign of osteoarthritis (OA). OA is a chronic disabling disorder with a high prevalence and is the most common locomotor disorder encountered in general practice. Most patients are told that they have to learn to live with it. In this dissertation, attention is centred on behaviourial and lifestyle factors that may change outcome factors such as disability and quality of life in a positive direction.

We decided to regard pain complaints as the most important feature of OA, in contrast to many epidemiological studies in which the focus was on the existence of radiological evidence of OA (ROA). We considered that a radiograph as such is not relevant because these people have to live with their pain symptoms and with disability.

We used two conceptual models. One is a model for coping with pain in which both coping with pain and physical activity as a lifestyle factor are mediators and the occurrence of physical disability is an outcome variable. The second model involves coping with problems (for instance pain and disability) and regards quality of life as an outcome variable. Six questions were formulated:

1- What are the problems (in terms of disability) in daily functioning of people* with pain in the knee or hip? How serious are these problems and what is their relationship with demographic and illness-related variables? This in relation to problems of 'healthy' older people.

2- What is the specific health status of people with pain in the hip or knee only, compared to people with additional mobility restricting conditions?

3- In which specific habitual physical activities do people with pain in the hip or knee participate? Can a physically active lifestyle mediate in the relationship between pain and disability?

4- What pain-coping strategies are used by people with pain in the hip or knee? Can coping with pain mediate the relationship between pain and disability?

5- What is the quality of life in people with pain in the knee or hip compared to that of 'healthy' people? What is the relationship between pain in the hip or knee, the occurrence of disability, coping with stressors in general and quality of life?

6- Which people with pain in the hip or knee attend a general practitioner or a medical specialist. What are the differences between attenders and non-attenders?

* in all research questions 'people' means community-living people aged 55 to 74 years.

Population and methods (Chapter 2)

The present study was carried out in cooperation with the *Rotterdam Study*[1], a prospective follow-up study of the occurrence and risk factors of chronic diseases and disablement in a cohort of 10,275 people age 55 years and older. An age and sex representative subsample (n=831) of people between 55 and 75 years, with no occurrence of senile dementia or cognitive problems, and living independently was used. Radiographs of the hips and knees that had been scored for the presence of ROA were available for all respondents. On two occasions in the Rotterdam Study, people were asked about pain in their hip or knee in last month. These answers were combined with the answer to the same question on a third occasion (response 83%; n=691) and coded as a pain chronicity score (*no pain* at all; *sporadic pain*= reported pain on one occasion; *episodic pain*= reported pain on two occasions; *chronic pain*= reported pain on three occasions). All people with pain were asked to participate in the present study, and a reference group without pain and ROA was formed. The final response included 59 people with chronic pain, 74 people with episodic pain, 101 people with sporadic pain, and a reference group of 72 people without pain or ROA. All respondents completed questionnaires about quality of life, health problems, coping, and disabilities and were interviewed about physical activities, diagnoses, and health care utilization.

Chapter 3

The objective of this chapter was to determine the physical and psychosocial disability in relation to pain in the hip or knee and to explore the relationships between pain, physical and psychosocial disability, and selected background variables (age, sex, marital status, education, body mass index, the existence of additional mobility restricting conditions, ROA, and the use of medication). Disability was assessed with the Sickness Impact Profile. The mean physical disability in the group with chronic (and more severe) pain (N=59) was 5.4 times and the psychosocial disability was 3.6 times higher than those of a reference group (N=72). The body mass index (BMI), the existence of additional mobility problems, and ROA were independently positively related to physical disability. Male sex, having additional mobility problems, and moderate ROA were independently positively related to psychosocial disability.

It was concluded that subjects with more chronic (and severe) pain in the hip or knee have relatively high levels of physical as well as psychosocial disability, compared to a reference group without any signs of osteoarthritis. Pain chronicity does not contribute significantly to physical disability after correction for other factors. Physical and psychosocial disability

in subjects with pain are better predicted by ROA and by problems other than pain in the hip or knee alone, than by the chronicity of the pain.

Chapter 4

The objective of this chapter was to identify the specific differences in health status between respondents with pain in the hip or knee only and a group with additional mobility restricting conditions. Groups with current pain in the hip or knee only (n=62) or with additional mobility restricting conditions (n=124), and a reference group without pain and ROA (n=72) were identified. Health status was measured with the IRGL (Impact of Rheumatic diseases on General health and Lifestyle). Additional mobility restricting conditions were self-reported.
The most reported additional conditions were more widespread OA, and cardiovascular and respiratory problems. The group with pain in the hip or knee only had a lower mobility than the reference group, but a higher mobility, less pain, less psychological distress, and less impact of symptoms on daily life than the group with additional conditions. No differences were found in background variables and comorbidity (known from the Rotterdam Study). A multivariate logistic regression analysis showed that the group with additional conditions differed from the group with knee or hip pain only, with respect to joint pain, cheerfulness, and impact on daily life.
It was concluded that the health status of people with pain in the hip or knee only is comparable to that of a reference group without pain. Health status is lower when pain in the hip or knee is present in combination with additional mobility restricting conditions.

Chapter 5

The relationship between the frequency (chronic, episodic, and sporadic) of arthritic pain in the hip or knee, other illness-related variables, physical disability, and a physically active lifestyle was analyzed. The hypothesis was tested that a physically active lifestyle is a mediating variable in the relationship between pain frequency and physical disability. Physical activity was measured with a structured interview method and physical disability with the Sickness Impact Profile. A stepwise regression model with demographic data, pain frequency, illness-related variables (such as ROA, pain severity and the existence of additional mobility restricting conditions), and lifestyle variables explained 45% of the variance in physical disability; lifestyle variables explained 7% of the variance in physical disability. *The results support the hypothesis that a physically active lifestyle (in particular*

sport activity) is a mediator in the relationship between pain chronicity and physical disability. Our results suggest also that regular habitual sport activities can counteract the development or worsening of physical disability in subjects with chronic pain in the hip or knee.

Chapter 6

The objective was to investigate the use of pain coping strategies and the mediating role of coping with pain in the relationship between the chronicity of pain and physical disability. Hundred-fifty-seven people who experienced pain 'in the last month' before completing the questionnaires were identified. Coping with pain was assessed with the list 'Pain Behaviour Inventory', physical disability with the Sickness Impact Profile, and household and sport activities with a validated structured interview method. A regression model was used to investigate the relationships.

People with chronic pain used 'resting', and 'reducing demands' as pain coping strategies more than people with less chronic pain did. Pain chronicity made a significant contribution to physical disability (R^2=.08); however, when corrected for demographic variables, illness-related variables, lifestyle, and coping with pain (total R^2=.45), no significant partial correlation was left. Sport activities added 4% and coping with pain 10% to the explained variance in physical disability. The interaction between 'resting' and sport activities did not contribute significantly to the regression model.

It was concluded that pain coping has a mediating role in the relationship between pain chronicity and physical disability. Less use of 'resting' as a pain coping strategy and a physically active lifestyle were independently associated with less physical disability.

Chapter 7

This chapter examines the quality of life (QOL) of respondents with chronic, episodic, or sporadic pain in the hip or knee and of a reference group without pain. Firstly, it was hypothesized that the experienced QOL is lower in people with more chronic pain. Secondly, the potential mediating and moderating roles of disability and of coping with problems in general (stressors) on the relationship between pain chronicity and QOL were assessed. A Visual Analogue Scale was used to assess global QOL. Physical as well as psychosocial disability was assessed with the Sickness Impact Profile (SIP). Coping with problems in general was assessed with the Utrecht Coping List.

As expected, a significantly lower QOL was found in people with more chronic pain. The

difference in QOL between the group with chronic pain and a reference group without pain was 10%. A multivariate regression model showed that physical and especially psychosocial disability are mediators in the relationship between pain chronicity and QOL, and that 'seeking social support' as a coping style is a more important predictor of the experienced QOL than either pain chronicity or physical disability. No moderating role of the style of coping with problems was found.

Chapter 8

The aim of this chapter was to determine the pattern of health care utilization of respondents with arthritic pain in the knee or hip. People with current pain were identified. A filter model was used to describe the pattern of health care utilization of people who presented as patients at different levels (GPs or specialist) of the health care system in the Netherlands.
A group of 186 people with current pain (in the month before the interview) was identified. Background variables, illness-related variables, and self-reported diagnoses were described and compared for attenders and non-attenders of GP and specialist. A reference group of patients of GPs was used to determine the validity and generalizability of the findings.
Eighty-two per cent of the respondents consulted a GP (passed filter 1). Sixty-five per cent of the GP attenders with 'arthritis' (passed filter 2) attended a specialist (passed filter 3). People who did not pass the various filters were different from those who did with respect to the body mass index (lower), the chronicity of pain (less chronic pain), and attendance of a physiotherapist (lower).
The chronicity of pain seems of more importance in determining the health care utilization pattern than the severity of pain, the level of disability, or the presence of radiological osteoarthritis. It was concluded that health promotion interventions are needed to increase the self-management ability of patients and to lower costs.

Chapter 9 (general discussion)

In this chapter the theme of the dissertation 'living with arthritic pain in the hip or knee' is discussed as a challenge of an ageing society. Some important methodological aspects are discussed: the choice for OA of the hip or knee, the choice for pain chronicity as operationalization of OA, the choice for self-reported measures of disability and health problems, the definition of additional mobility restricting conditions and comorbidity, the choice for two different approaches of coping, and finally, the cross-sectional design of the

study.

Then, our study is discussed in the context of other studies. First, in relation to studies concerning the role of psychological variables such as anxiety and depression. Second, in relation to studies concerning lifestyle factors such as exercise and sport. Third, in relation to other studies concerning health care for patients with OA.

Recommendation for future research are given, including the development of a lifestyle intervention for people with arthritic pain in the hip or knee, the role of fatigue as a correlate of pain and disability, and finally, research into the backgrounds of the co-existence of OA in other joints or the existence of additional mobility restricting conditions.

Implications for clinical practice are:

- extra attention should be paid to people with pain in the hip or knee with additional mobility restricting conditions. These people are especially vulnerable with respect to pain, a greater impact of joint symptoms on daily life, and psychosocial problems, all of which lead to a lower quality of life;
- patients should be told of the beneficial effects of a physically active lifestyle and should be advised to make less use of 'resting' as a pain coping strategy.

Implications for prevention are:

- in order to prevent unnecessary disability, people with starting arthritic complaints (with sporadically occurring pain) should be told of the benefits of a physically active lifestyle, a healthy diet to prevent overweight, and the use of appropriate coping styles and strategies;
- health promotion interventions are needed to increase the self-management ability of people with OA and to lower the costs of health care.

SAMENVATTING EN CONCLUSIES IN HET NEDERLANDS

Inleiding (hoofdstuk 1)

Doel van de studie die in dit proefschrift wordt beschreven is om inzicht te verkrijgen in de gezondheidsproblematiek, kwaliteit van leven en de manier waarop met klachten wordt omgegaan van zelfstandig levende ouderen van 55 tot en met 74 jaar met pijn in de heup of** knie. Op die leeftijd is pijn in de heup of knie meestal een teken van artrose (osteoarthrosis=OA). OA is een chronische aandoening die kan leiden tot beperkingen in het functioneren. OA komt bij ouderen vaak voor en is bij de huisarts de meest gepresenteerde aandoening van het bewegingsapparaat. De meeste patiënten krijgen te horen dat ze er mee moeten leren leven. In dit proefschrift wordt aandacht geschonken aan gedrags- en leefstijlfactoren die positieve invloed kunnen hebben op het optreden van beperkingen in het functioneren en op de kwaliteit van leven.
We besloten om pijnklachten te beschouwen als het belangrijkste kenmerk van OA, in tegenstelling tot veel epidemiologische studies waarbij de nadruk ligt op 'radiologische artrose' (ROA), waarbij schade aan het kraakbeen zichtbaar is op een röntgenfoto. We vonden dat ROA minder relevant is omdat mensen niet hoeven om te gaan met een foto maar met pijnklachten en beperkingen.
We gebruikten twee theoretische modellen. Het eerste is een model waarbij wordt verondersteld dat de manier waarop men omgaat met pijnklachten en het al dan niet hebben van een fysiek actieve leefstijl intermediërende variabelen zijn in de relatie tussen pijn en het uiteindelijk optreden van fysieke beperkingen. Het tweede model veronderstelt dat de manier waarop mensen in het algemeen met problemen omgaan (waartoe ook pijn en fysieke beperkingen kunnen horen), invloed heeft op de uiteindelijke kwaliteit van leven.
Zes onderzoeksvragen werden geformuleerd:

1- Wat zijn de problemen (in termen van beperkingen) in het dagelijks functioneren van mensen*** met pijn in de heup of knie? Hoe ernstig zijn deze problemen en wat is de relatie met demografische en ziekte-gerelateerde variabelen? Dit alles in relatie tot problemen van 'gezonde' ouderen.

2- Hoe is het gesteld met de gezondheidstoestand van mensen met alleen pijn in de heup of knie vergeleken met mensen die daarnaast ook andere problemen hebben

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**waar gesproken wordt over knie *of* heup wordt bedoeld mensen met pijn in de knie, heup of in beide gewrichten.

***bij alle vraagstellingen wordt met 'mensen' zelfstandig wonende ouderen van 55 tot en met 74 jaar bedoeld.

waardoor zij in hun mobiliteit beperkt zijn?

3- Wat voor soort fysieke activiteiten hebben mensen met pijn in de heup of knie? Kan een fysiek actieve leefstijl een intermediërende rol spelen tussen pijn en het optreden van beperkingen?

4- Op wat voor manier gaan mensen om met pijn in de heup of knie? Heeft de manier waarop men met pijn omgaat een mediërende rol in de relatie tussen pijn en het optreden van beperkingen?

5- Hoe is de kwaliteit van leven van mensen met pijn in de heup of knie vergeleken met 'gezonde' ouderen? Wat is de relatie tussen pijnklachten, het optreden van beperkingen, het omgaan met problemen in het algemeen en de kwaliteit van leven?

6- Welke mensen met pijn in de heup of knie gaan met die klachten naar een huisarts of specialist? Wat zijn de verschillen tussen mensen die dat wel en die dat niet doen?

Populatie en methoden (hoofdstuk 2)

De hier beschreven studie is uitgevoerd in samenwerking met de ERGO studie (Erasmus Rotterdam Gezondheidsstudie Ouderen), een prospectieve follow-up studie naar het voorkomen en de risicofactoren van chronische ziekten en beperkingen in een cohort van 10,275 mensen van 55 jaar en ouder. Er werd gebruik gemaakt van een voor leeftijd en geslacht representatieve steekproef (n=831) van zelfstandig wonende mensen tussen 55 en 75 jaar, zonder tekenen van dementie of andere cognitieve problemen. Van al deze respondenten waren röntgenfoto's van knieën en heupen beschikbaar die waren nagekeken op het voorkomen van ROA. Bij twee gelegenheden tijdens de ERGO studie werd mensen gevraagd of ze de afgelopen maand pijn hadden in de heup of knie. Deze antwoorden werden gecombineerd met het antwoord op dezelfde vraag bij een derde gelegenheid (respons 83%; n=691) en gecodeerd als een 'pijn chroniciteits' score (geen pijn; sporadische pijn=pijn bij één gelegenheid gerapporteerd; episodische pijn=pijn bij twee gelegenheden gerapporteerd; chronische pijn=pijn bij drie gelegenheden gerapporteerd). Alle mensen met pijn werd gevraagd om aan de huidige studie mee te werken. Tevens werd een referentiegroep gevormd van mensen die geen pijn hadden en ook geen ROA. De uiteindelijke respons was 59 mensen met chronische pijn, 74 mensen met episodische pijn, 101 mensen met sporadische pijn en een referentiegroep van 72 mensen. Alle respondenten vulden vragenlijsten in over kwaliteit van leven, gezondheidsproblematiek, omgaan met problemen en met pijnklachten, en het optreden van beperkingen. Tevens werd men geïnterviewd over de fysieke activiteit, over de gestelde diagnoses en over het gebruik van

gezondheidszorg-voorzieningen.

Hoofdstuk 3

Doel van dit hoofdstuk was te bepalen welke fysieke en psychosociale beperkingen optreden bij mensen met pijn in de heup of knie en de relaties na te gaan tussen pijn, beperkingen en enkele achtergrondsvariabelen (leeftijd, geslacht, burgelijke staat, opleiding, quetelet index, het bestaan van bijkomende mobiliteits-beperkende aandoeningen, ROA en het gebruik van medicijnen). Beperkingen werden vastgesteld met behulp van de Sickness Impact Profile. De gemiddelde fysieke beperking in de groep met chronische (en over het algemeen ernstiger) pijn (N=59) was 5.4 keer zo groot en de psychosociale beperking was 3.6 keer zo groot als in een referentiegroep (N=72). De quetelet index, het bestaan van bijkomende mobiliteits-beperkende aandoeningen en ROA waren onafhankelijk positief gerelateerd aan het optreden van fysieke beperkingen. Mannelijk geslacht, het optreden van bijkomende mobiliteits-beperkende aandoeningen en matige ROA waren onafhankelijk positief gerelateerd aan het optreden van psychosociale beperkingen.

Er werd geconcludeerd dat mensen met meer chronische (en ernstiger) pijn in de heup en of knie relatief meer fysiek en psychosociaal beperkt zijn dan de referentiegroep zonder tekenen van OA. De chroniciteit van de pijn draagt echter -na correctie voor andere factoren- niet significant bij aan het optreden van fysieke beperkingen. Fysieke en psychosociale beperkingen worden beter voorspeld door ROA en door het optreden van andere mobiliteits-beperkende aandoeningen, dan door de chroniciteit van de pijn.

Hoofdstuk 4

Doel van dit hoofdstuk was te bepalen welke specifieke verschillen in gezondheidstoestand er zijn tussen mensen met alleen pijn in de heup of knie en mensen met daarnaast andere mobiliteits-beperkende aandoeningen. Er waren 62 mensen met recente pijn in de heup of knie maar geen andere mobiliteits-beperkende aandoeningen, 124 mensen met daarnaast ook ander mobiliteits-beperkende aandoeningen en een referentiegroep van 72 personen (zonder pijn en ROA). De gezondheidstoestand werd bepaald met de IRGL (Invloed van Reuma op Gezondheid en Leefwijze). Bijkomende mobiliteits-beperkende aandoeningen waren zelf-gerapporteerd.

De meest gerapporteerde bijkomende mobiliteits-beperkende aandoeningen waren gegeneraliseerde OA, hart- en vaatziekten en ademhalingsproblemen. De groep met alleen pijn in de heup of knie was minder mobiel dan de referentiegroep, maar mobieler, met minder pijn, minder psychologische problemen en minder invloed van klachten op het

dagelijks leven dan de groep met bijkomende klachten. Geen verschillen werden gevonden in achtergrond-variabelen en comorbiditeit (bekend uit de ERGO studie). Een multivariate regressie-analyse liet zien dat de groep met bijkomende problemen verschilde van de groep met alleen pijn in de heup of knie in pijnklachten, opgewektheid en invloed op het dagelijks leven.
Er werd geconcludeerd dat de gezondheidstoestand van mensen met pijn in de heup of knie vergelijkbaar is met een referentiegroep zonder pijn. De gezondheidstoestand is minder als er naast pijn in de heup of knie sprake is van andere mobiliteits-beperkende aandoeningen.

Hoofdstuk 5

In dit hoofdstuk is de relatie tussen de frequentie (chronisch, episodisch of sporadisch) van pijn in de heup of knie door OA, andere ziekte-gerelateerde variabelen, fysieke beperkingen en een fysiek actieve leefstijl nagegaan. Als hypothese werd getoetst of een fysiek actieve leefstijl een mediërende variabele is in de relatie tussen de frequentie van de pijn en het optreden van fysieke beperkingen. Fysieke activiteit werd gemeten met een speciale gestructureerde interview methode en fysieke beperkingen met de Sickness Impact Profile. Een stapsgewijs regressie model met demografische variabelen, pijn frequentie, ziekte-gerelateerde variabelen (ROA, ernst van de pijn, en het voorkomen van andere mobiliteits-beperkende aandoeningen) en leefstijlvariabelen, verklaarde 45% van de variantie in fysieke beperkingen. Leefstijl variabelen alleen, verklaarde 7% van de variantie in fysieke beperkingen. *De resultaten ondersteunen de hypothese dat een fysiek actieve leefstijl (in het bijzonder sportieve activiteit) een mediërende factor is in de relatie tussen de frequentie (chroniciteit) van de pijn en fysieke beperkingen. De resultaten suggereren tevens dat regelmatige sportieve activiteiten het ontstaan en de verergering van fysieke beperkingen bij ouderen met chronische pijn in de heup of knie kan tegengaan.*

Hoofdstuk 6

Doel was te onderzoeken welke pijn-coping strategieën worden gebruikt door mensen met pijn in de heup of knie en de eventueel mediërende rol na te gaan van omgaan met pijn in de relatie tussen de chroniciteit van de pijn en fysieke beperkingen.
In de maand voorafgaand aan het invullen van de vragenlijsten, hadden 157 mensen pijn in de heup of knie. Omgaan met pijn werd vastgesteld met behulp van de Inventarisatielijst Pijn Gedrag, fysieke beperkingen met de Sickness Impact Profile en huishoudelijke en sportieve activiteit met een gevalideerde gestructureerde interview methode. De relaties

werden onderzocht met behulp van een regressie model.
Mensen met chronische pijn maakten meer gebruik van de pijn-coping strategieën 'rusten' en 'eisen verlagen' dan mensen met minder chronische pijn. De chroniciteit van de pijn droeg significant bij aan fysieke beperkingen (R^2=.08), maar als er gecorrigeerd werd voor demografische variabelen, ziekte-gerelateerde variabelen, leefstijl en omgaan met pijn (totale R^2= .45) bleef er geen significante partiële correlatie over. Sportieve activiteiten droegen 4% en omgaan met pijn 10% bij aan de verklaarde variantie in fysieke beperkingen. De interactie tussen 'rusten' en sportieve activiteiten droeg niet significant bij aan het regressiemodel.

- *Er werd geconcludeerd dat omgaan met pijn een mediërende rol heeft in de relatie tussen chroniciteit van de pijn en het optreden van fysieke beperkingen. Minder gebruik van 'rusten' als een strategie om met pijn om te gaan en een fysiek actieve leefstijl waren onafhankelijk van elkaar geassocieerd met minder fysieke beperkingen.*

Hoofdstuk 7

Dit hoofdstuk onderzocht de kwaliteit van leven (KvL) van mensen met chronische, episodische of sporadische pijn in de heup of knie en een referentiegroep zonder pijn. Ten eerste werd de hypothese gesteld dat de KvL lager is in mensen met meer chronische pijn. Ten tweede werd de potentieel mediërende en modererende rol van het optreden van beperkingen en de manier waarop met problemen in het algemeen wordt omgegaan vastgesteld voor de relatie tussen de chroniciteit van de pijn en KvL. Een Visual Analogue Scale werd gebruikt om de globale KvL vast te stellen. Fysieke en psychosociale beperkingen werden vastgesteld met de Sickness Impact Profile (SIP). Omgaan met problemen werd vastgesteld met de Utrechtse Coping Lijst.
Zoals werd verwacht hadden mensen met chronische pijn een significant lagere KvL. Het verschil in KvL tussen de groep met chronische pijn en een referentiegroep bedroeg 10%. Een multivariaat regressiemodel toonde aan dat fysieke en in het bijzonder psychosociale beperkingen mediërende factoren zijn in de relatie tussen pijn chroniciteit en KvL en dat 'sociale steun zoeken' als manier om met problemen om te gaan een belangrijkere voorspeller is van de KvL dan de chroniciteit van de pijn of fysieke beperkingen. Er werd geen modererende rol gevonden voor de manier waarop met problemen wordt omgegaan.

Hoofdstuk 8

Doel van dit hoofdstuk was het bepalen van het patroon van gebruik van zorgvoorzieningen door mensen met recente pijn in de heup of knie. Een zogenaamd filtermodel werd gebruikt om het zorggebruik-patroon te bepalen van mensen die zich op verschillende niveaus (huisarts of specialist) als patiënt presenteerden. 186 mensen rapporteerden pijn in de maand voor het interview en werden in het onderzoek betrokken. Achtergrond variabelen, ziekte gerelateerde variabelen en zelfgerapporteerde diagnoses werden beschreven en vergeleken voor mensen die wel of niet met hun klachten naar de huisarts of specialist gingen. Een referentiegroep uit een ander onderzoek onder patiënten afkomstig uit verschillende huisartspraktijken, werd gebruikt om de gevonden gegevens te beoordelen op validiteit en betrouwbaarheid.
82% van de respondenten consulteerde een huisarts (zij passeerden filter 1), 56% van degenen die de huisarts consulteerden en waarbij de diagnose 'artrose' werd gesteld (filter 2), consulteerden een specialist (zij passeerden filter 3). Mensen die de verschillende filters niet passeerden verschilden van mensen die dat wel deden in quetelet index (zij hadden minder overgewicht), chroniciteit van de pijn (die was minder) en zij waren minder onder behandeling van een fysiotherapeut.
De chroniciteit van de pijn schijnt een belangrijker determinant te zijn van het patroon van zorggebruik dan de ernst van de pijn, het niveau van beperkingen, of de aanwezigheid van radiologische artrose. Er werd geconcludeerd dat gezondheidsbevorderende interventies nodig zijn om de zelf-management vaardigheden van patiënten te vergroten en de kosten te verlagen.

Hoofdstuk 9 (algemene discussie)

In dit hoofdstuk is het thema van dit proefschrift 'leven met pijn door artrose van de heup of knie' bediscussieerd als een uitdaging voor een snel verouderende maatschappij. Enkele belangrijke methodologische aspecten zijn aan de orde gesteld: de keuze voor artrose van de knie of heup, de keuze voor chroniciteit van de pijn als operationalisatie van artrose, de keuze voor zelf-gerapporteerde maten van beperkingen en gezondheidsproblemen, de definitie van bijkomende mobiliteits- belemmerende aandoeningen en comorbiditeit, de keuze voor twee verschillende benaderingswijzen van coping en tenslotte de cross-sectionele opzet van de studie.
Vervolgens is de studie besproken in het licht van andere wetenschappelijke studies op hetzelfde gebied. Ten eerste in relaties tot studies over de rol van psychologische variabelen zoals angst en depressie. Ten tweede in relatie tot studies aangaande leefstijlfactoren zoals

het doen van oefeningen en sport en ten derde in relatie tot studies die gezondheidszorg voor patiënten met artrose als onderwerp hadden.
Er zijn aanbevelingen voor toekomstig onderzoek gedaan. Dit betreft de ontwikkeling van een programma om de leefstijl te veranderen van mensen met artrose van de heup of knie, de rol van moeheid als samenhangende factor in de relatie tussen pijn en beperkingen, en onderzoek naar de achtergrond van het gelijktijdig optreden van artrose in andere gewrichten of het bestaan van gelijktijdig optredende mobiliteits-beperkende aandoeningen.
Implicaties voor de klinische praktijk zijn:
- extra aandacht dient besteed te worden aan mensen met naast artrose van de heup of knie nog andere mobiliteits-beperkende aandoeningen. Deze mensen zijn vooral kwetsbaar omdat zij meestal meer pijn hebben, meer invloed van gewrichtssymptomen op het dagelijks leven kennen, en meer psychosociale problemen hebben die kunnen leiden tot een verminderde kwaliteit van leven;
- aan patiënten zou duidelijk gemaakt dienen te worden dat een fysiek actieve leefstijl goede effecten heeft en dat 'rusten' als een manier om met pijn om te gaan zo min mogelijk gebruikt dient te worden.
Implicaties voor preventie zijn:
- om onnodige beperkingen te voorkomen, zou aan mensen met beginnende pijn door artrose (vaak sporadisch optredend) duidelijk gemaakt dienen te worden wat de voordelen zijn van een fysiek actieve leefstijl, een gezonde voeding om overgewicht te voorkomen en wat de juiste manieren zijn om met klachten om te gaan;
- gezondheidsbevorderende interventies zijn nodig om de zelf-management vaardigheden van mensen met artrose te verbeteren en om de kosten van de gezondheidszorg voor deze groep te verlagen.

POSTFACE

In 1991 the TNO Institute of Preventive Health Care* (NIPG-TNO) instigated research in the field of 'Physical activity, mobility, health and independence of elderly people'. The aim of this research was to develop interventions in order to decrease disability and to maintain the quality of life and mobility of older people as much as possible. Little was known about the consequences of OA for mobility and quality of life. It was decided to design a study that entailed the development of a 'lifestyle programme' for specific groups of older people with osteoarthritis, in order to prevent unnecessary disability and loss of quality of life. This study was financed by "Het Nationaal Reumafonds" of the Netherlands and has been reported previously[1,2]. The writing of this dissertation based on this study was supported by "Het Praeventiefonds". The results were used to design a course to learn people with OA how to cope with this disorder. This course is evaluated in connecting research (started on January 1995) financed by "Het Praeventiefonds" and will we reported soon.

[1] Hopman-Rock M. Coping with osteoarthritis of the knee and/or hip: the development of a lifestyle programme. Part I: analysis of quality of life, health and behaviour. Leiden The Netherlands: TNO Prevention and Health, ISBN 90-6743-347-0, 1994.

[2] Hopman-Rock M. Coping with osteoarthritis of the knee and/or hip: the development of a lifestyle programme. Part II: analysis of the intention to participate in a lifestyle programme. Leiden The Netherlands: TNO Prevention and Health, ISBN 90-6743-348-9, 1994.

*In 1994 the name of the institute was changed in: TNO Prevention and Health

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CURRICULUM VITAE

De auteur van dit proefschrift werd geboren op 25 september 1951 te Den Helder. Zij behaalde in 1969 het HBS-B diploma aan de Rijks-HBS in Alkmaar. In het zelfde jaar startte zij met de studie biologie aan de Universiteit van Amsterdam. In 1972 behaalde zij het kandidaatsexamen. Van 1972 tot 1975 was zij biologielerares op de Rijksscholengemeenschap Noord-Kennemerland en de Christelijke Scholengemeenschap te Alkmaar. In 1976 werd zij kandidaats-assistent in de palynologie aan de Universiteit van Amsterdam. In 1977 behaalde zij het doktoraaldiploma in de biologie (hoofdvak palynologie, bijvakken didaktiek en limnologie).

Vanaf 1977 gaf zij part-time les aan het Barlaeus Gymnasium, de Christelijke Scholengemeenschap Oost, het Nicolaas Lyceum in Amsterdam en aan het Minkema College in Woerden. Tevens was zij hoofddocent van de opleiding tot natuurgids van het Instituut Voor Natuurbeschermingseducatie (IVN) en was zij actief in D66 (ondermeer als secretaris van het regiobestuur Utrecht).

In 1983 begon zij met de studie psychologie aan de Universiteit van Leiden. In 1985 werd zij onderzoeksassistent bij de vakgroep ontwikkelingspsychologie (onderwerp: taalontwikkeling van kinderen) en in 1986 projectleider bij de werkgroep Arbeidsvraagstukken en Welzijn (onderwerp: werk van secretaresses). In 1987 studeerde zij af in de psychologie met als hoofdvak 'Methoden en Technieken van sociaal-wetenschappelijk onderzoek'.

Vanaf 1987 is zij als wetenschappelijk medewerker in vaste dienst bij TNO Preventie en Gezondheid (het voormalig Nederlands Instituut voor Praeventieve Gezondheidszorg) in Leiden. Zij verricht onderzoek op het gebied van de Collectieve Preventie en houdt zich daarbij als projectleider vooral bezig met de ontwikkeling van gezondheidskundige interventies voor ouderen en chronische zieken.

In 1993 behaalde zij de registratie als epidemioloog A (Master of Science in Epidemiology).

Vanaf 1996 verzorgt zij de module 'onderzoek' bij de post-HBO opleiding 'voorlichting in de gezondheidszorg' van de Transfergroep Rotterdam & Omstreken.

Momenteel woont zij met haar gezin in Voorschoten. Zij is in mei 1997 25 jaar getrouwd en heeft een zoon (1977) en een dochter (1978).