

CHRONIC BENIGN PAIN DISORDER

JJ Kerssens & PFM Verhaak
March, 2001

Report to NWO-MW
Pain Program
NWO code 940-31-033
NWO code 940-31-034



bibliotheek
otterstraat 118-124
postbus 1568
3500 bn utrecht
tel 030 2729 614/615
fax 030 2729729
bibliotheek@nivel.nl
www.nivel.nl

Content

Introduction	1
Main Objectives	1
Methods	2
Introduction and research question of the various papers	9
Summary of the results of the various papers	20

Various papers

- Review
- Prevalence study*
- Different types of chronic pain patients
- Ambulatory health care utilization*
- Electronic diary assessment of pain
- Determinants of pain report and disability*
- Long term development of CBPD*
- Costs associated with CBPD*

Appendix with questionnaires

- A GP registration form
- B Multidimensional Pain Inventory (MPI)
- C Medical Outcome Study Short Form 36 and Medical consumption questionnaire
- D Pain Coping Questionnaire

* Since these papers are not yet published do not cite and keep them confidential.

Introduction

In 1993 the Council for Medical and Health Research (MW-NWO) of the Netherlands Organization for Scientific Research (NWO) started financing a research programme in order to stimulate the study of *pain*. One of the programmes' main objectives was to obtain descriptive epidemiological data and health services utilization of patients with a chronic benign pain disorder (CBPD). The Netherlands institute of health services research was commissioned to do two research projects in this programme. The first project was entitled: "Incidence and prevalence of CBPD and its associated health care consumption and functional impairments in the Netherlands". This project, with NWO code 940-31-033, was executed in cooperation with the department of health psychology (Utrecht University). At NWO's request this study was extended to include the analysis of a long term follow-up of CBPD patients, resulting in the second project, which was entitled: "Costs associated with chronic benign disorder in short and long term" (NWO code 940-31-34). The costs of CBPD were analyzed in cooperation with health economists from the department of Health, Organization, Policy and Economics (Maastricht University). Because the various papers written as a result of both projects are scattered in international journals (and some papers are not yet published) we would like to offer NWO this report to serve as a complete document of the study's results.

At this point we have written eight papers which are included in this document. We will refer to these paper with the following labels

Review

Prevalence study

Different types of chronic pain patients

Ambulatory health care utilization

Electronic diary assessment of pain

Determinants of pain report and disability

Long term development of CBPD

Costs associated with CBPD

Main objectives

The first study's objective is to provide reliable estimates of the total incidence and prevalence of CBPD and the health care consumption and functional impairments of patients with this disorder. The study consisted of two parts, an extensive descriptive survey, in which all included patients were followed for one year, and an intensive, process-oriented study in which a subsample of patients were meticulously followed with a computerized diary for several weeks. This study intended to reveal:

- 1) The incidence and prevalence of CBPD in the Dutch health care system
- 2) The extent of health care consumption and functional impairments in these patients

Four papers relate to these research questions: Review, Prevalence study, Different types of chronic pain patients, and Ambulatory health care utilization.

In the subsample a detailed prospective analysis was carried out at micro-level to ascertain:

- 3) The relationship between pain report, psychosocial factors and measures of health care consumption and functional impairment
- 4) How these variable progress over six months

Two papers relate to these research questions: Electronic diary assessment of pain, and Determinants of pain report and disability

In the second project, the following two additional objectives were formulated:

- 5) To study the longterm development of CBPD patients
- 6) To estimate the costs associated with CBPD

Two papers relate to these research questions: Long term development of CBPD, and Costs associated with CBPD

In the remainder of this introduction, the various objectives are transformed into more detailed research questions. But first a more formal description of CBPD is given, and the main methods of the projects are highlighted.

Chronic Benign Pain Disorder

Three elements make up the description of CBPD: chronic, benign and pain.

Pain is "an unpleasant sensory and emotional experience associated with actual and potential tissue damage, or described in terms of such damage" (IASP 1986). This definition refers to a number of aspects that complicate the study of the epidemiology of pain. For example, the definition refers to "actual and potential tissue damage", which excludes the possibility of a decisive objective test as a gold standard. Moreover, the definition stresses the subjective character of pain by referring to "unpleasant sensory and emotional experiences". Since pain is subjective its intensity and quality can only be evaluated by patient themselves. Several international accepted standard pain questionnaires have been developed, for instace the MPI..

Chronic pain is defined by the International Association for the Study of Pain (IASP) as "pain, that persists beyond the normal time of healing (...)", but "normal time" may vary from tissue to tissue, so the term is not very precise. A common operational definition of chronic is more than 6 months.

The IASP has worked out an elaborate system for the classification of chronic pain conditions from a medical point of view. This taxonomy has the following five axes: (1) body region; (2) body system; (3) temporal characteristics; (4) pain intensity and time of onset; and finally (5) the presumed etiology. The last axis is open to most argument since there is a great uncertainty about the mechanisms involved in the production of pain (Merskey 1986). Furthermore, in patients with chronic pain etiology is sometimes unknown. Whereas acute pain is functional and can be considered a mainly physiological response to tissue damage, chronic pain involves psychological and behavioral mechanisms in addition to physiological mechanisms. In acute pain there is a straightforward relation between nociception, pain, suffering, and pain behavior, but in chronic pain this direct link with a nociceptive substrate is not always present. When there is no such link, we refer to chronic *benign* pain.

Patients suffering from chronic benign pain experience pain sensations which cannot be explained by physical lesions or physiological dysfunctioning. Related terms found in the literature are idiopathic pain (von Knorring and Ekselius, 1994) and somatoform pain, both of which refer to psychiatric categories in the third version of the Diagnostic and Statistical Manual of Mental Disorders (DSM). In the fourth version (DSM-IV) chronic pain without an organic explanation is categorized as Chronic Pain Disorder Associated with Psychological Factors. As a matter of fact, the term chronic benign pain is not one that is used clinically outside the Netherlands.

NWO's Painprogramme stresses the importance of using an international definition and explicitly suggest to accept the DSM definition.

Methods

General Practitioners

Since 1970, a number of Dutch General Practitioners are participating in the Dutch Sentinel Practice Network (Bartelds 1997). These sentinel stations have been requested to report each patient known to have chronic pain. Their practice population, counted every 2 years, is recorded in age-categories for both males and females. In our project, 45 GPs in 35 different practices agreed to take part. These sentinel stations covers 0.67% of the Dutch population.

Patients

Patients were asked by their GPs in the period 1/1/1996 through 31/12/96 to cooperate with our project. The following criteria were used by the GPs to include patients:

- 1) Patients between 18 and 75 years of age;
- 2) Patients with pain which had lasted at least six months;
- 3) Pain is the most prominent aspect in the clinical presentation;
- 4) Pain is serious enough to justify clinical attention;
- 5) Pain has led to obvious discomfort and disability in daily life for at least for one month.

Exclusion criteria were: patients with pain caused by diagnosed malignancies, rheumatic or neurological disorders, such as cancer, rheumatoid arthritis and gout.

Inclusion criteria were: patients with unexplained pain or patients with a symptom-diagnosed pain syndrome, like: peripheral neuropathy, fibrositis, localized myofascial syndrome, tension headache, unexplained neck/shoulder pain, intercostal neuralgia, unexplained abdominal pain, rectal pain, ischialgia, post-traumatic dystrophy, trigeminal neuralgia, migraine, whiplash, brachialis, post-operative pain, unexplained menstruation pain, unexplained back pain, femoral neuralgia, and all other unexplained pain.

The second criterion served as a time frame to investigate the incidence of CBPD. Six months is a conventional point of division between chronic and sub-acute pain. Only after having pain for at least six months were patients included in our database. During 1996, it became clear that a majority of the GPs were unable to apply the project's inclusion criteria on a day-to-day bases. Consequently, we visited all the practices at the beginning of 1997 to look for further CBPD patients. Where the practice-computer system was compatible, we searched for appropriate ICPC codes (International Classification of Primary Care) or ATC codes (Anatomical-Therapeutical-Chemical). We looked for pain syndromes or pain medication. Where the practice-computer system was not useful in this respect, we went through the above-mentioned list of inclusion syndromes with the GP and the GP-assistant. This approach enabled us to estimate the prevalence, but not the incidence of CBPD.

Measurement Instruments

General Practitioner judgments

To obtain medical aspects of CBPD, a registration form was made on basis of the five IASP axes. At the moment of inclusion, following contact with the patient, the general practitioners rated each patient on each of the following characteristics:

- body region (Head, face and mouth; Cervical region; Upper shoulder and upper limbs; Thoracic; Abdominal region; Lower Back, lumbar spine, sacrum and coccyx; Lower limbs; Pelvic region; Anal, perineal, genital region; More than three major sites.);
- body system whose abnormal functioning produces the pain (Nervous system; Respiratory and Cardiovascular system; Musculoskeletal system and connective tissue; Cutaneous, subcutaneous and associated glands; Gastrointestinal system; Genito-urinary system; Other organs or viscera; More than one system region.);
- temporal characteristics (Continuous or nearly continuous, non-fluctuating; Continuous or nearly continuous, fluctuating severity; Recurring, irregularly; Recurring, regularly; Paroxysm Sustained with superimposed paroxysms; Other combinations.); and finally:
- the presumed etiology (Genetic or congenital disorders; Trauma, operation, burns; Infective parasite; Neoplasm; Toxic, metabolic, radiation; Degenerative, mechanical; Dysfunctional; Unknown or other; Psychological).

Pain intensity and time of onset of pain (also one of the IASP axis) was not recorded by the GP but by patients themselves;

The GP also rated the medical explanation/evidence of the patient's disorder (11 point scale: not explicable - completely explicable).

This registration form is include as Appendix A.

Multidimensional Pain Inventory (MPI)

The Dutch Language version of the MPI has been used (Lousberg, 1994).

The MPI profiles are based on a number of constructions and assumptions. The MPI is a multidimensional pain questionnaire which yields scores on 11 sub scales divided over three main parts:

- pain relevant psychosocial aspects
 - pain intensity
 - interference
 - life control
 - affective distress
 - social support
- behavioural aspects
 - punishing responses
 - solicitous responses
 - distracting responses
- daily activities
 - household chores
 - outdoor work
 - social activities/activities away from home

In the original American version of the MPI 12 sub scales were distinguished. During the development of the Dutch language version, only three factors in part III of the questionnaire, concerning daily activities could be extracted (Lousberg, 1994). Accordingly, social activities and

activities away from home have been amalgamated. The same adaptation was made in the Swedish language version of the MPI (Bergström et al., 1998).

Scores on these scales were used to classify respondents according to the four categories described: dysfunctional, interpersonally distressed, adaptive copers, average respondents. The program delivered with the questionnaires makes automatic categorizations (cf Lousberg, 1994). The categories are constructed so that the dysfunctional type is high in pain intensity, interference and affective distress, also high in support, solicitous responses and distracting responses, but low in life control and general activity. The interpersonally distressed type is average in pain intensity, interference and affective distress as well as in life control and general activity, but low in support, solicitous responses and distracting responses. The adaptive copers has the best of both worlds, combining low subjective pain relevant aspects with relatively high support. The average type has intermediate scores on all aspects. It was not possible to obtain a typology for every respondent: a number of them gave contradictory responses, so that they could not be classified. This group is called the "anomalous" group.

The pain relevant psychosocial aspects (pain intensity, interference, life control and affective distress) have been repeatedly measured by means of a MPI short form.

This MPI questionnaire is included as Appendix B.

Medical Outcome Study Short Form 36 (MOS SF36)

The short form of the measurement instrument, developed during the Medical Outcome Studies of the Rand Corporation to measure health status and functional status of respondents (MOS SF36) has been administered to all patients at the moment of inclusion. The following scales (sometimes shortened form) were included:

- general health status (one item)
- social functioning (one item)
- physical functioning (10 items)
- physical role performance (four items)
- mental health (five items)
- vitality (four items)

Because different scaling was used for the various (groups of) items, all sum scores were transformed to scores on a 100-point scale ranging from 0 (worse situation) to 100 (optimal situation)

This Questionnaire is included as Appendix C - Question 36 to 41.

Medical consumption questionnaire

The medical consumption questionnaire has been developed specifically for this study. It is an inventory with a three month retrospective view of number of visits (and number of visits due to pain complaints) to the:

- general practitioner
- medical specialist
- paramedical professions: physiotherapists and exercise therapists
- mental health care professionals
- alternative healers

Furthermore, the respondent is required to indicate the self-care activities undertaken to reduce or prevent pain

- taking medicine
- rest
- swimming
- yoga
- gymnastics
- other

This Questionnaire is include as Appendix C - Question 1 to 35.

Coping with Pain Questionnaire

The Coping with Pain Questionnaire is a Dutch version of Rosenstiles en Keefe's Coping Strategy Questionnaire including a total of 44 items and a visual analogue scale (VAS) answering format. This questionnaire measures the following seven ways of psychological adaption to living with chronic pain:

- Diverting attention;
- Reinterpreting pain sensations;
- Positive thinking;
- Denying pain sensations;
- Praying or hoping;
- Catastrophizing;
- Increasing activity.

Each of these scales contains 6 items. In addition, two items measure the effectivity of controlling pain and ability in decreasing pain.

The Coping with Pain Questionnaire is includes as Appendix D.

Non respons

The general practitioners selected 586 of their patients. Due to non-response and dropout, the ultimate sample might have been biased. The first selection appeared at the point that patients meeting criteria for CBPD did not participate. Since forms about these patients were also completed by the general practitioners, we can compare their judgements on participants with their judgments on non-participants (table 1).

Table 1:Non-response analyses: Participants (returning MPI at T1) vs Non-participants

	Participants 385	Non-participants 178
<i>Location of pain:</i>		
Head, face and mouth	20%	19%
Cervical region	15%	15%
Upper shoulder and upper limbs	15%	15%
Thoracic region	3%	4%
Abdominal region	4%	4%
Lower back, lumbar spine	21%	21%

sacrum and coccyx		
Lower limbs	7%	9%
Pelvic region	1%	2%
Anal, perianal and genital region	2%	3%
More than 3 sites	12%	10%
<i>Temporal characteristics</i>		
Continuous (non-fluct.)	16%	18%
Continuous (fluct.)	43%	38%
Intermittent, irregular	21%	22%
Intermittent, regular	15%	13%
Attacks	6%	8%
Medically explicable	5.8 (2.9)	5.9 (2.8)
<i>(10-point scale: 0: not explicable; 10: completely explicable), mean scores (s.d)</i>		

None of the differences between participants and non-participants were statistically significant. From table 1 we conclude that non-participants did not differ from participants as regards location of pain, its temporal characteristics, or the degree of medical explicability of the pain symptoms. There were 385 patients fulfilling the criteria who agreed to participate and completed the first questionnaire (including the first MPI).

The second selection, resulting from non-response, is derived from the longitudinal character of the study.

The study was a longitudinal cohort study, so the patients included were asked to complete and return a mailed questionnaire at T1 and every three months thereafter. Each new measurement was accompanied by a considerable loss of respondents. Table 3 shows the impact of non-response on T1 to T4 by presenting the distribution of age, gender, health parameters and a number of pain characteristics as measured on T1 for the group of respondents participating at T1, T2, T3 and T4.. The loss of respondents resulted in a growing proportion of female patients, although the age composition of the groups did not change substantially. The average pain duration increased, while pain location and medical explicability remained the same. No selective dropout of patients with relatively good or poor health could be observed. The distribution of MPI-typology remained the same as well.

Table 3: Patient and temporal characteristics at four measurement-points
Location of pain:

	T1	T2	T3	T4
Head, face and mouth	17%	17%	15%	16%
Cervical region	7%	7%	8%	6%
Upper shoulder and upper limbs	11%	12%	10%	11%
Thoracic region	4%	5%	5%	7%
Abdominal region	6%	5%	6%	5%

Lower back, lumbar spine sacrum and coccyx	14%	12%	12%	13%
Lower limbs	8%	8%	10%	9%
Pelvic region	1%	1%	1%	-
Anal, perianal and genital region	1%	1%	1%	1%
More than 3 sites	31%	31%	33%	31%
<i>Temporal characteristics</i>				
Continuous (non-fluct.)	18%	19%	17%	17%
Continuous (fluct.)	39%	37%	37%	36%
Intermittent, irregular	21%	20%	22%	22%
Intermittent, regular	13%	15%	16%	17%
Attacks	9%	9%	9%	9%
<i>Medically explicable (10-point scale: 0: not explicable; 10: completely explicable)</i>				
	5.8 (2.7)	5.7 (2.6)	5.9 (2.5)	6.1 (2.5)
% female	71%	73%	76%	79%
mean age	49.4 (14.1)	48.3 (13.1)	48.1 (12.4)	48.4 (12.0)
pain duration (years)	9.9 11.6	14.7	19	
<i>Health parameters</i>				
General health	31.1	31.8	31.7	33.3
Social functioning	50.9	50.7	51.9	52.3
Physical functioning	54.0	54.6	54.5	55.2
Physical role performance	25.8	26.2	26.9	28.9
Mental Health	54.5	54.5	54.8	55.5
Vitality	51.1	51.4	51.8	52.8
<i>MPI-typology</i>				
Dysfunctional	36%	35%	34%	32%
Interpersonally distressed	19%	20%	18%	19%
Adaptive copier	12%	11%	12%	16%
Average	33%	32%	35%	33%

Introduction and research questions of the various papers

Review

Before the actual study was undertaken a review of literature up till 1996 was made. The complex nature of chronic benign pain means that its prevalence cannot be measured by means of assessing well-circumscribed physical conditions, as is the case with diabetes or malaria. It requires a multidimensional approach incorporating a number of dimensions such as the localization of pain, pain intensity, temporal characteristics, affective appraisal, coping, and grading of pain (see VonKorff et al. 1990; Turk and Rudy 1992; Raspe and Kohlman 1994). Yet despite these difficulties in measuring the prevalence of chronic pain, forceful statements have been made about the prevalence and the costs and impact on social security systems of chronic pain. The statement that "Chronic pain is a major health problem and it has been estimated that between 25% and 30% of the populations in industrialized countries have chronic pain" opened an editorial in the British Journal of General Practice in 1992 (Seers 1992), and "Although precise data are lacking for the Netherlands, it is reported that 10,000 new cases (patients who are unable to work because of pain) are registered each year" (Lousberg 1994). Aronoff et al. (1983) estimated that chronic pain costs America 40 billion dollars a year. Nachemson (1994) wrote of the situation in Sweden: "Together with all the other chronic pain syndromes for which physicians have no proper explanation ... , the statement that the cost of these conditions might cause the end of the welfare state might not be untrue". Our first objective focuses on the literature, available at the start of our research (1996) on the epidemiology of chronic benign pain among adults, paying attention to the methodology used to assess the prevalence of chronic benign pain, the definitions and inclusion criteria, other descriptive factors, and, lastly, the prevalence determined.

The result of this review is found in the manuscript on page .. to ..

Prevalence study

Because of the lack of reliable figures, the Dutch National Council of Research for Medical Sciences commissioned the Dutch Institute of Primary Health Care to estimate the prevalence of chronic benign pain disorder among adults in general practice.

General Practitioners (GPs) have a central position in the Dutch health care system, because they are the first health professionals to contact in case of health related problems (Maarse 1997). Most of the other health services, including medical specialists and physiotherapists are accessible only after a referral of a GP (Kerssens & Groenewegen 1990). Besides that, patients are registered with a GP in a fixed list. More than 75% of the population see their GP at least once a year. For chronically ill people this percentage is even 94% (Rijken et al 1999). It was therefore assumed that GPs were a good intermediary for the detection of cases of chronic pain.

Apart from estimating the prevalence of CBPD we have set out to report descriptions of the patients included. As Crombie et al. (1994) have pointed out in an editorial about the epidemiology of chronic pain: "What is needed is detailed information on the pain problems in the community" (p1). Detailed information requires a medical description of CBPD as well as a report of the disorder's impact on patient's daily life.

The following research questions were formulated for the prevalence study:

- * What is the overall and the age specific prevalence of CBPD?
- * What kind of body regions, body system are involved?
- * What are the temporal characteristics of CBPD?
- * What kind of psychological, social and behavioural implications result from CBPD?

The prevalence study is found in the manuscript on page .. to ..

Different types of chronic pain patients

The recognition of the multidimensional character of pain with its interplay of physical, cognitive and behavioural factors led Turk and Rudy (1988, 1992) to the construction of the Multi Axial Assessment of Pain (MAP). Information has to be obtained on three axes: physical/medical; psychosocial; behavioural. The syndrome classification of the IASP serves to gather relevant data on the first axis. This classification is undertaken by a clinician. The second and third axes are assessed by the Multidimensional Pain Inventory (MPI), a self-report questionnaire which measures patients' appraisals of pain and the impact of pain on different domains of their lives, perceptions of the responses of significant others to their distress, and the performance of common activities. The MPI is constructed so that the outcome of an assessment is one of four patient profiles. *Dysfunctional*: patients who perceive the severity of their pain to be high, report pain as interfering with their daily lives, experience much affective distress, and have a low activity level. *Interpersonally Distressed*: patients with moderate pain and affective distress who have a common perception that significant others are not very understanding. *Adaptive Copers*: patients who experience considerable social support and relatively low levels of pain, affective distress, high levels of activity, and perceived control. Patients of the *Average type* have some of the characteristics of each of the three other types (cf Bergström, Jensen, Bodin, Linton, Nygren, and Carlsson, 1998; Kerns, Turk and Rudy, 1985; Lousberg, 1994;).

This multi-axial approach illustrates the complexity of the phenomenon of chronic benign pain. Chronic pain persists under the influence of physical, cognitive, emotional, behavioural, and social factors. However, by its very character, it is often defined (at least by the patient) as an exclusively medical problem for which medical solutions should be sought. This circumstance makes chronic pain and the resulting use of health services an important research topic for health psychology and health services research.

The possible relationship between pain coping characteristics (including behavioural and psychological factors) and health service usage has not previously been investigated in detail. There is a long tradition of health services research on help seeking behaviour, but this has not been focused exclusively on pain patients, and certainly not on the maladaptive character of help seeking behaviour in the light of the psychological models referred to earlier. This study aims to enhance the understanding of the relationship between cognitive and behavioural patient characteristics resulting in the MPI profiles mentioned above and medical help seeking in the population at large. It is a longitudinal study providing an opportunity to study the consequences of several MPI profiles on medical consumption in the long term, with the following research questions (hypotheses):

- * Do adaptive copers make less use of medical and paramedical services than the interpersonally distressed, and even less use of medical and paramedical services than dysfunctional patients?
- * Do interpersonally distressed patients make more use of psychological services than adaptive copers?
- * Do adaptive copers engage in more self-help activities (especially the more active) than dysfunctional or interpersonally distressed patients?
- * Do differences between the three groups in medical consumption continue during the annual follow-up?

The coping study can be found in the manuscript on page .. to ..

Ambulatory health care utilization

CBPD patients are believed to be major health service consumers, but this judgement is always that of the providers of health care, who may well only be encountering a relatively small group of patients with this disorder. It is of interest to note there have been very few studies within the domain of pain research devoting attention to pain patients' use of health services. Studies of pain and the use of health services have in general been limited to cross-sectional measurement of pain characteristics and health services utilization (Crook et al. 1984, Engel et al. 1996, Jensen et al. 1994, Van Tulder et al. 1998). This study was undertaken to try to fill the knowledge gap on this topic and provide a reliable description of the utilization of ambulatory health care by CBPD patients. Since patients may experience episodes without pain or intermittent pain or continuous pain, a longitudinal design was chosen covering both a number of people and periods of time within the same individual (Von Korff 1990).

Research questions

- * How much ambulatory health care is utilized by patients with Chronic Benign Pain Disorder when compared with a matched control group?
- * How do CBPD patients evaluate their own health when compared with a matched control group?
- * What is the course of the utilization of ambulatory health care by patients with Chronic Benign Pain Disorder over a period of one year?

Electronic diary assessment of pain

A large number of studies of the chronic benign pain disorder (CBPD) has been devoted to the identification of psychological factors, contributing to the maintenance of the pain or pertaining to physical, mental and social aspects of the disability resulting from the pain problem. The most important factors are operant reinforcement of pain behavior by spouses, pain cognitions and pain coping. For the most part these have been identified in cross-sectional studies that rely on one to a few assessments of the relevant attribute. In addition, the association between a psychological factor and an increase of pain or disability has typically been established for groups of patients by means of correlational procedures. A few studies related psychological factors to variations in pain report and well-being in individual patients on the basis of repeated diary assessments (Linton & Gotestam, 1985; Geisser et al, 1995; Affleck et al., 1996; Tennen & Affleck, 1996; Porter, et al., 1998). Since these studies were confined to only a few variables, a more comprehensive assessment and analysis within patients of psychological functioning in relation to pain intensity and disability is required. We therefore employed intensive diary assessments of reported pain intensity and disability, and of pain cognitions, pain coping and spousal operant behavior to study the associations between the variables as well as their temporal characteristics in patients with variable persistence of pain.

The pain taxonomy of the International Association for the Study of Pain (Merskey, 1986) includes standards for the temporal characteristics of pain: pain can be (1) continuous or nearly continuous - non fluctuating; (2) continuous or nearly continuous - fluctuating; (3) recurring, irregularly; (4) recurring, regularly; (5) paroxysmal or (6) sustained with superimposed paroxysms. The actual fluctuations in pain within days or across several days has largely been neglected in pain research, however, and diary assessments are best suited to verify the actual temporal pain characteristics. A potential limitation of diary assessments is reactivity to the repetitiveness of the recording: pain report may either increase due to sensitivity (Affleck et al, 1991; Cruise et al., 1996) or it may decrease due to response fatigue, which could both be induced by the daily measurement. The studies concerned with this issue measured pain once a day (Affleck et al., 1991; von Baeyer, 1994) for seven days (von Baeyer, 1994; Cruise et al., 1996) or two weeks (Kerns et al. 1988) and produced no evidence for both types of reactivity to the diary measurement. The present study again addresses the issue of reactivity, since this phenomenon may still occur with a more extended time schedule of several weeks and a higher density of recording of several assessments per day.

Investigations of the fluctuations of chronic benign pain within one day yielded systematic trends during the course of the day (Glynn & Lloyd, 1976a en 1976b; Jamison & Brown, 1991): Most frequent was an increase in pain intensity from the morning to the evening (Glynn & Lloyd, 1976a en 1976b; Jamison & Brown, 1991), but a U-shaped trend was also found with pain being worst both in the morning and in the evening (Jamison & Brown, 1991; Vendrig & Lousberg, 1997). The largest increase in pain over the day occurred in female patients and in patients who did not work out of the house (Glynn & Lloyd, 1976a; 1976b), while patients who exhibited no trend in pain over the day were found to be more emotionally distressed (Jamison & Brown, 1991). In the present study, trends in pain will be explored across the 4 weeks of diary recording and will be investigated within days, while controlling for the impact of gender, work status and emotional distress as potential predictors of the daily trend.

Pain report usually increases with the progression from the acute to the chronic pain state (Sedlak, 1985; Burton et al., 1995; van der Kloot et al. 1996) and patients with persisting pain were shown to have suffered from more severe pain in the acute phase than patients whose pain resolved (Potter & Jones, 1992; White et al., 1997). Whether persistence of pain also influences the temporal characteristics of pain is unknown. More evidence has been obtained for the association between persistence of pain and increased disability and general psychopathology (Sedlak, 1985; Vallfors, 1985; Iezzi et al., 1992; van der Kloot et al. 1996). One exception to these findings are the results of Philips & Grant (1991), who found that pain, sickness impact and downtime decreased, and exercise increased, 3 and 6 months after the onset of the pain. Furthermore, the persistence of pain was found to be related to less adaptive coping with pain: Burton et al. (1995) compared patients who suffered from pain for, respectively, 3 weeks and 3-52 weeks and found increased 'catastrophizing' of the pain problem in the patients with the longer persistence of pain. The present study examines the impact of pain persistence by comparing patients, who had suffered from pain for 3-6 months, for 6-12 months and for longer than 12 months with regard to pain intensity, temporal characteristics of pain, coping with pain, disability and general psychopathology.

The choice of constructs formulated in the diary of this study relied to a large extent on findings from singular measurements with psychological questionnaires, widely used in cross-sectional studies of pain. Diary measurements reflect the actual state of the subject and adequately capture variables, characterized by constant change, such as pain or mental and behavioral aspects of psychological functioning, which largely depend on the context of the moment or situation. Psychological questionnaires, in contrast, aim to represent more stable personality characteristics. It is therefore of interest to investigate to what extent and for which constructs the diary scores are in accordance with those obtained with psychological questionnaires. Two studies investigated the association between diary measures and scales of the Multiphasic Pain Inventory (Flor et al. 1990; Lousberg et al., 1997). With the exception of substantial association between MPI pain severity and the average pain intensity in the diaries of $r=0.75$ and $r=0.61$, respectively, the associations were weak or not statistically significant. To our knowledge the association between cross-sectional and diary measures of coping with pain and of disability have not as yet been established. Our study offers the opportunity to investigate these associations, since it included questionnaire and diary measures of these constructs.

The research questions of the present study can be summarized as follows.

- * Is pain report stable during 4 weeks of high-density diary recording in patients with (sub)chronic benign pain and what are the temporal characteristics of pain during the day?
- * Does the persistence of pain differentially influence pain intensity, temporal characteristics of pain, coping with pain, disability and general psychopathology?
- * What is the accordance between intensive diary assessments and scores from cross-sectional questionnaires of the same constructs in patients with (sub)chronic benign pain?

Determinants of pain report and disability

The Department of Health Psychology at Utrecht University was entrusted to monitor the patients self-reporting of the characteristics, the potential determinants of chronicity and the consequences of CBPD with a computer diary. 80 patients were recruited as a subsample of all the included patients. This study has focused on the relationship between potential determinants of chronicity and, respectively, pain report and disability

Determinants of chronic pain are factors that maintain pain beyond the normal time of healing. Psychological theory distinguishes operant, respondent and cognitive factors in pain maintenance (Lousberg, 1994). These factors may contribute to determine chronicity and influence the disability that follows from pain.

Operant factors. Expressions of pain and disability are potent signals, which elicit strong responses from others. Due to operant conditioning, these expressions can come under the control of immediate reinforcing consequences experienced by the patient (Fordyce, 1976). Family, particularly the spouse/partner, is inclined to respond with understanding or support and may discourage active and healthy behavior. When spouses remain supportive, this may inadvertently maintain or increase the expression of pain and disability (Turk, et al., 1996). Positive associations between spousal reinforcement of pain behavior and pain report emerged from experimental studies in healthy subjects (Lousberg, 1996; Linton and Gotestam, 1985) and in CPD patients (Romano, et al., 1995, 1992; Lousberg, et al., 1992; Turk, et al., 1992; Flor, et al., 1989, 1987; Blok, et al., 1980). Spousal reinforcement of pain behavior was found to reduce actual physical functioning in CPD (Romano, et al., 1995; Lousberg, et al., 1992) and was related to interference of the patient's pain with their daily lives (Flor, et al., 1989). Punishment of pain behavior was studied in CPD in terms of passive positive spousal reinforcement or low spousal solicitude and found to decrease pain report and increase physical activity in the patients (Lousberg, et al., 1992; Flor, et al., 1987; Block, et al., 1980). Last, positive effect in terms of increasing actual walking speed in CPD by contingent spousal reinforcement of well behavior was demonstrated by Geiger, et al., (1992).

Respondent factors. Reduction of movement usually promotes the healing of acute pain. Therefore fear of pain and of activities expected to result in pain motivate avoidance behavior. This instigated CPD models of classical conditioning (Turk and Flor, 1999; Turk, 1996; Philips, 1987) with pain-related fear (fear of pain and of movement inducing pain) as the key conditioned stimulus (CS) and avoidance behavior as the key conditioned response (CR). In pain due to injury pain-related fear may over time act as a CS for sympathetic activation, increase in tension and avoidance of activity (CR's) and this CS-CR chain may persist after the original unconditioned stimulus (e.g. injury) and response (e.g. pain) have subsided (Turk and Flor, 1999). Pain related to sustained muscle contraction in the absence of injury may also act as an unconditioned stimulus for sympathetic activation and tension increase (unconditioned responses), inducing more pain and avoidance learning. Thus, pain-related fear may over time operate as a CS for avoidance of activity (CR), even when the nociceptive stimuli and related sympathetic activation are no longer present. In CPD overprediction of pain may fuel generalized and excessive avoidance behavior in the absence of nociceptive stimulation, which is resistant to change as long as avoidance averts disconfirmation of the overprediction (Turk and Flor, 1999). Empirical studies in CPD showed that pain-related fear and avoidance behavior were related to disability (Mc Cracken et al., 1996; Vlaeyen et al., 1995a,b; McCracken et al.,

1992). In addition, pain-related fear was associated with pain report (McCracken, et al., 1996) and the reporting of non-specific bodily sensations (McCracken, et al., 1998). A third factor relevant in this context is selective attention. In CPD it was found that patients with a high level of pain-related fear selectively attend to bodily sensations (Asmundson, et al., 1999; Crombez, et al., 1999) and that attention to pain was related to pain report and predicted disability independent of pain intensity (McCracken, 1997). Therefore selective attention or hypervigilance to bodily sensations may fortify the maintenance of chronic pain in concert with pain-related fear and avoidance behavior.

Cognitive factors. Maladaptive cognitions are thought to aggravate the suffering from pain and to influence pain behavior. There is accumulating evidence of the positive association between catastrophizing and pain report in CPD patients (Sullivan, et al., 1998; Burckhardt, et al., 1997; Geisser, et al., 1994). Other cognitions related to pain report are negative self-statements (Gilet, et al., 1990), hopelessness/helplessness (Boston, et al., 1990; for a review see Jensen, et al., 1991) and lack of control over the pain (Toomey, et al., 1991). Catastrophizing was found to be related to disability (Sullivan, et al., 1998; Keefe, et al., 1989; Turner and Clancy, 1986) even when controlled for the impact of pain. Disability was also found to depend in part on the CPD patients' conviction that pain and disability belong together (Riley et al., 1988).

Disability. The view that disability is a primary consequence of pain is plausible in acute pain, when inactivity is a direct means to ameliorate pain or avoid pain increase. In chronic pain, however, impairment of physical functioning and activity level may become central and persist relatively independent from actual levels of pain. Although 30 chronic back pain patients acknowledged the connection between pain and activity in a global interview, no significant association was found between pain intensity and actual activity level in a test situation (Linton, 1985). Other studies have found pain intensity to explain 10% of the variance in physical impairment due to chronic low back pain (Waddell, et al., 1992) or to be weakly related to the levels of self-reported activity (Fordyce, et al., 1984).

In our view, physical capacity and general activity level do not fully span disability in CPD. Mental capacity may also be considered. In addition, activity should be distinguished from mobility and the assessment of both should be tailored specifically to pain. Therefore our study covered 4 aspects of disability: physical and mental capacity (subjective measures), activity hampered by pain and immobility due to the pain (behavior measures).

The present study aims to establish the contribution of operant, respondent and cognitive variables to pain and disability. It differs from the above mentioned studies, which focussed primarily on differences between persons. Our methods of data acquisition and analysis primarily pursued estimates of within-person relations between daily variables intensively measured in their natural setting, while on this basis important between-person differences were aimed to be established. This is important because of the fact that between- and within-person correlational outcomes from the same subjects may disagree considerably and that significant between-persons associations can emerge even without the occurrence of a single significant within-person association (Tennen and Affleck, 1996). In accounting for this, the approach of our study fits well with recent developments in health psychology research focussing on the quest for intraindividual processes over time (Affleck et al., 1999).

----- insert figure 1 about here -----

Figure 1 displays the multidimensional model of CPD, which geared the diary study. Each cell of the model was represented by sets of diary items. The present paper treats the associations between potential determinants and CPD (see left-hand part). CPD consequences will be addressed in a future publication. The research issues are:

- * Are operant, respondent and cognitive factors predictive of pain report?
- * Is pain report predictive of 4 aspects of disability?
- * Are operant, respondent and cognitive factors predictive of 4 aspects of disability, and are these factors predictive of disability, when the analysis controls for the impact of pain on disability?
- * Do the predictions differ in CPD patients with a shorter or longer pain duration?

The determinants of pain report and disability study can be found in the manuscript on page .. to ..

Two extra objectives

The epidemiological study focused on an epidemiological description of the prevalence of CBPD and an one-year follow-up of the medical consumption and functional impairments of patients identified with CBPD. In the cost study, two objectives are added to the original one:

- * to study the long term development of CBPD patients
- * to estimate the costs associated with CBPD

In order to meet these objectives two papers has been written. One to study the long term development of CBPD patients, another one regarding an estimation of the costs associated with CBPD.

Long term development of CBPD

When pain has once been experienced for a number of months, it tends to become really chronic in quite a number of cases. Croft (1998) reported a complete recovery after one year of 25 percent of patients, initially included with pain for longer than 3 months. Magni (1993) found 33% still suffering after eight years. Van Tulder (1998) reported on an average small improvements in pain intensity after one year but no improvement in mobility.

Regarding the pain-maintaining mechanisms, considerable attention has been given the past years to psychological, social and behavioural factors that maintain pain-experiences, initially provoked by nociception. Acute pain, caused by physical damage, will become chronic under the influence of pain coping behaviour as well as operant and respondent factors which may maintain pain behaviour. It is supposed that different patient profiles (Turk and Rudy 1992, Lousberg 1996) and different coping strategies (Brown and Nicassio 1987, Keefe and Williams 1990, Rosenstiel & Keefe 1983) are related to different outcomes, regarding chronicity. Moreover, it has been suggested that different pain diagnostic groups might use different strategies (Keefe et al. 1992). In order to study these assumptions, VonKorff (1992) called for a longitudinal approach.

In the .. paper such a longitudinal study is reported. The following research questions are considered:

- * What is the long term prognosis of chronic benign pain in general practice for different patient profiles?
- * What is the course of patient's self evaluation of their general health?
- * How is pain coping related to long-term prognosis?
- * How does the course of chronic pain, pain coping and different patient profiles affect medical consumption?

Costs associated with CBPD

Some time ago, Turk (1990,1993) has pointed out that costs are a neglected factor in chronic pain research. Since then, several studies (Lipowski 1990, James 1992, Christenson 1993, Dworkin 1994, Sheehan et al. 1996, McGrady 1999) indicated the extensive health care costs spend on chronic pain. Still, little information is available about costs relating to other sectors than health care, for instance costs due to absenteeism.

Broadly, three general categories of costs are used in a COI study: direct costs, indirect costs and intangible costs. Direct costs include all actual changes in resource use that is attributable to CBPD, whether medical or nonmedical. The direct medical costs which are overall identified in all CBPD studies are the costs of hospital and professional care, medication and diagnostic tests. Direct nonmedical costs are associated with the provision of medical services outside the health care sector. In CBPD studies this may include transportation of a patient to a medical service, out-of-pocket expenses, and the cost of informal care provided by family and friends. Indirect costs are the value of reduced productivity resulting from CBPD or mortality due to CBPD. Intangible costs are costs that cannot be expressed easily in monetary terms, such as pain, changes in social functioning, changes in the ability to perform normal daily activities and changes in mobility due to CBPD.

A COI study estimates and evaluates the direct and indirect costs of a disease. In addition to the most epidemiologic estimates of morbidity and mortality, COI studies give additional information regarding the economic burden of a disease. There are several approaches to estimating the costs of CBPD. The most widely employed are the prevalence method and the incidence method. The underlying idea of the prevalence method is that all CBPD costs should be assigned to the year in which they are borne or with which they are directly associated. Using this approach, direct costs and productivity losses resulting from CBPD are assigned to the year in which they occur. Expected future earnings lost as a result of premature CBPD mortality are assigned to the year of death. The incidence method is based on the principle that the flow of costs associated with CBPD should be assigned to the year in which that flow begins. All costs, both direct costs and productivity losses due to morbidity and mortality, are discounted to present value and assigned to the year in which the disease first appears. Another consideration is whether one is going to perform a bottom-up or a top-down cost-of-illness study. The top-down method calculates the national costs of CBPD using data-banks, statistics. In a bottom-up method a group of CBPD patients are asked what the costs of their disease are, for instance using a questionnaire. The results of this questionnaire are extrapolated to a population-level.

This study is a prevalence based bottom-up cost-of-illness study.

In the present study with data obtained from patients, we investigated the economic costs of CBPD in the Netherlands in 1998. In addition, separate cost components are distinguished to cover both direct costs and indirect costs. Furthermore, the costs of CBPD patients are compared to costs of control patients, matched for sex and age. Our general research questions is: How much costs do CBPD patients have, compared to a group of controls.

Summary of results of the various papers

Review

Our first aim was to determine which methods have been used to determine the prevalence of chronic benign pain. However, a search of the literature revealed that there have been no epidemiological studies into the prevalence of chronic benign pain in the general population. In fact, there have been few epidemiological studies of chronic pain in the general population. These studies made use of a wide range of definitions and yielded widely varying data for the prevalence of chronic pain. Neither the method of data collection nor the definition of chronic pain seemed to affect the prevalence reported. Eight of the studies included in our review took aspects other than the location of the reported pain into consideration.

This relative lack of epidemiological research affected our second aim, i.e., to determine the prevalence of chronic benign pain. Without doubt, many people suffer from pain to such an extent that they are seriously limited in their daily activities over a considerable period of time. The fifteen studies we reviewed yielded a median point prevalence of chronic pain of 15% in the adult population, with a range from 2 to 40%. There was some consensus about the characteristics of the patients who suffer from chronic pain: they are relatively often middle-aged women from the lower socioeconomic strata. Low back, neck, and shoulder are the body areas most frequently affected. Chronic pain is often associated with depression or other kinds of psychological distress.

It is difficult to explain the wide range in reported pain, but a prevalence of chronic pain of 10% of the population seems a very cautious estimate. There were no clear-cut differences between prevalence based on self-assessment and on diagnoses made by physicians after a clinical examination.

Self-assessment sometimes leads to relatively low figures: the telephone survey carried out by Bowsher et al. (1991) yielded a prevalence of chronic pain of only 7% and the telephone survey of Crook et al. (1984) yielded a prevalence of 11%, while in the study of Mäkelä and Heliövaara (1991) a thorough medical examination led to a prevalence of chronic musculoskeletal pain of at least 40%. The very low estimate reported by Potter et al. is probably because they investigated the incidence rather than known cases.

Although the benign character of chronic pain was seldom taken into consideration, some conclusions may be drawn about the extent to which somatic diseases are responsible for reported chronic pain. Frølund and Frølund (1986) identified the most important chronic pain categories as being "bone/joint" (24% of all chronic conditions), "muscle/ligament" (17%), "low back" (13%), "headache" (12%), and gastrointestinal (11%). With the exception of patients suffering from "bone/joint" pain, where arthritis might be held responsible for most of the cases, most patients suffering from pain in these categories will suffer from symptoms rather than from demonstrable diseases. The predominance of chronic low back pain and chronic neck pain found by Mäkelä and Heliövaara (1991) in their study suggests the same.

The positive relation between chronic pain and psychological distress (see also Smith, 1992) also points to the "benign", or better, "not organically explained" character of pain in a number of cases. Benjamin et al. (1988) reported that pain ratings were higher among patients with a mental illness without an organic pathology than among patients with an organic pathology. One might assume that in a substantial number of cases chronic pain is the expression of depression or other forms of psychological distress. However, the absence of an organic explanation for chronic pain should not automatically lead to a psychiatric diagnosis (Benjamin et al. 1988).

Prevalence

The purpose of our descriptive study was to establish the extent of the problem of CBPD in the Netherlands. This study is not a community study and hence does not provides estimates of pain prevalence in the population. However, in the Netherlands GPs have a central role in the health care system. Most other health professionals cannot be consulted without a GP's referral. So if chronic pain patients in the population choose to visit physiotherapists or complementary practitioners they still need to go to the GP for a referral. The majority of people visit their GP at least once per year and for chronically ill people this percentage is even 94% (Rijken et al. 1999). An average GP has about 2,350 patients on his/her list and patients do not very often change from one GP to another. This means that GPs know their patients rather well, especially those who are chronically ill. Besides that, most chronic benign pain patients share a long diagnostic history with their GP. Patients were asked by their GPs during 1996 to cooperate with our project. Of course there may be some persons with severe pain who do not attend their GP in that entire year. But during 1996, it became clear that a majority of the GPs was unable to apply the project's inclusion criteria on a day-to-day bases. Consequently, we visited all the practices at the beginning of 1997 to look for further CBPD patients. So even if a patient did not visit their GP in 1996 chances are high that he or she was included in the record review in 1997.

The prevalence estimate of CBPD in general practice is 7.91 per 1000 patients and for reasons stated above, we believe that this figure comes close to the prevalence of CBPD (with pain that is serious enough to justify clinical attention and obvious discomfort and disability in daily life) in the open population.

Different kind of chronic pain patients

The purpose of the study was to identify differences in medical consumption between different types of pain patients. Four hypotheses were formulated specifying our expectations about the characteristics of four different types of pain patients with respect to their medical consumption and coping behaviour.

The first hypothesis was confirmed as far as the high use of health services by dysfunctional patients was concerned. We found less difference than had been expected in medical consumption between interpersonally distressed and adaptive copers, in case of paramedical services and alternative healers. Differences in total counts, use of medical specialists and use of psychological help could be demonstrated. Hypothesis two, concerning more use of psychological help by interpersonally distressed patients, was thereby confirmed.

Hypothesis 3 is rejected. Adaptive copers are in no respect more active in their self-care activities than dysfunctional, or interpersonally distressed persons. The opposite tends to be the case; in most respects the adaptive copers had the lowest scores.

Hypothesis 4, on the stability in time of medical consumption, is confirmed. Dysfunctional patients remained at the top of the rank order and adaptive copers at the bottom. We conclude that better adaptation to pain is no guarantee of a decrease in medical consumption.

Differences in medical consumption between the four categories are mainly in the same direction as differences in health status: adaptive copers have better self-perceived health than dysfunctional patients. Their social functioning, mental health and vitality is also better than that of the interpersonally distressed. This finding is in accordance with earlier reports, indicating a high rate of psychopathology among dysfunctional and interpersonally distressed patients (Etscheidt, Steger, Braverman, 1995).

The total group of included pain patients had considerably lower scores on all health parameters than patients in other surveys using the SF 36 scales (Aaronson, Muller, Cohen, Essink-Bot, Fekkes, Sanderman, Sprangers, te Velde, Verrips, 1998; v d Zee, Sanderman, Heyink, 1993). In our study, all scales have lower means than the Netherlands national sample, but also lower than sub samples with migraine and cancer patients. Even cancer patients in a metastatic stage reported better physical functioning, physical role performance, vitality and mental health than our total sample. The adaptive copers (our "best" subgroup) have figures comparable with those of average cancer patients.

Health Care Utilization

The next purpose of the study was to investigate the utilization of ambulatory health care by patients with CBPD. We compared ambulatory health care utilization and self-evaluation of health of CBPD patients and matched controls and investigated the course of health care utilization during one year. Patients with Chronic Benign Pain Disorder consume at least twice as much ambulatory health care as a group of matched controls. This is probably because chronic pain is not a symptom that exists in isolation, but tends to create a cluster of related problems such as chronic fatigue, sleep disturbance, excessive rest and withdrawal from activities, comprising immune function and mood disorder. Chronic pain is often associated with depression or other kinds of psychological distress (Smith et al. 1999). This is probably the reason for a larger number of CBPD patients visiting counselors or psychologists at mental health care institutions than the control group patients.

Electronic diary assessment of pain

The present study employed a 4-week electronic ESM-diary to study temporal characteristics of pain intensity in patients differing in persistence of benign pain. The procedure was easily accepted and well tolerated by the subjects and produced reliable recordings: the 4 weeks of diary measurement accurately represented normal life in all subjects. In addition, the response rate of 88% is adequate in comparison to previous ESM-studies that yielded rates of approximately 80% with paper-and-pencil ESM-diaries (Csikszentmihalyi & Larson, 1987) and approximately 90% with electronic ESM-diaries (Shiffman et al., 1994; Sorbi et al., 1996; Honkoop et al., unpublished results). Compliance can be considered excellent, considering the relatively long period of sampling, the substantial number of questions per diary and the minor increase in missing observations across the weeks of recording.

Research issue 1 pertained to the stability of pain report and the temporal characteristics of pain during the day. Mean pain report did not change during the 4-week recording period. This confirms the finding of previous diary studies that pain report is stable over time (Kerns et al., 1988; von Baeyer, 1994; Cruise et al., 1996) and is not in accordance with the idea that response decay may occur as a result of boredom or fatigue with the task of daily recordings in longitudinal studies (Ston et al., 1991). With regard to the temporal characteristics of pain during the day, also addressed in research issue 1, a significant trend of pain intensity increasing from morning to evening was found, averaged over all subjects. This is in agreement with earlier findings of Glynn & Lloyd (1976a, 1976b) in patients with organic pain as well as patients for whom an organic cause of pain had not been established. But individual testing revealed that a significant trend in pain intensity occurred in only 53% of our subjects (linear increase: 47%; linear decrease: 3%; U-shaped trend: 3%), while pain intensity showed no trending at all in the other 47% of the subjects (N=38). So patients with chronic benign pain demonstrate clear differences in the trending of pain intensity during the day, but we were not able to identify characteristics discriminating between patients with and without trends. Research issue 2 concerned the impact of the persistence of pain on aspects of the pain problem, disability and general psychopathology. Pain behavior, disability, depression and general psychological distress supposedly increase as pain progresses from the acute to the chronic phase psychopathology (Sedlak, 1985; Vallfors, 1985; Iezzi et al., 1992; van der Kloot et al. 1996). On the other hand, adaptation to pain and disability may also occur in the course of time (Philips & Grant, 1991). Our results seem to favor the first hypothesis: patients with pain for 3-6 months -- i.e. patients whose pain is not yet chronic according to the IASP definition-- had pain of a lower intensity (diary) were less burned-out (diary) and physically disabled (SF-36 and diary) and reported less interference of pain with daily activities (MPI) than patients with pain for 6 months or longer.

Research issue 3 focused on the accordance between measures of the same constructs obtained with the ESM-diary and with cross-sectional measurements with the MPI (pain severity, interference of pain, affective distress, social support as well as punishing, solicitous and distracting responses to the pain problem of significant others), the SF-36 (physical functioning, role functioning, vitality) and CSQ (catastrophizing, denying/ignoring pain, positive self-talk and diverting attention).

Most MPI scales correlated significantly but moderately with equivalent diary items (range: $r=.28$ to $.51$). This agrees with a previous study (Lousberg et al., 1997), although most of our correlations were somewhat lower. Almost every subject in our study reported more severe pain on the MPI than in the ESM-diary and this was confirmed in 12 subjects whose MPI and diary assessments covered exactly the same week. It is conceivable that retrospection bias accounts for this difference. Subjects

tend to overestimate negative events in the process of recollection (Fahrenberger et al, 1996) and patients may thus have overestimated the severity of their pain in the retrospective assessment with the MPI.

All in all, electronic ESM assessment is a sensitive method, particularly appropriate to capture the subtle differences in actual states. In addition, it is non-intrusive, convenient and was well tolerated even during 4 weeks of continuous assessment. The method is therefore especially suited to gain new insight into the dynamics of pain severity, pain behavior and the psychosocial determinants of pain.

Determinants of pain report and disability

The central issue of the study was to establish predictors of pain report and disability and to determine whether these predictors differed in patients with a shorter and longer pain duration. Since the electronic ESM-diary generated data that varied between subjects, in days and in time-points per day, multilevel regression analysis was used to establish differences between patients, while taking into account within-subject differences in days and time-of-day.

Research issue 1 pertained to the prediction of pain report by 3 sets of psychological variables. In concert with (curvi)linear trends in time, respondent factors explained about 21%, cognitive factors 15% and operant factors 6% of the subject variance in pain. Consistent with previous CBPD studies of between-patient differences, pain intensity was in this study predicted by pain-related fear, hypervigilance, catastrophizing and spousal reinforcement of pain behavior. Unprecedented, pain intensity was also differentially associated with operant spousal responses to well behavior, although the operant contribution to pain prediction was limited due to a mixture of methodological, but probably also conceptual, reasons. Also unprecedented was that psychological variables also explained time (about 3-10%) and day (3-5%) variance in pain. Thus, psychological variables, which in the first place explain between-patient differences in CBPD also explain part of the differences within patients. This indicates that daily process measurement of pain and psychological variables is important in CBPD research, which agrees with the recent quest for intraindividual differences over time (Affleck, 1999) that marks health psychology research in general. The clinical relevance of daily process measures of (somatic) symptoms and psychological variables had been acknowledged earlier (de Vries and Delespaul, 1993) but is also supported by the results of this study.

Research issue 2 concerned pain as predictor of 4 aspects of disability. Pain report explained approximately 20% of the subject variance in physical and 8% in mental capacity (both decreased with pain) and about 9% in pain interference with activities and 4% in immobility due to the pain (both increased with pain). Again, more variance was explained at the subject than at the time (about 1-4%) or day (about 1-3.5%) level. So, pain report emerged as a substantial predictor of self-assessed physical impairment and also predicted mental impairment and behavioral activity. But pain explained only part of the variance, leaving room for the contribution of other (unmeasured) predictor variables.

Research issue 3 focussed on the psychological variables as predictors of disability. Operant factors were weak predictors explaining 3% at most of the subject variance in disability and about 4% of the time variance in immobility. When pain entered the analyses, the predictive effects boiled down to 0-2%. Respondent and cognitive factors were better predictors of disability, explaining 22 vs. 10% of the subject variance in physical and 6 vs. 14% in mental capacity (the subjective disability variables) 10 and 9% in interference and about 2-4% in immobility (the behavioral disability variables). When pain was added, respondent factors persisted to explain 3-8% and cognitive factors 2-10% of the subject variance. So, in this study, respondent and cognitive predictors clearly added to pain in explaining between-subject differences in disability and were strongest in the prediction of impaired physical and mental capacity. Our study thus contributes to empirically prove the impact of psychological factors on disability in CBPD.

Research issue 4 dealt with predictor differences patients with a shorter and longer pain duration. The prediction of pain report did not distinguish between patients differing in pain duration but the prediction of disability did. The strongest finding was that in chronic pain (n=65) pain report was more strongly related to immobility due to the pain than in subchronic pain (n=15). The study produced some evidence that --independent of pain-- catastrophizing predicts immobility due to the pain better in chronic than in subchronic pain, and predicts subjective physical impairment better in persistent than in recent or subchronic pain. This does agree with chronic pain models (Vlaeyen and Linton, 2000; Waddell, 1998) asserting that inactivity and physical impairment become major problems in CBPD, which --boosted by psychological factors and physical disuse (guarded movement; deconditioning)-- persist relatively independent of the pain itself.

Long term development of CBPD

In this paper, different aspects of chronic benign pain were analyzed in the course of three years. Pain severity, as an important aspect of chronic pain, and interference with daily activities (e.g. how much has the pain changed the amount of satisfaction or enjoyment you get from taking part in social and recreational activities?) seem to decrease a little over time. However, the decrease is only modest - about one point on a scale ranging from zero to twelve. According to the variance components of the multi-level model in which pain severity was analyzed, most of the variance is between patients, less between measurements within patients. This points to the fact that some patients have severe pain and other patients have less severe pain throughout the whole range of measurements. We did not find any evidence that pain severity of some patients decreased, while for other patients the pain severity increased. (this kind of analysis is very easily implemented in a multi-level model by treating the variable T as a random variable). One other aspect of chronic pain - affective distress, did not change over time.

How patients think about their pain and their health is a crucial factor in chronic pain management (Chapman & Gavrin 1999). CBPD patients evaluate their own health status low. They evaluate their own health lower than chronic patients do with various conditions like diabetes and rheumatoid arthritis (Rijken et al. 1998). Patients with chronic pain are limited in performing all physical activities including bathing and dressing. As a consequence, they have a lot of difficulties with work or other daily activities and they accomplish less than they would like in this respect. They experience also an extreme and frequent interference with normal social activities due to their physical and emotional problems. Physical functioning, social functioning and mental health did not change in the course of three years, while vitality and general health perception seemed to have increased only a little from the first year to the third. CBPD is thus really a chronic condition.

Costs

This study investigated the direct and indirect costs of CBPD patients with matched controls. Compared to controls, CBPD patients have much higher direct and indirect costs. The ratio for direct costs is about 4 and for indirect costs the ratio is about 20. Indirect costs constitutes the largest financial consequence of CBPD patients, far more than direct costs.

This study, with data directly obtained from patients, has given insight in various cost components. Indirect costs are calculated with respect to absenteeism for professional work and also for household activities. The costs for household activities exceed the costs for work, although the costs of one day lost on household activities is 140 NLG, while the costs of one day lost for professional work is generally higher.

The direct costs of health care for CBPD patients are much higher than for controls. Patients use a lot of health services because chronic pain is not a symptom that exists in isolation, but tends to create a cluster of related problems such as chronic fatigue, sleep disturbance, excessive rest and withdrawal from activities, comprised immune function and mood disorder

Health care utilization of the participating patients is quite high and also quite constant. In the course of three years we did not observe any decrease of health care utilization. Probably because our inclusion criteria 3,4 and 5, based on the DSM-IV, (pain is the most prominent aspect in the clinical presentation; pain is serious enough to justify clinical attention; and pain has led to obvious discomfort and disabilities in daily life) has focused the attention on very severe chronic pain patients, in contrast to other studies where patients are "often troubled by pain" (Crook et al. 1984), or using the term "chronic" without any specification (Mäkälä and Heliövaara 1991, Andersen 1994).

Compared to direct costs, the difference between patient and controls for indirect cost is far greater, we observed a ratio of more than 9 for work related costs and more than 14 for household related costs. The cost structure with high indirect costs has been found in studies of low back pain and neck pain as well (VanTulder et al. 1995, Borghouts et al. 1999). From an economic point of view it is important to prevent patients from becoming chronic.

Review Article

Prevalence of chronic benign pain disorder among adults: a review of the literature

Peter F.M. Verhaak^{a,*}, Jan J. Kerssens^a, Joost Dekker^a, Marjolijn J. Sorbi^b, Jozien M. Bensing^{a,b}

^aNetherlands Institute of Primary Care, P.O. Box 1568, 3500 BN Utrecht, The Netherlands

^bUniversity of Utrecht, Department of Clinical Psychology and Health Psychology, P.O. Box 80140, 3508 TC Utrecht, The Netherlands

Accepted 29 June 1998

Abstract

In this review epidemiological studies concerning chronic benign pain among adults are discussed. To this end, studies focusing on chronic pain, reporting prevalences at a population or primary health care level, including subjects aged between 18 and 75 years have been collected and analyzed. Focus of analysis was on research methods, definitions of chronic benign pain used, and reported prevalences. Prevalences varied between 2% and 40% of the population. Nor method used (telephone survey, postal survey, nor definition of chronicity (>1 month; >3 months; >6 months) clearly explained the differences in prevalence in the various studies. Implications for future research are discussed. © 1998 International Association for the Study of Pain. Published by Elsevier Science B.V.

Keywords: Chronic pain; Epidemiology

1. Introduction

Pain has been defined as ‘an unpleasant sensory and emotional experience associated with actual and potential tissue damage, or described in terms of such damage’ (IASP, 1986). This definition refers to a number of aspects that complicate the study of the epidemiology of pain. For example, the definition refers to ‘actual and potential tissue damage’, which excludes the possibility of a decisive objective test as a gold standard. Moreover, the definition stresses the subjective character of pain by referring to ‘unpleasant sensory and emotional experiences’. *Chronic pain* is defined by the IASP as ‘pain, that persists beyond the normal time of healing (...)’, but what exactly is meant by the term ‘normal time’? Whereas acute pain is functional and can be considered a mainly physiological response to tissue damage, chronic pain involves psychological and behavioral mechanisms in addition to physiological mechanisms. This complex and subjective character of pain is illustrated

by Loeser’s model (presented by Raspe and Kohlmann, 1994) of the components of pain (see Fig. 1).

In this model, the physical origin of pain is at core and is surrounded by successive layers of ‘pain experience’ and ‘suffering’, ending at the most derived level, ‘pain behavior’. Each succeeding layer introduces a certain ‘noise’, because it is determined not only by pain but also by ‘toughness’, cultural values, and secondary gains. In acute pain there is a straightforward relation between nociception, pain, suffering, and pain behavior, but in chronic pain this direct link with a nociceptive substrate is not always present. When there is no such link, we refer to *chronic benign pain*. Related terms found in the literature are idiopathic pain (von Knorring and Ekselius, 1994) and somatoform pain, both of which refer to psychiatric categories in the third version of the Diagnostic and Statistical Manual of Mental Disorders (DSM). In the fourth version (DSM-IV) chronic pain without an organic explanation is categorized as Chronic Pain Disorder Associated with Psychological Factors.

Patients suffering from chronic benign pain experience pain sensations which cannot be explained by physical lesions or physiological dysfunctioning. In such cases,

* Corresponding author. Tel.: +31 30 2728735; fax: +31 30 2729729; e-mail: p.verhaak@nivel.nl

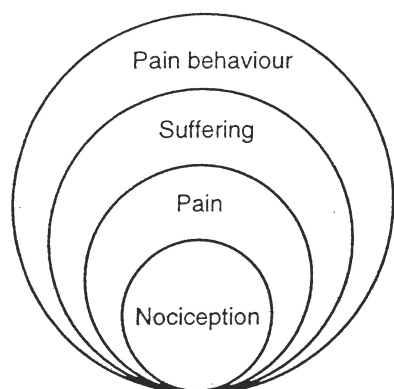


Fig. 1. Loeser's multifaceted model of the components of pain.

pain behavior might be a dysfunctional remnant of a previously functional behavior. Lousberg (1994) summarized three psychological models that explain how chronic pain is maintained. In the operant conditioning model, 'pain behavior' that was once functional can come under the control of positive or negative reinforcers, such as attention of the partner or removal of duties. In the antecedent control of pain model, pain might occur as a response to a physical stimulus, for example muscle tension that was previously associated with a nociceptive stimulus. In the cognitive-behavioral model, pain is associated with maladaptive cognitions such as feelings of helplessness or catastrophizing.

The complex nature of chronic benign pain means that its prevalence cannot be measured by means of assessing well-circumscribed physical conditions, as is the case with diabetes or malaria. It requires a multidimensional approach incorporating a number of dimensions such as the localization of pain, pain intensity, temporal characteristics, affective appraisal, coping, and grading of pain (see VonKorff et al., 1990; Turk and Rudy, 1992; Raspe and Kohlmann, 1994). Yet despite these difficulties in measuring the prevalence of chronic pain, forceful statements have been made about the prevalence and the costs and impact on social security systems of chronic pain. The statement that 'Chronic pain is a major health problem and it has been estimated that between 25% and 30% of the populations in industrialized countries have chronic pain' opened an editorial in the British Journal of General Practice in 1992 (Seers, 1992), and 'Although precise data are lacking for the Netherlands, it is reported that 10 000 new cases (patients who are unable to work because of pain) are registered each year' (Lousberg, 1994). Aronoff et al. (1983) estimated that chronic pain costs the United States 40 billion dollars a year. Nachemson (1994) wrote of the situation in Sweden: 'Together with all the other chronic pain syndromes for which physicians have no proper explanation..., the statement that the cost of these conditions might cause the end of the welfare state might not be untrue'. In fact, based on current knowledge and existing figures it is not possible to give a reliable estimate of the prevalence of chronic pain. Because of this lack of reliable figures, the Dutch National Council of Research for Medical Sciences commissioned

the Netherlands Institute of Primary Health Care to estimate the prevalence of chronic benign pain disorder among adults. To this end, we reviewed the literature on the epidemiology of chronic benign pain among adults, paying attention to the methodology used to assess the prevalence of chronic benign pain, the definitions and inclusion criteria, other descriptive factors, and, lastly, the prevalence determined.

2. Method

2.1. Inclusion and exclusion criteria

To be included in this review, studies had to meet the following inclusion criteria: they should focus on chronic pain; they should have an epidemiological character, reporting prevalence at a population or primary health care level; and they should include subjects aged between 18 and 75 years. Moreover, because the characteristic 'benign' is seldom mentioned explicitly, we included all epidemiological studies concerning pain, as long as the study was not exclusively focused on acute pain or on pain as a consequence of a defined disease, such as cancer or rheumatoid arthritis. Studies that concerned exclusively children or elderly people and which focused on cancer or arthritis were excluded. Because we wanted to focus on methodological and definition problems associated with the measurement of chronic benign pain, we did not formulate methodological or definitional criteria beforehand.

2.2. Search strategy

We searched the databases Medline and Embase for 1990 to 1996, using the key words 'chronic pain' and 'epidemiology' with exclusion of the key words 'children' and 'cancer'. We then continued with the traditional 'snowball method' by looking for references in recent publications, especially reviews and editorials on pain research (VonKorff, 1992; Crombie, 1994; Oosterhof and Brueren, 1994; Raspe and Kohlmann, 1994). This search identified 15 empirical studies which had assessed the prevalence of chronic pain in a general population.

3. Results

3.1. General characteristics

The studies included in our review are presented in Appendix A, together with their relevant characteristics. The studies were from the USA (4), UK (3), Denmark (2), Sweden (2), Canada, Finland, Germany, and New Zealand (1 each). Although the publications are from 1984 to 1994, the oldest survey included (NHANES: First National Health And Nutrition Examination Survey) stems from the early

eventies. Most data were collected between 1980 and 1990. Thirteen of the studies were population surveys; in two studies general practitioners screened their visiting patients during a certain period. Three studies were restricted to pain in specific body regions (musculoskeletal pain (2) and abdominal pain (1)); the other 12 studies investigated pain in general. Two studies (Magni et al., 1990, 1992) are comparable in method but concerned with two specific body regions. We will treat them in the following as one. The studies involved between 308 to more than 10 000 subjects.

2. Research methods

Four main research methods were used: (1) the telephone survey, which was used in three studies. In two studies (Bowsher et al., 1991; Crook et al., 1984), the data collected concerned the person who answered the telephone and other members of the household, which might have led to under-reporting of pain for the other members of the household; (2) the postal questionnaire, which was used in six studies; (3) interview with participant, which was used in three studies; and (4) expert assessments, in which general practitioners assessed the patients with pain in the attending population (Frølund and Frølund, 1986; Potter and Jones, 1992), or in which physicians working in mobile clinics examined patients (Mäkelä and Heliövaara, 1991).

The use of different methods appeared to lead to differences in non-response. For example, in the studies by Frølund and Frølund (1986) and Potter and Jones (1992), each sitting patient was in principle eligible. The study of Mäkelä and Heliövaara (1991) had a participation rate of 95%. The only information for the response rate for the telephone surveys was 95% in the study by Crook et al. (1984). The postal and interview studies had a lower response rate of 77% on average.

3. Definitions of chronic benign pain

'Pain' was defined in terms of its intensity (Brattberg et al., 1989; Andersson, 1994), duration (24 hours or longer; VonKorff et al., 1988; Potter and Jones, 1992; Croft et al., 1993), or illness behavior (James et al., 1991; 'severe enough to lead to consultation etc.'). Ten studies did not specify the concept of 'pain' further, although all but one used a time dimension for 'chronic pain'. Thus 'chronic pain' was defined by the persistence of pain for 1 month (Magni et al., 1990, 1992, 1993; Kohlmann, 1991), 3 months or longer (Frølund and Frølund, 1986; Sternbach, 1986; Bowsher et al., 1991; Croft et al., 1993; Andersson, 1994), and 6 months (VonKorff et al., 1988; Brattberg et al., 1989; Potter and Jones, 1992). James et al. (1991) did not use the duration of pain into consideration but investigated the lifetime prevalence of pain. Crook et al. (1984) limited the conceptualization of chronic pain to 'often troubled by pain'. Mäkelä and Heliövaara (1991) and Andersson (1994) used the term 'chronic' without specifying it.

Frølund and Frølund (1986) referred to 'problem cases', as 'those whose pain problem was considered unsolved pain and perhaps unsolvable'. Some other studies referred to a lack of attribution to 'real diseases' (Bowsher et al., 1991) or to positive associations of chronic pain with tiredness and depression (VonKorff et al., 1988; Magni et al., 1990, 1992; Potter and Jones, 1992; Croft et al., 1993), which might be an indication of the benign character of a substantial number of chronic cases. No study, however, defined the concept 'benign' explicitly.

3.4. Prevalence of chronic (benign) pain

The prevalence of chronic (benign) pain is summarized in Table 1, together with selected methodological characteristics. The studies are ranked according to the prevalence of chronic pain (low to high). Some studies gave separate data for pain in distinct locations (Sternbach, 1986; Magni et al., 1990, 1992; Mäkelä and Heliövaara, 1991). A maximum prevalence estimate is the sum of all separate figures (assuming there is no overlap at all) and a minimum prevalence estimate is the highest subscore (assuming maximum overlap). For these studies we give a range instead of one prevalence number.

The lowest and highest estimates for the prevalence of chronic pain are easily explained by the different epidemiological measures used: Potter and Jones (1992) gave the incidence instead of the prevalence, and James et al.

Table 1
Prevalence of chronic pain

Authors	Prevalence	Survey method	Definition of chronic	Non-response
Potter and Jones, 1992	<1% ^a	GP	>6 months	n.a.
Kohlmann, 1991	2%	Postal	>1 month	20%
Bowsher et al., 1991	7%	Telephone	>3 months	?
VonKorff et al., 1988, 1990, 1993	8%	Postal	'Persistent'	20%
Frølund and Frølund, 1986	9%	GP	>3 months	n.a.
Crook et al., 1984	11%	Telephone	>2 weeks ('persistent')	5%
Croft et al., 1993	13%	Postal	>3 months	34%
Magni et al., 1990, 1992 ^b	14 + 20%	Survey	>1 month	?
Andersson et al., 1993; Andersson, 1994	18%	Postal	>3 months	15%
Sternbach, 1986	10 + 29%	Telephone	>3 months	?
Mäkelä and Heliövaara, 1991	17 + 45%	Clinical examination	?	10%
Andersen and Worm-Pedersen, 1987	30%	Postal	?	10%
Brattberg et al., 1989	40%	Postal	>6 months	33%
James et al., 1991	82% ^c	Survey	No time limit	30%

^aPotter and Jones give the incidence, not the prevalence.

^bMusculoskeletal and abdominal pain.

^cWhere the prevalence presented is the point-prevalence. James et al. give the life-time prevalence.

Table 2

Prevalence of chronic pain according to the different research methods and definitions of chronic pain used

Method	Pain duration			
	>2 weeks to >1 month	>3 months	>6 months	Other/?
Telephone	11%	7%, 10–29%		
Postal	2%	13%, 18%	40%	8%, 30%
Direct interview	14–20%			82%
General practitioner/ expert		9%	<1%	17 + 45%

(1991) gave the life-time prevalence instead of the point-prevalence. The incidence reported by Potter and Jones is difficult to interpret because the authors reported only the number of patients (20) included in the study. The numerator is unknown, but as it consists of all patients who visited eight general practitioners over a 10-month period, we estimate the numerator to be higher than 10 000, yielding an incidence of less than 1%. The prevalence of chronic pain in the other studies varied from 2% (Kohlmann, 1991) to 40% (Brattberg et al., 1989). The median of the studies was 15%.

3.5. Methods of measurement and definition

The definition of 'chronic' used in the various studies could have affected the prevalence estimated. Pain lasting longer than 2 weeks would be expected to be more prevalent than pain lasting longer than 6 months. Moreover, the method by which the data were collected might influence the outcome: a clinical examination by a doctor is more stringent than an answer to a postal questionnaire. Table 2 lists the prevalence of chronic pain according to the different research methods and definitions of chronic pain used in the various studies. See also columns 2 and 3 in Appendix A.

Each method yields high and low prevalences. In each of the rows, distinguishing the different methods, prevalence rates above and below the median of 15% can be found. The prevalence estimates of chronic pain was not greatly affected by the time definition of chronic pain as well: the second highest prevalence was found when chronic pain was defined as pain present for longer than 6 months, and one of the lowest prevalence rates was recorded in a study in which chronic pain was defined as pain present for 2 weeks to 1 month. The prevalence of chronic pain was high in studies in which chronic pain was not defined or the definition was unclear.

As stated in Section 1, a multidimensional approach has been advocated for the measurement of chronic pain. Such an approach should take different aspects into account when defining chronic pain (grading). This was the case for the studies by Frølund and Frølund (1986), VonKorff et al.

(1988), Brattberg et al. (1989), and Andersson (1994). Furthermore, we assumed that experts and general practitioner assessors (Mäkelä and Heliövaara, 1991; Potter and Jones, 1992) implicitly take these different aspects into account. The other investigators used a simple definition of chronic pain limited to the affirmative response that pain persisted for a certain period in a certain location. See also column 3 in Appendix A. However, use of a multi-dimensional 'definition' of chronic pain hardly had any influence on the reported prevalence. The six studies which used a complex definition of chronic pain yielded a median prevalence of 13.5%, and those with a 'simple' definition a prevalence of 16%.

3.6. Patient characteristics

There was more consensus regarding sociodemographic characteristics (see column 6, Appendix A). In seven studies women were over-represented and in two studies the prevalence of chronic pain was equal for men and women, but in no study was an over-representation of men mentioned. Chronic pain generally increased with age, with some studies reporting a peak prevalence between the ages of 45 and 65 years. The prevalence of chronic pain was higher in the lower income groups. The most prevalent pain was musculoskeletal pain (back pain, joint pain), although headache and abdominal pain were also frequently mentioned. When investigated, a positive relation between chronic pain and affective, depressive, or psychological symptoms was found.

4. Discussion

Our first aim was to determine which methods have been used to determine the prevalence of chronic benign pain. However, a search of the literature revealed that there have been no epidemiological studies into the prevalence of chronic benign pain in the general population. In fact, there have been few epidemiological studies of chronic pain in the general population. These studies made use of a wide range of definitions and yielded widely varying data for the prevalence of chronic pain. Neither the method of data collection nor the definition of chronic pain seemed to affect the prevalence reported. Eight of the studies included in our review took aspects other than the location of the reported pain into consideration.

This relative lack of epidemiological research affected our second aim, i.e. to determine the prevalence of chronic benign pain. Without doubt, many people suffer from pain to such an extent that they are seriously limited in their daily activities over a considerable period of time. The 15 studies we reviewed yielded a median point prevalence of chronic pain of 15% in the adult population, with a range from 2% to 40%. There was some consensus about the characteristics of the patients who suffer from chronic pain: they are rela-

ively often middle-aged women from the lower socioeconomic strata. Low back, neck, and shoulder are the body areas most frequently affected. Chronic pain is often associated with depression or other kinds of psychological distress.

It is difficult to explain the wide range in reported pain, but a prevalence of chronic pain of 10% of the population seems a very cautious estimate. There were no clear-cut differences between prevalence based on self-assessment and on diagnoses made by physicians after a clinical examination. Self-assessment sometimes leads to relatively low figures: the telephone survey carried out by Bowsher et al. (1991) yielded a prevalence of chronic pain of only 7% and the telephone survey of Crook et al. (1984) yielded a prevalence of 11%, while in the study of Mäkelä and Heliövaara (1991), a thorough medical examination led to a prevalence of chronic musculoskeletal pain of at least 30%. The very low estimate reported by Potter and Jones (1991) probably because they investigated the incidence rather than known cases.

Although the benign character of chronic pain was seldom taken into consideration, some conclusions may be drawn about the extent to which somatic diseases are responsible for reported chronic pain. Frølund and Frølund (1986) identified the most important chronic pain categories as being 'bone/joint' (24% of all chronic conditions), 'muscle/ligament' (17%), 'low back' (13%), 'headache' (12%), and gastrointestinal (11%). With the exception of patients suffering from 'bone/joint' pain, where arthritis might be held responsible for most of the cases, most patients suffering from pain in these categories will suffer from symptoms other than from demonstrable diseases. The predominance of chronic low back pain and chronic neck pain found by Mäkelä and Heliövaara (1991) in their study suggests the same.

The positive relation between chronic pain and psychological distress (see also Smith, 1992) also points to the 'enigma', or better, 'not organically explained' character of pain in a number of cases. Benjamin et al. (1988) reported that pain ratings were higher among patients with a mental illness without an organic pathology than among patients with an organic pathology. One might assume that in a substantial number of cases chronic pain is the expression of depression or other forms of psychological distress. However, the absence of an organic explanation for chronic pain could not automatically lead to a psychiatric diagnosis (Benjamin et al., 1988).

Thus, pain without nociception is difficult to assess. Even the subjective elements involved in the measurement of chronic pain, an objective assessment of its 'real' prevalence seems a contradiction. We thus have to accept that pain is as an 'essential' element in the Platonic meaning is an impossible ideal (cf. also Wulff et al., 1986). As Mäkelä and Heliövaara state with respect to fibromyalgia: '...(it) resembles a constellation of stars: its components are real enough but the pattern is in the mind of the beholder.' Therefore, in

future research it might be more fruitful not to focus on reaching an as reliable as possible prevalence of pain without nociception but on analyzing the suffering and pain behavior of these patients, without worrying too much about the exact numbers. After all, the important question is not precisely how many patients experience pain each day, but the extent to which pain leads to disability, to loss of working days, to premature incapacity, or to unnecessary medical treatment.

Our current research has a prognostic character. Patients are included if they have experienced pain without a clear physical basis for more than 6 months, as assessed by their general practitioners. These patients will be monitored for 3 years, during which time we hope to learn about the course of several aspects of pain (for example, its intensity, temporal characteristics, and locations), the disabilities it causes in daily life, the medical treatment sought and the costs involved, the behavioral aspects (coping), and the impact on physical and psychosocial well-being. While we recognize that we will not determine the real number of patients with chronic benign pain, we hope that we will improve our understanding of the impact of this pain on the daily life of patients. By this, we will come to an estimation of the proportion of patients with chronic pain who appear to be seriously handicapped by their pain on one moment and of the proportion of patients whose condition will not improve after a number of years. In this way our study may contribute to the knowledge about the impact of chronic pain in the long run.

Acknowledgements

This literature review is part of a research project, funded by the Netherlands Organization for Scientific Research (Program Chronic Diseases, subprogram Pain) by Grant 940-31-033.

References

- Andersen, S. and Worm-Pedersen, J., The prevalence of persistent pain in a Danish population, *Pain, Suppl.* (1987) S332.
- Andersson, H.I., The epidemiology of chronic pain in a Swedish rural area, *Qual. Life Res.*, 3 (1994) s19–s26.
- Andersson, H.I., Eijlertsson, G., Leden, I. and Rosenberg, C., Chronic pain in a geographically defined general population: studies of differences in age, gender, social class and pain localization, *Clin. J. Pain*, 9 (1993) 174–182.
- Aronoff, G.M., Evans, W.O. and Enders, P.L., A review of follow-up studies of multidisciplinary pain units, *Pain*, 16 (1983) 1–11.
- Benjamin, S., Barnes, D., Berger, S., Clarke, I. and Jeacock, J., The relationship of chronic pain, mental illness and organic disorder, *Pain*, 32 (1988) 185–195.
- Bowsher, D., Rigge, M. and Sopp, L., Prevalence of chronic pain in the British population: a telephone survey of 1037 households, *Pain Clin.*, 4 (1991) 223–230.
- Brattberg, G., Thorslund, M. and Wikman, A., The prevalence of pain in a general population. The results of a postal survey in a county of Sweden, *Pain*, 37 (1989) 215–222.

- Croft, P., Rigby, A.S., Boswell, R., Schollum, J. and Silman, A., The prevalence of chronic widespread pain in the general population, *J. Rheumatol.*, 20 (1993) 710–713.
- Crombie, I.K., Epidemiological studies in pain research, *J. Pain Sociol.*, 11 (1994) 30–32.
- Crook, J. and Tunks, E., Defining the chronic pain syndrome, an epidemiological method, *Adv. Pain Res. Ther.*, 9 (1985) 870–877.
- Crook, J., Rideout, E. and Browne, G., The prevalence of pain complaints in a general population, *Pain*, 18 (1984) 299–314.
- Crook, J., Weir, R. and Tunks, E., An epidemiological follow-up survey of persistent pain sufferers in a group family practice and speciality pain clinic, *Pain*, 36 (1989) 49–61.
- Frølund, F. and Frølund, C., Pain in general practice, *Scand. J. Primary Health Care*, 4 (1986) 97–100.
- IASP, Classification of Chronic Pain. Description of pain syndromes and definitions of pain terms, *Pain*, Suppl. (1986) S3.
- James, F.R., Large, R.G., Bushnell, J.A. and Wells, J.E., Epidemiology of pain in New Zealand, *Pain*, 44 (1991) 279–283.
- Kohlmann, T., Schmerzen in der Lübecker Bevölkerung. Ergebnisse einer bevölkerungsepidemiologischen Studie, *Der Schmerz*, 5 (1991) 208–213.
- Lousberg, R., Chronic Pain. Multiaxial Diagnostics and Behavioral Mechanisms, Thesis, University of Maastricht, Universitaire Pers Maastricht, 1994.
- Magni, G., On the relationship between chronic pain and depression when there is no organic lesion, *Pain*, 36 (1987) 1–21.
- Magni, G., Cardieron, C., Rigatti-Lunchini, S. and Merskey, H., Chronic musculoskeletal pain and depressive symptoms in the general population. An analysis of the 1st National Health and Nutrition Examination Survey data, *Pain*, 43 (1990) 29–307.
- Magni, G., Rossi, M.R., Rigatti-Lunchini, S. and Merskey, H., Chronic abdominal pain and depression. Epidemiologic findings in the United States. Hispanic health and nutrition examination survey, *Pain*, 49 (1992) 77–85.
- Magni, G., Marchetti, M., Moreschi, C., Merskey, H. and Rigatti-Lunchini, S., Chronic musculoskeletal pain and depressive symptoms in the National Health and Nutrition Examination: I. Epidemiologic follow-up study, *Pain*, 53 (1993) 163–168.
- Mäkelä, M. and Heliövaara, M., Prevalence of primary fibromyalgia in the Finnish population, *Br. Med. J.*, 303 (1991) 216–219.
- Nachemson, A., Chronic pain. The end of the welfare state?, *Qual. Life Res.*, 3 (1994) s11–s17.
- Oosterhof, S.J. and Brueren, M.M., Chronisch benigne pijn, *Huisarts Nu*, 23 (1994) 251–259.
- Potter, R. and Jones, J.M., The evolution of chronic pain among patients with musculoskeletal problems. A pilot study in primary care, *Br. J. Gen. Pract.*, 42 (1992) 462–464.
- Raspe, H. and Kohlmann, T., Disorders characterised by pain: a methodological review of population surveys, *J. Epidemiol. Community Health*, 48 (1994) 531–537.
- Seers, K., Chronic non-malignant pain, *Br. J. Gen. Pract.*, 42 (1992) 452–453.
- Smith, G.R., The epidemiology and treatment of depression when it coexists with somatoform disorders, somatization or pain, *Gen. Hosp. Psychiatry*, 14 (1992) 265–272.
- Sternbach, R.A., Survey of pain in the United States: the Nuprin pain report, *Clin. J. Pain*, 2 (1986) 49–53.
- Turk, D.C. and Rudy, T.E., Classification logic and strategies in chronic pain. In: D.C. Turk and R. Melzack. (Eds.), *Handbook of Pain Assessment*, Guildford Press, New York, 1992.
- von Knorring, L. and Ekselius, L., Idiopathic pain and depression, *Qual. Life Res.*, 3 (1994) s57–s68.
- VonKorff, M., Epidemiologic and survey methods: chronic pain assessment. In: D.C. Turk and R. Melzack (Eds.), *Handbook of Pain Assessment*, Guildford Press, New York, 1992.
- VonKorff, M., Dworkin, S.F., Resche, L.L. and Kruger, A., An epidemiologic comparison of pain complaints, *Pain*, 32 (1988) 173–183.
- VonKorff, M., Dworkin, S.F. and Resche, L.L., Graded chronic pain status: an epidemiological evaluation, *Pain*, 40 (1990) 279–291.
- VonKorff, M. and Resche, L., Le. and Dworkin, S.F. First onset of common pain symptoms: a prospective study of depression as a risk factor, *Pain*, 55 (1993) 251–258.
- Wulff, H.R., Pedersen, S.A. and Rosenberg, R., *Philosophy of Medicine*, Blackwell Scientific, Oxford, 1986.

pendix A

Authors	Research methods	Definition	Aspects taken into account	Prevalence	Demographic and comorbidity characteristics
Worms and Worms, 1987	Postal survey Denmark, 1977 1 region Open population, 18 years+ <i>n</i> = 3400 Response rate: 85%		Persistent pain: 30%		
Andersson et al., 1993; Andersson, 1994	Postal survey Sweden, 1988 2 regions Open population, 25–75 years <i>n</i> = 1609 Response rate: 90%	Chronic pain: persistent or recurrent pain, >3 months, intensity 4/5 (5-point-scale). Dysfunctional chronic pain: persistent or recurrent pain, >6 months, intensity 4/5 (5-point-scale), with impairment of activities of daily life or sick leave at least once in last 3 months	Intensity Location Gradation	Pain >3 months, any intensity: 50% Chronic pain: 18% Dysfunctional chronic pain: 12.8%	45 + –64 years higher prevalence 25–34 years lower prevalence ♂ = ♀ Blue collar workers higher prevalence Especially neck–shoulder–low back
Sher et al., 1991	Telephone survey Great Britain, 1990 National Open population All ages <i>n</i> = 2942 Response rate: ?	Chronic pain: pain which has lasted on and off for longer than the last 3 months	Location Temporal characteristics Social disability	Chronic pain: 7%	Lower SES higher prevalence ♂ < ♀ Pain was frequently attributed to arthritis (44%), illness (8%), injury (7%), heart (6%) and surgery (4%)
Berg et al., 1989	Postal survey Sweden, 1977 Regional Open population 18–84 years <i>n</i> = 827 Response rate: 67%	Pain intensity: 6-point scale Pain consequences: 6-point scale Obvious pain = intensity ≥3 ('like being stiff after exercise') + consequences ≥4 ('pain affects to quite a high degree')	Intensity Location Gradation Temporal characteristics Disability	Any kind of pain: 66% Obvious pain >6 months: 40%	Obvious pain is more prevalent in 45–64 years than in 18–44 and 65–84 ♂ = ♀ Obvious pain especially in shoulders, low back, legs, neck
et al., 1993	Postal survey England, 1991 Registered population of 2 general practices 18–85 years <i>n</i> = 1340 Response rate: 66%	Pain: 'A report of any pain during the past month which has lasted for longer than 24 hours' Chronic pain: 'pain as defined above, which started more than 3 months ago' Widespread pain: 'along the axial skeleton and in two contralateral quadrants of the body' Chronic widespread pain: 'widespread pain >3 months'	Location	Pain: 56% Widespread pain: 16% Chronic widespread pain: 13%	Chronic widespread pain increases with age ♂ < ♀ Positive association with: somatic symptoms, tiredness, affective symptoms
et al., 1984	Telephone survey Canada, 1977 Sample from registered population of a general practice <i>n</i> = 827 Response rate: 95%	Persistent pain: 'often troubled with pain and pain in preceding 2 weeks' Temporary pain: 'not often troubled but pain in preceding 2 weeks'	Location	Persistent pain: 11% Temporary pain: 5%	Persistent pain: older, more retired, more widowed, lower income than no pain
d and Frølund, 1985	Registration by 26 general practitioners in 1 week Denmark, 1983 2886 consultations (week prevalence)	Chronic pain: 'pain persisting for at least 3 months or frequent exacerbations of an essentially chronic condition' Problem cases: 'pain unsolved and perhaps unsolvable'	Location	Pain in 22% of the consultations Chronic pain in 9% of the consultations Problem cases: 3.7%	Female/male ratio increases with age Acute/chronic ratio increases with age

Appendix A (continued)

Authors	Research methods	Definition	Aspects taken into account	Prevalence	Demographic and comorbidity characteristics
James et al., 1991	Psychiatric Interview (DIS) New Zealand, 1986 Regional Open population 18–64 years $n = 1498$ Response rate: 70%	Q: 'Ever experienced pain, severe enough to have led to consultation with a doctor or to the use of medication or interfered with life or activities a lot?' Excluded: pain associated with medication, alcohol or drug use	Location	82% reported a life-time pain experience	$\delta < \eta$; $\eta \eta$ more locations than $\delta \delta$; Pain was generally attributed to a physical cause $\geq 30\%$ attributed to a psychological cause in the following cases: menstruation pain, abdominal pain, $\delta < \eta$
Kohlmann, 1991	Postal survey Germany, 1989 Regional Open population 26–76 years $n = 308$ Response rate: 80%	Chronic pain: pain in at least one body region during the last 6 months for more than 30 days	Location	2.4% chronic pain	$\delta < \eta$
Magni et al., 1990	National Health and Nutrition Examination Survey I USA, 1971–1975 Noninstitutionalized population of USA 25–74 years $n = 3023$ Response rate: ?	Chronic musculoskeletal pain: subjects suffering from pain in the neck, back, hip, knee or having significant swelling and pain or joints on most days for at least 1 month during the last 12 months	Location Temporal characteristics Sensory	14.4% chronic pain, 7.4% uncertain ('some pain but impossible to determine the duration')	$\delta < \eta$ Increase with age Decrease with income $\eta \eta$, chronic pain, low income and non-white race contributed to depression
Mäkelä and Heliövaara, 1991	Population survey (2 stage: screening and physical examination of the 52.3% who reported moderate or severe musculoskeletal symptoms or impaired function of at least one joint) Finland, 1977–1980 30 years and older $n = 7217$ Response rate: 90%	Diagnosis of chronic low back pain, chronic neck pain, osteoarthritis by mobile clinic physician (no criteria mentioned)	Location	17.1% chronic low back pain 11.8% chronic neck pain 15.8% osteoarthritis	
Magni et al., 1992	Hispanic Health and Nutrition Examination Survey USA, 1982–1984 Sample of 76% of Hispanic population of USA 20–74 years $n = 5498$ Response rate: ?	Chronic abdominal pain: abdominal pain or lower chest pain had been present for at least 30 days in the 12 months preceding the interview	Location Temporal characteristics	5.5% chronic abdominal pain: 4.6% of Mexican, 5.8% of Cuban, 8.3% of Puerto-Rican population	$\delta < \eta$ Higher prevalence among lower income groups No age effect Chronic pain, low income, not married and (for Mexican and Cuban Americans), female sex contributed to depression
Potter and Jones, 1992	Registration by eight general practitioners for 10 months England, 19?? 18–65 years $n = ?$ (8 practices = approx. 20 000?)	Pain: new episode of musculoskeletal pain of 4 weeks' duration Chronic pain: still pain after 26 weeks, otherwise: Acute pain	Intensity Sensory/affective/evaluative Coping	48 patients included 20 chronic pain, 25 acute pain, 3 no follow-up	Chronic pain more intense pain than acute pain Chronic pain more depressed than acute pain Chronic pain more passive coping strategies than acute pain
Sternbach, 1986	NUPRIN-survey: Telephone survey USA, 1985 Open US population 18 years and older $n = 1254$ Response rate: ?	Chronic pain: pain for 101 or more days in the preceding year	Location Disability Severity	10% chronic joint pain 9% chronic back pain 5% chronic headache 5% chronic muscle pain	$\delta < \eta$ Higher prevalence among younger respondents No income effect

Appendix A (continued)

Authors	Research methods	Definition	Aspects taken into account	Prevalence	Demographic and comorbidity characteristics
van Korf et al., 1988, 1990, 1993	Mailed questionnaire USA, 1986 Sample of enrollees of HMO 18–75 years <i>n</i> = 1016 Response rate: 80%	Pain: pain problems that lasted a whole day or more, encountered during the last 6 months	Intensity Location Temporal characteristics Disability Interference	41% encountered back pain 26% headache ($\delta < \eta$) 17% abdominal pain 12% facial pain ($\delta < \eta$) 12% chest pain 8.1% has severe and persistent pain, all (4.5%)	No age effect Higher prevalence among lower income groups Psychological distress increases among pain patients, especially among those who have higher levels of non-pain somatic

number of respondents.

MEDICAL HELP-SEEKING BY DIFFERENT TYPES OF CHRONIC PAIN PATIENTS

P.F.M. VERHAAK^{1,*}, J.J. KERSSENS¹, J.M. BENSING^{1,2},
M.J. SORBI², M.L. PETERS³ and D.A. KRUISE²

¹Nivel, Netherlands Institute for Health Services Research

²Department of Health Psychology, University of Utrecht

³Department of medical, clinical and experimental psychology, University of Maastricht

(Received 7 April 1999; in final form 20 April, 2000)

This paper reports on a study of the use of health services by different types of patients with chronic benign pain. The purpose of the study was to identify differences in medical consumption between different types of pain patients. In the course of one year 586 patients were selected by 45 general practitioners: they included patients who had had almost daily chronic pain symptoms for at least six months, without a medical diagnosis (such as cancer or arthritis) to explain the pain. Patients were categorized according to the Multidimensional Pain Inventory which distinguishes four categories: the *dysfunctional*, who perceive severe pain and gain social support; the *interpersonally distressed*, who combine pain with affective and relational distress; *adaptive copers*, who cope with their pain in a number of ways; the *average* type, with characteristics of all three other types. It was hypothesised that adaptive copers would make less use of health services and would be more involved in self-help activities than dysfunctional or interpersonally distressed patients. Frequent use of psychological services by the interpersonally distressed group was expected. It was predicted that difference in health services use would continue during the subsequent year.

No differences were found between the four groups in location, temporal characteristics, or possible medical causes of the pain symptoms. Dysfunctional patients used more services than the others. Adaptive copers used the least. The four groups did not differ in self-care activities. Group-membership as well as pain severity are related to the use of health services. None of the groups showed a significant decline in the use of health services during the year. It is concluded that chronic pain is invalidating, but that not all patients are equally excessive in their use of medical services.

KEY WORDS: Chronic pain, coping with pain, medical consumption, health services research.

INTRODUCTION

Chronic pain is defined by the International Association for the Study of Pain as "pain that persists beyond the normal time of healing" (Mersky, 1986, p. 5). Acute pain is functional and can be considered as a "biologically meaningful, useful, and time-limited experience" (Vasudevan 1992, p. 101). Acute pain may become chronic and may not be completely attributable to nociception. This is known as *chronic benign pain disorder* (CBPD).

The recognition of the multidimensional character of pain with its interplay of physical, cognitive and behavioural factors led Turk and Rudy (1988, 1992) to the construction of the Multi Axial Assessment of Pain (MAP). Information has to be obtained on three axes: physical/medical; psychosocial; behavioural. The syndrome classification of the IASP serves to gather relevant data on the first axis. This classification is undertaken by a clinician. The second and third axes are assessed by the Multidimensional Pain Inventory (MPI),

* Corresponding author. E-mail: P. Verhaak@nivel.nl.

a self-report questionnaire which measures patients' appraisals of pain and the impact of pain on different domains of their lives, perceptions of the responses of significant others to their distress, and the performance of common activities. The MPI is constructed so that the outcome of an assessment is one of four patient profiles. **Dysfunctional**: patients who perceive the severity of their pain to be high, report pain as interfering with their daily lives, experience much affective distress, and have a low activity level. **Interpersonally Distressed**: patients with moderate pain and affective distress who have a common perception that significant others are not very understanding. **Adaptive Copers**: patients who experience considerable social support and relatively low levels of pain, affective distress, high levels of activity, and perceived control. Patients of the **Average type** have some of the characteristics of each of the three other types (cf. Bergström, Jensen, Bodin, Linton, Nygren, and Carlsson, 1998; Kerns, Turk and Rudy, 1985; Lousberg, 1994).

This multi-axial approach illustrates the complexity of the phenomenon of chronic benign pain. Chronic pain persists under the influence of physical, cognitive, emotional, behavioural, and social factors. However, by its very character, it is often defined (at least by the patient) as an exclusively medical problem for which medical solutions should be sought. This circumstance makes chronic pain and the resulting use of health services an important research topic for health psychology and health services research.

It is of interest to note there have been very few studies within the domain of pain research devoting attention to pain patients' use of health services. Most research has concerned the characterization of chronic pain patients on a variety of psychological and psychiatric dimensions. Further, most research has been on clinical populations. Studies of pain and the use of health services have in general been limited to the cross-sectional measurement of pain characteristics and health service usage (Crook, Rideout and Browne, 1984; Engel, VonKorff and Katon, 1996; Jensen, Turner, Romano and Lawler, 1994; Van Tulder, Koes, Metsemakers and Bouter, 1998). The consistent finding in all these studies is that pain persistence and pain intensity relate positively to health care utilization and higher costs. Some epidemiological research aimed at case finding in medical practice (Frolund and Frolund, 1986; Potter and Jones, 1992; Verhaak, Kerssens, Dekker, Sorbi and Bensing, 1998) and some recent research on general practitioners' treatment of pain patients (Van Tulder *et al.*, 1998) supplement the substantial body of research on the treatment of pain patients in a clinical setting.

The possible relationship between pain coping characteristics (including behavioural and psychological factors) and health service usage has not previously been investigated in detail. There is a long tradition of health services research on help seeking behaviour, but this has not been focused exclusively on pain patients, and certainly not on the maladaptive character of help seeking behaviour in the light of the psychological models referred to earlier. The present study aims to enhance the understanding of the relationship between cognitive and behavioural patient characteristics resulting in the MPI profiles mentioned above and medical help seeking in the population at large. It is a longitudinal study providing an opportunity to study the consequences of several MPI profiles on medical consumption in the long term.

The construction of MPI profiles (see Method section for details) leads to the identification of dysfunctional patients with a perception of severe pain, interpersonally distressed patients with a perception of average pain, and adaptive copers with a relatively low perceived pain level. Dysfunctional and interpersonally distressed patients would be expected to use more maladaptive coping strategies, such as pain avoidance and to search for medical solutions; whereas adaptive copers would seek solutions in more active coping strategies.

There is an underlying assumption that a dysfunctional patient's pain is maintained by reinforcement (receiving attention, being looked after), while the interpersonally distressed patient's pain is maintained by affective distress and interpersonal conflict. For adaptive copers, no maintenance mechanism is assumed.

These assumptions lead one to expect dysfunctional patients to be high consumers of health services in all respects, even after controlling for their perceived health status. Interpersonally distressed patients could be expected to make particularly heavy use of psychological services, because of their experience of interpersonal conflict. Adaptive copers ought to be light consumers of health services in all respects. Lastly, given the maladaptive coping styles employed by dysfunctional and interpersonally distressed patients (cf. Jensen, Turner, Romano and Karoly, 1991), and the pain maintaining context in which they live, this high consumption could be expected to remain high in the follow-up stage, in contrast with that of adaptive copers who are expected to remain at their relatively lower level. This rationale led to the formulation of the following hypotheses.

- H1 Adaptive copers make less use of medical and paramedical services than the interpersonally distressed, who make less use of medical and paramedical services than dysfunctional patients.
- H2 Interpersonally distressed patients make more use of psychological services than adaptive copers.
- H3 Adaptive copers engage in more self-help activities (especially the more active) than dysfunctional or interpersonally distressed patients.
- H4 Differences between the three groups in medical consumption continue during the annual follow-up.

METHOD

The study is a longitudinal prospective cohort study. A cohort of chronic pain patients was assessed on a number of psychological and behavioural factors; the patients' usage of health services was followed up 3, 6, 9, and 12 months after inclusion.

Inclusion

Patients were included by their general practitioners. In the course of one year they selected those patients who presented symptoms of pain, or were known to have such symptoms, and who fulfilled the following criteria:

- the pain had existed for more than six months
- pain was the most prominent aspect in the presentation and serious enough to justify clinical attention
- the pain could not be explained by a physical diagnosis (for example, cancer or arthritis)
- the patient's age was between 18 and 65 years.

General practitioners were requested to select all patients meeting the inclusion criteria and ask them for their informed consent.

Data Collection

Forty-five general practitioners (35 practices) were involved in the selection process. They were participants in a countrywide network of sentinel stations forming a continuous monitoring system for health services research. The network is a representative sample of Netherlands practices, covering all degrees of urbanization and all regions of the Netherlands.

The number of chronic pain patients included by each doctor varied from one to 40 patients on a yearly basis (cf. Kerssens *et al.*, submitted). The general practitioners selected 586 patients; of these, 385 patients (66%) were prepared to participate and complete the MPI and other questionnaires. A few of the non-participants were patients who refused to take part when invited to do so. Most non-participants were excluded by their doctors, because they were concerned about the negative consequences of attention which might be paid to the chronic pain.

The general practitioners completed a registration form for each patient, providing information on the medical aspects of the pain reported. This form was completed for both the participants and the non-participants. Following inclusion, patients completed several questionnaires, including one reporting their medical consumption during the previous three months and the MPI. All the questionnaires used are discussed below. The medical consumption questionnaire was mailed to all participating patients every three months. Non-responders were reminded once by mail and if necessary again by telephone. In this paper the first four measurement points are considered.

Measurements

1) *MPI*. The Dutch Language version of the MPI has been used (Lousberg, 1994).

The MPI profiles are based on a number of constructions and assumptions. The MPI is a multidimensional pain questionnaire which yields scores on 11 sub scales divided over three main parts:

- pain relevant psychosocial aspects
 - pain intensity
 - interference
 - life control
 - affective distress
 - social support
- behavioural aspects
 - punishing responses
 - solicitous responses
- distracting responses
 - daily activities
 - household chores
 - outdoor work
 - social activities/activities away from home

In the original American version of the MPI 12 sub scales were distinguished. During the development of the Dutch language version, only three factors in part III of the questionnaire, concerning daily activities could be extracted (Lousberg, 1994). Accordingly, social

activities and activities away from home have been amalgamated. The same adaptation was made in the Swedish language version of the MPI (Bergström *et al.*, 1998).

Scores on these scales were used to classify respondents according to the four categories described: dysfunctional, interpersonally distressed, adaptive copers, average respondents. The program delivered with the questionnaires makes automatic categorizations (cf. Lousberg, 1994). The categories are constructed so that the dysfunctional type is high in pain intensity, interference and affective distress, also high in support, solicitous responses and distracting responses, but low in life control and general activity. The interpersonally distressed type is average in pain intensity, interference and affective distress as well as in life control and general activity, but low in support, solicitous responses and distracting responses. The adaptive copers has the best of both worlds, combining low subjective pain relevant aspects with relatively high support. The average type has intermediate scores on all aspects. It was not possible to obtain a typology for every respondent: a number of them gave contradictory responses, so that they could not be classified. This group is called the "anomalous" group.

2) *General Practitioner Judgments.* At the moment of inclusion, following contact with the patient, the general practitioners rated each patient on each of the following characteristics:

- Location of the pain
- Temporal characteristics of pain
 - continuous, non fluctuating
 - continuous, fluctuating
 - intermittent, irregular
 - intermittent, regular
 - attacks
 - contiguous with attacks
 - other
- Medical explanation/evidence (11 point scale: not explicable – completely explicable)

3) *MOS SF36.* The short form of the measurement instrument, developed during the Medical Outcome Studies of the Rand Corporation to measure health status and functional status of respondents (MOS SF36) has been administered to all patients at the moment of inclusion. The following scales (sometimes shortened form) were included:

- general health status (one item)
- social functioning (one item)
- physical functioning (10 items)
- physical role performance (four items)
- mental health (five items)
- vitality (four times)

Because different scaling was used for the various (groups of) items, all sum scores were transformed to scores on a 100-point scale ranging from 0 (worse situation) to 100 (optimal situation)

4) *Medical consumption questionnaire.* The medical consumption questionnaire has been developed specifically for this study. It is an inventory with a three month retrospective view of number of visits (and number of visits due to pain complaints) to the:

- general practitioner
- medical specialist
- paramedical professions: physiotherapists and exercise therapists
- mental health care professionals
- alternative healers

Furthermore, the respondent is required to indicate the self-care activities undertaken to reduce or prevent pain

- taking medicine
- rest
- swimming
- yoga
- gymnastics
- other

Analysis

Differences between groups in terms of the general practitioners' judgements and self-care activities were on an interval scale and normally distributed; they were tested by χ^2 , *t*-test or analysis of variance. In the latter case, post hoc contrast analysis was performed, testing differences between all four groups and (dysfunctional + interpersonally distressed) versus (adaptive copers + average). Pairwise differences between groups were assessed in a multiple range test using the Tukey HSD procedure. Differences significant at a probability level < 0.05 will be reported.

Differences between groups relating to medical consumption (mostly with a skewed distribution) were tested by means of loglinear Poisson regression. In Poisson regression, the counts (for example, the number of visits to the doctor) are described as a function of the three-month period. Test statistics were derived from *D*, the scaled deviance (McCullagh and Nelder, 1989). For the analysis of longitudinal differences, Poisson regression was used in a multilevel design where measurements were repeated within patients (Bryk and Raudenbusch 1992; Goldstein 1995).

Non-response

The general practitioners selected 586 of their patients. Due to non-response and dropout, the ultimate sample might have been biased. The first selection appeared at the point that patients meeting criteria for CBPD did not participate. Since forms about these patients were also completed by the general practitioners, we can compare their judgements on participants with their judgments on non-participants (Table 1).

None of the differences between participants and non-participants were statistically significant. From table 1 we conclude that non-participants did not differ from participants as regards location of pain, its temporal characteristics, or the degree of medical explicability

Table 1 Non-response analyses: Participants (returning MPI at T1) vs Non-participants

	Participants 385	Non-participants 178
<i>Location of pain:</i>		
Head, face and mouth	20%	19%
Cervical region	15%	15%
Upper shoulder and upper limbs	15%	15%
Thoracic region	3%	4%
Abdominal region	4%	4%
Lower back, lumbar spine sacrum and coccyx	21%	21%
Lower limbs	7%	9%
Pelvic region	1%	2%
Anal, perianal and genital region	2%	3%
More than 3 sites	12%	10%
<i>Temporal characteristics</i>		
Continuous (non-fluct.)	16%	18%
Continuous (fluct.)	43%	38%
Intermittent, irregular	21%	22%
Intermittent, regular	15%	13%
Attacks	6%	8%
Medically explicable (10-point scale: 0: not explicable; 10: completely explicable), mean scores (s.d)	5.8 (2.9)	5.9 (2.8)

of the pain symptoms. There were 385 patients fulfilling the criteria who agreed to participate and completed the first questionnaire (including the first MPI).

Using the MPI classification, 284 (74%) of the 385 patients who completed the MPI at inclusion were classified into one of the four categories, as: 27% dysfunctional, 13% interpersonally distressed, 10% adaptive copers, 24% average. The scores of the other 26% on the different MPI scales did not fit the MPI classification. They have been referred to as *anomalous* and have been left out of any analyses using MPI typology. To have anomalous cases making up a quarter of the total is very high when compared with the studies in which the MPI was validated (Lousberg, 1994). This is addressed in the discussion section. Patients omitted from our analyses because of the "anomalous" classification have been compared with patients included in the analyses in table 2. Patients who did not fit into the classification scheme were on average five years older ($t = -2.87$; $p = 0.005$) and in poorer general health ($t = 2.80$; $p = 0.005$). The groups did not differ in pain location, degree of medical explicability, pain duration, gender, or the five other health parameters: social functioning, physical functioning, physical role performance, mental health and vitality.

The last selection, resulting from non-response, is derived from the longitudinal character of the study. The study was a longitudinal cohort study, so the patients included were asked to complete and return a mailed questionnaire at T1 and every three months thereafter. Each new measurement was accompanied by a considerable loss of respondents. Table 3 shows the impact of non-response on T1 to T4 by presenting the distribution of age, gender, health parameters and a number of pain characteristics as measured on T1 for the group of respondents participating at T1, T2, T3 and T4. The loss of respondents resulted in a growing proportion of female patients, although the age composition of the groups did not change substantially. The average pain duration increased, while pain location and medical explicability remained the same. No selective dropout of patients with relatively good or poor health could be observed. The distribution of MPI-typology remained the same as well.

Table 2 Patients classified by MPI vs unclassifiable (anomalous) patients

	<i>Classified</i> 284	<i>Anomalous</i> 101
<i>Location of pain:</i>		
Head, face and mouth	19%	20%
Cervical region	16%	11%
Upper shoulder and upper limbs	14%	17%
Thoracic region	5%	2%
Abdominal region	3%	6%
Lower back, lumbar spine sacrum and coccyx	21%	21%
Lower limbs	10%	5%
Pelvic region	1%	2%
Anal, perianal and genital region	3%	4%
More than 3 sites	9%	11%
<i>Temporal characteristics</i>		
Continuous (non-fluct.)	17%	22%
Continuous (fluct.)	40%	31%
Intermittent, irregular	20%	25%
Intermittent, regular	14%	12%
Attacks	8%	9%
<i>Medically explicable</i> (10-point scale)		
% female	5.9 (2.8)	5.8 (2.7)
mean age	72%	73%
pain duration (years)	46.8 (13.1)	52.4 (17.8)
	10.2	10.3
<i>Health parameters</i>		
General health	32.9	25.4
Social functioning	52.4	46.5
Physical functioning	54.1	53.7
Physical role performance	25.1	28.5
Mental Health	55.4	51.6
Vitality	52.4	46.8

Table 3 Patient and temporal characteristics at four measurement-points

	<i>T1</i>	<i>T2</i>	<i>T3</i>	<i>T4</i>
<i>Location of pain:</i>				
Head, face and mouth	17%	17%	15%	16%
Cervical region	7%	7%	8%	6%
Upper shoulder and upper limbs	11%	12%	10%	11%
Thoracic region	4%	5%	5%	7%
Abdominal region	6%	5%	6%	5%
Lower back, lumbar spine sacrum and coccyx	14%	12%	12%	13%
Lower limbs	8%	8%	10%	9%
Pelvic region	1%	1%	1%	—
Anal, perianal and genital region	1%	1%	1%	1%
More than 3 sites	31%	31%	33%	31%
<i>Temporal characteristics</i>				
Continuous (non-fluct.)	18%	19%	17%	17%
Continuous (fluct.)	39%	37%	37%	36%
Intermittent, irregular	21%	20%	22%	22%
Intermittent, regular	13%	15%	16%	17%
Attacks	9%	9%	9%	9%

*Medically explicable**(10-point scale: 0: not explicable; 10: completely explicable)*

	5.8 (2.7)	5.7 (2.6)	5.9 (2.5)	6.1 (2.5)
% female	71%	73%	76%	79%
mean age	49.4 (14.1)	48.3 (13.1)	48.1 (12.4)	48.4 (12.0)
pain duration (years)	9.9	11.6	14.7	19

Health parameters

General health	31.1	31.8	31.7	33.3
Social functioning	50.9	50.7	51.9	52.3
Physical functioning	54.0	54.6	54.5	55.2
Physical role performance	25.8	26.2	26.9	28.9
Mental Health	54.5	54.5	54.8	55.5
Vitality	51.1	51.4	51.8	52.8

MPI-typology

Dysfunctional	36%	35%	34%	32%
Interpersonally distressed	19%	20%	18%	19%
Adaptive copers	12%	11%	12%	16%
Average	33%	32%	35%	33%

Table 4 Personal Characteristics of patients from 4 MPI categories

	<i>Dysfunctional</i>	<i>Interpersonally Distressed</i>	<i>Adaptive</i>	<i>Average Coper</i>
N:	103	51	37	93
% female	74%	69%	62%	74%
mean age	45.3	47.9	50.1	46.0
pain duration (years)	8.5	13	12.5	9.4
<i>Health parameters</i>				
General health	30.6 ³	28.1 ³	43.8 ^{1,2,4}	33.5 ³
Social functioning	48.7 ³	45.0 ^{3,4}	63.0 ^{1,2}	56.3 ²
Physical functioning	47.5 ^{2,4}	60.8 ¹	57.9	57.2 ¹
Physical role performance	18.1 ³	21.6	38.5 ¹	29.4
Mental Health	52.7 ³	47.5 ^{3,4}	64.7 ^{1,2}	58.4 ²
Vitality	49.6 ³	44.8 ^{3,4}	66.0 ^{1,2,4}	54.9 ^{2,3}

¹Score differs significantly from score of group 1 (dysfunctional)²Score differs significantly from score of group 2 (interpersonally distressed)³Score differs significantly from score of group 3 (adaptive copers)⁴Score differs significantly from score of group 4 (average)**RESULTS**

In table 4 some personal characteristics of patients in the distinguished MPI categories are given. More than two thirds of all the patients included were women. The MPI groups did not differ from each other in the background characteristics of age or gender. Neither did they differ with respect to the duration of pain complaints: all four groups had suffered for a long time and were chronic patients. The pain patients included had as a whole poor self-perceived health in all respects. The MPI groups differed from one another on most of the scales. In general terms, the adaptive copers felt more healthy than the dysfunctional and interpersonally distressed types. They evaluated their general health, social functioning, mental health and vitality more positively. Respondents in the average category fell more or less in between. The scores of the interpersonally distressed patients were particularly

Table 5 IASP-Characteristics of patients from 4 MPI categories

	<i>Dysfunctional</i>	<i>Interpersonal Distressed</i>	<i>Adaptive Coper</i>	<i>Average</i>
N:	103	51	37	93
<i>Location of pain:</i>				
Head, face and mouth	20%	14%	21%	20%
Cervical region	17%	12%	7%	21%
Upper shoulder and upper limbs	15%	12%	7%	13%
Thoracic region	5%	7%	7%	3%
Abdominal region	1%	5%	—	5%
Lower back, lumbar spine sacrum and coccyx	19%	23%	10%	25%
Lower limbs	9%	12%	21%	7%
Pelvic region	1%	—	3%	1%
Anal, perianal and genital region	1%	5%	3%	3%
More than 3 sites	12%	12%	14%	3%
<i>Temporal characteristics</i>				
Continuous (non-fluct.)	20%	17%	26%	11%
Continuous (fluct.)	50%	37%	29%	36%
Intermittent, irregular	11%	20%	29%	36%
Intermittent, regular	11%	15%	6%	19%
Attacks	8%	12%	9%	6%
Medically explicable	4.9	4.6	4.5	5.5
<i>(10-point scale: 0: not explicable; 10: completely explicable)</i>				

low on Mental Health and Vitality. Only in physical functioning did the interpersonally distressed person score highest – significantly higher than the dysfunctional category.

Table 5 reveals the IASP characteristics of patients in the four MPI categories. The most common complaints were lower back pain, headache, pain in the cervical region, and pain in the upper shoulder. According to the general practitioners, most patients suffered from pain continuously, with about one third of them reporting intermittently occurring pain. The distribution of pain on an 11-point scale from completely medically explicable to completely inexplicable was skewed towards the inexplicable pole.

There appeared to be no differences between the four categories in location of pain or possible medical explanation. There was a trend however, ($X^2=12.2$; $df=5$; $p=.058$)

Table 6 Use of health services during the past 3 months by persons from 4-MPI categories at the moment of inclusion

	<i>Dysfunctional</i>	<i>Interpersonally Distressed</i>	<i>Adaptive Coper</i>	<i>Average</i>
N:	103	51	37	93
<i>Number of visits</i>				
All services	16.5 ^{2,3,4}	10.3 ^{1,3,4}	7.8 ^{1,2,4}	11.6 ^{1,2,3}
GP	3.0 ⁴	3.0 ⁴	3.5 ⁴	2.3 ^{1,2,3}
Medical specialis	1.2 ³	1.0 ³	0.5 ^{1,2,4}	1.4 ³
Paramedical	9.8 ^{2,3,4}	4.0 ^{1,4}	3.3 ^{1,4}	6.2 ^{1,2,3}
Psychological	1.0 ^{2,3,4}	1.8 ^{1,3,4}	0.1 ^{1,2,4}	0.7 ^{1,2,3}
Alternative healer	1.5 ^{2,3,4}	0.5 ^{1,4}	0.3 ^{1,4}	1.1 ^{2,3}

¹ Score differs significantly from score of group 1 (dysfunctional)

² Score differs significantly from score of group 2 (interpersonally distressed)

³ Score differs significantly from score of group 3 (adaptive coper)

⁴ Score differs significantly from score of group 4 (average)

Table 7 Self care activities, performed by persons from 4-MPI categories at the moment of inclusion (% of patients in group, that carries out activity)

	<i>Dysfunctional</i>	<i>Interpersonally Distressed</i>	<i>Adaptive Coper</i>	<i>Average</i>
N:	103	51	37	93
1) Taking medication	23%	40%	32%	22%
2) Taking rest	76%	67%	50%	68%
3) Swimming	23%	37%	14%	24%
4) Yoga	6%	9%	0%	8%
5) Gymnastics	10%	9%	11%	14%
6) Other	38%	26%	43%	41%
Any of the above	89%	98%	89%	91%
Passive (1 or 2)	79%	81%	61%	76%
Active (3 or 4 or 5)	34%	47%	25%	38%

with respect to temporal characteristics, for dysfunctional patients to report more continuous pain, while others reported relatively more intermittent pain.

The use of health services at the time of inclusion for the four categories is presented in table 6.

Several significant differences were found between the four categories in their use of health services in the past three months. In general, more use of the health services as a whole was made by the dysfunctional patients. They also consulted all practitioners more frequently than the other groups (mostly adaptive copers and average patients). Only mental health services were used more often by another group: the interpersonally distressed patients.

About 85% of the patients who visited their GP, 90% of the patients who visited a medical specialist, 100% of the patients who visited an alternative healer and 75% of the patients who visited a paramedical therapist did this because of their pain. There was no difference in this respect between the four MPI-categories.

Self-care with regard to pain is shown in table 7 for each type of pain patient.

Most of the patients reported at least one kind of activity which they carried out themselves to relieve their pain. We found no differences between the various MPI categories, regardless of whether we grouped self-care activities into active and passive activities, or whether we clustered all categories. It became clear that adaptive copers did not stand out as particularly active performers of self-care activities; neither did dysfunctional or interpersonally distressed patients put more trust in medication or rest than the other groups.

The question remains as to whether dysfunctional patients have the highest level of medical consumption because of their typology, or because of their state of health as such (dysfunctional patients are lower on health parameters than adaptive copers and in some respects average patients). To address this question we analysed the effect of general health (as measured by the SF-36) and typology on the total number of visits. The effects were tested separately and in combination with each other.

Table 8 shows the respective regression equations. Both general health and typology had a significant effect on the number of medical visits, and both effects remained after controlling for each other. It can be seen from the equations that, in comparison with the reference group, dysfunctional patients show a higher level of medical consumption than did average patients, while adaptive copers and average patients have a significantly lower level of medical consumption. The estimates of typology category increased slightly after the introduction of general health in the equation; they all remained significantly different. These

Table 8 Loglinear poisson regression on total number of visits in first quarter

	estimate	sig.
<i>Equation 1 (general health as only determinant)</i>		
General health	.1629	$p < .001$
<i>Equation 2 (Pain typology as only determinant)</i>		
Dysfunctional	.4591	$p < .001$
Interpersonally distressed	-.015	n.s.
Average	.1101	$p < .05$
Adaptive copers	-.295	$p < .01$
<i>Equation 3 (Pain severity and pain typology both as determinants)</i>		
General health	.139	$p < .01$
Dysfunctional	.465	$p < .001$
Interpersonally distressed	.004	n.s.
Average	.146	$p < .05$
Adaptive copers	-.332	$p < .01$

results lead to the conclusion that membership of the dysfunctional patient category has a positive effect on medical consumption, apart from the effect of general health, which for dysfunctional patients is already low.

Graph 1 shows the development of the use of health services over a period of one year.

It can be observed that the difference noted at T1 between dysfunctional patients and the remaining categories remained much the same throughout the following measurement points. During the year, adaptive copers and respondents categorized as "average" had fewer help seeking contacts than people from the dysfunctional category. Multilevel analysis confirmed that neither of the groups showed a statistically significant decline in medical consumption from the moment of inclusion because of their chronic pain. (Table 9)

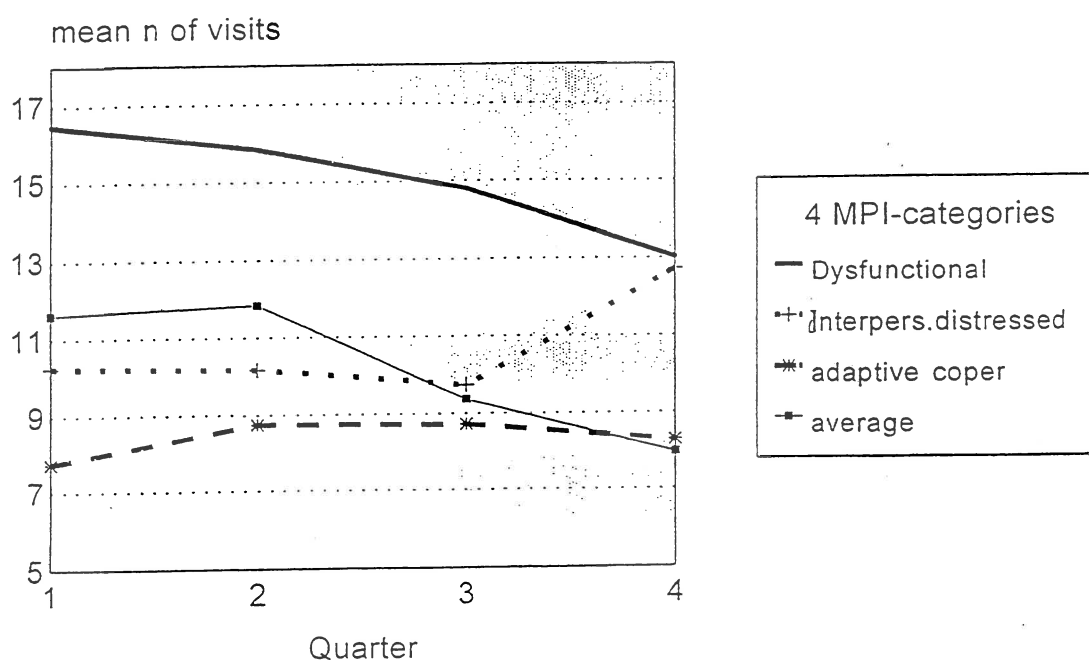


Figure 1 Medical consumption by respondents from 4 different categories, Mean number of contacts (GP, specialist, paramedics, psychological, alternative).

Table 9 Total number of visits: regression coefficients and corresponding standard error of multilevel linear regression model with repeated measurements (T1, T2, T3, T4) within patients

	<i>Coefficient</i>	<i>Standard error</i>	<i>P</i>
Constant	15.32	1.09	
Interpersonally distressed	-4.31	1.38	<.01
Adaptive coping	-6.65	1.60	<.001
Average	-4.52	1.17	<.001
T2	-0.41	1.40	n.s
T3	-1.70	1.25	n.s
T4	-1.98	1.40	n.s

In table 9, the use of health services by the dysfunctional patient at T1 is represented by the constant. Interpersonally distressed patients, adaptive copers and average patients recorded a use of health services at T1 that was 4.31 respectively 6.65 and 4.52 less than dysfunctional patients. All these differences are statistically significant. At T2, these figures should be decreased with .41, etc. Differences between the four points in time are not significant.

DISCUSSION

Patients suffering for at least six months from chronic pain without a demonstrable physical cause were included in the study and followed for a period of one year. The purpose of the study was to identify differences in medical consumption between different types of pain patients. Four hypotheses were formulated specifying our expectations about the characteristics of four different types of pain patients with respect to their medical consumption and coping behaviour.

The first hypothesis was confirmed as far as the high use of health services by dysfunctional patients was concerned. We found less difference than had been expected in medical consumption between interpersonally distressed and adaptive copers, in case of paramedical services and alternative healers. Differences in total counts, use of medical specialists and use of psychological help could be demonstrated. Hypothesis two, concerning more use of psychological help by interpersonally distressed patients, was thereby confirmed.

Hypothesis 3 is rejected. Adaptive copers are in no respect more active in their self-care activities than dysfunctional, or interpersonally distressed persons. The opposite tends to be the case; in most respects the adaptive copers had the lowest scores.

Hypothesis 4, on the stability in time of medical consumption, is confirmed. Dysfunctional patients remained at the top of the rank order and adaptive copers at the bottom. We conclude that better adaptation to pain is no guarantee of a decrease in medical consumption.

Differences in medical consumption between the four categories are mainly in the same direction as differences in health status: adaptive copers have better self-perceived health than dysfunctional patients. Their social functioning, mental health and vitality is also better than that of the interpersonally distressed. This finding is in accordance with earlier reports, indicating a high rate of psycho pathology among dysfunctional and interpersonally distressed patients (Etscheidt, Steger and Braverman, 1995).

The total group of included pain patients had considerably lower scores on all health parameters than patients in other surveys using the SF 36 scales (Aaronson, Muller, Cohen,

Essink-Bot, Fekkes, Sanderman, Sprangers, te Velde and Verrips, 1998; v d Zee, Sanderman and Heyink, 1993). In our study, all scales have lower means than the Netherlands national sample, but also lower than sub samples with migraine and cancer patients. Even cancer patients in a metastatic stage reported better physical functioning, physical role performance, vitality and mental health than our total sample. The adaptive copers (our "best" subgroup) have figures comparable with those of average cancer patients.

Our results differ in one aspect from the results of other studies using the MPI classification. The proportion of respondents that could not be categorized was considerably larger than that reported during the construction of the Dutch Language Version of the MPI. Although the ratios between dysfunctional, interpersonally distressed, adaptive copers and average (35% – 18% – 13% – 32%) in our study are comparable with those reported by Lousberg (35% – 23% – 12% – 27%), we had to categorize more than a quarter as anomalous, while Lousberg only designated 1.8% as such. An important difference in population might account for this difference. Lousberg recruited his respondents in clinical populations or specialized hospital departments, while we recruited our respondents in general practice. Our population might have been substantially more heterogeneous.

Our population has been selected by general practitioners. Hard selection criteria were duration of pain (more than 6 months) and absence of physical diagnosis, such as cancer or arthritis, that might explain the pain. A more subjective criterion was that pain should be serious enough to justify clinical attention. There has been variation between participating doctors with respect to the number of patients included and with respect to the degree in which the GPs considered the pain symptoms medically inexplicable. Such inter-doctor variation is not uncommon, and in fact unavoidable in case of symptoms or diagnoses that lack a clear physical substratum as a benchmark (cf. Verhaak, 1986).

In order to maximize the reliability of patient's self-report, only clearly defined events (such as visits to a doctor or therapist) within a limited time-frame of three months have been included in our questionnaire. Previous research has demonstrated that retrospective questionnaires are as good as health diaries, when a report on health care activities, such as health service contacts, is considered (Verbrugge, 1980). Furthermore, the patients included were familiar with being asked about their health services use every three months and even had a memo pad to note down their visits for the coming quarter.

The study included no planned interventions. Of course, most of the patients included had sought relief for their pain problems, as is demonstrated by the self-care activities in table 7 and by the vast majority of consultations being due to pain. No differences between MPI-categories could be observed for self-care activities. The four categories differed in most aspects on health services use. However, all categories used these services to an equal degree because of pain. We therefore assume that possible interventions were distributed equally over the four MPI-categories.

Our study has been seriously handicapped by the loss of respondents between the several measurement points. It is possible that this loss has led to a bias in our results. We controlled for this bias by non-response analysis and by the statistical procedures we used. Patients who entered the study were not different from patients who were excluded as regards the kind of pain symptoms or the extent of medical explication of these symptoms. Patients excluded from analysis because they were classified as anomalous tended to be older and have a poorer general health perception. Finally, patients who produced data on all measurement points in time were relatively more often female and with a longer pain history.

We dealt with this problem of bias by carrying out multilevel analysis with repeated measurements. In this way we could compensate for selection bias. Second, repeating the

longitudinal analysis with only those patients who had completed four measurements produced the same results: a high level of medical consumption by dysfunctional patients, a low level by adaptive copers, and no decrease in the course of time for any of the groups.

The results of this study indicate that chronic pain is extremely debilitating, given the very low scores on general health perception, functional status and mental health. Nevertheless, such low health status only manifests itself in excessive medical consumption by part of the population of chronic pain patients, the dysfunctional category which is one third of those who could be classified. In fact, it is remarkable that another category, the interpersonally distressed, has a comparably low health perception, as measured by the MOS-SF36, but a medical consumption pattern that more closely resembled the adaptive copers and the average patients, patients with better health perception.

We may conclude that it is possible to distinguish pain patients with different profiles on the basis of the MPI. The differences become manifest in the use of health services (especially the difference between dysfunctional patients and adaptive copers and the special position of interpersonally distressed patients in the case of mental health), they are not reproduced in the self-care activities reported. Insofar as these different profiles are associated with differences in the use of health care facilities, it is not only general health which is responsible for such differences, but also the surplus value expressed in the MPI profiles. It should be stressed that issues in medical help seeking as such are not already incorporated in the MPI questionnaire. None of the 61 MPI-items relate to medical help seeking. The MPI predicts the degree of medical help seeking in a way, but it is not contaminated by it.

From the point of view of health services research, this differentiation made by the MPI is interesting, because it reveals different patterns in the use of health care services. The differentiation is not only explained by specific need factors, such as pain intensity and general health, but also by more generic characteristics, such as the MPI profiles. Dysfunctional patients have a higher medical consumption than interpersonally distressed patients, although their general health is for both categories very poor in all respects. Moreover, MPI-typology added an extra explanation for the number of health care visits to the variance explained by general health.

From the viewpoint of health psychology this surplus value of the MPI is of particular importance. Future research should be directed to further exploration of the relationships between MPI classification and personality characteristics which might be to explain help-seeking behaviour.

Acknowledgment

This study was supported by grant 940-31-033, research program Chronic Diseases/Pain Research of the Netherlands Organization for Scientific Research, Medical Sciences.

References

- Aaronson, N.K., Muller, M., Cohen P.D., Essink-Bot, M.L., Fekkes, M., Sanderman, R., Sprangers, M.A., Velde, A. te and Verrips, E. (1998) Translation, validation and norming of the Dutch language version of the SF-36 Health Survey in the community and chronic disease populations. *Journal of Clinical Epidemiology*, **51**, 1055-1068.
- Bergström, G., Jensen, I., Bodin, L., Linton, S.J., Nygren, A.L. and Carlsson, S.G. (1998) Reliability and factor structure of the Multidimensional Pain Inventory - Swedish Language Version (MPI-S). *Pain*, **75**, 101-110.
- Bryk, A.S. and Raudenbusch, S.W. (1992) *Hierarchical linear models: applications and data management methods*. Newbury Park: Sage publications.

- Crook, J., Rideout, E. and Browne, G. (1984) The prevalence of pain complaints in a general population. *Pain*, **18**, 299–314.
- Engel, C.C., VonKorff, M. and Katon, W.J. (1996) Back pain in primary care: predictors of high health-care costs. *Pain*, **65**, 197–204.
- Etscheidt, M.A., Steger, H.G. and Braverman, B. (1995) Multidimensional Pain Inventory profile classifications and psychopathology. *Journal of Clinical Psychology*, **51**, 29–36.
- Frolund, F. and Frolund, C. (1986) Pain in general practice. *Scandinavian Journal of Primary Health Care*, **4**, 97–100.
- Goldstein, H. (1995) *Multilevel statistical models*. New York: Holted Press (second edition).
- Jensen, M.P., Turner, J.A., Romano, J.M. and Karoly, P. (1991) Coping with chronic pain: a critical review of the literature. *Pain*, **47**, 249–283.
- Jensen, M.P., Turner, J.A., Romano, J.M. and Lawler, B.K. (1994) Relationship of pain-specific beliefs to chronic pain adjustment. *Pain*, **57**, 301–309.
- Kerns, R.D., Turk, D.C. and Rudy, T.E. (1985) The West Haven Yale Multidimensional Pain Inventory (WHYMPI). *Pain*, **20**, 345–356.
- Kerssens, J.J., Verhaak, P.F.M., Bartelds, A.I.M., Sorbi, M.J., Bensing, J.M., Peters, M.L. and Kruise, D.A. The epidemiology of Chronic Benign Pain Disorders in General Practice. Submitted for publication.
- Lousberg, R. (1994) *Chronic Pain. Multi-axial diagnostics and behavioural mechanisms*. Thesis UPM: University of Maastricht.
- McCullagh, P. and Nelder, J.A. (1989) *General Linear Models 2nd ed.* London: Chapman and Hall.
- Mersky, H. (1986) Introduction at Classification of chronic pain. Description of pain syndromes and definitions of pain terms, *Pain Suppl.* S3–S9.
- Potter, R.G. and Jones, J.M. (1992) The evolution of chronic pain among patients with musculoskeletal problems: a pilot study in primary care. *British Journal of General Practice*, **42**, 462–464.
- Stewart, A.L., Hays, R.D. and Ware, J.E. (1988). The MOS hort-form general health survey. *Medical Care*, **26**, 724–35.
- Tulder, M.W., van Koes, B.W., Metsemakers, J. and Bouter, L.M. (1998) Chronic low back pain in primary care: a prospective study on the management and course. *Family Practice*, **15**, 126–132.
- Turk, D.C. and Rudy, T.E. (1992) Classification logic and strategies in chronic pain. In: D.C. Turk and R. Melzack (Eds.), *Handbook of pain assessment* (pp. 409–428). New York: The Guildford Press.
- Turk, D.C. and Rudy, T.E. (1988) Towards an empirically derived taxonomy of chronic pain patients: integration of psychological assessment data. *Journal of Consulting and Clinical Psychology*, **56**, 233–238.
- Vasudevan, S.V. (1992) Impairment, disability and functional capacity assessment. In: D.C. Turk and R. Melzack, *Handbook of pain assessment* (pp. 100–108). New York: The Guildford Press.
- Verbrugge, L.M. (1980) Health diaries. *Medical Care*, **18**, 73–95.
- Verhaak, P.F.M., Kerssens, J.J., Dekker, J., Sorbi, M.J. and Bensing, J.M. (1998) Prevalence of chronic benign pain disorder among adults: a review of the literature. *Pain*, **77**, 231–239.
- Verhaak, P.F.M. (1986) *Interpretatie en behandeling van psychische klachten in de huisartspraktijk. Een onderzoek naar verschillen tussen huisartsen. (Interpretation and treatment of psychological symptoms in general practice. Research into variance between doctors)*. Thesis. Utrecht, NIVEL.
- Zee, K. van der, Sanderman, R. and Heyink, J. (1993). De psychometrische kwaliteiten van de MOS-36 Short Form Health Survey (SF-36) in een Nederlandse populatie. *Tijdschrift voor Sociale Gezondheidszorg*, **71**, 183–191.



057

Electronic diary assessment of pain, disability and psychological adaptation in patients differing in duration of pain

Madelon L. Peters^{a,*}, Marjolijn J. Sorbi^b, Dieta A. Kruise^b, Jan J. Kerssens^c, Peter F.M. Verhaak^c,
Jozien M. Bensing^c

^aDepartment of Medical Clinical and Experimental Psychology, University of Maastricht, P.O. Box 616, 6200 MD Maastricht, The Netherlands

^bDepartment of Health Psychology, University of Utrecht, P.O. Box 80 140, 3508 TC Utrecht, The Netherlands

^cNetherlands Institute of Primary Health Care, P.O. Box 1568, 3500 BN Utrecht, The Netherlands

Received 18 March 1999; received in revised form 19 July 1999; accepted 2 August 1999

ct

puterized diary measurement of pain, disability and psychological adaptation was performed four times a day for 4 weeks in 80 patients with various duration of unexplained pain. Reported are (1) the temporal characteristics and stability of pain report during the 4-week measurement period, (2) the association between pain duration and pain report, disability and general psychopathology, and (3) the difference between diary assessment versus questionnaire assessment of pain, disability and psychological adaptation. No evidence of measurement reactivity was found: pain report was stable across the 4-week period. However, pain report appeared to be highly variable both between and within days. About half the patients showed a clear increasing trend in pain during the day. Several differences were found between subgroups of patients varying in pain duration. Patients with less than 6 months of pain reported significantly less pain intensity, disability and fatigue than patients whose pain persisted for more than 6 months. Pain coping and responses to pain behaviors by the spouse differed for the subgroups: longer pain duration was associated with increased catastrophizing and solicitous responses from the spouse. Comparison of scores obtained with diary versus questionnaire assessment indicated moderate correlations for most variables. Retrospective (questionnaire) assessment of pain intensity yielded significantly higher pain scores than diary assessment. © 2000 International Association for the Study of Pain. Published by Elsevier Science B.V.

Keywords: Chronic pain; Diary assessment; Pain intensity; Pain adjustment; Disability; Temporal characteristics

Introduction

A large number of studies of the chronic pain disorder have been devoted to the identification of psychological factors, contributing to the maintenance of the pain or leading to physical, mental and social aspects of the disability resulting from the pain problem. Pain cognitions, coping factors and spouse responses to pain behavior have been indicated as important determinants. For the most part, conclusions are based on cross-sectional studies that relate one to a few assessments of the relevant attribute. In contrast, the association between a psychological factor and the course of pain or disability has typically been established for groups of patients by means of correlational studies. There have also been some studies relating psychological factors to variations in pain report and well-being in individual patients on the basis of repeated diary

assessments (Linton and Gunnar-Gotestam, 1985; Affleck et al., 1992a,b, 1994, 1996; Geisser et al., 1995; Tennen and Affleck, 1996; Porter et al., 1998). However, these studies were confined to only a few variables, and a more comprehensive assessment within patients of psychological functioning in relation to pain intensity and disability is called for. We therefore employed intensive diary assessments of reported pain intensity and disability, and of pain cognitions, pain coping and spouse responses to pain behavior to study the associations between these variables as well as their temporal characteristics in patients varying in pain duration.

The pain taxonomy of the International Association for the Study of Pain (Merskey, 1986) includes standards for the temporal characteristics of pain: pain can be (1) continuous or nearly continuous – non-fluctuating; (2) continuous or nearly continuous – fluctuating; (3) recurring, irregularly; (4) recurring, regularly; (5) paroxysmal; or (6) sustained with superimposed paroxysms. How pain intensity actually fluctuates within days or across several days has not been

*Corresponding author. Tel.: +31-43-388-1603; fax: +31-43-367-0968.
E-mail address: madelon.peters@dep.unimaas.nl (M.L. Peters).

studied much. In order to verify actual temporal pain characteristics diary assessments seems best suited, although a potential limitation of diary assessments is reactivity to the repetitiveness of the recording. Pain report may either increase due to sensitivity (Affleck et al., 1991; Cruise et al., 1996) or it may decrease due to response fatigue, which could both be induced by the daily measurement. The studies concerned with this issue measured pain once a day (Affleck et al., 1991; von Baeyer et al., 1994) for 7 days (von Baeyer et al., 1994; Cruise et al., 1996) or 2 weeks (Kerns et al., 1988) and produced no evidence for both types of reactivity to the diary measurement. The present study again addresses the issue of reactivity, since this phenomenon may still occur with a more extended time schedule of several weeks and a higher density of recording of several assessments per day.

Investigations of the fluctuations of pain intensity within one day yielded systematic trends during the course of the day (Glynn and Lloyd, 1976a,b; Jamison and Brown, 1991): Most frequent was an increase in pain intensity from the morning to the evening (Glynn and Lloyd, 1976a,b; Jamison and Brown, 1991), but a U-shaped trend was also found with pain being worst both in the morning and in the evening (Jamison and Brown, 1991; Vendrig and Lousberg, 1997). The largest increase in pain over the day occurred in female patients and in patients who did not work out of house (Glynn and Lloyd, 1976a,b), while patients who exhibited no trend in pain over the day were found to be more emotionally distressed (Jamison and Brown, 1991). In the present study, trends in pain will be explored across the 4 weeks of diary recording and will be investigated within days, while controlling for the impact of gender, work status and emotional distress as potential predictors of the daily trend.

Pain report usually increases with the progression from the acute to the chronic pain state (Sedlak, 1985; Burton et al., 1995; van der Kloot et al., 1996) and patients with persisting pain were shown to have suffered from more severe pain in the acute phase than patients whose pain resolved (Potter and Jones, 1992; White et al., 1997). Whether pain duration is also related to temporal characteristics of pain is unknown. More evidence has been obtained for a positive association between pain duration and increased disability and general psychopathology (Sedlak, 1985; Vallfors, 1985; Iezzi et al., 1992; van der Kloot et al., 1996). One exception to these findings are the results of Philips and Grant (1991), who found that pain, sickness impact and downtime decreased, and exercise increased, 3 and 6 months after the onset of the pain. Furthermore, pain duration was found to be related to less adaptive coping with pain: Burton et al. (1995) compared patients who suffered from pain for, respectively, 3 weeks and 3–52 weeks and found increased ‘catastrophizing’ of the pain problem in the patients with longer pain duration. The present study examines the impact of pain duration by comparing patients, who had suffered from pain for 3–6 months, for 6–12 months and

for longer than 12 months with regard to pain intensity temporal characteristics of pain, coping with pain, disability and general psychopathology.

The choice of constructs formulated in the diary of this study relied to a large extent on findings from questionnaires used in cross-sectional studies of pain. Diary measurements reflect the actual state of the subject and adequately capture variables, characterized by constant change, such as pain or mental and behavioral aspects of psychological functioning, which largely depend on the context of the moment or situation (Stone and Shiffman, 1994). Psychological questionnaires, in contrast, aim to represent more stable personality characteristics. It is therefore of interest to investigate to what extent and for which constructs the diary scores are in accordance with those obtained with psychological questionnaires. Two studies investigated the association between diary measures and scales of the Multidimensional Pain Inventory (Flor et al., 1991; Lousberg et al., 1997). With the exception of substantial association between MPI pain severity and the average pain intensity in the diaries of $r = 0.75$ and $r = 0.61$ respectively, the associations were weak or not statistically significant. To our knowledge the association between cross-sectional and diary measures of coping with pain and of disability have not as yet been established. Our study offers the opportunity to investigate these associations, since it included questionnaire and diary measures of these constructs.

The research questions of the present study can be summarized as follows.

1. Is pain report stable during 4 weeks of high-density diary recording in patients with (sub)chronic pain and what are the temporal characteristics of pain during the day?
2. Is pain duration associated with pain intensity, temporal characteristics of pain, coping with pain, disability and general psychopathology?
3. What is the accordance between intensive diary assessments and scores from cross-sectional questionnaires on the same constructs in patients with (sub)chronic pain?

A subsequent paper will review the within-subject associations between the variables and the psychosocial predictors of pain report and disability.

2. Methods

2.1. Subjects

Eighty male and female patients who had suffered from pain without an established cause for at least 6 weeks and were aged between 18 and 60 years were recruited for participation in the study. Subjects were required to have good command of the Dutch language and to be capable of operating a hand-held (palmtop) computer. Recruitment continued until 80 patients with valid diary data were recruited.

consisting of two groups of 40 patients matched for pain duration, sex, age and education with a pain duration of (1) shorter than or equal to 12 months or (2) longer than 12 months. Seven subjects were excluded in the process of recruitment due to insubstantial pain or problems in keeping diary.

Of the 80 participants, 44 were recruited from a larger sample of patients ($n = 344$) participating in a national survey study of the prevalence of CBPD among adults in general practice in the Netherlands (Kerssens et al., submitted). Recruitment was also conducted through physiotherapists ($n = 30$) and a newspaper announcement ($n = 6$) in order to find enough patients with a pain duration less than 12 months. In the two groups, mean pain duration was 7.2 months and 125.6 months, respectively.

In order to establish whether the participants in the diary represented the CBPD patients in the Netherlands, the sociodemographic and pain characteristics were compared to the sample of the CBPD survey study. Data are shown in Table 1.

Both the diary and the survey sample comprised more women than men, and the proportion of women did not significantly differ between the samples (Fisher's exact $P = 0.269$). Marital status was comparable but – due to the age restriction of 60 years – patients in the diary study were significantly younger than those in the survey sample ($P = 0.01$). In addition, patients in the diary sample had a lower education (chi-square = 10.6, $P = 0.032$), were less retired (chi-square = 14.1, $P = 0.007$) and as a consequence of the deliberate selection of patients with a relatively short duration of pain for the diary study, had pain of significantly shorter duration ($P < 0.001$). Last, the diary study included more patients with pain in the neck and back than the CBPD sample of the survey study, a difference due to the recruitment through physiotherapists, who see many patients with these particular types of pain.

In order to assess the association of pain duration with other disease variables (see Table 2), the group with pain shorter than or equal to 12 months was broken down into patients who had suffered from pain from 3–6 months ($n = 15$) and 6–12 months ($n = 25$). These two subgroups were again comparable with respect to age, sex and marital status.

Education was somewhat higher in the patients with pain for 3–6 months and they worked full-time more often, these differences were not significant. Table 2 displays characteristics of pain, medication use and comorbid conditions of the patients with pain duration shorter than 12 months, 6–12 months and longer than 12 months. Severity according to the MPI was equal in the three groups of patients, but pain location according to the IASP classification differed: compared to both groups with pain shorter than or equal to 12 months, considerably more patients with pain longer than 12 months reported pain in more than one major sites of the body. Most of these patients were also affected with fibromyalgia. The use of analgesic and other medications was similar for all patients; about half of

Table 1

Comparison of the diary sample to the general population of CPD patients in the Netherlands

	Diary sample ($n = 80$)	Survey sample ($n = 344$)	Difference
Pain duration (months) ^a	66.4 (86.0)	133 (143)	$P < 0.001$
Age (years) ^a	40.6 (6.7)	48.0 (12.9)	$P < 0.001$
Sex (%female)	78%	71%	$P = 0.269$
Marital status			$P = 0.408$
Single	6.2	7.8	
With partner	86.3	78.1	
Separated	5.0	8.4	
Widowed	2.5	5.7	
Education			
College	8	10.7	$P = 0.032$
Trade school/business	35	18.9	
High school	19	25.9	
Vocational training	27	29.9	
Elementary school	11	14.6	
Employment			
Full time	18.8	22.3	$P = 0.007$
Part time	21.2	20.3	
Disability pension	40.0	34.6	
Retirement	0.0	11.5	
Unemployed/homemaker	20.0	11.2	
IASP classification			$P < 0.001$
Head/face/mouth	6.5	12.0	
Cervical	32.5	10.9	
Shoulders/upper limbs	14.3	14.7	
Thoracic	0	6.8	
Abdominal	3.9	5.8	
Lower back/spine	22.1	14.0	
Lower limbs	6.5	12.8	
Pelvic	0	1.0	
Anal/genital	0	1.6	
More than 3 major sites	14.3	20.5	

^a Mean (SD).

the patients used non-steroid analgesics while opioid analgesics were hardly used. Co-morbid physical conditions occurred in all groups, with 11 patients having two ($n = 9$) or more ($n = 2$) diseases in addition to the pain.¹

2.2. Measurement

2.2.1. Cross-sectional questionnaires

At the start of the study sociodemographic data and IASP classification of the pain problem were obtained and patients completed the Multidimensional Pain Inventory-Dutch version (MPI-DLV; Kerns et al., 1988; Lousberg et al., 1999), a shortened version of the SF-36 health survey (Ware and Sherbourne, 1992; Ware et al., 1993), and the Brief Symptom Inventory (BSI, Derogatis and Melisaratos,

¹ Differences between the groups in pain location, medication and comorbidity were not tested for significance as the expected numbers per cell were too small to allow for Chi-square testing.

Table 2
Pain characteristics, medication use and co-morbid conditions in the diary sample

	3–6 months (<i>n</i> = 15)	6–12 months (<i>n</i> = 25)	> 12 months (<i>n</i> = 40)	Total group (<i>n</i> = 80)	Difference
Pain duration (in months) ^a	4.3 (0.8)	8.9 (2.5)	125.6 (88.9)	66.4 (86.0)	<i>P</i> < 0.00
MPI pain severity ^a	4.1 (1.8)	4.0 (1.0)	4.2 (1.4)	4.1 (1.3)	<i>P</i> = 0.82
<i>IASP classification (%)</i>					
Head/face/mouth	6.7	0	10.5	6.5	
Cervical	40.0	37.5	23.7	31.2	
Shoulders/upper limbs	33.3	12.5	5.3	13.0	
Thoracic	0	0	0	0	
Abdominal	0	8.3	2.6	3.9	
Lower back/spine	13.3	25.0	21.1	20.8	
Lower limbs	0	8.3	5.3	5.2	
Pelvic	0	0	0	0	
Anal/genital	0	0	0	0	
More than 3 major sites	6.7	8.3	31.6	19.5	
<i>Use of medications (n)</i>					
Non-opioid analgesics	8	14	21	43	
Opioids	1	1	2	6	
Anti-migraine	0	1	2	3	
Antidepressant	2	2	3	4	
Sedatives	2	4	5	11	
Miscellaneous ^b	4	2	12	18	
<i>Co-morbid conditions (n)</i>					
Hypertension	1	1	7	9	
Cardiac problems	0	2	1	3	
Asthma	2	2	4	8	
Chronic bronchitis	0	0	2	2	
Allergy	2	3	2	7	
Stomach/intestinal	1	2	6	9	
Diabetes	0	2	1	3	
Hyperthyroidism	0	2	0	2	
Epileptic condition	0	0	1	1	

^a Mean (SD).

^b For asthma (5), stomach/intestines (4), epilepsy (2), hypertension (1), coughing (4), infection (1) and hormones (1).

1983), the shortened version of the SCL-90. The Coping Strategy Questionnaire (CSQ, Rosenstiel and Keefe, 1983; Dutch version: CPV, Spinhoven et al., 1994) was incorporated in the study design in a later phase and consequently completed by subjects 6 months after filling out the first set of questionnaires.

The MPI contains 12 scales for 'pain severity', 'interference of pain with daily activities', 'life control', 'affective distress', 'social support', spouse responses to pain behavior in terms of 'punishing responses'/'solicitous responses'/'distracting responses', 'household chores', 'outdoor work', 'social activities' and 'general activities'. The MPI also allows for a classification of pain patients as either the 'Dysfunctional', 'Interpersonally Distressed', 'Adaptive Coping' or 'Average' type. Patients without a spouse (*n* = 2) could ignore the spouse response scales, and accordingly were also omitted from the final MPI classification. Ten items of the SF-36 that were already covered by other instruments in this study were excluded. The scales included were: 'physical functioning', 'social functioning', 'role functioning', 'mental health', 'vitality' and 'subjective health'. The BSI assesses 9 aspects of psychological functioning: 'somatization', 'obsessive-compulsiveness', 'inter-

personal sensitivity', 'depression', 'anxiety', 'hostility', 'phobic anxiety', 'paranoid ideation' and 'psychotism'. Finally, the CSQ evaluates the use of 6 cognitive coping strategies: 'diverting attention', 'reinterpretation of pain', 'positive self-talk', 'ignoring/denying pain', 'praying and hoping' and 'catastrophizing'.

2.2.2. ESM measurement and diary

Data were collected for 4 weeks by means of the Experience Sampling Method (ESM) (Delespaul, 1995). ESM is a signal-controlled diary method for the repeated recording of momentary state measures within the real-life environment. It is particularly valuable for the investigation of the dynamics of physical, mental and behavioral processes and their interactions, because of the large number of measurements, prompted by a randomized beep signal. ESM is unbiased by anticipation or retrospection, unobtrusive and comes closest to a direct in vivo observation of a subject or patient (de Vries, 1992; de Vries and Delespaul, 1993).

For the present study, the ESM-diary was implemented on a palm-top computer (PTC), shown to be well suited for ESM research (Affleck et al., 1996; Sorbi et al., 1996).

Table 3
Representation of scales of the MPI, SF-36 and CSQ in the ESM-diary

Scale of questionnaires	Corresponding items in the ESM-diary
Pain severity	How much pain do I experience right now?
Interference of pain in daily activities	(What was I doing at the time of the beep?) My pain hindered me in doing this
Affective distress	Right now I feel depressed
Social support	I am satisfied about the support I experienced today (evening diary)
Punishing responses	He/she is annoyed with me
Solicitous responses	He/she is particularly kind ^a He/she spares me He/she takes over duties He/she takes care of me
Distracting responses	He/she encourages me to go on He/she encourages me to be active
Physical functioning	Right now I am capable of sitting ^a Right now I am capable of standing Right now I am capable of walking Right now I am capable of climbing a stair Right now I am capable of running Right now I am capable of performing activities that are moderately strenuous (such as vacuum cleaning) Right now I am capable of performing activities that are highly strenuous (such as moving furniture)
Role functioning	I am satisfied with how I dealt with my work/with household chores today (evening diary) I am satisfied with how I dealt with my family or with my partner today (evening diary)
Vitality	Right now I feel tired Right now I feel burned-out
Catastrophizing	Right now I think it is terrible to have such pain ^a Right now the pain is too much for me Right now I feel that I will never be well again
Ignoring/denying pain	Right now I ignore the pain ^a Right now I just go on in spite of the pain
Positive self-talk	Right now I keep my spirits up
Diverting attention	Right now I distract my attention from pain by thinking of other things

^aComposite score of these items was made.

In the CSQ only 4 of the 6 cognitive scales were represented in the diary.

to increase the reliability of ESM by controlling the times, by preventing the subject to review own diary and by registering the exact signal and response as well as the number of missing recordings. Our

patients were prompted four times per day by a beep signal that occurred randomly within 4 pre-determined time frames between 08:00 and 21:30 h. Unanswered signals were repeated after 5 min, and if still not responded to were coded as missing recordings. In case of inconvenience (e.g. when attending church or a concert), subject could voluntarily skip one beep in succession. In addition to the recording of 4 signal-controlled diaries per day, the subject was requested to activate the PTC immediately after waking up and before going to sleep to keep a morning diary and evening diary, respectively.

Pain intensity was measured in all of the diaries. In addition, the signal-controlled diary (84 items) measured pain cognitions, pain coping, responses to pain behavior by significant others and aspects of disability; the morning diary (12 items) assessed sleep quality and the evening diary (30 items) assessed sickness leave, medical consumption and satisfaction with role functioning. All items were formulated according to ESM premises, i.e. mimicking the internal dialogue of the respondent (e.g. 'right now, I feel...'). Where possible, the diary items were adapted from questionnaire items: each scale of a given questionnaire was usually represented by one or a few items; several questionnaire items, however, which either overlapped or were too detailed, were aggregated into one item. Table 3 shows the scales of the MPI, SF-36 and CSQ that were represented in the ESM-diary and how these were translated into ESM-items.

Most items were answered on 7-point scales, anchored: 1 = not at all, 4 = moderate, 7 = very much, or 1 = none, 4 = moderate, 7 = severe for pain intensity. A randomly changing response option of the scale was highlighted when an item occurred on the screen of the PTC and subjects could respond by scrolling across the scale and press the enter-key. Yes/no answers were also used and provided by pressing 'Y' or 'N'; open-answers were incidentally required and could be typed in on the keyboard. Each diary ended with an opportunity for comments and with thanks for the recording. The appearance of many items depended upon the presence of pain; other items depended on the presence of significant others. Because of this conditional occurrence, the number of items presented in the signal-controlled diary ranged between 31 and 84. The total diary took about 5 min to complete. A pilot study with 4 CBPD patients demonstrated the feasibility of the method and proved that the procedure was well-tolerated (Peters and Sorbi, 1997).

2.3. Procedure

Participants were visited at home by one of the researchers for a 1-hour instruction and demonstration of the PTC and ESM-diary. After explaining the general procedure and obtaining an informed consent from the subject, the diary was practiced and difficult questions were discussed. Hereafter, the PTC with the diary, four spare batteries, an extra

RAM-disk, two pre-stamped return envelopes and a manual for the PTC diary were left with the subject. Telephonic assistance was made available in the case of problems and participants were contacted by telephone 2–3 days later for a briefing. After 2 weeks of data collection, the subject was prompted in the morning diary to change the RAM-disks. The first RAM-disk was mailed to the researchers, who checked the quality and quantity of the data. The subjects were then contacted by phone for a second briefing, in which feedback regarding their data was provided and general inquiries about the proceedings were made.

After 4 weeks of diary recording one of the researchers collected the PTC and a debriefing interview was held about the general experiences of the subject, significant events during the sampling period and problems encountered with the diary. All subjects received a remuneration of 100 Dutch guilders.

The quality and quantity of the total data set per subject were checked again, subjects with invalid data ($n = 7$) were excluded and recruitment continued until two matched groups of 40 patients were complete.

2.4. Characteristics of the diary data

All 80 subjects considered the 4-week period of diary recording as representative of their normal life, according to the debriefing interviews. The mean number of diary entries was 108.4 (range 41–140, see Table 4): 79 subjects produced 77–140 entries while one subject, who encountered an exceptionally large number of technical problems and was therefore dismissed after 2 weeks, had only 41 entries. The PTC was carried for exactly 4 weeks by 74 subjects, three subjects carried it between 3 to 4 weeks and two subjects carried it somewhat longer than 4 weeks to compensate for missed diaries. Table 4 displays the mean numbers of the three types of diary entries as well as the numbers and percentages of diaries not recorded due to, respectively, technical problems with the PTC, unanswered signals and signals skipped voluntarily by the subject.

About 12% of the signals were either skipped or not responded to, while 5.1% were missing due to technical problems with the PTC, such as empty batteries or errors made when exchanging the RAM-disks. This left us with a total of 7146 recorded signal-controlled diaries (mean 89.3,

range 30–115). No information was obtained about the reasons for non-response to signals. Inspection of missing data revealed that non-response was not related to time of day; quite often two or more beeps in succession were missed, suggesting that the PTC may have been left home while patients were away.

The mean number of both the morning and evening diaries was 27.2 (range 13–35); 4.4% of morning diaries and 5.7% of evening diaries were skipped by the subjects and comparable percentages of entries (3.5% and 4.4%, respectively) were lost due to technical problems. Completed were 1979 morning diaries (mean: 24.7; range: 4–32) and 1937 evening diaries (mean: 24.2; range: 4–32). The most probable reason for skipping morning and evening diaries is forgetting: patients were not signaled for these diaries.

2.5. Data analysis

All analyses were performed using SPSS 7.5.3 (SPSS Inc. 1996). Stability of pain intensity during the 4 weeks of diary recording was tested by means of ANOVA for repeated measurements with 'week' as the within-subject factor. Linear trending of pain intensity during one day was tested by regressing standardized pain intensity data (z -score transformation) on time of day in hours for all subjects. In addition, for each individual patient the presence of first, second and third order trends was established using a curve fitting procedure. Chi-square analyses were used to test whether the presence or absence of trending could be related to pain duration.

Between-group differences on cross-sectional assessments were tested with ANOVA. Bonferroni pair-wise post hoc comparisons were applied to significant between-group differences. Multilevel analyses (MLN; Bryk and Raudenbush, 1992; Goldstein, 1995) were employed to assess between-group differences in the ESM-diary assessments. Multilevel models are designed to analyze variables at different levels simultaneously using a statistical model that includes the various dependencies. The present analyses accounted for three levels of variance (time, day, subject) in the signal-controlled diary and for two levels of variance (day, subject) in the evening diary. The three patient groups were coded by means of two dummy variables in such a way

Table 4
Numbers of diary entries and percentages of missing values in the diaries

Numbers of diary entries and percentages of missing values in the diaries					
		Number of diary entries	Missing diary entries due to		
			Technical problems	Voluntarily skipped signals	Unanswered signals
Signal-controlled diaries	Mean	108.4 (41–140)	5.5 (0–27)	1.7 (0–22)	11.6 (0–49)
	%		5.1% (0–25.7)	1.5% (0–19.6)	10.6% (0–44.1)
Morning diaries	Mean	27.2 (13–35)	0.9 (0–7)	1.2 (0–10)	
	%		3.5% (0–25.9)	4.4% (0–35.7)	
Evening diaries	Mean	27.2 (13–35)	1.2 (0–14)	1.6 (0–23)	
	%		4.4% (0–52)	5.7% (0–85.2)	

Table 5
Pain intensity, missing diaries and diaries with no pain in the 4 weeks of diary recording

	Pain intensity, mean (SD)	Total missing sc-diaries ^a (%)	Skipped sc-diaries (%)	sc-diaries with no pain (%)
Week 1	3.67 (1.98)	8.2	0.95	26.5
Week 2	3.66 (2.03)	10.9	1.93	28.9
Week 3	3.70 (2.04)	10.2	1.65	29.2
Week 4	3.61 (2.08)	13.0	1.80	29.3

sc-diaries: signal-controlled diaries.

(1) the group with 3–6 months of pain was compared to groups with pain for 6–12 and longer than 12 months (2) the groups with pain for 3–6 and 6–12 months were compared to the group with pain longer than 12 months. In order to eliminate the variance induced by time per se, the data set was controlled for potential linear and U-shaped trends in the time-of-day prior to these comparisons. In addition, the accordance between ESM- and cross-sectional assessments was tested by computing Pearson's rank correlations between the scores on the respective questionnaire subscales and the averaged diary scores representing the same constructs (see Table 3). The MPI subscales on spouse behaviour were correlated to the respective diary items only on the occasions that the spouse was present, i.e. responses to items by another person were disregarded.

Results

Mean pain intensity, stability of pain recording and temporal characteristics of pain during the day

The mean pain intensity in the 7146 signal-controlled diaries was 2.66 (SD: 2.0).² There were large differences between patients: mean pain intensity ranged from 0.4 to 6.0. No pain was recorded in 0–88% (mean: 29%) of the signal-controlled diaries. Twenty-one patients (26%) recorded pain in all of their diaries, while 26 patients (34%) were free of pain in half or more of their diary recordings.

Regarding the stability of pain recording addressed in research issue 1, Table 5 provides the means for pain intensity, the percentages of missing diary recordings and diaries with no pain per week.

No significant effect of week on pain intensity was found ($F(3, 7144) = 0.446$, $P = 0.50$).³ There was, however, a small but significant linear increase in both the percentage of missing diaries ($F(3, 73) = 7.15$, $P < 0.001$, linear trend: $F(1, 73) = 12.4$, $P = 0.001$) and the percentage of skipped diaries ($F(3, 73) = 3.0$, $P = 0.036$, linear trend: $F(1, 73) = 5.25$, $P = 0.025$). The percentage of pain-free

diaries also increased somewhat, but this did not reach significance ($F(3, 73) = 0.95$, $P = 0.423$).

Regarding the temporal characteristics of pain during the day, the second part of research issue 1, standardized pain intensity scores were plotted against time of the day for all patients. This revealed a systematic linear trend, with more severe pain occurring later in the day. Linear regression showed that hour of the day significantly predicted pain intensity ($\beta = 0.155$, $P < 0.001$). The trend was also supported by comparison of the average morning and evening pain scores with each of the pain intensity means per hour of the day: mean pain intensity in the morning was lower (mean = 2.3, SD = 2.0), whereas mean pain intensity in the evening was higher (mean = 3.1, SD = 2.1) than all of the mean pain intensity scores per hour.

However, not all patients showed an increase of pain intensity during the day: a significant linear trend of increased pain intensity occurred in 38 and of decreased pain intensity in two subjects; a significant U-shaped trend was found in two subjects and no significant trend was found for the remaining 38 subjects. In the light of previous findings, we then tested whether differences between individuals in trending could be ascribed to emotional distress (BSI), sex or work status: the trending in pain intensity during the day had no association with, respectively, distress (BSI), sex and work status, nor did we find any significant difference in daily trends in pain intensity between, respectively, male and female patients or patients who did and did not work outside of the house (respective betas were 0.14 for men, 0.16 for women, 0.16 for work and 0.15 for no work).

3.2. Comparison of patients varying in pain duration

Research issue 2 concerns the association between pain duration and various aspects of the pain problem, disability and general psychopathology. The three patient groups were first compared with regard to their scores on the cross-sectional questionnaires. The CSQ was not used in this comparison as it was administered 6 months later, when most patients had already entered the chronic phase. Significant differences between the groups were found for the subscales 'Interference of pain with daily activities' (MPI), 'physical functioning' and 'subjective health' (both SF-36) and 'obsessive-compulsiveness' (BSI). Post-hoc comparisons showed that patients with pain for 3–6 months

² With 0 = no pain and 6 = severe pain. For purposes of comparison with the MPI pain severity scale, the ESM scale (1–7) was recorded to a scale.

³ Analyses are based on 76 subjects for which 4 weeks of data-collection were available.

showed less interference, better functioning and less obsessive compulsiveness than patients with pain for more than a year. Subjective health was best in patients with pain for 6–12 months and they differed significantly from patients with pain of longer duration. It should be noted that for only four of the 27 subscales tested significant differences between patient groups were found; if correction for multiple comparisons would have been applied statistical significance is lost.

Research issue 2 also covers the between-group differences of several of the above constructs as measured with the ESM-diary (see Table 3). First, between-group differences were tested regarding the trends in pain intensity during the course of the day, which were reported earlier. Chi-square analyses showed that the presence or absence of trending in pain intensity, as well as the slope of the curves representing these trends, did not significantly differ between the groups (respective beta's were 0.13, 0.18 and 0.15). Fig. 1 provides a graphical presentation of the pain intensity curves per group over the day. Multilevel analysis (MLN) was used to test for differences on the other constructs measured in the diary. Table 6 summarizes the results.

Measurement with the ESM diary revealed that patients with longer pain duration reported a significantly higher pain intensity, averaged per day and calculated separately for the morning and evening diaries. Patients with pain for 3–6 months reported a significantly lower pain intensity than the two other groups. For exploratory reasons, we also tested whether patients with pain in more than three major sites of the body ($n = 15$) differed from patients with pain in less than three major sites ($n = 65$). Pain in more than three sites was associated with a non-significant increase in pain intensity averaged per day and a non-significant increase in pain in the morning and in the evening. As the above reported effect of pain duration may have been confounded by number of pain sites (more than three major

sites was found most frequently in patients with more than 12 months of pain), the analysis was repeated for patients with less than three major sites only. For total pain during the day the group difference now just failed to reach significance (chi-square = 3.5, $df = 1$), but pain in the morning and evening diary was still significantly different for patients with less than 6 months pain in comparison to the other groups.

The MLN also revealed that patients with a pain duration of more than one year experienced significantly more solicitous and more distracting responses to their pain from spouses than patients with pain for 3–12 months. In accordance with the significant between-group differences in physical functioning as measured with the SF-36, physical capacity measured with the ESM-diary also showed a significant difference. Patients with pain for 3–6 months reported significantly better physical capacity than patients with pain duration of 6 months or longer. In addition, patients with pain for 3–6 months experienced significantly more vitality than the other patients.

Between-group differences in pain coping could not be assessed with the CSQ, but 4 of the 6 CSQ strategies were covered by the ESM-diary (see Table 3). According to the diary recordings patients with pain for 3–12 months catastrophized their pain to a lesser degree but also ignored and denied their pain less than patients with pain persisting for 12 months or longer.

3.3. Accordance between ESM-diary assessments and cross-sectional questionnaires

In order to answer research issue 3, correlation coefficients were computed between averaged diary score per subject and the questionnaire score of the same construct. For each subject the mean pain intensity was calculated separately on the basis of the signal-controlled diaries, the morning diaries and the evening diaries. In addition, a mean overall pain intensity score was established by averaging the mean intensity scores for the morning diaries, the signal-controlled diaries and the evening diaries. These four averaged pain intensity diary scores were then correlated with the MPI pain severity score, obtained most proximate in time to the diary recordings.⁴

Pain severity according to the MPI was significantly higher than overall pain intensity in the diary (4.0 vs. 2.8, paired $t = 6.21$, $df = 62$, $P < 0.001$): a scatter plot showed that almost every subject reported more severe pain on the MPI than in the diary. In addition, MPI pain severity correlated significantly but moderately with mean pain intensity in the diary (overall: $r = 0.40$; signal-controlled diary: $r = 0.40$; morning diary: $r = 0.34$; evening diary: $r = 0.34$).

⁴ The MPI was filled out every 3 months. The MPI-item for 'pain severity' covered pain intensity 'during the last week'. Since pain intensity may change over time, the analysis was restricted to the MPI scores of 63 subjects, which were obtained no longer than 4 weeks before or after the diary sampling period.

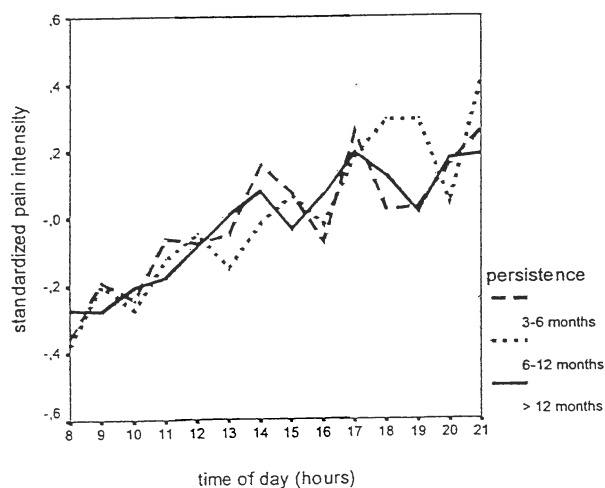


Fig. 1. Comparison of the temporal course over the day of standardized pain intensity z-scores according to pain duration in the diary sample.

Table 6
Comparison of the diary scores representing scales of the MPI, SF-36 and CSQ according to pain duration in the diary sample^a

	Group 1, 3–6 months	Group 2, 6–12 months	Group 3, > 12 months	Chi-square ^b
Pain intensity per day	1.91 (1.57)	2.76 (1.82)	2.83 (1.73)	4.5 ^{1/2,3}
Ignoring pain intensity	1.32 (1.71)	2.34 (2.04)	2.57 (1.97)	8.4 ^{1/2,3}
Interfering pain intensity	2.20 (2.00)	3.44 (2.08)	3.21 (2.05)	5.1 ^{1/2,3}
Interference of pain	3.43 (1.66)	3.43 (1.84)	3.57 (1.81)	ns
Affective distress	1.89 (1.21)	1.99 (1.39)	2.24 (1.56)	ns
Social support	5.16 (1.39)	4.91 (1.45)	5.08 (1.70)	ns
Soliciting responses	1.19 (0.61)	1.18 (0.71)	1.27 (0.81)	ns
Solicitous responses	7.61 (6.65)	7.75 (7.00)	9.85 (8.17)	6.1 ^{1,2/3}
Distracting responses	3.51 (3.08)	3.08 (2.38)	4.23 (3.47)	5.2 ^{1,2/3}
Physical capacities	4.49 (1.08)	3.98 (1.34)	3.75 (1.24)	4.0 ^{1/2,3}
Satisfaction work	4.60 (1.42)	4.40 (1.60)	4.41 (1.61)	ns
Satisfaction family	5.52 (1.38)	4.61 (1.65)	4.99 (1.61)	ns
Burn-out	2.65 (1.56)	3.39 (1.88)	3.36 (1.84)	4.4 ^{1/2,3}
Catastrophizing	9.17 (3.67)	9.94 (4.03)	11.42 (3.95)	5.4 ^{1,2/3}
Ignoring/denying	3.25 (1.69)	3.17 (1.61)	4.13 (1.83)	6.1 ^{1,2/3}
Positive self-talk	3.61 (1.56)	3.70 (1.80)	3.74 (1.96)	ns
Diverting attention	4.69 (1.33)	4.19 (1.60)	4.16 (1.80)	ns

^aValues are mean (SD).

^bA chi-square of 3.84 or above with *df* = 1 is significant at *P* < 0.05. ^{1/2,3} signifies that group 1 differs significantly from groups 2 and 3. ^{1,2/3} signifies that groups 1 and 2 differ significantly from group 3.

0.43). These moderate correlations may be due to the lag between both types of measurement, even though it was never longer than 4 weeks. The analysis was therefore repeated for 12 subjects who had filled out the MPI during the 4 weeks of diary recording, selecting the diary items of the week, covered by the MPI measurement: the correlation for overall pain improved to $r = 0.70$ ($P = 0.01$), but relied heavily on two subjects, one with no pain and one with maximum pain on both instruments. In most subjects overestimated pain on the MPI as compared to the diary, but the difference was no longer significant (4.0 vs. 3.3, $t = 1.83$, *df* = 11, $P = 0.095$). Significant but moderate correlations with the diary items were also obtained for most of the remaining MPI items: $r = 0.34$ for 'interference of pain with daily activities', $r = 0.42$ for 'affective distress', $r = 0.51$ for 'social support', $r = 0.53$ for 'solicitous responses' and $r = 0.53$ for 'distracting responses'. The MPI scale for 'punishing responses' did not correlate significantly with the diary item supposed to capture this aspect. Of the SF-36 scores 'physical functioning' correlated significantly with the mean score of the diary items for 'physical capacities' ($r = 0.73$). The scale 'role functioning' correlated significantly ($r = 0.38$) with the diary item for 'satisfaction with dealing with work or household', but not with 'satisfaction with dealing with family or partner'. The SF-36 vitality scale correlated moderately but significantly with diary items for fatigue ($r = -0.34$) and burn-out ($r = -0.33$). The CSQ scale 'catastrophizing' correlated considerably with the composite diary score for 'catastrophizing' ($r =$

-0.66), while moderate correlations of $r = 0.41$ were found between the CSQ scales 'diverting attention' and 'ignoring/denying pain' and the respective diary items. 'Positive self-talk' yielded no significant correlation.

4. Discussion

The present study employed a 4-week electronic ESM-diary to study temporal characteristics of pain intensity in patients differing in duration of unexplained pain. The procedure was easily accepted and well tolerated by the subjects and produced reliable recordings: the 4 weeks of diary measurement accurately represented normal life in all subjects. The response rate of 88% is comparable to previous studies using electronic ESM-diaries (Shiffman et al., 1994; Sorbi et al., 1996), although the use of a financial reward for each completed diary yielded response rates as high as 99% (Affleck et al., 1996, 1998). Nevertheless, in view of the relatively long period of sampling and the substantial number of questions per diary, compliance can be considered good. Importantly, missing observations only increased slightly across the 4 weeks of recording, and were randomly distributed across time of day.

Research issue 1 pertained to the stability of pain report and the temporal characteristics of pain during the day. Mean pain report did not change during the 4-week recording period. This confirms the finding of previous diary studies that pain report is stable over time (Kerns et al., 1988; von Baeyer et al., 1994; Cruise et al., 1996) and is not in accordance with the idea that response decay may

occur as a result of boredom or fatigue with the task of daily recordings in longitudinal studies (Stone et al., 1991). Although the number of omitted and skipped diaries increased somewhat from week 1 to week 4, mean pain report for the remaining diaries was stable across the weeks. Another potential danger of our diary, not as yet alluded to, may be induced by the electronic branching of questions in the PTC: the answer 'no' to the pain item induced the omission of 50% of the questions per diary. It is therefore conceivable that subjects may have learned to avoid the recording of long diaries by denying their pain. This was, however, not supported by the data: the number of pain-free diaries did not increase during the 4 weeks and day-to-day frequencies of 'no pain' yielded no significant trending over the days. We therefore conclude that longer and more intensive diary sampling than used in previous studies produced no evidence for reactivity to the repetitiveness of the recording.

With regard to the temporal characteristics of pain during the day a significant trend of pain intensity increasing from morning to evening was found, averaged over all subjects. This is in agreement with earlier findings of Glynn and Lloyd (1976a,b) in patients with pain from various causes. But individual testing revealed that a significant trend in pain intensity occurred in only 53% of our subjects (linear increase: 47%; linear decrease: 3%; U-shaped trend: 3%), while pain intensity showed no trending at all in the other 47% of the subjects ($n = 38$). This is similar to the results of Jamison and Brown (1991), who reported a linear increase in 35% and no trend in 36% of patients. However, they also reported the presence of second order trends (U-shaped in 8% and inverted U-shaped in 14%). Most likely, the absence of an inverted U-shaped trend in pain intensity in our study is due to the timing of the last diary assessment per day: in our study this was between 18:30 and 20:30 h, whereas Jamison and Brown employed hourly pain ratings during the entire waking time, thus probably until much later in the evening. In some patients pain intensity may start to decrease later in the evening, parallel to a decrease in physical activity.

Our study did not confirm the additional finding of Jamison and Brown that patients with no trending in daily pain were more emotionally distressed than patients with pain trending: no differences were found between the two groups on the nine separate scales and on the total score of the BSI. Neither could the difference between male and female patients and between working and non-working patients in the slope of pain increase (Glynn and Lloyd, 1976a) be confirmed in this study. Thus, although patients with chronic benign pain demonstrate clear differences in the trending of pain intensity during the day, we were not able to identify characteristics discriminating between patients with and without trends.

Research issue 2 concerned the association between pain duration and various aspects of the pain problem, disability and general psychopathology. Pain behavior, disability,

depression and general psychological distress supposedly increase as pain progresses from the acute to the chronic stage (Sedlak, 1985; Vallfors, 1985; Iezzi et al., 1992; van der Kloot et al., 1996). On the other hand, adaptation to pain and disability may also occur in the course of time (Philip and Grant, 1991). The present study was not a prospective longitudinal study following the same cohort of patient over time and therefore differences between patients group with various duration of pain may not be the result of duration per se. However, if anything, our results are more in line with the first hypothesis: patients with pain for 3–6 months – i.e. patients whose pain is not yet chronic according to the IASP definition – had pain of a lower intensity (diary), were less burned-out (diary) and physically disabled (SF-36 and diary) and reported less interference of pain with daily activities (MPI) than patients with pain for 6 months or longer. With regard to general psychopathology only one of the nine BSI scales, 'obsessive-compulsiveness', yielded a significant between-group difference with higher scores in patients with longer pain duration. With regard to the issue of pain coping, our study confirmed the finding of Burton et al. (1995) of less adaptive coping with pain, i.e. increased 'catastrophizing' of the pain problem in the patients with longer pain duration. Unexpectedly, patients with pain for longer than 12 months also ignored and denied their pain more than patients with pain for 3–12 months. Last, patients with pain for longer than 12 months received more solicitous responses but also more distracting responses to their pain from spouses.

Thus it appears that the association between pain duration and interference and disability was most prominent if patient groups with a cut-off point of 6 months were contrasted. In contrast, coping strategies and spouse responses to pain differed most between patients when a cut-off point of 12 months was used. Unfortunately, we did not include patients with pain for less than 3 months, which – in view of the finding of Philips and Grant (1991) that the major changes in pain and interference of pain occurred already in the first 3 months of pain, and more or less stabilized between 3 to 6 months of pain – could have been the group contrasting most with patients with longer pain duration.

Research issue 3 focused on the accordance between measures of the same constructs obtained with the ESM-diary and with cross-sectional measurements with the MPI (pain severity, interference of pain, affective distress, social support as well as punishing, solicitous and distracting responses to the pain problem by the spouse), the SF-36 (physical functioning, role functioning, vitality) and CSQ (catastrophizing, denying/ignoring pain, positive self-talk and diverting attention).

Most MPI scales correlated significantly but moderately with equivalent diary items (range: $r = 0.33–0.53$). This agrees with a previous study (Lousberg et al., 1997), although most of our correlations were somewhat lower. The moderate associations in our study may partly be

explained by the difference between instruments in both the exact wording of items and the number of items used to represent a construct. The moderate correlation between MPI pain severity and the diary item for pain intensity may be somewhat surprising because singular items, highly similar in terminology were used and because 3 comparable studies in this respect produced correlations of $r = 0.75$, $r = 0.61$ and $r = 0.64$ (Kerns et al., 1988; Flor et al., 1991; Lousberg et al., 1997). But although differences between the time frames of the assessments with the MPI and with the diary were comparable to the two earlier studies, our study yielded a lower correlation of $r = 0.40$. Therefore seems likely that the lower correlations in the present study is due to the remaining difference in diary procedure. The earlier studies applied paper-and-pencil diaries, which allow the subject to determine the moment of recording and scroll through recordings already completed, and which require assessments, not restricted to the singular moment of recording but covering a stretch of time. Paper-and-pencil diaries thus provide relatively low control over response tendencies in the subjects. The electronic ESM-diary may produce more accurate momentary measures of the variables under study since the content of the recording is determined and the inspection of previous recordings prevented by the PTC. However, the paper-and-pencil diaries are more susceptible to response tendencies, which may increase the stability of measurement, the electronic ESM-diary may be more susceptible to situational influences, which increases the variability of the recordings. It could thus very well be that the lower correlations in our study are at least partly due to the diary method employed in measuring actual momentary states.

In this context it is noteworthy that almost every subject in our study reported more severe pain on the MPI than in the ESM-diary and this was confirmed in 12 subjects whose MPI and diary assessments covered exactly the same week. It is conceivable that retrospection bias accounts for this difference. Subjects tend to overestimate negative events in the process of recollection (Fahrenberg et al., 1996) and subjects may thus have overestimated the severity of their pain in the retrospective assessment with the MPI. This is consistent with the conclusion of a review study of memory for pain demonstrating that recall of pain in chronic pain patients is inaccurate and frequently an overestimation in comparison to actual state measures of pain (Erskine et al., 1997).

The measures for physical disability in the SF-36 and in the ESM-diary correlated highly ($r = 0.73$). This suggests that physical disability is a relatively stable characteristic, not subject to momentary changes within a 4-week measurement period. Two other scales of the SF-36 (role functioning and vitality) correlated moderately but significantly with the corresponding diary items. This may again reflect the fluctuations in these characteristics, especially since role functioning was defined in the diary as role satisfaction.

Four of the CSQ strategies of coping with pain were represented in the ESM-diary. A substantial correlation between the CSQ and the ESM-diary was found for catastrophizing ($r = 0.66$), while moderate correlations of $r = 0.41$ were found for, respectively, diverting attention and ignoring/denying pain. The last strategy, positive self-talk, yielded no significant correlation, but this may have been due to a wording of the diary item according to the ESM premise of mimicking the internal dialogue that differed considerably from the terminology in the CSQ.

All in all, the electronic ESM diary seems to be highly sensitive in measuring the dynamics of physical, mental and behavioral processes that are intrinsically characterized by constant fluctuation, such as pain intensity and mental or behavioral responses to situational cues. The ESM-diary identified differences between patients with, respectively, sub-chronic, recently chronic and longstanding chronic pain with regard to pain intensity, vitality and responses to the pain provided by others, differences which were not detected with the cross-sectional questionnaires. This cannot be attributed to the greater power and scrutiny in accounting for different sources of variance of the multi-level analyses of the diary scores, because ANOVA of scores averaged per individual largely gave the same results (data not shown). Thus, electronic ESM assessment is a sensitive method, particularly appropriate to capture the subtle differences in actual states. In addition, it is a convenient method, which was well tolerated even during 4 weeks of continuous assessment.

One of the disadvantages of electronic diary assessment can be the difficulty in handling the apparatus for some people. Even though answering the questions in itself is not very difficult, exchanging RAM-cards and batteries can be. At least some training will always be necessary. Finally, electronic devices are never completely error proof, and – as our results show – data may be lost due to technical errors. Stand-by assistance to handle technical errors should be available.

In spite of these considerations, electronic diaries seem a suitable method to gain insight into the dynamics of pain severity, pain behavior and the psychosocial determinants of pain. Questions can be asked or omitted in a flexible manner and a subsequent step to take will be the development of an interactive device for use in future research.

Acknowledgements

The study was supported by the Netherlands Organization for Scientific Research (NWO), grant #940-31-033.

References

- Affleck G, Tennen H, Urrows S, Higgins P. Individual differences in the day-to-day experience of chronic pain: a prospective daily study of rheumatoid arthritis patients. *Health Psychol* 1991;10:419–426.

- Affleck G, Tennen H, Urrows S, Higgins P. Neuroticism and the pain/mood relation in rheumatoid arthritis: Insights from a prospective daily study. *J Consult Clin Psychol* 1992;60:119-126.
- Affleck G, Urrows S, Tennen H, Higgins P. Daily coping with pain from rheumatoid arthritis: Patterns and correlates. *Pain* 1992;51:221-229.
- Affleck G, Tennen H, Urrows S, Higgins P. Person and contextual features of daily stress reactivity: Individual differences in relations of undesirable daily events with mood disturbance and chronic pain intensity. *J Pers Soc Psychol* 1994;66:329-340.
- Affleck G, Urrows S, Tennen H, Higgins P, Abeles M. Sequential daily relations of sleep, pain intensity, and attention to pain among women with fibromyalgia. *Pain* 1996;68:363-368.
- Affleck G, Tennen H, Urrows S, Higgins P, Abeles M, Hall C, Karoly P, Newton C. Fibromyalgia and women's pursuit of personal goals: A daily process analysis. *Health Psychol* 1998;17:40-47.
- Bryk AS, Raudenbush SW. Hierarchical linear models: applications and data analysis methods, Newbury Park, CA: Sage Publications, 1992.
- Burton AK, Tillotson MT, Main CJ, Hollis S. Psychosocial predictors of outcome in acute and subchronic low back trouble. *Spine* 1995;20:722-728.
- Cruise CE, Broderick J, Porter L, Kaell A, Stone AA. Reactive effects of diary self-assessment in chronic pain patients. *Pain* 1996;67:253-258.
- de Vries MW. The experience of psychopathology, Cambridge: Cambridge University Press, 1992.
- de Vries MW, Delespaul PAEG. Zelfobservatie en intensieve time-sampling in de psychiatrie. In: Hoogduin CAL, Schnabel P, Vander-eucken W, van der Velden K, Verhulst F, editors. *Jaarboek psychiatrie en psychotherapie*, Meppel: Van Loghum Slaterus, 1993.
- Delespaul PAEG. Assessing schizophrenia in daily life, Maastricht: University Press, 1995.
- Derogatis LR, Melisaratos N. The Brief Symptom Inventory: an introductory report. *Psychol Med* 1983;13:595-605.
- Erskine A, Morley S, Pearce S. Memory for pain: a review. *Pain* 1990;155-265.
- Fahrenberg J. Ambulatory assessment: issues and perspectives. In: Fahrenberg J, Myrtek M, editors. *Ambulatory assessment*, Toronto: Hogrefe and Huber, 1996. pp. 3-20.
- Flor H, Rudy TE, Streit B, Schugens MM. Zur anwendbarkeit des West Haven-Yale Multidimensional Pain Inventory im deutschen sprachraum. *Der Schmerz* 1991;4:82-87.
- Geisser ME, Robinson ME, Rischardson C. A time series analysis of the relationship between ambulatory EMG: pain and stress in chronic low back pain. *Biofeedback Self-Regul* 1995;20:339-355.
- Glynn CJ, Lloyd JW. Diurnal variation and individual differences in the perception of intractable pain. *J Psychosom Res* 1976a;20:289-301.
- Glynn CJ, Lloyd JW. The diurnal variation in perception of pain. *Proc R Soc Med* 1976b;69:369-372.
- Goldstein H. Multilevel statistical models, New York: Halsted Press, 1995.
- Iezzi A, Adams HE, Stokes GS, Pilon RN. An identification of low back pain groups using biobehavioral variables. *J Occupat Rehab* 1992;2:19-33.
- Jamison RN, Brown GK. Validation of hourly intensity profiles with chronic pain patients. *Pain* 1991;45:123-128.
- Kerns RD, Finn P, Haythornthwaite J. Self-monitoring pain intensity: psychometric properties and clinical utility. *J Behav Med* 1988;11:71-82.
- Linton SJ, Gunnar-Gotestam K. Relations between pain, anxiety, mood and muscle tension in chronic pain patients. *Psychother Psychosom* 1985;43:90-95.
- Lousberg R, Schmidt AJM, Groenman NH, Vendrig L, Dijkman-Caes CIM. Validating the MPI-DLV using experience sampling data. *J Behav Med* 1997;20:195-206.
- Lousberg R, van Breukelen GJP, Groenman NH, Schmidt AJM, Arntz A, de Winter FAM. Psychometric properties of the Multidimensional Pain Inventory, dutch language version (MPI-dlv). *Behav Res Ther* 1999;37:167-182.
- Merskey H. Classification of chronic pain: Descriptions of chronic pain syndromes and definitions of pain terms. *Pain* 1986;1.
- Peters ML, Sorbi MJ. Determinanten en consequenties van het chronische benigne pijnsyndroom. unpublished report, Utrecht, 1997.
- Philips HC, Grant L. The evolution of chronic back pain problems: a longitudinal study. *Behav Res Ther* 1991;29:435-441.
- Porter LS, Gil KM, Sedway JA, Ready J, Workman E, Thompson RJ. Pain and stress in sickle cell disease: an analysis of daily records. *Int J Behav Med* 1998;5:185-203.
- Potter R, Jones J. The evolution of chronic pain among patients with musculoskeletal problems: a pilot study in primary care. *Br J Gen Pract* 1992;42:462-464.
- Rosenstiel AK, Keefe FJ. The use of coping strategies in chronic low back pain patients: Relationship to patient characteristics and current adjustment. *Pain* 1983;17:33-44.
- Sedlak K. Low-back pain. Perception and tolerance. *Spine* 1985;10:440-444.
- Shiffman S, Fischer LA, Paty JA, Gnys M, et al. Drinking and smoking: field study of their association. *Ann Behav Med* 1994;16:203-209.
- Sorbi M, Honkoop PC, Godaert GLR. A signal-contingent computer diary for the assessment of psychological precedents of the migraine attack. In: Fahrenberg J, Myrtek M, editors. *Ambulatory assessment: computer assisted psychological and psychophysiological methods in monitoring and field studies*, Goettingen: Hogrefe and Huber, 1996. pp. 403-412.
- Spinhoven P, Ter Kuile MM, Aeg L. CPV Coping met pijn vragenlijst. In: Rosenstiel A, Keefe FJ, editors. *Coping with Pain Questionnaire*, Lisse: the Netherlands: Swetz and Zetlinger, 1994.
- SPSS Inc, SPSS 7.5 for Windows, 1996.
- Stone AA, Kessler RC, Haythornthwaite JA. Measuring daily events and experiences: decisions for the researcher. *J Personal* 1991;59:575-607.
- Stone AA, Shiffman S. Ecological momentary assessment (EMA) in behavioral medicine. *Ann Behav Med* 1994;16:199-202.
- Tennen H, Affleck G. Daily processes in coping with chronic pain: methodological and analytic strategies. In: Zeidner M, Endler NS, editors. *Handbook of coping: theory, research, applications*, New York: John Wiley and Sons, 1996. pp. 151-177.
- Vallfors B. Acute, subacute and chronic low back pain: clinical symptoms, absenteeism and working environment. *Scand J Rehab Med Suppl* 1985;11:1-98.
- van der Kloot WA, Kroeze S, Bakx VEM, van der Meij J, Elvers WH, Oostendorp RAB. Psychologische aspecten van langdurige pijn bij patiënten met klachten aan het bewegingsapparaat. *Gedrag en Gezondheid* 1996;24:49-64.
- Vendrig A, Lousberg R. Within-person relationships among pain intensity, mood and physical activity in chronic pain: a naturalistic approach. *Pain* 1997;73:71-76.
- von Baeyer C, White CL, LeFort SM, Amsel R, Jeans ME. Reactive effects of measurement of pain. *Clin J Pain* 1994;10:18-21.
- Ware J, Sherbourne C. The MOS 36-item short-form health survey (SF-36). Within-person relationships among pain intensity, mood and physical activity in chronic pain: a naturalistic approach. *Med Care* 1992;30:473-483.
- Ware JE, Snow KK, Kosinski M, Grandek B. SF36 Health Survey; manual and interpretation guide. New England Medical Center, Boston: The Health Institute, 1993.
- White CL, LeFort SM, Amsel R, Jeans ME. Predictors of the development of chronic pain. *Res Nurs Health* 1997;20:309-318.

Operant, respondent and cognitive determinants of pain report and disability in patients with chronic benign pain

Marjolijn J. Sorbi, Madelon L. Peters, Dieta A. Kruise, Cora J.M. Maas,
Jan J. Kerssens, Peter F.M. Verhaak, Jozien M. Bensing

Marjolijn J. Sorbi, Ph.D., Dieta A. Kruise, M.Sc. & Jozien M. Bensing, Ph.D.,
Department of Health Psychology, Utrecht University, P.O. Box 80 140, 3508 TC
Utrecht, The Netherlands

Madelon L. Peters, Ph.D., Department of Medical Clinical and Experimental
Psychology, University of Maastricht, P.O. Box 616, 6200 Maastricht, The
Netherlands

Cora J.M. Maas, Ph.D., Department of Methodology and Statistics, Utrecht
University, P.O. Box 80 140, 3508 TC Utrecht, The Netherlands

Jan J. Kerssens, Ph.D., Peter F.M. Verhaak, Ph.D. & Jozien M. Bensing, Ph.D.,
Netherlands Institute of Primary Health Care, P.O. Box 1568, 3500 BN Utrecht, The
Netherlands

Correspondence to:

Marjolijn J. Sorbi, Ph.D.

Department of Health Psychology, Utrecht University,

P.O. Box 80 140, 3508 TC Utrecht, The Netherlands.

e-mail: M.Sorbi@FSS.UU.NL

Tel: 0031 - 30 - 253 2384

Fax: 0031 - 30 - 253 4718

Abstract

The present study employed a high density electronic ESM-diary during 4 weeks to investigate potential psychological determinants of chronic pain and disability in 80 CBPD patients. The method was well tolerated and produced complete and reliable recordings (>82% valid entries; >7100 diaries). The central issue was to establish predictors of pain report and disability and determine whether these predictors differed with pain duration. Multilevel regression analysis established differences between patients, taking into account within-subject differences in days and time-of-day.

Operant factors were relatively weak predictors due, in part, to methodological reasons. Operant spousal response to pain and well behavior explained 6% of the pain variance, while responses to well behavior clearly contributed to pain in explaining 5% of the variance in immobility due to the pain. *Respondent* factors explained 21% of the variance in pain and 2-22% in disability, and *cognitive* factors 15% in pain and 4-14% in disability. Pain was the strongest disability predictor but respondent and cognitive factors added independently to explain, respectively 0-8% and 2-10% of the disability variance. Best predictors were pain-related fear and catastrophizing; second best were avoidance behavior, hypervigilance and negative self-statements. These predictors explained, however, not only differences *between* but also *within* patients in time-of day and days. This underscores the importance of daily process measurement of pain and psychological variables in CBPD research and clinical practice. Last, immobility due to the pain seemed to increase when pain exists between 6 and 12 months; catastrophizing and avoidance behavior appeared to become more powerful in stirring immobility and physical impairment when pain becomes (persistently) chronic.

The results of this study are reliable and unique due to the scrutiny of the method and careful selection of subjects. The results confirm that pain only partly explains disability and substantiate the relevance of psychological variables in CBPD disability and pain report.

1. Introduction

1.1. *The problem of chronic pain and implications for research*

Chronic pain is a pressing problem. Past estimations of its economic costs produced a figure of \$ 40 billion per year for the United States (Aronoff et al., 1983). More recently chronic pain was acknowledged as a major health problem afflicting 90 million Americans at any given time (Willis, 1992) and striking at least one quarter of the industrialized populations (Seers, 1992). These alarming signs instigated epidemiological studies conducted since 1986 in the United States, Canada, the United Kingdom, Scandinavia, Germany and New Zealand. A comparative review revealed that the prevalence of chronic pain varies between 2% and 40% of the populations and that neither research method nor definition of chronicity could explain the differences (Verhaak et al., 1998).

Hence it seems that the phenomenon of pain by itself is problematic. Even today pain is considered a 'mysterious and elusive aspect of illness' (Taylor, 1999, p. 301). In 1986 the IASP coined the criteria for the classification of pain, in order to gear clinical practice and research in this area. *Pain* was defined as 'an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in term of such damage' and *chronic pain* as 'pain that persists beyond the normal time of healing (...) ' (IASP, 1986). Subjective aspects in these definitions complicate the phenomenon of pain: tissue damage and physical lesions are not essential for pain to occur and medical explanations of its persistence are insufficient. Thus, clinicians and researchers lack a decisive standard for the objectification of pain. Those who bear it too may lack an external criterion for their very symptoms, because pain is not exclusively sensory but also an emotional experience. Pain is scientifically acknowledged as a multidimensional phenomenon: nociception, e.g. the physical origin, is at the core of pain, but the dimensions of 'pain experience', 'suffering' and 'pain behavior' are also distinguished (see Loeser's model presented by Raspe and Kohlman, 1994). Personality and social factors such as toughness, secondary gains and cultural values increasingly determine the latter three dimensions, which adds to the complexity of pain, especially when it becomes chronic. Chronic pain is called '*benign*', when the physical origin of the complaint is unknown.

For the purpose of pain research, the subjective nature of pain implies that self-reports of patients are the unit of measurement and the multidimensional nature of pain necessitates a multidimensional design. The Netherlands Organization for Scientific Research (NWO) adopted this view in supporting two related studies of the chronic benign pain disorder (CBPD): The Netherlands Institute of Primary Health Care was commissioned to estimate the incidence and prevalence of CBPD in a multidimensional national survey. The Department of Health Psychology at Utrecht University was entrusted to monitor CBPD characteristics, potential determinants of chronicity and CBPD consequences with a computer diary. For both studies patients were recruited from a national GP's network, representative of Dutch primary health care. Participants suffered from pain for at least 6 months, which was the most prominent aspect of the clinical presentation to the GP, had led to obvious discomfort and disability in daily life for at least one month and justified clinical attention (Kerssens et al., submitted).

Results of the diary study regarding the reliability and validity of the computer diary and the characteristics of CBPD have been published (Peters et al., 2000). The focus of the present paper is on the associations between potential determinants of chronicity and, respectively, pain report and disability.

1.1. Determinants of chronicity and aspects of disability

Determinants of *chronic* pain are factors, which contribute to *maintain pain beyond the normal time of healing*. According to psychological theory, pain may be sustained by operant, respondent and cognitive factors (Lousberg, 1994): these factors may influence the chronicity of pain and the disability that follows from pain. We will briefly elucidate this.

Operant factors. Fordyce (1976) was the first to apply operant learning theory to the field of chronic pain. Expressions of pain and disability are potent signals, which elicit strong responses from others. Due to operant conditioning, these expressions can come under the control of immediate reinforcing consequences experienced by the patient. Family members, in particular the spouse or partner, are inclined to respond with understanding, support or help and may discourage active and healthy behavior. When spouses remain supportive, such positive attention may inadvertently maintain or in fact increase the expression of pain and disability (Turk, et al., 1996). Positive

associations between pain and spousal reinforcement of pain behavior have been reported from experimental studies in healthy subjects (Lousberg, 1996; Linton and Gotestam, 1985) and in CBPD (Romano, et al, 1995, 1992; Lousberg, et al., 1992; Turk, et al., 1992; Flor, et al., 1989, 1987; Blok, et al., 1980), several of which also reported associations between reinforcement and (physical) activity (Lousberg, et al., 1992; Flor, et al., 1987), physical impairment (Romano, et al., 1995) or pain interference with daily life (Flor, et al., 1989). Punishment, another proces in operant learning, was studied in CBPD in terms of passive or 'downward' --e.g. decreased positive-- spousal reinforcement (Lousberg, et al., 1996; Flor, et. al., 1987; Block, et al., 1980). Operant increase of well behavior, in terms of speeding up walking by CBPD patients in response to contingent positive reinforcement was demonstrated by Geiger, et al. (1992).

Respondent factors. Since reduction of movement usually promotes the healing of acute pain, fear of pain and of activities that are expected to result in pain motivate avoidance behavior. This constitutes the basis for models of classical conditioning (Turk and Flor, 1999; Turk, 1996; Philips, 1987) with pain-related fear (fear of pain and movement) as the key conditioned stimulus (CS) and avoidance behavior as the key conditioned response (CR). According to Turk and Flor (1999) pain-related fear may --in pain due to an injury-- over time act as a CS for sympathetic activation, tension increases and avoidance of activity (CR's) and this CS-CR chain may persist after the original unconditioned stimulus (e.g. injury) and response (e.g. pain) have subsided. On the other hand, pain related to sustained muscle contraction in the absence of injury may be regarded as an unconditioned stimulus for sympathetic activation and for tension increases (unconditioned responses), which elicit more pain and instigate avoidance learning. Here pain-related fear may over time operate as a CS for avoidance of behavior (CR), even when the nociceptive stimuli and related sympathetic activation are no longer present. Through respondent conditioning and stimulus generalization, expanding numbers of originally normal or pleasurable activities will elicit fear and aversion and be avoided. In chronic pain patients overprediction of pain may fuel generalized and excessive avoidance behavior in the absence of nociceptive stimulation, which is resistant to change as long as avoidance succeeds in preserving the overprediction from repeated disconfirmation (Turk and Flor, 1999). Empirical studies in chronic pain showed that pain-related fear (fear of pain and movements that may induce pain) and avoidance behavior were related to

disability (Mc Cracken et al., 1996; Vlaeyen et al., 1995a,b; McCracken et al., 1992), but pain-related fear was also related to pain report (McCracken et al., 1996) and to the reporting of non-specific bodily sensations (McCracken et al., 1998). Recent evidence suggests that chronic pain patients who fear their pain pay selective attention to threatening bodily sensations (Asmundson et al., 1999; Crombez et al., 1999). In turn, selective attention --or hypervigilance-- seems to induce increased detection and amplification of bodily sensations (Schmidt et al., 1994; Barsky & Klerman, 1983). Since attention to pain was shown to be related to pain report and predicted disability independent of pain intensity in CBPD (McCracken, 1997), hypervigilance to bodily sensations may be highly relevant to the maintenance of chronic pain in the context of respondent pain-related fear and avoidance behavior.

Cognitive factors. Cognition and affect are strongly interrelated and gear behavior in concert. In pain, negative cognitions are thought to aggravate the suffering and to influence the behavioral expression of pain. Recently there is accumulating evidence of the positive association between catastrophizing and pain report in patients with chronic pain (Sullivan et al., 1998; Burckhardt et al., 1997; Geisser et al., 1994). Other cognitions related to pain report are negative self-statements (Gilet al, 1990) lack of control over the pain (Toomey et al., 1991) and hopelessness/helplessness (Boston et al., 1990; for a review see Jensen et al., 1991). Disability was found to be associated with the conviction of CBPD patients that pain and disability belong together (Riley et al., 1988). Catastrophizing was also found to be related to disability (Sullivan et al., 1998; Keefe, et al., 1989; Turner and Clancy, 1986) even when the analysis was controlled for pain intensity.

Disability. Disability is primarily a consequence of pain. This is plausible with regard to the first stages of developing a pain problem, when activity reduction is a direct means to ameliorate pain or avoid a pain increase. In chronic pain, however, impaired physical functioning and activity level may become central and persist relatively independent from pain occurrence or intensity. Linton (1985) found that, although 30 chronic back pain patients reported a connection between pain and activity in a global interview, in a test situation *no* significant association was found between pain intensity and actual activity level, measured by self-monitoring or observed behavior. On the other hand, Wadell et al. (1992) showed that pain intensity explained 10% of the variance in the physical impairment experienced from chronic low back pain and

in one of the earliest studies in this matter pain report was weakly related to the levels of self-reported activity (Fordyce, et al., 1984).

In our view, disability in CBPD has more aspects than impaired physical capacity and activity: mental capacity could also be considered, while activity should be distinguished from mobility and the impairment in both variables should be tailored specifically to pain. This would imply measures relying on self-assessment (physical and mental capacity) and measures of behavior (activity hampered by pain and immobility due to the pain).

1.2. Focus of the study

The present study distinguishes itself from all of the above mentioned studies in one important aspect. In contrast to focussing primarily on *between-persons* associations, the method of data acquisition and analysis of our study pursues estimates of *within-person* relations between intensively measured daily process variables, while the influence of between-persons differences in the variables is estimated simultaneously. That is to say: the within-person processes in their natural setting are central to the study and it is on the basis of the within-person analysis that important between-person differences are aimed to be established. This is important because of the known differences in between- and within-person correlational outcomes and the fact that significant between-persons associations can emerge even without the occurrence of a single significant within-person association in the study subjects (Tennen and Affleck, 1996). In accounting for this, the approach of our study is in accordance with recent developments in health psychology research that focus on the quest for *intraindividual* processes over time (Affleck et al., 1999).

Figure 1 displays the multidimensional model of CBPD, which geared the diary study. Each cell of the model was represented by sets of diary items. The present paper focuses on the left-hand part, e.g the associations between potential determinants and CBPD. Relations with consequences (see right-hand part) will be addressed in a future publication.

----- insert figure 1 about here -----

Thus, the research issues concern the associations between potential determinants of CBPD and, respectively, pain report and disability:

1. Are operant, respondent and cognitive factors predictive of *pain report*?
2. Is pain report predictive of 4 aspects of disability?
- 3.a. Are operant, respondent and cognitive factors predictive of 4 aspects of *disability*?
- 3.b. Are these factors predictive of *disability*, when the analysis controls for the impact of pain on disability?
4. Do the predictions differ in patients with a shorter or longer pain duration?

2. Methods

2.1. Subjects

The study included 80 subjects (women: 71%, men: 29%), aged between 18 and 60 years (mean 40.6, sd=9.7). They suffered from pain with an unknown nociceptive substrate for an average of 66 months (sd=86). The pain characteristics have been described elsewhere (Peters, et al., 2000). Subjects were homemaker (20%), employed (40%) or received a disability pension (40%). Recruitment continued until two groups, matched for pain location, age, sex, marital status and education were formed who suffered from pain shorter than or equal to 12 months (N=40; mean pain duration: 7.2 months) or longer than 12 months (N=40; mean pain duration: 125.6 months). Patients were recruited from the survey sample of 344 CBPD patients (N=44) and --in order to find enough patients with a pain duration of less than 12 months-- through physiotherapists (n=30) and a newspaper announcement (n=6).

Since the diary study focused on the determinants and consequences of *chronic* pain, comparisons between patients with a short duration of pain (who may recover within the normal time of healing) and those with pain of substantially longer duration were of particular importance. Therefore, group 1 was broken down in two subgroups of patients who had suffered from pain for 3-6 months (n=15) and for >6-12 months (n=25). These subgroups were again comparable with respect to age, sex and marital status and differences in level of education and extent of full-time work were not significant. Pain severity was equal, the use of medications (mostly non-steroid analgesics) similar but pain location according to the IASP classification differed in

the three groups. Pain in more than 3 major sites of the body was reported by, respectively, 32% of the patients with pain >12 months, 8.3% with pain for >6-12 months and 6.7% with pain for 3-6 months.

2.2. ESM measurement and diary

Data were collected 4 times per day for 4 weeks employing the Experience Sampling Method (ESM) (Delespaul, 1995). ESM is a signal-controlled diary method for the repeated recording of momentary state measures within the real-life environment. It is particularly well suited to investigate the dynamics of physical, mental and behavioral processes as well as their interactions, because of the large number of measurements, unbiased by anticipation or retrospection due to the prompting of self-report by a randomized signal. In addition, ESM is unobtrusive and comes closest to an in-vivo observation of a subject (de Vries, 1992; de Vries and Delespaul, 1993). The ESM-diary was implemented on palmtop computers (PTC's). PTC's increase the reliability of ESM by controlling the signals, preventing the subject from reviewing previous records and registering the exact time of the signal and the response, as well as the number of missing recordings (Affleck et al., 1996; Sorbi et al., 1996). In the present study the beeping signal occurred randomly within four predetermined time frames between 8.00AM and 9.30PM¹. Unanswered signals were repeated after 5 minutes and, when not answered, were coded as missing recordings. Subjects were allowed to voluntarily skip one signal in succession in case of inconvenience. In addition to the 4 beep diary recordings per day, subjects were required to fill in a morning diary immediately after waking up and an evening diary before going to sleep.

The beep diary contained 84 items covering all of the cells of the CBPD-model (see figure 1) and took about 5 minutes to complete. The number of items displayed in the computer diary ranged between 31 and 84, because the appearance of many items depended on the presence of pain, while other items depended on the presence of significant others. The morning diary contained 12 items to assess pain and sleep quality; the evening diary consisted of 30 items to assess pain, causal attributions of pain, sickness leave, medical consumption and satisfaction with role functioning. Most items were answered on 7-point scales, anchored 1=not at all, 4=moderate, 7=very much and anchored 1=none, 4=moderate, 7=severe for pain intensity. Yes/no answers

¹ Between, respectively, 8-11.00AM; 11.30AM-2.30PM; 3-6.00PM; 6.30-9.30PM

were also used; open answers were incidentally required and could be typed in. Each diary ended with an opportunity for comments and with thanks for the recording.

2.3. Construction of the diary

The selection of diary items was grafted upon questionnaires commonly used with pain patients, in particular instruments, which yielded significant empirical outcomes relevant for CBPD. A literature review geared the selection of constructs most representative of each of the cells of the CBPD model (see figure 1). When more than one instrument represented a given construct we choose the instrument, employed in the survey study. In addition, most instruments provided several items for the same construct. These were aggregated into one more general formulation. Consistent with our aim to limit the time to a maximum of 5 minutes per signaled recording, each construct was generally covered by no more than 2 to 3 items. In the cases that items from research instruments were not available, we constructed items and these were subjected to a procedure of inter-judge accordance. All of the diary items were formulated according to specific ESM requirements. Most important is the formulation in terms of self-statements (e.g. “right now, I ...”), in order to focus on the momentary state and mimic the internal dialogue of the respondent. Formulations were as short and simple as possible and spoken language was preferred to written language. In order to circumvent the introduction of response sets and aversiveness of the diary due to a predominance of negative items, care was taken to maintain a balance between positive and negative formulations. All items were screened for ambiguity or double negations and a pilot study was conducted in 4 CBPD patients, which demonstrated the feasibility of the method, proved that the procedure was well tolerated by the patients and led to minor changes in the content of the diary.

2.4. Content of the diary

Pain intensity. Each diary started with the assessment of pain intensity by means of 2 questions: “right now I feel pain?”; if yes²: “how much pain do I feel right now?” (1=none to 7=severe). Then an open question appeared (“where do I feel the pain?”) with the opportunity to report several pain locations. Below we will list the items

² If ‘no’ was entered, all items referring to having pain were automatically skipped in the diary.

included in the diary to measure operant, respondent and cognitive factors and disability.

Operant factors. In accordance with operant conditioning theory the diary contained items covering reinforcement as well as punishment by others of the patients' pain behavior and well behavior. All items were adapted from the MPI-DV (Lousberg and Groeman, 1993; Kerns, et al., 1985) and modified where necessary. Preparatory questions served to determine the context of the recording: "where am I?" (open answer); "am I alone?"; if no: "who is/are with me?" (open answer) "he/she/at least one of them knows that I am in pain?"; if yes: "how does he/she know that I am in pain?" (open answer). In order to tailor the operant items explicitly to the patients' pain, these items were then introduced by "how does he/she respond to my pain?" The operant items listed below were answered on a 7-point scale (1=no to 7=very much):

reinforcement of pain behavior

- "he/she is particularly kind to me"
- "he/she spares me"
- "he/she takes over duties"
- "he/she takes care of me"

punishment of pain behavior

- "he/she ignores my pain"
- "he/she is bothered by my pain"

reinforcement of well behavior

- "he/she encourages me to go on"
- "he/she encourages me to be active"

punishment of well behavior

- "he/she indicates that I should take rest"
- "he/she notes that I demand too much of my body"

Respondent factors. Grafted upon the key elements of classical conditioning models in CBPD, the diary included items for pain-related fear and avoidance behavior; because hypervigilance was strongly assumed relevant in this context it was also covered in the diary. The fear items were adapted from the FABQ (Waddell et al., 1993) and the TSK (Vlaeyen et al., 1995b). The remaining items were constructed, because of lack (in case of hypervigilance) or insufficient specificity (see Wadell, 1993; Mc Cracken, et al., 1992; Hoppe, 1985, in case of avoidance behavior, which was decided to be tailored to physical activity) of available instruments. Responses were again provided on a 7-point scale (1=no to 7=very much):

pain-related fear

- "right now I am afraid to move because of the pain" (with pain)
- " ...I am afraid to move, because this may provoke my pain" (with no pain)
- " ...the pain will become worse if I move just a little bit" (with pain)

“ ...the pain will reoccur if I move just a little bit” (with no pain)

avoidance behavior

- “right now I avoid physical exertion that may worsen my pain” (with pain)
- “ ...I avoid physical exertion that may trigger my pain” (with no pain)

hypervigilance

- “right now...I feel everything that is happening in my body”

Cognitive factors. Conform the empirical evidence of cognitive factors in CBPD, the diary covered items for catastrophizing, optimism, control and negative self-statements. Nineteen instruments were screened and the final formulation of the items was borrowed from 5 questionnaires: the CSQ (Rosenstiel and Keefe, 1983), PCQ (Boston et al., 1990), INTRP (Gil et al., 1990), PCL (Vlaeyen, 1991) and MPIDV (Lousberg and Groenman, 1993). All items were answered on a 7-point scale (1=no to 7=very much). In addition, an open item for pain attributions was included in the evening diary:

catastrophizing

- “right now...I feel that I will never be well again”
- “ ...I think it is terrible to have such pain”
- “ ...the pain is too much for me”

optimism

- “right now...I am convinced that my pain will subside again”
- “ ...I continue to be optimistic in spite of the pain”

control

- “right now...there is something I can do to ease my pain”
- “ ...I am able to tolerate the pain well”

negative self-statements

- “right now...I blame myself for having pain”
- “ ...I burden others with my pain”
- “ ...I feel useful” (recoded)

attributions

- “today my pain was influenced most by ...” (open answer)
- “this made my pain ... (better / no impact / worse)

Disability. Seven questionnaires were screened for the purpose of constructing items for the diary. The present paper is confined to 4 aspects: physical capacity, mental capacity, interference of pain with activities and immobility due to the pain. Pain interference and immobility were assessed in context of the beeping signal. Since the questionnaires reviewed were cross-sectional instruments, these could not gear the formulation of these items. The items for physical capacity were partly directed by the MOS short form health survey (SF-36; Ware and Sherbourne, 1992). The researchers

designed the items for mental capacity. Response categories differed for each of the constructs:

physical capacity (answered on a 7-point scale ranging from 1=no to 7=very much)

- “right now I am able to...sit”
- “...stand upright”
- “...walk”
- “...walk stairs”
- “...walk fast or run”
- “...do moderately strenuous work (like vacuum cleaning)”
- “...do very strenuous work (like moving furniture)”

mental capacity (answered on a 7-point scale ranging from 1=no to 7=very much)

- “right now I am able to...do mental work”
- “...concentrate on my work”

pain interference with activities

- “what did I do at the moment of the beep?” (open answer)
- “the pain interfered with this activity” (7-point scale, 1=no to 7=very much)

immobility due to the pain (answers y/n)

- “at the moment of the beep I was: walking/standing up/sitting/laying down”
- “I was (sitting/laying down) because of the pain”

2.5. Procedure and characteristics of the diary data

After recruitment patients were visited at home for a briefing session, including instruction, demonstration and practice with the PTC and ESM-diary, explanation of the general procedure and the signing of an informed consent form. Participants were contacted by telephone 2-3 days later, and after 2 weeks of diary recording, for a second and a third briefing. During the 4 weeks of recording telephonic assistance was made available in the case of problems. After completion of the 4 weeks of recording patients were visited for a debriefing interview, receipt of a remuneration of fl. 100,- and collection of the PTC.

According to the debriefing interview all participants regarded the 4 weeks of recording as representative of their normal life. Most subjects carried the PTC for exactly 4 weeks (n=74); 3 subjects carried it for a shorter (3-4 wks) and 2 for a longer period; the recording of one subject was stopped after 2 weeks because of an exceptionally large number of technical problems. The number of recorded *beep diaries* ranged from 40 to 140 (mean: 108.4). Of these signals, 12.1% were either skipped by the subjects or not responded to and 5.1% were missed due to problems with exchanging the PTC memory card, empty batteries or a specific technical problem, which accounted for the missing of several entries in succession in several

cases. Non response was not related to time of day. This left us with 7146 valid entries of the beep diary (mean 89.3; range 30-115). Of the *morning-* and *evening diaries* respectively 7.9% and 10.1% were missing due to skipped entries and technical problems. Completed were 1979 morning diaries (mean 24.7; range 3-32) and 1937 evening diaries (mean 24.2; range 4-32).

2.6. Data preparation

Pain report was calculated for each beep diary and could range from no to severe pain. Regarding the remaining constructs scores of items representing the same construct were summed, after the recoding --where relevant-- of negatively formulated items. For the *operant factors*, only beep diaries recorded when the spouse or partner was present entered the analyses ($N \leq 1476$ cases). *Respondent factors* were assessed in each beep diary, but the wording depended upon the presence or absence of pain. The *cognitive factors* were tailored to thoughts and feelings regarding current pain; the items thus appeared in the beep diary only when pain was reported ($N \leq 5062$ cases). 'Attributions' were assessed once per day in the evening diaries; open answers were coded post-hoc as either an external/somatic or an internal/psychological attribution and the totals of both were calculated per subject. In order to obtain a single score, each subject was then classified on a 5-point scale for attributional style (almost exclusively external/somatic; mostly external/somatic; mixed; mostly internal/psychological; almost exclusively internal/psychological). Regarding *disability*, 'pain interference' was assessed only when pain was present but irrespective of what type of activity the subject was involved in, while 'physical-' and 'mental capacity' and 'immobility' were assessed in each beep diary. For 'immobility' a score of '2' was assigned when a subject was laying down because of the pain, a score of '1' when he/she was sitting because of the pain and a score of '0' applied to all other cases, e.g. of walking, standing, sitting or laying down but *not* because of the pain.

2.7. Data analysis

The 4-week collection of data within 4 predetermined time-frames and with a morning and evening diary per day led to measurements that vary in time throughout the day, in

days and between subjects. Multilevel regression analysis (MLwiN; Multilevel Models Project, 1998) was employed to determine the associations between the variables at these different levels. On the basis of a statistical model, which accounts for the various dependencies (Goldstein, 1995; Bryk & Raudenbusch, 1992) the total variance of the dependent variable is divided into 3 parts, accounted for by differences between, respectively, the *subjects*, the *days* and the *time-points* per day. The independent variables in the regression model may explain (part of) the variance at each of these 3 levels.

The testing of research issue 1 was conducted separately for each of the 3 sets of psychological variables (e.g. operant, respondent and cognitive factors) as predictors of pain report. For issue 2, pain report was tested as predictor of each of the 4 disability variables. For issue 3 each of the 3 sets of psychological variables was again tested separately as respective predictors of the 4 disability variables. Issue 4 was dealt with as part of all of these analyses.

In each of the regression analyses the variables were entered in fixed order and in successive steps. After each step non-significant predictors were removed. In *step 1*, the various predictor variables from the diary were entered, together with time and time² to control for potential linear and U-shaped trends in the dependent variables, induced by time-of-day. In *step 2*, pain duration was entered to test for between-group differences in the dependent variable³. Pain duration was coded with a dummy variable for 2 separate comparisons. Patients with pain for 3-6 months (n=15; code 0) were compared to patients with pain >6 months (n=65; code 1) and patients with pain for 12 months (n=40, code 0) were compared to patients with pain >12 months (n=40; code 1). In *step 3*, interaction terms were entered in the equation. Interactions between pain duration and variables, which had emerged from step 1 as significant predictors, established whether the predictive power of these variables differed for patients with a shorter and longer pain duration (issue 4). Interaction terms were constructed by first centering the variables identified in step 1 as significant predictors and subsequently establishing the random variance of these centered variables at the subject level.

In order to test the psychological variables as predictors of disability (issue 3), three models were specified. *Model 1* tested the power of the operant, respondent and cognitive variables respectively, in predicting disability (issue 3a). The models 2 and 3

³ 'Attributions' was entered also in step 2, since each subject had received one score for 'attributional style' (see data preparation).

were employed to predict disability by psychological variables, while controlling for the impact of pain (issues 3b). *Model 2* tested pain and *model 3* tested the psychological variables and pain as predictors of disability. The power of psychological variables in predicting disability when controlled for the impact of pain was established by subtracting --per level-- the proportions of the total variance computed with model 2 from the proportions of the total variance computed with model 3.

3. Results

Provided are the MLn-results regarding the prediction of, respectively, pain report by psychological variables (table 1), disability by pain (table 2) and disability by psychological variables and by pain (tables 3-6). Significant predictor variables with beta coefficients indicating their relative predictive power are presented per equation in the tables 1-6. These tables also show the distribution of the total variance over the 3 levels (subject, day, time) and --per level-- the percentages of explained variance, obtained with each model. Table 7 summarizes the results. Provided are the *proportions* of the *total* variance⁴ in pain report and in disability that were explained by psychological variables. The relatively strongest predictors of each of the disability variables are also presented.

Before we turn to answering the research issues we point out that the dependent variables differ regarding the distribution of variance over the 3 levels (tables 1-2⁵). Most of the variance in pain report (53-57%) and in mental (63%) and physical capacity (76%) was found at the *subject* level. In interference of pain with activities and in immobility due to the pain most of the variance was found at the *time* level (59% and 80%, respectively). The variance at the *day* level was relatively small, both in pain report (11-13%) and in disability (6-12%).

----- insert tables 1 to 7 about here -----

⁴ For example: the variance in pain report explained by operant factors on the subject level is 10% of 57% of the total variance (see model 1, table 1) that is 5.7% (see table 7).

⁵ Table 2 provides the largest numbers of observation of the disability variables.

3.1. Prediction of pain report by psychological variables (issue 1)

A significant positive association occurred between time-of-day and pain report (see table 1): pain increased during the day and, given the negative curvilinear trend in time, the increase leveled down with time-of-day. Except for cognitive attributions, all psychological variables tested within the 3 sets appeared as significant predictors of pain report. Differences between subjects generated the largest proportions of the total variance (see table 7): at this level *operant factors* explained 5.7%, *respondent factors* 20.7% and *cognitive factors* 14.8% of the total variance. The psychological variables also explained 1.2 to 9.5% of the time - and 2.2 to 4.7% of the day variance. Since pain also depended on time-of-day, (curvi)linear trends in time contributed to the explained variance in the analyses of particularly the respondent and cognitive variables.

Beta coefficients in table 1 indicate the relative predictive power of variables per set of psychological predictors. Three almost equally powerful operant predictors emerged: pain report *increased* with *reinforcement* of pain and *punishment* of well behavior (beta's: .186; .141) and *decreased* with punishment of pain behavior (-.161). The respondent and cognitive variables, on the other hand, differed in predictive power: *pain-related fear* appeared clearly as best (.342) and hypervigilance as second-best (.197) respondent predictor and *catastrophizing* (.460) as strongest cognitive predictor of pain; these variables were associated with increased pain report.

3.2. Prediction of disability by pain report (issue 2)

Table 2 shows that significant and substantial associations occurred between time-of-day and 2 disability variables. During the day mental capacity *increased* (beta: .219) but the increase equalized with time-of-day (-.299), while immobility *decreased* (-.278) but the decrease subsided with time-of-day (.342).

Pain report explained small proportions of the total disability variance at the time (1.2 to 4.0%) and at the day level (1.1 to 3.5%) but at the subject level explained substantial proportions in impaired *physical capacity* (19.8%), and *pain interference* with activities (8.6%). In concert with time and time², pain also explained 7.6% of the subject variance in impaired *mental capacity* and 3.9% in *immobility* due to the pain.

All disability variables were significantly and with substantial power predicted by pain report: *physical* (beta: -.315) and *mental capacity* (-.230) decreased with pain, while *interference of pain* with activities (.322) and *immobility* due to the pain (.343) increased with pain.

3.3. Prediction of disability by psychological variables (issue 3)

The results, concerning issue 3a (see model 1 in the tables 3-7) can be summarized as follows. *Operant factors* appeared as weak predictors of disability (beta's <.1 in 3/4 of the testings). Exceptions were the prediction of immobility and of mental capacity. Three of the 4 operant factors contributed to explain 2.3% of the subject- and 3.7% of the time variance in immobility: immobility due to the pain decreased with spousal reinforcement of the patients' well behavior (beta: -.202) and increased with punishment of well (.194) and reinforcement of pain behavior (.161). In addition, operant factors explained 3.3% of the subject variance in mental capacity: punishment of well behavior contributed most to the prediction and was related to impaired mental capacity (-.134).

In contrast, respondent and cognitive factors explained substantial variance in disability. *Respondent factors* explained impaired physical capacity (22%), pain interference (10.2%), impaired mental capacity (6.3%) and immobility (3.2%). In all variables, but especially in physical capacity (beta: -.336) and pain interference (.383), *pain-related fear* appeared as the strongest predictor: it was related to decreased physical and mental capacity and to increased pain interference and immobility. *Cognitive factors* explained impaired mental (13.9%) and physical capacity (10%), pain interference (9.2%) and immobility (4.2%). Here *catastrophizing* stood out as the most prominent predictor of increased disability (.182; -.297) with the exception of impaired mental capacity, which was best predicted by negative self-statements.

Of particular interest now is whether the psychological variables predict disability, when the analyses controlled for the impact of pain (issue 3.b, see model 2 and model 3 in the tables 3-7). Pain was the best predictor of disability in 9 and the second-best predictor in 2 of the 12 sets of analyses. Only in mental capacity did pain *not* occur as the prominent predictor.

However, psychological variables remained as predictors, notwithstanding the predominance of pain in the disability prediction. When pain was accounted for

(models 3-2), *operant factors* continued to significantly explain 2% of the subject variance in mental capacity. *Respondent factors*, however, persisted in significantly explaining substantial subject variance (8.6%) in physical capacity, as well as some variance in pain interference (3%) and mental capacity (1.9%). *Pain-related fear* remained the strongest predictor, associated with *increased* pain interference (beta: .304) and *decreased* physical and mental capacity (-.244; -.133). Likewise, *cognitive factors* endured in explaining substantial subject variance (9.9%) in mental capacity and some variance in physical capacity (3.1%), pain interference (3.2%) and immobility (2.1%). Here *catastrophizing* remained the strongest predictor, associated with *increased* pain interference (.202) and immobility (.109) and *decreased* physical (-.116) and mental (-.097) capacity. *Negative self-statements* about the pain appeared as the second-best cognitive predictor: it was negatively associated with mental (-.152) and physical (-.075) capacity and positively associated with immobility (.107).

Thus pain *did not* wipe out the predictive power of, particularly, the respondent and cognitive factors. Pain also did not affect the relative power of the psychological factors *within* sets of analyses (see model 1 and model 3 beta's). It is noteworthy here that cognitive factors were stronger than pain in predicting mental capacity; that catastrophizing equaled and pain-related fear exceeded pain in predicting interference, even though pain was likely to lead this prediction, because interference was assessed only when pain was actually present; and that operant spousal responses to well behavior clearly contributed to pain in predicting immobility in CBPD.

3.4. Differences in prediction in patients differing in pain duration (issue 4).

The psychological prediction of pain report (issue 1) did not differ significantly in patients with a shorter or longer pain duration. This was not the case in the prediction of disability. First, in the testing of pain as predictor of disability (issue 2), pain report interacted significantly with pain duration in predicting immobility (beta: .193), adding 4% to the explained subject variance: patients with pain >6 months exhibited a stronger association between pain and immobility than patients with pain for 3-6 months. Second, the testing of psychological variables as predictors of disability, controlled for pain (issue 3b, see table 7), yielded 3 significant interaction effects, which added, however, only 1% or less to the explained subject variance. Patients with pain >6 months produced stronger associations than patients with pain for 3-6 months

between, respectively, avoidance behavior (.266) or catastrophizing (.280) and immobility; patients with pain >12 months exhibited a stronger association between catastrophizing and impaired physical capacity (-.133) than patients with a shorter pain duration.

4. Discussion

The present study employed a 4-week electronic ESM-diary to investigate potential psychological determinants of chronic pain and disability in 80 CBPD patients. The method was well tolerated, produced compliant and reliable recordings (>82% valid entries; >7100 diaries) and detected between-patient differences in pain and responses of significant others, not detected by cross-sectional questionnaires (Peters, et al., 2000). The central issue of the study was to establish predictors of pain report and disability and to determine whether these predictors differed in patients with a shorter and longer pain duration. Since the ESM-diary generated data that varied between subjects, in days and in time-points per day, multilevel regression analysis was used to establish differences between patients, while taking into account within-subject differences in days and time-of-day.

The random variance in pain intensity and 2 disability variables (physical and mental capacity) was found primarily on the subject level and to a smaller extent on the time- and day level. This means that pain intensity, physical and mental capacity appeared over weeks as relatively stable CBPD characteristics reflecting between-subject differences but --given the time variance-- also reflect momentary states during the day within the patients.

The study also revealed significant time trends in part of the variables. Pain intensity and mental capacity *increased*, while immobility due to the pain *decreased* during the day and all of these trends equalized at the end of the day. Time of measurement thus partly characterizes these variables. Time measurement during the day should therefore be taken into account in CBPD research and clinical assessment.

It is noteworthy here that immobility and pain interference exhibited the largest random variance not between subjects but in time-of-day. One explanation may be the impact of pain (shown to depend partly on time-of-day), since immobility had entered

the analyses only when it was due to the pain and interference with activities had been assessed only when pain was present. Another explanation is that mobility and activities (in the measurement of interference) do not occur randomly but partly follow a daily regimen, set by fixed routines for household chores, having meals, taking rest or watching TV. It is of interest now that the immobility data were skewed (see table 8).

----- insert table 8 about here -----

Immobility had *not* been affected by pain in 87% of the diary entries, while sitting because of pain had occurred in 7% (N=503) and laying down due to pain in 6% (N=415). Table 8 shows that immobility increased somewhat, when pain passed the 6-months threshold for chronicity: sitting and laying down went up from 6% in subchronic to 15% in chronic pain, but differences between recently and persistent chronic pain were small (15 vs. 16%). This is in accordance with our finding that patients with chronic pain exhibited a stronger association between pain and immobility due to pain than patients with subchronic pain.

Thus immobility *due to the pain* occurred infrequently in the subjects of this study and this is surprising, given the severity of CBPD in the participants (Peters, et al, 2000; Kerssens, et al, submitted). When performed, it occurred predominantly in the morning. The finding that immobility due to the pain *decreased* during the day, while pain *increased* indicates that, although pain induced immobility --probably due to morning stiffness-- mainly at the beginning of the day, the patients had been more mobile in the afternoon in spite of relatively more severe pain.

Research issue 1 pertained to the prediction of pain report by 3 sets of psychological variables. In concert with (curvi)linear trends in time, respondent factors explained about 21%, cognitive factors 15% and operant factors 6% of the subject variance in pain. Pain-related fear and hypervigilance stood out as the strongest *respondent predictors*, catastrophizing was the best *cognitive predictor* and spousal reinforcement of pain and of well behavior were the strongest *operant predictors*. Most of our subject level findings are in accordance with previous CBPD studies that did not employ an (electronic) diary. Cross-sectional associations had been established between pain report and, respectively, attention to pain and pain-related fear (McCrackern, et al.,

1997, 1998), which in turn was related to the reporting of non-specific bodily sensations (McCracken, et al., 1996) and most likely is associated with selective attention to these sensations (Asmundson, et al., 1999; Crombez, et al., 1999). Pain report had also been shown to be related to catastrophizing (Sullivan, et al., 1998; Burckhardt et al., 1997; Geisser, et al., 1994) and to spousal reinforcement of pain behavior (Romano, et al., 1992, 1995; Lousberg, et al., 1992; Turk, et al., 1992; Flor, et al., 1989, 1987; Block, et al., 1980). To our knowledge, however, our findings that spousal reinforcement and punishment of well behavior are differentially related to CBPD pain intensity have as yet been unprecedented. Most likely the detection of these operant processes is due to the electronic ESM-diary method that proved to identify subtle between-patient differences in spousal responses, not identified with cross-sectional instruments (Peters, et al., 2000). Several explanations may account for the fact that in this study operant factors did explain a relatively small part of the pain variance. First, the operant prediction may have been limited by an almost 80% loss of observations --due to the context dependency of the operant variables, which in this study were analysed only when assessed under presence of the spouse-- given that in this study the explained variance increased with numbers of observation (analyses of respondent factors were based on 100%, cognitive on 71% and operant on 21% of the diaries). Second, it is under debate whether patients' assessments of spousal responses are inaccurate due to social desirability, wishful thinking and retrospective or anticipation biases (see Romano, et al., 1991). The findings of Romano, et al. (1995), for example, were based on observational measures of pain behavior and spousal responses. Since the controversion mainly pertains to results for operant factors and disability, we will return to this when discussing issue 3 of this study. Third, Turk and Okifuji (1997) recently were the first to investigate the contribution of physical, operant, cognitive and affective factors to individual differences in pain behavior. They found that all but the operant factors were significantly related to observed pain behavior and concluded that the behavioral manifestation of pain is based on complex interactions instead of singular factors. Thus operant factors may, apart from the measurement issue, by definition fall short in separately predicting pain behavior.

In sum, consistent with previous CBPD studies of between-patient differences, pain intensity was in this study predicted by pain-related fear, hypervigilance, catastrophizing and spousal reinforcement of pain behavior. Unprecedented, pain intensity was also differentially associated with operant spousal responses to well

behavior, although the operant contribution to pain prediction was limited due to a mixture of methodological, but probably also conceptual, reasons. Also unprecedented was that psychological variables also explained time (about 3-10%) and day (3-5%) variance in pain. Thus, psychological variables, which in the first place explain between-patient differences in CBPD also explain part of the differences *within* patients. This indicates again that daily process measurement of pain and psychological variables is important in CBPD research, which agrees with the recent quest for intraindividual differences over time (Affleck, 1999) that marks health psychology research in general. The clinical relevance of daily process measures of (somatic) symptoms and psychological variables had been acknowledged earlier (de Vries and Delespaul, 1993) but is also supported by the results of this study.

Research issue 2 concerned pain as predictor of 4 aspects of disability. Pain report explained approximately 20% of the subject variance in physical and 8% in mental capacity (both *decreased* with pain) and about 9% in pain interference with activities and 4% in immobility due to the pain (both *increased* with pain). Again, more variance was explained at the subject than at the time (about 1-4%) or day (about 1-3.5%) level. The present study exceeded previous results: pain explained 20% of the variance in impaired physical capacity, compared to 10% of variance in physical impairment, explained by pain in chronic low back pain⁶ (Waddell et al., 1992) and pain explained 9% of interference with activities (beta: .322), while pain report was weakly related to self-reported activity in one of the earliest studies (Fordyce, et al., 1984). Linton (1995) found *no* significant association between pain intensity and actual activity level in chronic back pain. The present study employed 2 behavioral measures related to activity -- interference and immobility--, which were tailored specifically to the occurrence of pain. We believe that this tailoring to pain is the reason why our study produced significant associations between pain intensity and behavioral activity measures. In sum, pain report emerged as a substantial predictor of self assessed physical impairment and also predicted mental impairment and behavioral activity. But pain explained only part of the variance, leaving room for the contribution of other predictor variables.

⁶ Of the present sample 31% suffered from cervical pain, 21% from pain in lower back & spine, 19.5% from pain in head/face/shoulders & upper limbs, 19.5 from pain in more than 3 major sites and 9% from pain in lower limbs or from abdominal pain (Peters, et al., 2000).

Research issue 3 focussed on the psychological variables as predictors of disability. Operant factors were weak predictors explaining 3% at most of the subject variance in disability and about 4% of the time variance in immobility. When pain entered the analyses, the predictive effects boiled down to 0-2%.

Previous studies reporting associations between (spousal) reinforcement and disability (Romano, et al., 1995; Lousberg, et al., 1992; Geiger, et al., 1992; Flor, et al., 1989, 1987) differed largely in methods of measurement. To assess reinforcement, behavioral observation (Romano, et al, 1995), cross-sectional instruments (Lousber, et al, 1992; Flor, et al., 1989) or a partner diary (Flor, et al., 1987) have been used or this was manipulated experimentally (Geiger, et al, 1992). Cross-sectional instruments were also employed to assess activity level (Flor, et al., 1987), pain interference with daily life (Flor, et al., 1989) or physical impairment (Romano, et al, 1995), while a walking test was employed experimentally to measure physical activity (Lousber, et al, 1992) or walking speed (Geiger et al., 1992). According to Flor, et al. (1987), the cross-sectional patient measure of spousal reinforcement was the best predictor of activity level and superior to the partner's diary measures. In contrast, Lousberg, et al. (1992) found that actual exertion in CBPD decreased with a solicitous spouse *only* when the spouse rated the support, while the patients' ratings were irrelevant. Last, Romano, et al. (1995) found that observational measures of solicitous spousal behavior was associated to cross-sectionally assessed physical impairment. In our view the large differences between all --including our own-- studies make it as yet impossible to draw valid conclusions. Our study also showed, however, that operant spousal responses to well behavior in particular clearly contributed to pain in explaining 5% of the subject variance in immobility due to the pain (see model 3 outcomes). Thus the positive findings thusfar, although still inconclusive, in our view do justify further research of operant mechanisms in CBPD. In addressing operant factors, future research should seriously account for the issues of context dependency, relevance of direct spousal assessment and complexity of pain behavior.

Respondent and cognitive factors were better predictors of disability, explaining 22 vs.10% of the subject variance in physical and 6 vs. 14% in mental capacity (the subjective disability variables), 10 and 9% in interference and about 2-4% in immobility (the behavioral disability variables). When pain was added, respondent factors persisted to explain 3-8% and cognitive factors 2-10% of the subject variance. The psychological prediction of self-assessed physical and mental capacity best

survived the control for pain. Again, *pain-related fear* was the strongest respondent and *catastrophizing* was the best cognitive predictor. Second-best were *avoidance behavior* and *hypervigilance* (each in the respondent prediction of 2 disability variables) as well as *negative selfstatements* (which ruled out pain in the cognitive prediction of mental capacity).

Our findings corroborate the findings of previous studies regarding the relevance of pain-related fear and avoidance behavior (McCracken, et al., 1996, 1992; Vlaeyen, et al, 1995a,b) for disability in CBPD and show that --in addition to attention to pain (McCracken, 1997)-- hypervigilance contributes to the prediction of disability controlled for pain. The association between catastrophizing and disability controlled for pain had been already firmly demonstrated (Sullivan, et al., 1998; Keefe, et al., 1989; Turner and Clancy, 1986), but the impact of negative self-statements had not as yet been established for disability.

In this study, respondent and cognitive predictors clearly added to pain in explaining between-subject differences in disability and were strongest in the prediction of impaired physical and mental capacity. Our study thus contributes to empirically prove the impact of psychological factors on disability in CBPD.

Research issue 4 dealt with predictor differences patients with a shorter and longer pain duration. The prediction of pain report did not distinguish between patients differing in pain duration but the prediction of disability did. The strongest finding was that in *chronic pain* (n=65) pain report was more strongly related to immobility due to the pain than in *subchronic pain* (n=15). On first sight this was surprising, given the finding that pain intensity and actual activity level in chronic pain had been unrelated (Linton, 1985) and the assumption that through the impact of fear-avoidance, immobility becomes an independent behavior pattern in chronic pain, which persists relatively independent of pain intensity (Vlaeyen and Linton, 2000). It should be kept in mind, however, that in the present study immobility *due to the pain* was assessed instead of general immobility. It is well conceivable that in CBPD pain is *not* independent of immobility, when immobility is tailored to pain and measured as a direct response to the pain. Furthermore, our study showed that pain but particularly immobility varied within subjects, particularly during the course of the day. Thus prospective measurement over the day and statistical account for the time variance in both variables may be responsible in revealing what had not as yet been detected cross-

sectionally, e.g. that immobility due to the pain *increases* when pain passes the 6-months threshold for chronicity (see table 8). In our study this was found only in recent chronic pain (mean: 8.9 months, see Peters, et al., 2000), while the increase *did not* continue in persistent pain (mean: 10.5 years, see Peters, et al., 2000). Our data thus suggest that when pain persists longer than 6 months (with 3 months at average in this study) the association between pain and immobility due to the pain does not increase significantly after the pain has reached a duration of 1 year.

Although the explained variance was insubstantial, this study also showed that catastrophizing as well as avoidance behavior were more strongly related to immobility in patients with *chronic* than in those with *subchronic pain*. In addition, the patients with *persistent chronic pain* exhibited a stronger negative association between catastrophizing and physical capacity than the patients with a shorter pain duration.

These findings reveal a tendency that some psychological variables are more strongly related to *behaviorally*-assessed disability in chronic than in subchronic pain and, in addition, are more strongly related to a *subjective* indicator of physical impairment in persistent than in recent chronic or subchronic pain. Thus, this study produced some evidence that --independent of pain-- catastrophizing predicts immobility due to the pain better in chronic than in subchronic pain, and predicts subjective physical impairment better in persistent than in recent or subchronic pain. This does agree with chronic pain models (Vlaeyen and Linton, 2000; Waddell, 1998) asserting that inactivity and physical impairment become major problems in CBPD, which --boosted by psychological factors and physical disuse (guarded movement; deconditioning)-- persist relatively independent of the pain itself.

The present study generates 3 recommendations for future investigations of the role of operant responses of significant others in maintaining the problem of CBPD.: (1) employment of more intensive time sampling schedules or adding event-sampling of occasions when significant others are present; (2) focus on the impact on chronic pain of additional significant others, particularly the physician who is treating the CBPD patient; (3) firsthand assessment through behavior observation or diary recordings provided directly by the spouse or others.

In conclusion, the present study established psychological predictors of pain report and disability. Strong *predictors of pain report* were pain-related fear, catastrophizing and

hypervigilance. Analyses of *predictors of disability* singled out pain as the most important predictor but psychological predictors also emerged. The strongest were again pain-related fear and catastrophizing; second best were avoidance behavior, hypervigilance and negative self-statements. Thus, although pain intensity appeared as an important predictor of disability in CBPD, psychological factors add independently to this prediction and should therefore be carefully assessed in diagnosing CBPD patients. We should keep in mind that the analyses established associations, no causal relations. Still, our results confirm that pain only partly explains disability in CBPD.

The study also determined some differences in the prediction of disability between patients with subchronic, chronic and persistent chronic pain. Immobility due to the pain seemed to increase when pain persists between 6 and 12 months and catastrophizing and avoidance behavior independent of pain seem to become more powerful in stirring immobility and physical impairment when pain becomes (persistently) chronic.

The results summarized above are reliable and unique due to the sensitivity and scrutiny of the electronic ESM diary method as well as the careful selection and matching of the participating CBPD patients. In addition, the outcomes of this study bear implications for the refinement of conceptual models, which focus on psychological factors in the maintenance of CBPD.

Acknowledgment

The study was supported by the Netherlands Organization for Scientific Research (NWO), Program Chronic Diseases, subprogram Pain with grant #940-31-033. We thank Peter C. Honkoop for adapting the PTC software to the requirements of this study and Lisalotte C.B. Verspui for assisting in the acquisition of the data.

References

- Affleck G, Urrows S, Tennen H, Higgins P, Abeles M. Sequential daily relations of sleep, pain intensity and attention to pain among women with fibromyalgia. *Pain* 1996;68:363-368.
- Affleck G, Zautra A, Tennen H, Armeli S. Multilevel daily process designs for consulting and clinical psychology: a preface for the perplexed. *J Consult Clin Psychol* 1999;67:746-754.
- Aronoff GM, Evans WO, Enders PL. A review of follow-up studies of multidisciplinary pain units, *Pain* 1983;16:1-11.
- Asmundson GJ, Norton PJ, Norton GR. Beyond pain: the role of fear and avoidance in chronicity, *Clin Psychol Rev* 1999;19:97-119.
- Barsky AJ, Klerman GL. Overview: hypochondriasis, bodily complaints and somatic styles, *Am J Psychiat* 1983;140:273-283.
- Block AR, Kremer EF, Gaylor M. Behavioral treatment of chronic pain: The spouse as a discriminative cue for pain behavior, *Pain* 1980;9:243-252.
- Boston K, Pearce SA, Richardson PH. The Pain Cognition Questionnaire. *J Psychosom Res* 1990;34:103-109.
- Bryk AS, Raudenbusch SW. Hierarchical linear models: Applications and data analysis methods, Newbury Park CA: Sage Publications Inc, 1992.
- Burckhardt CS, Clark SR, O'Reilly CA, Bennett RM. Pain-coping strategies of women with fibromyalgia: Relationship to pain, fatigue and quality of life. *J Musculoskel Pain* 1997;5:5-21.
- Crombez G, Vlaeyen JWS, Heuts PHTG, Lysen R. Pain-related fear is more disabling than pain itself: evidence of the role of pain-related fear in chronic back pain disability, *Pain* 1999;80:329-339.
- Crombez G, Eccleston C, Baeyens F, van Houdenhove B, van den Broeck A. Attention to chronic pain is dependent upon pain-related fear. *J Psychosom Res* 1999;47:403-410.
- Delespaul PAEG. Assessing schizophrenia in daily life, Maastricht: University Press, 1995.
- Flor H, Kerns RD, Turk DC. The role of spouse reinforcement, perceived pain and activity levels of chronic pain patients. *J Psychosom Res* 1987;31:251-259.
- Flor H, Turk DC, Rudy TE. Relationship of pain impact and significant other reinforcement of pain behaviors: the mediating role of gender, marital status and marital satisfaction. *Pain* 1989;38:45-50.
- Flor H, Turk DC. Psychophysiology of chronic pain: do chronic pain patients exhibit symptom-specific psychophysiological responses? *Psychol Bull* 1989;105:215-259.
- Fordyce WE. The acquisition of operant pain. In: Fordyce, W.E., Behavioral methods for chronic pain and illness. St Louis MO: Mosby Company, 1976. pp. 41-73.

- Fordyce WE, Lansky D, Calsyn DA, Shelton JL, Stolov WC, Rock DL. Pain measurement and pain behavior. *Pain* 1984;18:53-69.
- Geiger G, Todd DD, Clark HB, Miller RP, Kori SH. The effects of feedback and contingent reinforcement on the exercise behavior of chronic pain patients. *Pain* 1992;49:179-185.
- Geisser ME, Robinson ME, Pickren WE. Differences in cognitive coping strategies among pain-sensitive and pain-tolerant individuals on the cold-pressor test. *Behav Ther* 1992;23:31-41.
- Gil M, Williams DA, Keefe FJ, Beckham JC. The relationship of negative thoughts to pain and psychological disease. *Behavior Therapy* 1990;21:349-362.
- Goldstein H. *Multilevel Statistical Models*, New York: Halsted Press, 1995.
- Hill A. The use of pain coping strategies by patients with phantom limb pain. *Pain* 1993;55:347-353.
- Hoppe F. Zur Faktorenstruktur von Schmerzerleben und Schmerzverhalten bei chronischen Schmerzpatienten. *Diagnostica* 1985;31:70-78.
- van den Hout JHC, Vlaeyen JWS, Houben RMA, Soeters APM, Peters ML. The effects of failure feedback and pain-related fear on pain report, pain tolerance and pain avoidance in chronic low back pain patients, *Pain* (submitted).
- IASP. Classification of Chronic pain. Description of pain syndromes and definitions of pain terms. *Pain* 1986;Suppl. S3.
- Jensen MP, Turner JA, Romano JM, Karoly P. Coping with chronic pain: a critical review, *Pain* 1991;47:249-283.
- Keefe GJ, Brown GK, Wallston KA, Caldwell DS. Coping with rheumatoid arthritis pain: Catastrophizing as a maladaptive coping strategy. *Pain* 1989;37:51-56.
- Kerns RD, Turk DC, Rudy TE. The West Haven Yale Multidimensional Pain Inventory (WHYMPI). *Pain* 1985;20:345-356.
- Kerssens JJ, Verhaak PFM, Bartelds AIM, Sorbi MJ, Bensing JM. The Epidemiology of Chronic Benign Pain Disorders in General Practice, *Pain* (submitted).
- Linton SJ, Gotestam KG. Controlling pain reports through operant conditioning: a laboratory demonstration, *Percept Motor Skills* 1985;60:427-437.
- Linton SJ. The relationship between activity and chronic back pain. *Pain* 1985;21:289-294.
- Lousberg R, Schmidt AJM, Groenman NH. The relationship between spouse solicitousness and pain behavior: searching for more experimental evidence. *Pain* 1992;51:75-79.
- Lousberg R, Groenman N. *De Multidimensional Pain Inventory – Dutch Version*, Lisse: Swets & Zeitlinger Publishers, 1993.
- Lousberg R, Groenman NH, Schmidt AJM, Gielen AACM. Operant conditioning of the pain experience, *Percept Motor Skills* 1996;83:883-900.

- Martin MY, Bradley LA, Alexander RW, Alarcon GL, Triana-Alexander M, Aaron LA, Alberts KA. Coping strategies predict disability in patients with primary fibromyalgia, *Pain* 1996;68:45-53.
- McCracken LM, Zayfet C, Gross RT. The Pain Anxiety Symptom Scale: development and validation of a scale to measure fear of pain, *Pain* 1992;50:67-73.
- McCracken LM, Gross RT, Aikens J, Carnkike Jr CLM. The assessment of anxiety and fear in persons with chronic pain: A comparison of instruments. *Behav Res Ther* 1996;34:927-933.
- McCracken LM. 'Attention' to pain in persons with chronic pain: a behavioral approach, *Behavior Therapy* 1997;28:271-284.
- McCracken LM, Faber SD, Janeck AS. Pain-related anxiety predicts non-specific physical complaints in persons with chronic pain. *Behav Res Ther* 1998;36:621-630.
- Multilevel Models Project. MlwiN, London: Institute of Education, 1998.
- Peters ML, Sorbi MJ, Kruise DK, Kerssens JJ, Bensing JM. Electronic diary assessment of pain, disability and psychological adaptation in patients differing in duration of pain. *Pain* 2000;84:181-192.
- Philips HC. Avoidance behavior and it's role in sustaining chronic pain. *Behav Res Ther* 1987;25:273-279.
- Philips HC, Jahanshahi, M. The components of pain behavior report. *Behav Res Ther* 1986;24:117-125.
- Raspe H, Kohlman T. Disorders chracterized by pain: a methodological review of population surveys, *J. Epidemiol Comm Health* 48 1994;48:531-537.
- Riley JF, Ahern, DK, Follick, MJ. Chronic pain and functional impairment: assessing beliefs about their relationship. *Arch Phys Med Rehabil* 1988;69:579-582.
- Romano JM, Turner JA, Friedman LS, Bulcroft RA, Jensen MP, Hops H. Observational assessment of chronic pain patient-spouse behavioral interactions. *Beh Ther* 1991;22:549-567.
- Romano JM, Turner JA, Friedman LS, Bulcroft RA, Jensen MP, Hops H, Wright SF. Sequential analysis of chronic pain behaviors and spouse responses. *J Consult clin Psychol* 1992;60:777-782.
- Romano MJ, Turner JA, Friedman LS, Bulcroft RA, Jensen MP, Hops H, Wright SF. Chronic pain patient-spouse behavioral interactions predict patient disability. *Pain* 1995;63:353-360.
- Rosenstiel A, Keefe FJ. The use of coping strategies in low back pain patients: Relationship to patient characteristics and current adjustment. *Pain*, 17 1986;17:33-44.
- Schmidt AJM, Wolfs Takens DJ, Oosterlaan J, van der Hout MA. Psychological mechanisms in hypochondriasis: attention-induced physical symptoms without sensory stimulation. *Psychother Psychosom* 1994;61:117-120.

- Seers K. Chronic non-malignant pain, *Br J Gen Pract* 1992;42:452-453.
- Sorbi MJ, Honkoop PC, Godaert GLR. A signal-contingent computer diary for the assessment of psychological precedents of the migraine attack. In: Fahrenberg J, Myrtek M, editors. *Ambulatory Assessment: Computer assisted psychological and psychophysiological methods in monitoring and field studies*, Göttingen: Hogrefe & Huber Publishers, 1996. pp. 403-412.
- Sullivan MJ, Stanish W, Waite H, Sullivan M, Tripp DA. Catastrophizing, pain and disability in patients with soft-tissue injuries. *Pain* 1998;77:253-260.
- Taylor SE. *Health Psychology*, 4th edition, Boston MA: McGraw-Hill, 1999.
- Tennen H, Affleck G. Daily processes in coping with chronic pain: Methods and analytic strategies, In: Zeidner M, Endler N, editors. *Handbook of Coping*, New York: Wiley, 1996. pp. 151-180.
- Toomey TC, Mann JD, Abashian S, Thompson-Pope S. Relationship between perceived self-control and pain, pain description and functioning. *Pain* 1991;45:129-133.
- Turk DC. Biopsychosocial perspective on chronic pain. In: Gatchel RJ, Turk DC, editors. *Psychological Approaches to Pain Management*, New York: Guilford Press, 1996. pp. 3-32.
- Turk DC, Kerns RD, Rosenberg R. Effects of marital interaction on chronic pain and disability: Examining the downside of social support, *Rehabil Psychol* 1992;37:259-274.
- Turk DC, Okifuji A. Evaluating the role of physical, operant, cognitive and affective factors in the pain behavior of chronic pain patients. *Behav Modif* 1997;21:259-280.
- Turk, D.C. and Flor, H., Chronic pain: a biobehavioral perspective. In: Gatchel RJ, Turk DC, editors. *Psychosocial Factors in Pain. Critical Perspectives*, Guilford Press, New York, 1999. pp. 18-34.
- Turner JA, Clancy S. Strategies for coping with chronic low back pain: relationship to pain and disability. *Pain* 1986;24:355-364.
- Verhaak PFM, Kerssens JJ, Dekker J, Sorbi MJ, Bensing JM. Prevalence of chronic benign pain disorder among adults: a review of the literature. *Pain* 1998;77:231-239.
- Vlaeyen JWS. *Chronic Low Back Pain*, Lisse: Swets & Zeitlinger Publishers, 1991.
- Vlaeyen JWS, Kole-Snijders AMJ, Boeren RGB, van Eek H. Fear of movement / (re)injury in chronic low back pain and its relation to behavioral performance. *Pain* 1995a;65:363-372.
- Vlaeyen JWS, Kole-Snijders AMJ, Rotteveel AM, Ruesink R, Heuts PHTG. The role of fear of movement/(re)injury in pain disability. *J Occup Rehabil* (1995b;5:235-252.
- Vlaeyen JWS, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain* 2000;85:317-332.
- de Vries MW. *The Experience of Psychopathology*, Cambridge: Cambridge University Press, 1992.

- de Vries MW, Delespaul PAEG. Zelfobservatie en intensieve time-sampling in de psychiatrie. (Self observation and intensive time sampling in psychiatry). In: Hoogduin CAL, Schnabel P, Vandereyken W, van der Velden K, Verhulst F, editors. Jaarboek Psychiatrie en Psychotherapie, Meppel: Van Loghum Slaterus, 1993. pp. 94-108.
- Wadell G. Pain and disability. In: Wadell G. The back pain revolution, London: Churchill Livingstone, 1998.
- Wadell G, Sommerville D, Henderson I, Newton M. Objective clinical evaluation of physical impairment in chronic low back pain. Spine 1992;17:617-628.
- Wadell G, Newton M, Henderson I, Somerville D, Main C. A fear-avoidance beliefs questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. Pain 1993;52:157-168.
- Ware JE, Sherbourne CD. The MOS 36-item short form health survey (SF-36). I. Conceptual framework and item selection. Med Care 1992;30:473-483.
- Willis Jr WD. Hyperalgesia and allodynia, New York: Raven Press, 1992.

Table 1. Prediction of **pain report** by psychological variables

model 1 (psych.variables & time)		
prediction by operant factors (n=1469*)		
	<i>beta-coefficients</i>	
- reinforcement of pain behavior	.186	
- reinforcement of well behavior	-.161	
- punishment of well behavior	.141	
- time	.053	
<i>variance:</i>	<i>unexplained</i>	<i>explained (R²)</i>
time	30	4
day	13	17
subject	57	10
prediction by respondent factors (n=7127*)		
	<i>beta-coefficients</i>	
- pain-related fear	.342	
- avoidance behavior	.087	
- hypervigilance	.197	
- time	.210	
- time ²	-.152	
<i>variance:</i>	<i>unexplained</i>	<i>explained (R²)</i>
time	33	18
day	11	31
subject	56	37
prediction by cognitive factors (n=5062*)		
	<i>beta-coefficients</i>	
- catastrophizing	.460	
- control	-.081	
- negative-selfstatements	.095	
- time	.271	
- time ²	-.191	
<i>variance:</i>	<i>unexplained</i>	<i>explained (R²)</i>
time	35	27
day	12	39
subject	53	28

* assessment of operant factors depended on the presence of the spouse/partner (1469-1476 observations) and cognitive factors on the presence of pain (5062 observations); respondent factors were assessed in each diary (7121-7127 observations). Differences in numbers of observation are due to missing values.

Table 2. Prediction of 4 aspects of **disability** by pain report

model 1 (pain & time)			
prediction of physical capacity (n=7122)			
		<i>beta-coefficients</i>	
- time		.049	
- pain		-.315	
<i>variance:</i>	<i>unexplained</i>	<i>explained (R²)</i>	<i>R² as proportion of total variance</i>
time	15	22	3.3
day	9	25	2.3
subject	76	26	19.8
<hr/>			
		<i>beta-coefficients</i>	
- time		.219	
- time ²		-.299	
- pain		-.230	
<i>variance:</i>	<i>unexplained</i>	<i>explained (R²)</i>	<i>R² as proportion of total variance</i>
time	25	11	2.8
day	12	9	1.1
subject	63	12	7.6
<hr/>			
prediction of pain interference (n=5071*)			
		<i>beta-coefficients</i>	
- pain		.322	
<i>variance:</i>	<i>unexplained</i>	<i>explained (R²)</i>	<i>R² as proportion of total variance</i>
time	59	2	1.2
day	8	44	3.5
subject	33	26	8.6
<hr/>			
prediction of immobility** (n=7071*)			
		<i>beta-coefficients</i>	
- time		-.278	
- time ²		.342	
- pain		.343	
<i>variance:</i>	<i>unexplained</i>	<i>explained (R²)</i>	<i>R² as proportion of total variance</i>
time	80	5	4.0
day	6	42	2.5
subject	14	28	3.9

* Numbers of observation differed depending on the operationalization of the disability variables.

** pain report interacted significantly with pain duration in predicting immobility (beta: .193), adding 4% explained (R²) at the subject level: the association between pain report and immobility was stronger in pain>6 months

Table 3. Prediction of **physical capacity** by psychological variables and pain report

		model 1 (psych.variables & time)	model 2 (pain)	model 3 (total)
prediction by operant factors and pain (n=1476)				
		----- <i>beta-coefficients</i> -----		
- reinforcement of pain behavior		-.116		-.075
- reinforcement of well behavior		.097		.059
- punishment of well behavior		-.068		-.037
- time		-.057	-.048	-.044
- pain			-.273	-.240
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	14	4	10	13
day	8	13	25	29
subject	78	2	15	14
prediction by respondent factors and pain (n=7121)				
		----- <i>beta-coefficients</i> -----		
- pain-related fear		-.336		-.244
- avoidance behavior		-.133		-.110
- hypervigilance		-.137	-.082	
- time		-.069	-.063	-.050
- pain			-.402	-.278
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	15	24	22	31
day	9	27	25	35
subject	76	29	26	37
prediction by cognitive factors and pain (n=5062)				
		----- <i>beta-coefficients</i> -----		
- catastrophizing		-.182		-.116
- optimism		.030		.033
- control		.060		.047
- negative self-statements		-.090		-.075
- time		-.053	-.046	-.041
- pain			-.232	.147
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	13	14	15	18
day	10	25	13	26
subject	77	13	14	18

Table 4. Prediction of **mental capacity** by psychological variables and pain report

		model 1 (psych.variables & time)	model 2 (pain)	model 3 (total)
prediction by operant factors and pain (n=1476)				
		----- <i>beta-coefficients</i> -----		
- punishment of pain behavior		-.046		-.040
- reinforcement of well behavior		.068		.049
- punishment of well behavior		-.134		-.093
- time		-.068	-.065	-.058
- pain			-.197	-.177
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	20	5	6	7
day	15	2	9	9
subject	65	5	9	12
prediction by respondent factors and pain (n=7121)				
		----- <i>beta-coefficients</i> -----		
- pain-related fear		-.167		-.113
- avoidance behavior		-.096		-.064
- hypervigilance		-.096		-.083
- time		.017	.022	.021
- time ²		-.002	-.003	-.003
- pain			-.277	-.159
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	25	12	11	15
day	12	8	10	12
subject	63	10	12	15
prediction by cognitive factors and pain (n=5062)				
		----- <i>beta-coefficients</i> -----		
- catastrophizing		-.125		-.097
- optimism		.081		.082
- control		.059		.054
- negative self-statements		-.159		-.152
- time		-.075	-.077	.070
- pain			-.169	.063
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	22	14	10	15
day	12	20	2	19
subject	66	21	8	23

Table 5. Prediction of **pain interference** by psychological variables and pain report

		model 1 (psych.variables & time)	model 2 (pain)	model 3 (total)
prediction by operant factors and pain (n=1476)				
		----- <i>beta-coefficients</i> -----		
- reinforcement of pain behavior		.104		.028
- pain			.385	.372
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	56	0	0	6
day	7	8	38	39
subject	37	2	35	34
prediction by respondent factors and pain (n=5067)				
		----- <i>beta-coefficients</i> -----		
- pain-related fear		.383		.304
- avoidance behavior		-.077		-.084
- hypervigilance		.180		.146
- pain			.321	.210
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	59	6	2	7
day	8	40	44	54
subject	33	31	26	35
prediction by cognitive factors and pain (n=5062)				
		----- <i>beta-coefficients</i> -----		
- catastrophizing		.297		.202
- control		-.065		-.049
- negative self-statements		.062		.042
- pain			.322	.200
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	59	3	2	4
day	8	40	44	53
subject	33	29	26	36

Tabel 6. Prediction of **immobility** by psychological variables and pain report

		model 1 (psych.variables & time)	model 2 (pain)	model 3 (total)
prediction by operant factors and pain (n=1469)				
		----- <i>beta-coefficients</i> -----		
- reinforcement of pain behavior		.161		.108
- reinforcement of well behavior		-.202		-.159
- punishment of well behavior		.194		.149
- time		.123	.120	.110
- pain			.316	.266
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	73	5	4	6
day	8	17	46	46
subject	19	12	21	25
prediction by respondent factors and pain (n=7062)				
		----- <i>beta-coefficients</i> -----		
- pain-related fear		.129		.087
- avoidance behavior		.106		.094
- hypervigilance		.029		.007
- time		.033	.033	.026
- pain			.178	.118
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	80	7	5	9
day	6	34	42	51
subject	14	13	28	19
prediction by cognitive factors and pain (n=5013)				
		----- <i>beta-coefficients</i> -----		
- catastrophizing		.203		.109
- optimism		-.063		-.063
- negative self-statements		.127		.107
- attributions		.098		.098
- time		.077	.092	.063
- pain			.272	.182
<i>variance:</i>	<i>unexplained</i>	----- <i>explained (R²)</i> -----		
time	81	5	4	5
dag	4	21	31	36
subject	15	28	20	34

<i>explained (R²)</i>		<i>strongest predictors</i>	<i>explained (R²)</i>	<i>strongest predictors</i>	<i>explained (R²)</i>	<i>strongest predictors</i>
<i>prop. total variance</i>			<i>prop. total variance</i>		<i>prop. total variance</i>	
pain report	S*	5.7%	- reinf. pain behav. (-.186)	- pain-related fear (.342)	14.8%	- catastrophizing (.460)
	D*	2.2%	- reinf. well behav. (-.161)	- time (.210)	4.7%	- time (.271)
	T*	1.2%	- pun. well behav. (.141)	- hypervigilance (.197)	9.5%	- time square (.191)
pain duration		-----	-----	-----	-----	-----
disability		<i>model1** model3</i>	<i>model1** model3</i>	<i>model1** model3</i>	<i>model1** model3</i>	<i>model1** model3</i>
		- <i>model2***</i>	- <i>model2***</i>	- <i>model2***</i>	- <i>model2***</i>	- <i>model2***</i>
physical capacity	S	1.6%	- pain (-.240)	- pain (-.278)	10.0%	- pain (.147)
	D	1.0%	- reinf. pain behav. (-.075)	- pain-related fear (-.244)	2.5%	- catastrophizing (-.116)
	T	0.6%	0.4%	- avoidance behav. (-.110)	1.8%	- negative self statements (-.075)
pain duration		-----	-----	-----	pain>12 mths: stronger neg ass (catastroph-physical capacity)	
mental capacity	S	3.3%	2.0%	- pain (-.177)	13.9%	- negative self-statements (-.152)
	D	0.3%	0%	- pun. well behav. (-.093)	2.4%	- catastrophizing (-.097)
	T	1.0%	0.2%	3.0%	3.1%	- optimism (.082)
pain duration		-----	-----	-----	-----	-----
pain inter-ference	S	0.7%	0%#	- pain (.372)	9.2%	- catastrophizing (.202)
	D	0.6%	0.1%	- pain-related fear (.304)	3.2%	- pain (.200)
	T	0%	3.4%	- pain (.210)	1.8%	- hypervigilance (.146)
pain duration		-----	-----	-----	-----	-----
immo-bility	S	2.3%	0.8%	- pain (.266)	4.2%	- pain (.182)
	D	1.4%	0%	- reinf. well behav. (-.159)	0.8%	- catastrophizing (.109)
	T	3.7%	1.5%	- pun. well behav. (.149)	4.0%	- negative self-statements (.107)
pain duration		-----	-----	-----	pain>6 mths: stronger pos ass (catastrophizing-immobility)	

* S = subject level; D = day level; T = time level;
 ** proportions of the total variance in disability, explained by psychological variables (model 1)
 *** proportions of the total variance in disability, explained by psychological variables, exclusive of the variance explained by pain (model 3 – model 2)
 # the variance in disability explained by pain *and* psychological variables is slightly smaller than the variance in disability explained by pain alone;
 the zero-percentages indicate that psychological variables do *not* add explained variance to the proportions of total variance in disability explained by pain

Tabel 8. Percentages of diary entries in which pain did not or did affect mobility

patient groups	% with pain <i>not</i> affecting mobility	% with immobility due to the pain	
		sitting	laying down
all patients (N=80)	87%	7%	6%
persistent chronic pain (>12 mths; N=40)	84%	9%	7%
subchronic & recent chronic pain (3-12 mths; N=40)	90%	5%	5%
chronic pain (>6 mths; N=65)	85%	8%	7%
subchronic pain (3-6 mths; N=15)	94%	3%	3%

The long term course of chronic benign pain disorder (CBPD)

Kerssens JJ*, Verhaak PFM*, Bensing JM.*.**

* Nivel Foundation, Netherlands Institute for Health Services Research, P.O.

Box 1568, 3500 BN Utrecht, The Netherlands

** Department of Health Psychology, Utrecht University, P.O. Box 80140,

3508 TC Utrecht, The Netherlands

Address correspondence to:

JJ Kerssens, PhD. Nivel Foundation, P.O. Box 1568, 3500 BN UTRECHT,

The Netherlands.

E-mail: j.kerssens@nivel.nl

Telephone: +31 302 729 646

Fax: +31 302 729 729

The long term course of chronic benign pain disorder (CBPD)

Abstract

Aim of this study is to investigate the long term prognosis of chronic benign pain in general practice for different patient profiles, the course of patients's self evaluation of their general health and their ambulatory health care utilization. During one year 344 patients (59% response) returned consent forms given to them by their general practitioner. Patients suffered pain for at least six months with almost daily chronic pain symptoms, without an explanatory medical diagnosis (such as cancer or arthritis). Patients were followed during three years and assessed on four occasions with three months interval and on two occasions with one year interval (month 3, 6, 9, 12, 24, and 36). Multi-level analyses was applied to model repeated measurements.

In the course of three years pain severity and interference with daily activities seem to decrease a little over time. However, the decrease is modest - about one point on a scale ranging from zero to twelve. Multi-level analyses shows that some patients have severe pain and other patients have less severe pain throughout the whole range of measurements. So pain severity is quite stable. SF-36 scores shows a poor health condition which did not change in the course of three years. CBPD patients are visiting general practitioners, the medical specialists and the hospital for diagnostic procedures quite often. CBPD patients also utilize a lot of services from the alternative practitioner and even more

services from the physical therapists. Although the various figures fluctuate somewhat in the course of time, none of the utilization show an downward or upward trend.

CBPD patients have very poor self-perception of their health and very high utilization of medical services and an unfavorable prognosis of pain severity.

1. Introduction

Chronic pain without a clear organic explanation is prevalent in the general population, although there is a wide variety in estimations of the point-prevalence. Prevalences between 2 percent and 40 percent were reported in a review by (Verhaak et al. 1998). Chronic pain was generally defined as pain existing for at least more than one month. Some studies took three or six months as limit before pain was defined as “chronic”. In our own study, focused on chronic *benign* pain, we found a prevalence of 0,7 percent of patients meeting our criteria. These were patients in the general population, included by their GP because of pain that existed for more than 6 months, which was the most prominent aspect in the clinical presentation and serious enough to justify clinical attention while the pain could not be explained by a physical diagnosis (e.g. cancer or arthritis). Related terms of chronic benign pain found in the literature are idiopathic pain (Knorring and Ekselius, 1994) and somatoform pain, both of which refer to psychiatric categories. .

When pain has once been experienced for a number of months, it tends to become really chronic in quite a number of cases. Croft (1998) reported a complete recovery after one year of 25 percent of patients, initially included with pain for longer than 3 months. Magni (1993) found 33% still suffering after eight years. Van Tulder (1998) reported on an average small improvements in pain intensity after one year but no improvement in mobility.

Regarding the pain-maintaining mechanisms, considerable attention has been given the past years to psychological, social and behavioural factors that maintain pain-experiences, initially provoked by nociception. Acute pain, caused by physical damage, will become chronic under the influence of pain coping behaviour as well as operant and respondent factors which may maintain pain behaviour. It is supposed that different patient profiles (Turk and Rudy 1992, Lousberg 1996) and different coping strategies (Brown and Nicassio 1987, Keefe and Williams 1990, Rosenstiel & Keefe 1983) are related to different outcomes, regarding chronicity. Moreover, it has been suggested that different pain diagnostic groups might use different strategies (Keefe et al. 1992). In order to study these assumptions, VonKorff (1992) called for a longitudinal approach.

In this paper such a longitudinal study will be reported. We will consider the following research questions:

- 1) What is the long term prognosis of chronic benign pain in general practice for different patient profiles?
- 2) What is the course of patient's self evaluation of their general health?
- 3) How is pain coping related to long-term prognosis?
- 4) How does the course of chronic pain, pain coping and different patient profiles affect medical consumption?

4. Methods

Design

The study is a longitudinal prospective cohort study. A cohort of patients with CBPD has been assessed on four occasions with three months intervals and on two occasions with one year interval (month 3-6-9-12-24-36).

Inclusion

Patients were included by their general practitioner. In the course of one year the selected those patients who presented symptoms of pain, or were know to have such symptoms, and who fulfilled the following criteria:

- 1) patients were between 18 and 75 years of age;
- 2) pain had existed for more than six months;
- 3) pain was the most prominent aspect in the clinical presentation and serious enough to justify clinical attention;
- 5) pain could not be explained by a physical diagnosis (for example, cancer or arthritis).

Patients were asked by their GP (N = 45) to participate in the study in the period 1/1/1996 through 31/12/96. The GPs are affiliated with the Dutch Sentinel Practice network (Bartelds 1993, Claas et al 1995). GPs handed out consent forms and the Multidimensional Pain Inventory (Dutch Version) self-administered questionnaire (Kerns et al. 1985, Rudy 1989, Lousberg 1999), which the consenting patients returned to NIVEL

Patients

Altogether a number of 586 patients fulfilled the inclusion criteria and had pain for at least six months. A number of 344 patients (59%) returned their consent forms. Patients mean age is 48 years . The majority of the patients is female (71%). Pain is most frequently located in the lower back and lower limbs while 31% of the patients have pain in more than three major body sites. Pain is most frequently associated by the musculoskeletal system and most often (nearly) continuous. Mean pain duration is 10 years.

Non-response

Patients were followed during three years and assessed on six occasions. On each new occasion a smaller group of patients was left. From the 344 consented CBPD patients a number of 336 (98%) responded on T1, 274 (80%) on T2, 238 (69%) on T3, 198 (58%) on T4, 163 (47%) on T5 and 128 (37%) on T6. All in all we have data on 1337 measurement occasions.

The loss of respondents resulted in a growing percentage of female patients, but the age composition of the six measurements occasions did not change substantially. Although the average pain duration increased, no selective dropout of patients with relatively good or poor health could be observed (see also Verhaak et al. 2001).

Questionnaires

MPI-brief screening version

Following inclusion, patients completed the Multidimensional Pain Inventory (Dutch Version) which consists of 62 items in several subscales divided over three main parts (Kerns et al. 1985, Rudy 1989, Lousberg 1999). On later repeated measurement occasions, a subset of items was used - The MPI brief screening version - to measure four different constructs of chronic pain: pain intensity; interference with social and recreational activities; life control; and affective distress (VonKorff 1992).

MOS 36-Item Short Form Health Survey (SF-36)

Self evaluation of patients health was measured by means of the Dutch translation of the MOS SF 36 (VanderZee et al. 1993). The SF-36 includes one multi-item scale that assesses eight health concepts: 1. physical functioning (PF); 2. role limitations caused by physical problems(RP); 3. social functioning(SF); 4. bodily pain (BP); 5. general mental health (MH); 6. role limitations due to emotional problems (RE); 7. vitality (VT); and 8. general health perceptions (GH). The survey was constructed for self-administration by persons 14 years of age and older (Ware & Sherbourne 1992). Considerable evidence is reported for the reliability of the SF-36 (Cronbach's alpha greater than 0.85, reliability coefficient greater than 0.75 for all dimensions except social functioning) and for construct validity in terms of distinguishing between groups with expected health differences. Because of overlapping pain items with the MPI brief screening version, subscales regarding bodily pain (BP), and role limitations due to

emotional problems were excluded (RE), leaving six of the original eight dimensions.

Ambulatory health care utilization

Patient reported the following health care utilization during the past three months on each of the six occasions. Visits to (and number of visits to) the following ambulatory health care services: general practitioner; medical specialist; physical therapist; mental health care institution; and alternative practitioner. They also reported visits to hospital for diagnostic procedures and hospital admissions.

Coping

Patients completed the Dutch translation of the Coping Strategies Questionnaire (Spinhoven et al. 1991) only once, on the second measurement occasion. The CSQ consists of 42 items that are partitioned into seven scales with high internal consistency (Rosenthal & Keefe 1983). The scales include (a) diverting attention, (b) reinterpreting pain sensations, (c) catastrophizing, (d) ignoring pain sensations, (e) praying and hoping, (f) coping self statements, and (g) increasing activities. In order to investigate the relation between pain coping and chronic pain, patients were classified in a high and a low coping group on the basis of the means score for each scale. The same procedure was applied to investigate the relation between pain coping and health care utilization.

Statistics

For analyzing the repeated measurements we used the hierarchical linear model - or sometimes denoted as the random effects model or multi-level models (Laird & Ware 1982, Goldstein 1995, Bryk & Raudenbusch 1992)

One of the major advantage of the hierarchical linear model approach to repeated measurements is its flexibility to deal with unbalanced data structures, that is, where data for some (or all) individuals is incomplete (Snijders & Bosker 1999 p166). There are two levels. The measurements of the different occasions (up to six) is the lowest level (in more traditional analysis: the within subject variable). Patients are the highest level. Dependent variables are: Pain severity, interference, life control and affective distress, as well as the utilization of the various ambulatory health care services.

3. Results

Long term course of chronic benign pain disorders

Figure 1

Figure 1 shows the course of the four dimensions of chronic pain on the six measurement occasions. Pain severity is rated highest on the first occasion, with mean 7.6, and is then decreasing slowly. On the last occasion mean pain severity is 6.6 on a scale from 0 to 12. Affective distress is showing a similar trend but on a lower level, with means ranging from 5.5 on the first occasion to 4.8 on the last. Interference with social and recreational activities is even declining more (6.8 - 5.4), except for the last occasion where a small increase is observed (mean 5.8). The last dimension, locus of control, is showing an opposite trend, increasing slowly from mean 7.6 on the first occasion to 6.6 on the last, on a scale from 0 to 12.

Table 1 showing the results of a two-level model of the pain severity index in the course of the measurements.

Table 1

The coefficient T reflects the course of time. Its negative sign indicates a decreasing trend. The coefficient T^2 points to the fact that the model has a quadratic element. So the decline is not a straight line but a curve and the greatest decrease in pain severity is between the first measurements. In later measurements the decrease tends to become zero. The total variance of the pain severity index is 9.883 (5.679 plus 4.204). According to the model's variance components more than half of the variance ($5.679 / 9.883 = 57\%$) is between patients, while the remaining variance is between measurements within patients. This points to the fact that some patients have severe pain and other patients have less severe pain throughout the whole range of measurements. Although there is some variation between patients in their pain decrease, we did not find any evidence that pain severity of some patients decreased, while for other patients the pain severity increased.

The variables T and T^2 have also been used to model interference, affective distress and locus of control. Results of interference are similar to those of pain severity (data not shown). The models with locus of control and affective distress do not have significant T's, indicating an unchanging level of these indicators (data not shown in table).

In sum, pain severity and interference with social and recreational activities are decreasing, while locus of control and affective distress do not change.

Long term course and patient profiles

Table 1 is also showing the results of a two-level model of the pain severity index according to the different MPI profiles. Again, the coefficient T and T² point to the curvi-linear course of the pain severity. In addition to this, the coefficients of different patient profiles indicate that dysfunctional patient report the severest pain. The other coefficients are not statistically significant.

The long term course of general health

Table 2

Table 2 is given the figures of the course of general health on the six occasions, transformed to a scale from 0 (worst condition) to 100 (best health status). At the first occasion mental health was rated highest, but still well below 60 and the mean score regarding limitations in usual role activities because of physical health problems was the lowest of all. Physical functioning, social functioning and mental health did not change in the course of three years. Vitality and general health perception seemed to have increased a little from the first occasion onwards. The mean score regarding limitations in usual role activities because of physical health problems shows the largest improvement, but does not reached a mean score higher than 32, on a scale from 0 to 100.

Pain coping and the course of chronic pain

The relation between the seven scales of pain coping and pain severity is analyzed in 7 multi-level models. Before giving results of these analyses, figure 2 is showing the course of pain severity for patients who scored high or low on one of the coping scales: diverting attention.

Figure 2

The (solid) line of patients who scored high on diverting attention seems to decrease somewhat less than the (interrupted) line of the low scoring group. However, both lines seems to follow the course of the pain severity as was shown in figure 1.

A relation between coping with pain and pain severity should result in a statistically significant interaction term (T times dichotomized pain coping scale score) in the various multilevel analyses. Only one out of seven interaction terms was statistically significant (data not shown in table). Pain severity of patients who scored high on the subscale praying and hoping decreased more than patient who scored low on this coping strategy. At the sixth measurement occasion their pain severity scores were about equal.

Ambulatory health care utilization

Table 3

Patients with Chronic Benign Pain Disorder utilize much medical services. In table 3 it is shown that in the course of three months more about 80% of the patients have visited their general practitioner. Apart from the first occasion, the percentages change only a little during the three years.

CBPD patients are visiting the medical specialist and the hospital for diagnostic procedures also quite often. CBPD patients utilize a lot of services from the alternative practitioner and even more services from the physical therapists.

Although the various figures in the fluctuate somewhat none of the providers show an downward or upward trend.

This means that the utilization of ambulatory health care is fairly constant over time.

The course of chronic pain and ambulatory health care utilization

Table 4 gives the results of the analysis of the relation between the course of chronic pain and the utilization of health care. Since we have measured pain severity, interference with daily activities, locus of control and affective distress on each occasion all the variables of this table are on the level of the measurements.

Table 4

Pain severity is having a positive association with the probability of going to the General practitioner, of going to the physical therapist as well as going to the hospital for diagnostic procedures. All these associations are positive, indicating the fact that patients with more severe pain have a greater probability of visiting these services. Interference with daily activities is positively associated with the chance of visiting an alternative practitioner and locus of control is negatively associated with this service. Affective distress is associated with the general practitioner and counselor / psychologist. Patients with more affective distress have a higher probability of visiting these services.

Pain coping and health care utilization

The relation between the seven scales of pain coping and the seven health services is analyzed in 49 multi-level models. Again, we are looking at interaction terms (measurements times dichotomized pain coping scale score) while the probability of visiting a general practitioner, etc are the dependent variables. Only eight out of 49 interaction terms reached statistical significance, four of which regard praying and hoping. The probability of visiting a general practitioner, medical specialist, physical therapist and going to the hospital for diagnostic procedures is decreasing more for patients who score high on praying and hoping than for those who score low (data not in table). And the probability of undergoing diagnostic procedures in hospital is also decreasing more for patients who score high on diverting attention than for those who score low. Finally, the

probability of visiting an alternative practitioner is decreasing more for patients who score high on praying and hoping, reinterpreting pain sensations and coping self statements than for those who score low on each of these coping strategies (data not in table).

Patient profiles and ambulatory health care utilization

Table 5 is showing the regression coefficients of the course of time and the different patient profiles on each of the health care services.

Table 5

As can be observed from the table there is only one statistically significant association between the patient profiles and the probability of health care utilization. Adaptive copers have a smaller probability of visiting a counselor or psychologist in a ambulatory mental health care organization.

4. Discussion

In this paper, different aspects of chronic benign pain were analyzed in the course of three years. Pain severity, as an important aspect of chronic pain, and interference with daily activities (e.g. how much has the pain changed the amount of satisfaction or enjoyment you get from taking part in social and recreational activities?) seem to decrease a little over time. However, the decrease is only modest - about one point on a scale ranging from zero to twelve. According to the variance components of the multi-level model in which pain severity was analyzed, most of the variance is between patients, less between measurements within patients. This points to the fact that some patients have severe pain and other patients have less severe pain throughout the whole range of measurements. We did not find any evidence that pain severity of some patients decreased, while for other patients the pain severity increased. (this kind of analysis is very easy implemented in a multi-level model by treating the variable T as a random variable). One other aspects of chronic pain - affective distress, did not change over time.

How patients think about their pain and their health is a crucial factor in chronic pain management (Chapman & Gavrin 1999). CBPD patients evaluate their own health status low. They evaluate their own health lower than chronic patients do with various conditions like diabetes and rheumatoid arthritis (Rijken et al. 1998). Patients with chronic pain are limited in performing all physical activities, including bathing and dressing. As a consequence, they have a lot of

difficulties with work or other daily activities and they accomplish less than they would like in this respect. They experience also an extreme and frequent interference with normal social activities due to their physical and emotional problems. Physical functioning, social functioning and mental health did not change in the course of three years, while vitality and general health perception seemed to have increased only a little from the first year to the third. CBPD is thus really a chronic condition.

CBPD patients use a lot of health services. This is probably because chronic pain is not a symptom that exists in isolation, but tends to create a cluster of related problems such as chronic fatigue, sleep disturbance, excessive rest and withdrawal from activities, comprised immune function and mood disorder. Chronic pain is often associated with depression or other kinds of psychological distress (Smith et al. 1999). This is likely the reason that a relatively large number of CBPD patients are visiting a counselor or psychologists at the mental health care institutions. Furthermore, a wide range of psychological techniques has been shown to be beneficial in management of chronic pain, particular in improving function and quality of life (Flor et al. 1992, Aronoff et al. 1983).

Chronic benign pain is also often located in the musculoskeletal system. That is why many CBPD patients visit a physical therapist. In the Netherlands, the majority of patients are referred by GPs (Kerssens & Groenewegen 1989) to small private outpatient practices (Hingstman & Boon 1989). Most of them are treated in a series of therapy sessions which last almost half an hour each

(Dekker et al. 1993, Valk et al. 1995) The standard number of sessions is 9, that is the number the public health insurance companies is willing to remunerate in one year. But 95% the patients have supplementary insurance for another series of 9 (18 in total). Our results have indicated that about half of the CBPD patients visit the physical therapist while the mean number of visits is about 6 (table 4). So CBPD patients who visit a physical therapist, see their therapist about once a week.

In our analysis of pain coping and the course of pain severity, we have dichotomized pain coping scores to create a group of patients with a frequent use of a coping strategy. In all the models we have found that people with more severe pain used all the coping strategies more frequent than people with less severe pain. As regards pain coping and health care utilization things were different. Patients who frequently use the various pain coping strategy do not seem to utilize more health services. This finding is in accordance with Jensen & Karoly (1991). They also did not find a relationship between pain coping and medical service utilization.

Acknowledgments

This study was supported by Grant 940-31-034, Research Program Chronic Diseases/Pain Research of the Netherlands Organization for Scientific Research, Medical Science.

References

- Aronoff, GM, Evans WO, Enders PL. A review of follow-up studies of multi disciplinary pain units. *Pain*. 1983; 16: 1-11.
- Bartelds AIM. Validating of Sentinel Data. *Gesundh Wes*. (1993) 55, 3-7.
- Brown GK, Nicassio PM, Wallston KA. Development of a questionnaire for the assessment of active and passive coping strategies in chronic pain patients. *Pain*. 1987 Oct; 31(1): 53-64.
- Bryk AS, Raudenbusch SW. Hierarchical linear models: applications and data management methods. Newbury Park, Sage publications, 1992.
- Chapman CR, Gavrin J. Suffering: the contributions of persistent pain. *Lancet*. 1999; 353: 2233-2237.
- Claas EC, de Jong JC, Bartelds AIM, et al. Influenza types and patient population. *Lancet* (1995), 346, 263-7.
- Croft PR, Macfarlane GJ, Papageorgiou AC, Thomas E, Silman AJ. Outcome of low back pain in general practice: a prospective study. *Br Med J* 1998; 316: 1356-1359.
- Dekker J. VanBaar ME, Curfs EChr, Kerssens JJ. Diagnosis and treatment in physical therapy: an investigation of their relationship. *Phys Ther*. 1993;73:568-580.
- Flor H, Fydrich T, Turk DC. Efficacy of multidisciplinary pain treatment centers: a meta-analytic review. *Pain*. 1992; 49: 221-230.
- Goldstein H. Multilevel Statistical Models. New York; Halsted Press, 1995.
- Hingstman L, Boon H. Regional dispersion of independent professionals in primary health care in the Netherlands. *Soc Sci Med*. 1989;28:121-131.
- Jensen MP, Karoly P. Control beliefs, coping efforts, and adjustment to chronic pain. *J Consult Clin Psychol*. 1991; 59: 431-438.
- Keefe FJ, Williams DA. A comparison of coping strategies in chronic pain patients in different age groups. *Journal of Gerontology* 1990; 45: 161-165.
- Keefe FJ, Salley AN, Lefebvre JC. Coping with pain: conceptual concerns and future directions. *Pain*. 1992; 51: 131-134.

- Kerns RD, Turk DC, Rudy TE. The West-Haven-Yale Multidimensional Pain Inventory (WHYMPI). *Pain*. 1985; 23: 345-356.
- Kerssens JJ, Groenewegen PP. Referrals to physiotherapy; the relation between the number of referrals, the indication for referral and the inclination to refer. *Social Science and Medicine*. 1989; 30: 797-804.
- Knorrning LV, Ekselius L. Idiopathic pain and depression. *Qual.Life Res*. 1994; 3: s57-s68.
- Laird NM, Ware JH. Random effects models for longitudinal data. *Biometrics*. 1982; 38: 963-974
- Lousberg R, Groenman N, Schmidt A. Profile characteristics of the MPI-DLV clusters of pain patients. *J Clin Psychol*. 1996; 52: 161-7
- Lousberg R, Groenman NH, Schmidt AJM, Arntz A, Winter FAM. Psychometric properties of the Multidimensional Pain Inventory - Dutch Language Version (MPI-DLV). *Behavioral Research Therapy*. 1999; 37: 167-182
- Magni G, Marchetti M, Moreschi C, Merskey H, Rigatti-Lunchini S. Chronic musculoskeletal pain and depressive symptoms in the National Health and Nutrition Examination I. Epidemiologic Follow-up study. *Pain*. 1993; 53: 163-168.
- Rijken PM, Foets M, Peters L, DeBruin AF, Dekker J. *Patientenpanel Chronisch Zieken. Kerngegevens 1998*. Utrecht; Nivel, 1999.
- Rosenstiel AK, Keefe FJ. The use of coping strategies in chronic low back pain: relationship to patient characteristics and current adjustments. *Pain*. 1983; 17: 33-44.
- Rudy TE. Multiaxial assessment of pain. Multidimensional pain inventory. University of Pittsburgh, Pittsburgh, USA, 1989.
- Smith BH, Hopton JL, Chambers WA. Chronic pain in primary care. *Family Practice* 1999; 16: 475-482.
- Snijders, T.A.B., Bosker R.J. Multilevel analysis: an introduction to basic and advanced multilevel modeling. Sage publications, London, 1999.

- Spinhoven Ph, Kuile Mt, Linssen ACG, Gazendam B. Pain coping strategies in a Dutch population of chronic low back pain patients. *Pain*. 1989; 37: 77-83.
- Turk DC, Rudy TE. The robustness of an empirically derived taxonomy of chronic patients. *Pain*. 1990; 43: 27-35.
- Turk DC, Rudy TE. Classification logic and strategies in chronic pain. In: Turk DC, Melzack M. *Handbook of pain assessment*. The Guilford Press; New York, 1992, 409-428.
- Valk RWA, Dekker J, Baar ME van. Physical therapy for patients with back pain: a description. *Physiother*. 1995;81:345-354.
- VanderZee, K., Sanderman, R., Heyink, J. De psychometrische kwaliteit van de MOS 36-item Short Form Health Survey (SF-36) in een Nederlands populatie. *Tijdschrift voor Sociale Gezondheidszorg*. 1993; 71: 183-191
- VanTulder MW, Koes BW, Metsemakers J, Bouter LM. Chronic low back pain in primary care: a prospective study on the management and course. *Family Practice*. 1998; 15: 126-132.
- Verhaak PFM, Kerssens JJ, Dekker J, Sorbi M, Bensing JM. Prevalence of chronic benign pain disorder. A review of the literature. *Pain*. 1998; 77: 231-9.
- Verhaak PFM, Kerssens JJ, Bensing JM, Sorbi M, Peters ML, Kruise DA.. Medical help-seeking by different types of chronic pain patients. *Psychology and Health*. 2001 [Accepted].
- Vonkorff M. Epidemiological and Survey methods: chronic pain assessment. In: Turk DC, Melzack M. *Handbook of pain assessment*. The Guilford Press; New York, 1992, 391-408.
- Ware JEr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care*. 1992; 30: 473-83.

Table 1 Regression coefficients and corresponding standard errors of pain severity on 6 measurement occasions (3, 6, 9, 12, 24, 36 months)

	Estimate	s.e.	Estimate	s.e.
<i>Linear regression</i>				
Constant	7.656	0.162	7.288	0.269
T	-.487***	0.117	-.497***	0.116
T ²	.058*	0.024	.060**	0.024
Dysfunctional			1.445**	0.379
Interpersonaly distressed			0.209	0.459
Adaptive copers			-0.73	0.528
Average			0.18	0.386
<i>Variance components</i>				
Patient	5.679	0.541	5.262	0.508
Measurement	4.204	0.19	4.196	0.189

Table 2. Mean scores on 6 SF-36 scales on 6 measurement occasions (3, 6, 9, 12, 24, 36 months)

	3	6	9	12	24	36
PF - physical functioning	54.9	55.4	56.1	57.2	55.9	55.2
RP - role limitations	20.9	25.1	26.8	30.0	29.4	31.4
SF - social functioning	51.6	51.2	51.8	52.5	51.7	52.0
MH - mental health	58.7	59.0	59.4	58.9	60.1	58.9
VT - vitality	44.7	45.2	47.0	46.4	46.6	47.7
GH - general health perception	35.6	36.3	40.8	41.0	34.1	35.4

Table 3. Percentage of patients who contacted different kinds of medical services on 6 measurement occasions (3, 6, 9, 12, 24, 36 months)

	3	6	9	12	24	36
<i>Contact with ...</i>						
General practitioner	90.2	78.1	75.6	74.8	78.1	78.6
Medical specialist	46.8	43.3	43.2	40.9	39.5	49.6
Hospital - diagnostic procedures	48.9	38.5	38.2	35.1	39.8	39.7
Hospital admission	6.7	9.3	4.0	6.5	8.2	4.0
Physical therapist	50.9	42.3	42.5	41.1	42.9	40.6
Counselor / Psychologist	14.2	16.4	14.2	16.7	15.5	15.9
Alternative practitioner	22.6	20.4	20.7	19.5	18.1	19.0

Table 4 Regression coefficients of eight different multi-level models of ambulatory health care utilization according to pain severity, interference with daily activities, locus of control an affective distress on 6 measurement occasions (3, 6, 9, 12, 24, 36 months).

	Gp	Ms	Hdp	Had	Pt	C/P	Ap
<i>Linear regression</i>							
Constant	0.618	0.36	0.269	0.039	0.238	0.069	0.296
Pain severity	.015***	0	.015***	0	.022***	0.01	0
Interf.erence	0.01	0	0	0.01	0.01	0	.011***
LOC	0	0	0	0	0	0	-.013**
Affective Distress	.010**	0	0	0	0	.010**	0
<i>Variance components</i>							
Patient	0.032	0.08	0.05	0	0.098	0.048	0.082
Measure	0.115	0.159	0.188	0.059	0.136	0.07	0.08*

p<.05; ** p<.01; *** p<.001. Gp = General practitioner; Mp = Medical specialist; Hdp = Hospital - diagnostic procedures; Had = Hospital admission; Pt = Physical therapist; C/P = Counselor / Psychologist; Ap = Alternative practitioner.

Table 5 Regression coefficients of eight different multi-level models of ambulatory health care utilization according to different patient profiles - dysfunctional, interpersonally distressed, adaptive copers, and average patients on 6 measurement occasions (3, 6, 9, 12, 24, 36 months).

	Gp	Ms	Hdp	Ha	Pt	C/P	Ap
<i>Linear regression</i>							
Constant	0.92	0.503	0.517	0.07	0.484	0.137	0.225
T	-.102***	-.049*	-.082**	0	-.056*	0	0
T ²	.017***	.011**	.015**	0	.009*	0	0
Dysfunctional	0	0	0	0.02	0.105	0.03	0.07
Interp. Distressed	0	-0.1	-0.1	0	0	0.09	0
Adaptive Coper	-0.1	-0.11	-0.11	0	-0.1	-.110*	-0.11
Average	-0.1	-0.1	-0.1	0	0	0	0
<i>Variance components</i>							
Patient	0.04	0.09	0.06	0	0.102	0.05	0.08
Measure	0.112	0.158	0.183	0.06	0.139	0.07	0.08*

p<.05; ** p<.01; *** p<.001. Gp = General practitioner; Mp = Medical specialist; Hdp = Hospital - diagnostic procedures; Had = Hospital admission; Pt = Physical therapist; C/P = Counselor / Psychologist; Ap = Alternative practitioner

Figure 1. Means scores on 4 scales of the MPI-brief screening version on 6 measurement occasions (3, 6, 9, 12, 24, 36 months).

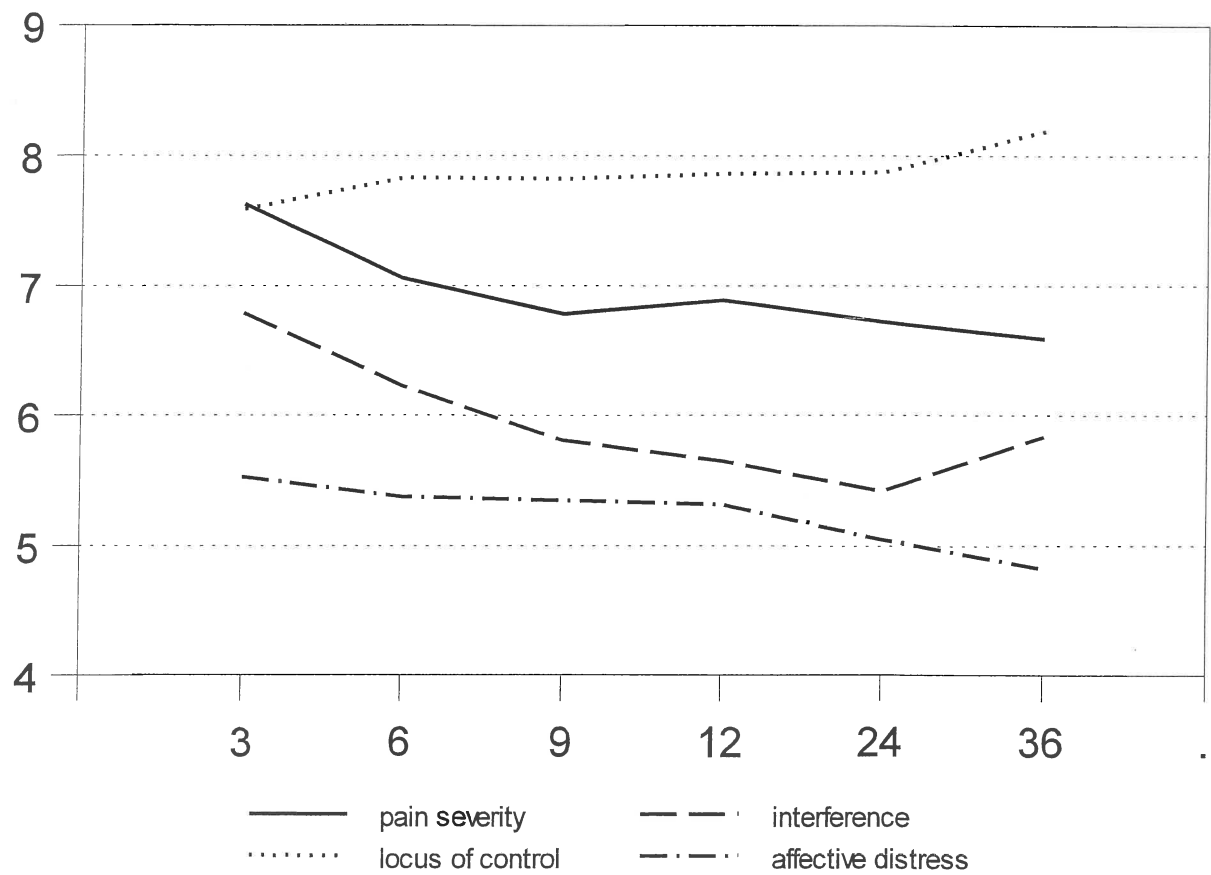
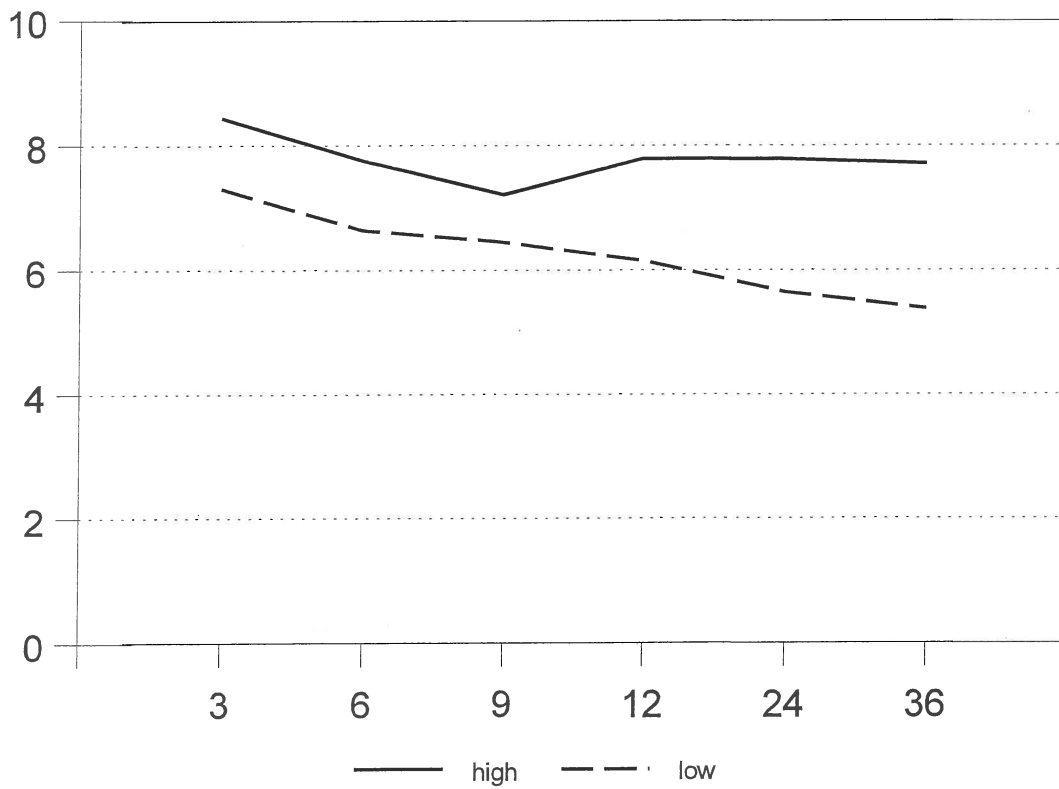


Figure 2. Mean scores of patient severity of low or high scoring patients on diverting attentio
of the pain on 6 measurement occasions (3, 6, 9, 12, 24, 36 months).



Ambulatory Health Care Utilization of Patients with Chronic Benign Pain Disorder

Kerssens JJ*, Verhaak PFM*, Sorbi MJ**, Peters ML**, Bensing JM.****

* Nivel Foundation, Netherlands institute of Primary Health Care

** Department of Health Psychology, Utrecht University

*** Department of Medical, Clinical and Experimental Psychology, Maastricht University

**** Nivel Foundation and Department of Health Psychology, University of Utrecht

June 2000

Address correspondence to:

JJ Kerssens, PhD. NIVEL Foundation, P.O. Box 1568, 3500 BN UTRECHT, The Netherlands.

E-mail: j.kerssens@nivel.nl

Acknowledgments

This study was supported by Grant 940-31-033, Research Program Chronic Diseases/Pain Research of the Netherlands Organization for Scientific Research, Medical Science.

Abstract word count: 215

Ambulatory Health Care Utilization of Patients with Chronic Benign Pain Disorder

Abstract

Background. Patients with chronic benign pain disorder (CBBP) are thought to utilize a lot of ambulatory health care, but thus far no facts or figures are available.

Objective. Aim of this study is to investigate the utilization of ambulatory health care by patients with CBPD. We compared ambulatory health care utilization and self-evaluation of health of CBPD patients and matched controls and investigated the course of health care utilization during one year.

Methods. In one year 344 patients (59% response) returned consent forms given to them by 45 general practitioners. These were patients who had suffered pain for at least six months with almost daily chronic pain symptoms, without an explanatory medical diagnosis (such as cancer or arthritis). In addition, 371 control patients, matched for sex and age, returned the questionnaire mailed to them (response 51%).

Results. The consumption of medical services by patients with CBPD was at least twice as much as that of the matched control group. Physical therapists, psychologists and alternative practitioners, in particular, were consulted much more often. The utilization of ambulatory health care is fairly constant over a one-year period. CBPD patients have very poor self-perception of their health.

Conclusion. CBPD patients have very poor self-perception of their health and very high utilization of medical services.

Introduction

Epidemiological studies of pain have been largely concerned with how many people suffer from chronic pain and how its frequency varies with demographic factors such as age or sex. In spite of the fact that these studies show a wide range of prevalence estimates, it has become clear that chronic pain is a major public health problem. (Crook et al. 1984, Andersen 1987, Brattberg et al. 1989, Magni et al. 1990, Mäkelä & Heliövaraa 1991, Croft et al. 1993, Anderson 1994, Gureje et al. 1998). Prevalence estimates range from less than 1% (Potter 1992) to 82% (James 1991) which may be partly explained by differences in the definition of pain (Crombie et al. 1994) and differences in the demarcation of chronic. In addition, different methods of studying chronic pain (telephone surveys, postal questionnaires, direct interviews) result in a wide range of estimates (Verhaak et al. 1998).

Chronic Benign Pain Disorder

In chronic pain a direct link with a nociceptive substrate is not always present (Merskey 1986). When there is no such link, we refer to the pain as benign. Related terms found in the literature are idiopathic pain (Knorring and Ekselius, 1994) and somatoform pain, both of which refer to psychiatric categories. In the fourth version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) chronic pain without an organic explanation is categorized as Chronic Pain Disorder Associated with Psychological Factors. We refer to this disorder as the Chronic Benign Pain Disorder (CBPD). The overall prevalence of CBPD in the Netherlands is 7.91 per 1000 patients registered with general practitioners.

CBPD patients are believed to be major health service consumers, but this judgement is always that of the providers of health care, who may well only be encountering a relatively small group of patients with this disorder. It is of interest to note there have been very few studies within the domain of pain research devoting attention to pain patients' use of health services. Studies of pain and the use of health services have in general been limited to cross-sectional measurement of pain characteristics and health services utilization (Crook et al. 1984, Engel et al. 1996, Jensen et al. 1994, Van Tulder et al. 1998). This study was undertaken to try to fill the knowledge gap on this topic and provide a reliable description of the utilization of ambulatory health care by CBPD patients. Since patients may experience episodes without pain or intermittent pain or continuous pain, a longitudinal design was chosen covering both a number of people and periods of time within the same individual (Von Korff 1990).

Research questions

- 1) How much ambulatory health care is utilized by patients with Chronic Benign Pain Disorder when compared with a matched control group?
- 2) How do CBPD patients evaluate their own health when compared with a matched control group?
- 3) What is the course of the utilization of ambulatory health care by patients with Chronic Benign Pain Disorder over a period of one year?

Methods

Design

The study is a longitudinal prospective cohort study with assessments of CBPD patients on four occasions with three months intervals (T1, T2, T3 and T4). The utilization of health care and the evaluation of their own health was measured on each occasion. The control group was matched for age and sex and was measured at (T1) only, so comparisons of patients and controls was limited to T1.

Subjects

Patients were asked by their GP (N = 45) to participate in the study in the period 1/1/1996 through 31/12/96. The GPs are affiliated with the Dutch Sentinel Practice network (Bartelds 1993, Claas et al 1995). GPs handed out consent forms and the Multidimensional Pain Inventory (Dutch Version) self-administered questionnaire (Kerns et al. 1985, Rudy 1989, Lousberg 1999), which the consenting patients returned to NIVEL.

The following inclusion criteria for patients were used by the GPs:

- 1) Age between 18 and 75;
- 2) Pain for at least six months;
- 3) Pain as the most salient aspect in the clinical presentation;
- 4) Pain serious enough to justify clinical attention;
- 5) Pain leading to obvious discomfort and disability in daily life for at least one month.

Exclusion criteria were: pain caused by diagnosed malignancies, rheumatic or neurological disorders, such as cancer, rheumatoid arthritis and gout.

Altogether 586 patients met the inclusion criteria and had suffered pain for at least six months. 344 patients (59%) returned consent forms.

Control patients were recruited by the same GPs who had submitted the CBPD patient group. Two controls patients were chosen from the GP list for each CBPD patient. Patients and controls were matched for sex and age. Only one exclusion criterion was applied to control patients only: in that patients with chronic benign pain disorder were excluded. The matched controls were approached only once (T1). 371 out of 726 controls returned the mailed questionnaire (51% response). The non-response rate only slightly affected matching, i.e. the mean age of CBPD patients was 47 (27.0% male) while the mean age of controls was 48.9 years (28.9% male).

Measurements of CBPD patients and controls

Self-evaluation of patient health was measured by means of the Dutch translation of the MOS SF 36 (VanderZee et al. 1993). The SF-36 includes one multi-item scale that assesses eight health concepts: 1. physical functioning (PF); 2. role limitations caused by physical problems (RP); 3. social functioning (SF); 4. bodily pain (BP); 5. general mental health (MH); 6. role limitations due to emotional problems (RE); 7. vitality (VT); and 8. general health perceptions (GH). The survey was constructed for self-administration by persons 14 years of age and older (Ware & Sherbourne 1992). Considerable evidence is reported for the reliability of the SF-36 (Cronbach's alpha greater than 0.85, reliability coefficient greater than 0.75 for all dimensions except social functioning) and construct validity in terms of distinguishing between groups with expected health differences. Because of overlapping items with the Multidimensional Pain Inventory, subscales regarding bodily pain (BP), and role limitations due to emotional problems were excluded (RE), so we have six of the

eight dimensions. Because of the different scaling for the various items or groups of items, all total scores were transformed to scores on a 100-point scale ranging from 0 (worse condition) to 100 (optimal condition) (VanderZee et al.1993).

Questions about ambulatory health care utilization were combined with the MOS SF 36 in a self-completed questionnaire. The following questions were asked: consultations and number where relevant with: general practitioner; medical specialist; physical therapist and alternative practitioner during the past three months. Medication prescribed by GPs, specialists and alternative practitioners was also investigated.

Another series of questions related to attendance at hospital for diagnostic procedures, visits to ambulatory mental health care institutes and hospital admissions, also during the past three months. We did not inquire into health care received by patients during their stay in hospital.

Statistical analysis

Most statistics are descriptive, being frequencies, means and percentages. Comparison between CBPD patients and controls during consultation with the various health care providers and institutes was by means of Odds Ratios. Comparison of the various SF 36 health indicators was by means of a t-test with unequal variances.

The number of consultations with the various health care providers for CBPD patients over one year was analyzed using a hierarchical linear model (also known as a multilevel model) (Bryk & Raudenbusch 1992, Goldstein 1995). Since repeated measurements are nested within patients, there is a measurement level and a patient level. Measurements at T1, T2, T3 and T4 are on the lowest level and patients are on the highest level. One of the advantages of the hierarchical linear model approach to repeated measurements is its flexibility in dealing with unbalanced data structures, where data for some individuals is incomplete (Snijders & Bosker 1999).

Non-response

Since the study is prospective, CBPD patients were asked to complete and return a mailed questionnaire at T1 and every three months thereafter. Each new measurement resulted in a considerable loss of respondents. On each new occasion a smaller group of patients was left. From the 344 consenting CBPD patients, 336 responded at T1, 274 at T2, 238 at T3 and 198 at T4. Table 1 shows the impact of non-response at T1 to T4 by presenting the distribution of age, gender, average pain duration and a number of health parameters.

Insert table 1 about here

The loss of respondents resulted in a growing percentage of female patients, although the age composition of the four groups did not change substantially. The average pain duration increased a lot, while no selective dropout of patients with relatively good or poor health could be observed.

Results

CBPD patients have a much higher level of medical service consumption than the matched control group. Table 2 shows that twice as many CBPD patients consult their general practitioner in a three month period than control patients (OR=11.6).

Insert table 2 about here

The Odds Ratio for visiting a medical specialist is 3.2. CBPD patients who attend hospital for diagnostic procedures also visit more often than control patients (OR 2.8). CBPD patients utilize a lot of alternative practitioner services and even more physical therapist services. The greatest difference, however, relates to the utilization of mental health care (OR=13.4). Apart from the hospital admissions, all Odds Ratios in table 2 have a statistically significant difference from one.

As regards prescription medication, the differences between CBPD patients and controls are much smaller. The percentage of patients who visit the GP and used medication has an odds ratio of about 2.3. For medication from the medical specialist the difference is less and not statistically significant.

Insert table 3 about here

It appears that control patients more often receive prescription medication from alternative practitioners than the CBPD patient group. The reason is that the small number of controls (19) were consulting more homeopathic physicians, while the larger number of CBPD patients were consulting relatively more acupuncturists and healers, although the difference is not statistically significant.

Insert table 4 about here.

CBPD patients give a low evaluation of their own health status when compared with controls. This applies to all the various SF 36 health indicators. All the differences were highly statistically significant, according to the t-test statistics. The difference between CBPD patients and controls was especially large in social functioning, vitality and physical functioning.

Figure 1 represents the course of ambulatory health care utilization of patients with Chronic Benign Pain Disorder during one year. Table 5 gives the numerical results of the regression analysis.

Insert table 5 about here

The constant in the regression analyses represents the reference group for the time measurements. In our case: the number of consultations with the various health care providers at the first measurement T1. The number of consultations with the physical therapists exceeds those with other providers. The variables T2, T3, T4 represent the number of consultations at the repeated measurements, compared with the number of consultations at T1. Although there seems to be a downward trend in the number of GP, physical therapist and the alternative practitioner consultations, only one of the coefficients is statistically significant (consultations with the general practitioner at T4). Compared with the preceding coefficients however (e.g. T4-T3), none of the coefficients are statistically significant. This means that the utilization of ambulatory health care is fairly constant over time.

In a hierarchical linear model there are different sources of variance (whereas in a traditional linear model there is only one). The variance component at the patient level in table 4 is higher than the variance component at the measurement level. This means that differences among patients are greater than differences among the repeated measurements within patients. The correlations between repeated measurements range between .3 (for GP consultations) to .6 (for physical therapy consultations (data not shown in table)).

Discussion

Patients suffering from pain for at least six months, with almost daily chronic pain symptoms, with an explanatory medical diagnosis (CBPD patients), were included in the study and followed for a period of one year. The purpose of this paper was to investigate the utilization of ambulatory health care by patients with CBPD. We compared ambulatory health care utilization and self-evaluation of health of CBPD patients and matched controls and investigated the course of health care utilization during one year.

Patients with Chronic Benign Pain Disorder consume at least twice as much ambulatory health care as a group of matched controls. This is probably because chronic pain is not a symptom that exists in isolation, but tends to create a cluster of related problems such as chronic fatigue, sleep disturbance, excessive rest and withdrawal from activities, comprising immune function and mood disorder. Chronic pain is often associated with depression or other kinds of psychological distress (Smith et al. 1999). This is probably the reason for a larger number of CBPD patients visiting counselors or psychologists at mental health care institutions than the control group patients. Furthermore, a wide range of psychological techniques has been shown to be beneficial in the management of chronic pain, particularly in improving function and quality of life (Flor et al. 1992, Aronoff et al. 1983).

Chronic benign pain is also often located in the musculoskeletal system. That is why many CBPD patients consult a physical therapist. In the Netherlands, the majority of patients are referred by GPs (Kerssens & Groenewegen) to small private outpatient practices (Hingstman & Boon 1989). Most of them are treated in a series of therapy sessions which last almost half an hour each (Dekker et al. 1993, Valk et al. 1995). The standard number of sessions is 9, that is the number that the public health insurance companies are willing to pay for in one year. But 95% of the patients have supplementary insurance for another series of 9 (18 in total). Our results have indicated that about half of the CBPD patients consult physical therapists, while the mean number of visits is about 6 (table 4). So CBPD patients who consult a physical therapist, see their therapist about once a week.

With regard to prescription medication the differences between CBPD patients and controls were only slight. Specialists in particular appear to be reluctant to prescribe medication. This seems strange, because minor analgesics have been shown to provide a definite benefit in chronic pain (McQuay et al. 1997). If pain is not controlled by this, use of stronger analgesics should be considered (McQuay, 1999). There is also strong evidence for the effectiveness of 'unconventional' analgesics, including antidepressants, anticonvulsants and systemic anaesthetic-type drugs in neuropathic pain (McQuay & Moore 1998). Management of chronic pain may be subdivided into treatment and rehabilitation (Smith et al. 1999). Indeed there are important gains to be made by combining these approaches early in management (Von Korff et al. 1990).

How patients think about their pain and their health is a crucial factor in chronic pain management (Chapman & Gavrin 1999). CBPD patients rate their own health status lower than control patients do. The difference between CBPD patients and controls is especially large in social functioning, vitality and physical functioning. In addition to this, CBPD patients rate their health status lower than chronic patients with various conditions like diabetes and rheumatoid arthritis (Rijken et al. 1998). Patients with chronic pain are limited in performing all physical activities, including bathing and dressing. As a consequence, they have a lot of difficulties with work or other daily activities and the

accomplish less than they would like to in this respect. They also experience extreme and frequent interference with normal social activities due to their physical and emotional problems. However, not all CBPD patients are alike. According to the Multidimensional Pain Inventory, patients can be categorized in four categories: the dysfunctional who perceive severe pain and gain social support; the interpersonally distressed, who combine pain with affective and relational distress; adaptive copers who cope with their pain in a number of ways and the average type, with characteristics of all three other types (Turk & Rudy 1988). We have found in another part of our study, that dysfunctional patients use more services than others, while adaptive copers use the least, even when controlled for the severity of the pain (Verhaak et al. 2000). Furthermore, adaptive copers assess their health as better than the other patients.

Our repeated measurement analysis has shown the utilization of ambulatory health care to be fairly constant over a period of one year. Since this is a purely descriptive epidemiological study in which no intervention took place such stability might have been expected. It is an indication for the proper inclusion of chronic benign pain patients: if GPs had been led by acute exacerbations of pain, a considerable remission might have been observed. Since all patients stayed on a very high and stable level, we may conclude that no such selection occurred. It is possible that the loss of respondents between the measurements led to a bias of more severe patients. However, repeating the longitudinal analysis with only those patients who completed four measurements produced the same results.

We have included patients with pain as the most prominent aspect in the clinical presentation, serious enough to justify clinical attention and leading to obvious discomfort and disabilities in daily life, based on the DSM IV. These criteria have focused attention on very severe chronic pain patients, in contrast to other studies where patients are "often troubled by pain" (Crook et al. 1984), or using the term "chronic" without any specification (Mäkelä and Heliövaara 1991, Andersen 1994). Furthermore, we have operationally defined "chronic" to mean pain lasting more than six months. Theoretically, the longer the time span, the fewer the patients. VonKorff et al. (1988) showed that, while 37% reported recurrent pain, only 8% had severe and persistent pain and less than 3% had such pain lasting more than six days. Given the severity of the Chronic Benign Pain Disorder and the fact patients feel pain for rather a long time, the fact that their ambulatory health care utilization is rather high, is not difficult to understand.

Acknowledgment

This study was supported by Grant 940-31-033, research program Chronic Disease / Pain research of the Netherlands Organization for Scientific Research, Medical Sciences.

References

- 1 Crook, J., Rideout, E., & Browne, G. The prevalence of pain complaints in a general population. *Pain*, 18, (1984) 299-314.
- 2 Andersen, S. & Worm-Pedersen, J. The prevalence of persistent pain in a Danish population. *Pain*, (1987) S332.
- 4 Magni, G., Carldieron, C., Rigatti-Lunchini, S., & Merskey, H. Chronic musculoskeletal pain and depressive symptoms in the general population. An analysis of the 1st National Health and Nutrition Examination Survey data. *Pain*, 43, (1990) 29-307
- 5 Mäkelä, M. & Heliövaara, M. Prevalence of primary fibromyalgia in the Finnish population. *British Medical Journal*, 303, (1991) 216-219.
- 6 Croft, P., Rigby, A.S., Boswell, R., Schollum, J., & Silman, A. The prevalence of chronic widespread pain in the general population. *Journal of Rheumatology*, 20, (1993) 710-713.
- 7 Andersson, H.I. The epidemiology of chronic pain in Swedish rural area. *Quality of Life Research*, 3, (1994) s19-s26.
- 8 Gureje O, VonKorff M, Simon GE, Gater R. Persistent pain and well-being. A World Health Organization study in primary care. *JAMA* (1998) 280, 147-151.
- 9 Potter, R., Jones, J.M. The evolution of chronic pain among patients with musculoskeletal problems. A pilot study in primary care. *British Journal of General Practitioners*, 42, (1992), 462-464.
- 10 James, F.R. Large, R.G., Bushnell, J.A., Wells, J.E. Epidemiology of pain in New Zealand. *Pain*, 44 (1991) 279-283.
- 11 Crombie, I.K. Epidemiological studies in pain research. *Journal of Pain and Sociology*, 11, (1994) 30-32.
- 12 Verhaak PFM, Kerssens JJ, Dekker J, Sorbi M, Bensing JM. Prevalence of chronic benign pain disorder. A review of the literature. *Pain*. 77:1998;231-9.
- 13 Merskey Ed. Classification of chronic pain. Descriptions of chronic pain syndromes and definition of pain terms. *Pain*, 39, (1986), Supplement 3, s1-s226.
- 14 Knorring, L.von & Ekselius, L. Idiopathic pain and depression. *Quality of Life Research*, 3, (1994) s57-s68.
- 15 Engel, C.C., VonKorff, M., Katon, W.J. Back pain in primary care: predictors of high health-care costs. *Pain*, 65 (1996), 197-204.

- 16 Jensen IB, Nygren AK, Gamberale F, Goldie I, Westerholm P. Coping with long-term musculoskeletal pain and its consequences: is gender a factor? *Pain* 57:167-172, 1994.
- 17 Van Tulder, M.W., Koes, B.W., Metsemakers, J.F. Bouter, L.M. Chronic low back pain in primary care: a prospective study on the management and course. *Family Practice*, 15, (1998) 126-32
- 18 VonKorff, M., Dworkin, S.F., Resche, L.Le, & Kruger, A. An epidemiologic comparison of pain complaints. *Pain*, 32, (1988) 173-183.
- 19 Bartelds AIM. Validating of Sentinel Data. *Gesundh Wes.* (1993) 55, 3-7.
- 3 Brattberg, G., Thorslund, M., & Wikman, A. The prevalence of pain in a general population. The results of a postal survey in a county of Sweden. *Pain*, 37, (1989) 215-222.
- 20 Claas EC, de Jong JC, Bartelds AIM, et al. Influenza types and patient population. *Lancet* (1995), 346, 263-7.
- 21 Kerns RD, Turk DC, Rudy TE. The West-Haven-Yale Multidimensional Pain Inventory (WHYMPI). *Pain*, 23 (1985) 345-356.
- 22 Rudy TE. Multiaxial assessment of pain. Multidimensional pain inventory. University of Pittsburgh, Pittsburgh, USA, 1989.
- 23 Lousberg R, Groenman NH, Schmidt AJM, Arntz A, Winter FAM. Psychometric properties of the Multidimensional Pain Inventory - Dutch Language Version (MPI-DLV). *Behavioral Research Therapy*. (1999) 37, 167-182.
- 24 Van der Zee, K., Sanderman, R., Heyink, J. De psychometrische kwaliteit van de MOS 36-item Short Form Health Survey (SF-36) in een Nederlands populatie. *Tijdschrift voor Sociale Gezondheidszorg*, 71, (1993), 183-191.
- 25 Ware, J.E. Jr., Sherbourne, C.D. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care*. 30, (1992), 473-83
- 26 Bryk AS, Raudenbusch SW. Hierarchical linear models: applications and data management methods. Newbury Park, Sage publications, 1992
- 27 Goldstein H. Multilevel Statistical Models. New York; Halsted Press, 1995.
- 28 Snijders, T.A.B., Bosker R.J. Multilevel analysis: an introduction to basic and advanced multilevel modeling. Sage publications, London, 1999.
- 29 Smith BH, Hopton JL, Chambers WA. Chronic pain in primary care. *Family Practice* 16:475-482, 1999.

- 30 Flor, H., Fydrich, T., Turk, D.C. Efficacy of multidisciplinary pain treatment centers: a meta-analytic review. *Pain*, 49, (1992), 221-230.
- 31 Aronoff, G.M., Evans, W.O., Enders, P.L. A review of follow-up studies of multi disciplinary pain units. *Pain*, 16, (1983) 1-11
- 32 Kerssens JJ, Groenewegen PP. Referrals to physiotherapy; the relation between the number of referrals, the indication for referral and the inclination to refer. *Social Science and Medicine* (1989) 30, 797-804.
- 33 Hingstman L, Boon H. Regional dispersion of independent professionals in primary health care in the Netherlands. *Soc Sci Med*. 1989;28:121-131.
- 34 Dekker J. Baar ME van, Curfs EChr, Kerssens JJ. Diagnosis and treatment in physical therapy: an investigation of their relationship. *Phys Ther*. 1993;73:568-580.
- 35 Valk RWA, Dekker J, Baar ME van. Physical therapy for patients with back pain: a description. *Physiother*. 1995;81:345-354.
- 36 McQuay, H.J., Moore, R.A., Ecclestone, C., Morley, S., Williams A. Systematic review for outpatient services for chronic pain control. *Health Technology Assessment*, 1, (1997), 15-30.
- 37 McQuay, H.J. Opioids in pain management. *Lancet*, 353 (1999), 2229-2232.
- 38 McQuay, H.J., Moore, R.A. An evidence based resource for pain relief. (1998) Oxford University Press, Oxford.
- 39 VonKorff, M., Dworkin, S.F., & Resche, L.Le. Graded chronic pain status: an epidemiological evaluation. *Pain*, 40, (1990) 279-291.
- 40 Chapman C.R., Gavrin J. Suffering: the contributions of persistent pain. *Lancet*, 353, (1999), 2233-2237.
- 41 Rijken PM, Foets M, Peters L, DeBruin AF, Dekker J. Patientenpanel Chronisch Zieken. Kerngegevens 1998. Utrecht; Nivel, 1999.
- 42 Turk DC, Rudy TE. The robustness of an empirically derived taxonomy of chronic patients. *Pain* 43:27-35, 1990.
- 43 Verhaak PFM, Kerssens JJ, Bensing JM, Sorbi M, Peters ML, Kruise DA.. Medical help-seeking by different types of chronic pain patients. *Psychology and Health* [Accepted].

Table 1 Non-respons analyses with various descriptives at T1, T2, T3 and T4

Measurements	T1	T2	T3	T4
Percentage female	71%	73%	76%	79%
Mean age	49.4 (14.1)	48.3 (13.1)	48.1 (12.4)	48.4 (12.0)
Pain duration in years	9.9	11.6	14.7	19
GH - general health perception	35.6	36.3	40.8	41.0

Table 2. Percentage of patients who contacted different kinds of medical services in the last three months - Chronic Benign Pain Disorder patients compared to a group of matched controls

	CBPD patients (N=336)	Controls (N=371)	Odds ratio	95% C.I.
Contact with ..	%	%		
General practitioner	90.1	43.9	11.6	7.7 - 17.5
Medical specialist	46.8	21.6	3.2	2.3 - 4.4
Hospital - diagnostic procedures	48.8	17.4	4.5	3.2 - 6.4
Hospital admission	6.4	3.5	1.9	0.9 - 3.8
Physical therapist	45.2	9.2	8.2	5.4 - 12.4
Counselor / Psychologist	15.5	1.4	13.4	5.3 - 34.0
Alternative practitioner	22.6	6	4.6	2.8 - 7.6

Table 3. Percentage of patients who visited the GP etc. and used medication in the last three months

	CBPD patients	Control patients	Odds ratio	95% C.I.
	%	%		
General practitioner	79.8	63.6	2.3	1.5 - 3.5
Medical specialist	52.6	43.8	1.4	0.8 - 2.4
Alternative practitioner	31.4	50	0.5	0.2 - 1.2

Table 4. Comparison of health indicators on a scale from 0-100 (and Standard Deviation) of CBPD patients and controls, with T-test statistic

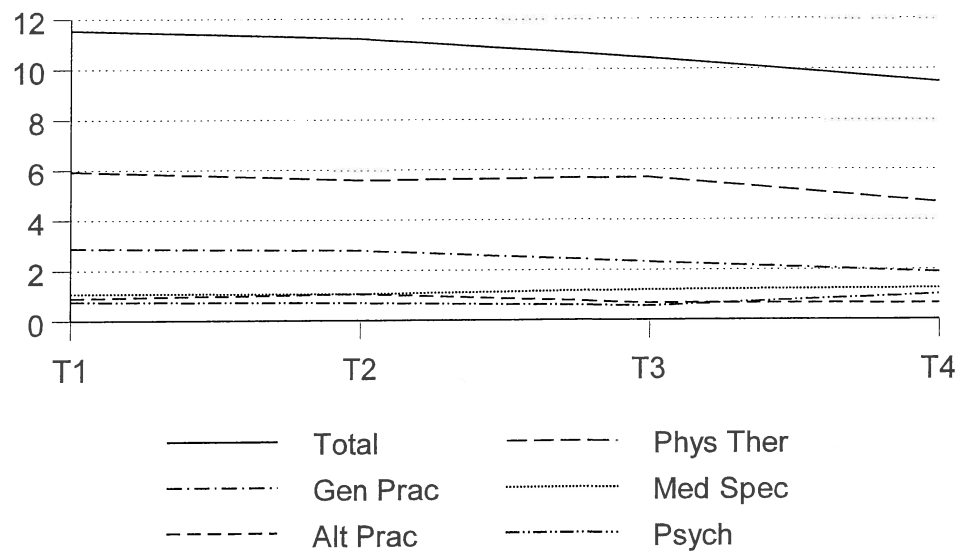
	CBPD (N=336)	Controls (N=371)	T
PF - physical functioning	54 (24)	75 (20)	12.57 ***
RF - role limitations caused by physical problems	21 (35)	50 (48)	8.92 ***
SF - social functioning	52 (30)	83 (23)	15.80 ***
MH - mental health	59 (21)	70 (14)	7.37 ***
VT - vitality	45 (18)	63 (15)	15.16 ***
GH - general health perception	36 (20)	48 (24)	10.87 ***
Change in general health perception	39 (27)	52 (16)	7.69 ***

Scales transformed to 0 - 100, $p < .001$

Table 5 Regressions coefficients and corresponding standard errors of multilevel model of the course of medical consumption according to different kinds of medical services (N patients = 336, N measurements = 1036).

	Total	Gen Prac	Med Spec	Phys Ther	Alt Prac	Psycho
Constant	11.46 (0.72)	2.88 (0.25)	1.07 (0.11)	5.95 (0.59)	0.89 (0.16)	0.76 (0.13)
T2	-0.07 (0.76)	-0.08 (0.35)	0.01 (0.13)	-0.17 (0.58)	0.23 (0.16)	-0.08 (0.14)
T3	-1.05 (0.85)	-0.58 (0.39)	0.12 (0.15)	-0.18 (0.64)	-0.08 (0.18)	-0.28 (0.15)
T4	-1.61 (0.94)	-1.03 (0.42)	0.18 (0.16)	-0.64 (0.70)	-0.11 (0.20)	0.17 (0.17)
Patient variance	82.43 (9.22)	1.67 (0.67)	1.51 (0.20)	62.23 (6.45)	4.21 (0.45)	2.75 (0.31)
Measurements variance	76.54 (4.45)	17.19 (0.98)	2.41 (0.14)	42.86 (2.50)	3.40 (0.20)	2.43 (0.17)

Mean number of visits per three months period



Costs of Chronic Benign Pain Disorders in the Netherlands

Kerssens JJ*, Evers SMAA**, Verhaak PFM*, VanMerode GG**, Paulus ATG**, Bensing JM.****

* Nivel Foundation, Netherlands Institute for Health Services Research

** Department of Health Organization Policy and Economics, Maastricht University

*** Department of Health Psychology, Utrecht University

December 2000

Address correspondence to:

JJ Kerssens, PhD. Nivel Foundation, P.O. Box 1568, 3500 BN UTRECHT, The Netherlands.

E-mail: j.kerssens@nivel.nl

Acknowledgments

This study was supported by Grant 940-31-034, Research Program Chronic Diseases/Pain Research of the Netherlands Organization for Scientific Research, Medical Science.

Abstract

Background

Aim of this study is to investigate the direct and indirect cost components of CBPD. We distinguished health care costs and non-health care costs and compared CBPD patients with matched controls

Methods

In one year 344 patients (59% response) returned consent forms given to them by 45 general practitioners. These were patients who had suffered pain for at least six months with almost daily chronic pain symptoms, without an explanatory medical diagnosis (such as cancer or arthritis). The patients completed questionnaires about health care utilization and costs every three months, with maximum of six questionnaires. In addition, 371 control patients, matched for sex and age, returned a (single) questionnaire mailed to them (response 51%). The Friction Costs Method (FCM) was used to calculate loss of production.

Results

The total direct costs for the health services are almost 900 DFL per patient per annum. About 2-4 times higher than the costs for controls. Medication costs are also higher for CBPD patients, about two times as high compared to controls. Direct non-health care costs for CBPD patients are about 830 DFL per year versus 360 for controls. The difference in indirect costs is much greater. CBPD patients experience about 12 times as much production loss than controls.

Conclusions

Compared to controls, CBPD patients have much higher direct and indirect costs. Indirect costs constitutes the largest financial consequence of CBPD patients.

Introduction

Pain is probably the most common symptomatic reason to seek medical consultation and also gives rise to a high level of absenteeism. All of us have headaches, burns, cuts and other forms of pain and, at some time or another, most of us have stayed home because of a painful condition. When pain has been experienced for a number of months, it tends to become chronic in quite a number of cases. Croft (1998) reported a complete recovery after one year of 25 percent of patients, initially included with pain for longer than 3 months. Magni (1993) found 33% still suffering after eight years. Van Tulder (1998) reported on an average small improvements in pain intensity after one year. Because chronic pain patients endure severe pain and suffering, they have high health care utilization, disability and absenteeism from work. Since the nature of chronic pain involves long-term illness, it can lead to a substantial economic burden to patients and society. Loeser and Melzack (1999) have indicated that health care expenditures for chronic pain patients are enormous, rivaled only by the costs of wage replacement and welfare programs for those who do not work because of pain. Past estimations of its economic costs produced the figures of \$40 billion per year for the United States (Aronoff 1983).

Chronic benign pain disorders (CBPD) or chronic pain without a clear organic explanation is prevalent in the general population, although there is a wide variety in estimations of the point-prevalence. Prevalences between 2 percent and 40 percent were reported in a review by (Verhaak et al. 1998). Chronic pain was generally defined as pain existing for at least more than one month. Some studies took three or six months as limit before pain was defined as "chronic". Related terms of chronic benign pain found in the literature are idiopathic pain (Knorring and Ekselius, 1994) and somatoform pain, both of which refer to psychiatric categories..

Some time ago, Turk (1990,1993) has pointed out that costs are a neglected factor in chronic pain research. Since then, several studies (Lipowski1990, James 1992, Christenson 1993, Dworkin 1994, Sheehan et al. 1996, McGrady 1999) indicated the extensive health care costs spend on chronic pain. Still, little information is available about costs relating to other sectors than health care, for instance costs due to absenteeism.

Broadly, three general categories of costs are used in a COI study: direct costs, indirect costs and intangible costs. *Direct costs* include all actual changes in resource use that is attributable to CBPD, whether medical or nonmedical. The direct medical costs which are overall identified in all CBPD studies are the costs of hospital and professional care, medication and diagnostic tests. Direct nonmedical costs are associated with the provision of medical services outside the health care sector. In CBPD studies this may include transportation of a patient to a medical service, out-of-pocket expenses, and the cost of informal care provided by family and friends. *Indirect costs* are the value of reduced productivity resulting from CBPD or mortality due to CBPD. *Intangible costs* are costs that cannot be expressed easily in monetary terms, such as pain, changes in social functioning, changes in the ability to perform normal daily activities and changes in mobility due to CBPD.

A COI study estimates and evaluates the direct and indirect costs of a disease. In addition to the most epidemiologic estimates of morbidity and mortality, COI studies give additional information regarding the economic burden of a disease. There are several approaches to estimating the costs of CBPD. The most widely employed are the prevalence method and the incidence method. The

underlying idea of the *prevalence method* is that all CBPD costs should be assigned to the year in which they are borne or with which they are directly associated. Using this approach, direct costs and productivity losses resulting from CBPD are assigned to the year in which they occur. Expected future earnings lost as a result of premature CBPD mortality are assigned to the year of death. The *incidence method* is based on the principle that the flow of costs associated with CBPD should be assigned to the year in which that flow begins. All costs, both direct costs and productivity losses due to morbidity and mortality, are discounted to present value and assigned to the year in which the disease first appears.

Another consideration is whether one is going to perform a bottom-up or a top-down cost-of-illness study. The *top-down method* calculates the national costs of CBPD using data-banks, statistics. In a *bottom-up method* a group of CBPD patients are asked what the costs of their disease are, for instance using a questionnaire. The results of this questionnaire are extrapolated to a population-level.

This study is a prevalence based bottom-up cost-of-illness study.

In the present study with data obtained from patients, we investigated the economic costs of CBPD in the Netherlands in 1998. In addition, separate cost components are distinguished to cover both direct costs and indirect costs. Furthermore, the costs of CBPD patients are compared to costs of control patients, matched for sex and age. Our general research question is: How much costs do CBPD patients have, compared to a group of controls.

Methods

Design

The study is a longitudinal prospective cohort study. A cohort of patients with CBPD has been assessed on four occasions with three months intervals and on two occasions with one year interval (month 3-6-9-12-24-36). This study is also a case-control study. The control patients were matched for age and sex and assessed on only one occasion (month 3).

Inclusion

Patients were included by their general practitioner. In the course of one year they selected those patients who presented symptoms of pain, or were known to have such symptoms, and who fulfilled the following criteria:

- 1) patients were between 18 and 75 years of age;
- 2) pain had existed for more than six months;
- 3) pain was the most prominent aspect in the clinical presentation and serious enough to justify clinical attention;
- 4) pain could not be explained by a physical diagnosis (for example, cancer or arthritis).

Patients were asked by their GP (N = 45) to participate in the study in the period 1/1/1996 through 31/12/96. The GPs are affiliated with the Dutch Sentinel Practice network (Bartelds 1993, Claas et al 1995). GPs handed out consent forms and the Multidimensional Pain Inventory (Dutch Version), a self-administered questionnaire (Kerns et al. 1985, Rudy 1989, Lousberg 1999), which the consenting patients returned to us.

Patients

Altogether a number of 586 patients fulfilled the inclusion criteria and had pain for at least six months. A number of 344 patients (59%) returned their consent forms. The difference between these two groups was largely due to GPs who preferred not to saddle a number of included patients with questionnaires, because in their opinion these patients could not handle many (psychological) questions about their condition. Patients' mean age is 48 years. The majority of the patients is female (71%). Pain is most frequently located in the lower back and lower limbs while 31% of the patients have pain in more than three major body sites. Pain is most frequently associated by the musculoskeletal system and most often (nearly) continuous. Mean pain duration is 10 years.

Non-response

Since the study is prospective, CBPD patients were asked to complete and return a mailed questionnaire at T1 and every three months thereafter. Each new measurement resulted in a considerable loss of respondents. From the 344 consented CBPD patients a number of 336 (98%) responded on T1, 274 (80%) on T2, 238 (69%) on T3, 198 (58%) on T4, 163 (47%) on T5 and 128 (37%) on T6. All in all we have data on 1337 measurement occasions.

The loss of respondents resulted in a growing percentage of female patients, but the age composition of the six measurement occasions did not change substantially. Although the average pain duration increased, no selective dropout of patients with relatively good or poor health could be observed (see also Verhaak et al. 2000).

Measurements of CBPD patients and controls

Questions about ambulatory health care utilization were combined with the MOS SF 36 (Ware & Sherbourne 1992, VanderZee et al. 1993, Aronson et al. 1998) in a self-completed questionnaire. The following questions were asked: consultations (and number of consultations where relevant) with: general practitioner; medical specialist; physical therapist and alternative practitioner during past three months. Medication prescribed by GPs, specialists and alternative practitioners was also investigated. Another series of questions related to attendance at hospital for diagnostic procedure visits to ambulatory mental health care institutes and hospital admissions, also during the past three months. We did not inquire into health care received by patients during their stay in hospital. In order to maximize the reliability of patients self-report, only clearly defined events (such as visit to a doctor or a therapists) with a limited time-frame of three months have been included in our questionnaires. Previous research has demonstrated that retrospective questionnaires are as good as health diaries, when report of health actions, such as health services contacts, is considered (Verbrugge 1980). Besides included patients were aware of being asked about their health care utilization and even had a memo pad to note down their visits for the coming three months.

Control patients were recruited by the same GPs who had submitted the CBPD patient group. Two control patients were chosen from the GP list for each CBPD patient. Patients and controls were matched for sex and age. Only one exclusion criterion was applied to control patients only: in that patients with chronic benign pain disorder were excluded. The matched controls were approached only once (T1). 371 out of 726 controls returned the mailed questionnaire (51% response). The non-response rate only slightly affected matching, i.e. the mean age of CBPD patients was 48 (29% male) while the mean age of controls was 50 years (also 29% male).

Costs

The method applied here has been used in other COI studies (Ament & Evers, 1993; Evers & Ament, 1995; Evers, Engel, & Ament, 1997).

Direct costs:

The direct costs are in general based on figures Dutch Guidelines for Cost Measurement, (Oostenbrink, Koopmanschap, & Rutten, 2000)]. Additional data are collected by contacting the National Organisation for Alternative Treatment or by using tariffs (zie directe kostenrapport). The costs of drugs and the costs of diagnostic procedures are calculated using information from the Health Insurance Executive Board (Ziekenfondsraad, 1999a; Ziekenfondsraad, 1999b).

Indirect cost:

To quantify the indirect costs, the human capital approach is used (Ament & Evers, 1993). The Human Capital Approach, which values indirect costs based on the expected economic productivity of the individual, is the easiest to apply. In the Human Capital Approach, the extent of production losses is based on the remaining lifetime economic value to society of a healthy individual of that age.

measured by (market earnings). The Human Capital Approach values production potential, for instance permanent disablement or premature death at a specific age is valued by the total productive value or income from that age until the age of retirement is counted as indirect costs. According to this approach the individual's value to society is his or her production potential.

Finally, to test the likelihood of the assumptions made when measuring and evaluating the direct and indirect costs, a sensitivity analysis was performed.

Method of indirect costing

By means of Friction Costs Method (FCM) costs due to absenteeism were calculated. The FCM is based on the assumption that short-term absences may be covered by others or made up by the sick person in his return to work. For long term absence and disability, a persons work can be taken over by someone unemployed. The FCM assumes that production losses are confined to the period needed to replace a sick worker only, which is called the friction period. (Koopmanschap et al. 1995, Koopmanschap & Rutten 1996). The maximum friction period in 1998 is 123 days (Oostenbrink et al. 2000). Production losses related to absenteeism longer than the maximum friction period are valued equal to this maximum. The FCM discriminate direct and indirect costs. Direct costs represent the health services costs of patients with CBPD. Indirect costs represents costs due to production losses, more precisely, as wealth lost to society, because of CBPD. Production losses of household work In economic literature several authors have paid attention to the valuation of household work (Castles 1994, Goldschmidt-Clermont 1982, Posnett & Jan 1996, Smith & Wright 1994). Basically there are two methods to value time cost; the input method and the output method. The input method takes the total of unpaid hours as a starting point and multiplies it by the price per hour. The output method essentially uses the value that goods and services produced would have on the market. In this study the input method was chosen, because the output method needs more appropriate data.

Assignments of unit costs (prices)

Costs are either calculated via volumes (for instance visits to the GP) or reported by patients (for instance medication over-the-counter).

Costs are the sum of resource use in volumes multiplied by their unit costs. For a clear understanding of the costing of this study, all collected resource quantities were valued using unit costs (prices) for 1998. Direct costs units are represented in table 1.

Table 1

The fees for visit to the GP is NLG 37.48, medical specialists, hospital diagnostic procedures, hospital admissions and allied health care (predominantly physiotherapy) are based on tariffs of the National Health Tariffs Authority (COTG). Fees for counseling are based on the average of fees for social work, ambulatory mental health care, and self-employed psychologists. Fees for visits to alternative practitioners were obtained from several alternative therapy organizations. Medication on prescription are valued according to the Pharmaceutical Reimbursement System (VWS 1997).

The following costs are reported by patients: Medication Over-The-Counter, rebuilding / adjusting house, clothing, aids / supportive devices.

Indirect costs units. The cost for one day lost on household activities is 140.00 NLG (Oostenbrink 2000). Household activities are not subjected to a maximum friction period. The costs for absenteeism at work is dependent on a combination of age and gender. See table 2.

Table 2

Almost all questions related to a time frame of three months. Costs were transformed the cost per year by the multiplication factor $(4/n_i)$, where n_i is the number of questionnaires for patient i . Questions to control patients about rebuilding / adjusting house, clothing, and aids / supportive devices had a time frame of past two years (multiplication factor $1/2$).

Results

Direct Health Care Costs

The CBPD costs for general practice are, according to table 3, 98.72 NLG per annum. For controls, the costs are 27.28 per annum.

Table 3

The ratio between these costs are 3.62. The costs for medical specialties are 171.56 NLG and is also higher than those of controls. As a matter of fact all, the direct health care costs for CBPD patients are higher than the costs for controls, the ratio ranging from 2.36 (laboratory costs) to 16.84 (counselor / psychologist). CBPD costs for physical therapy and alternative practice are also much higher than those for controls. The total costs for the health services in table 3 are 748.21 per patient per annum. More than four (4.05) times higher than the costs for controls.

The CBPD costs for medication are in table 4.

Table 4

CBPD patients are prescribed medication by the general practitioner, the medical specialist, and also by alternative practitioners. Patients also buy medication over-the-counter. Most of the costs are related to the general practitioner. All in all, patients spend on average 136 NLG each year on medication. Again, one can observe higher costs for CBPD patients than for controls. The ratio of the total costs for medication of both groups is exactly 2.00.

Direct Non-Health Care Costs

The cost components of direct non-health care costs relates to rebuilding (or adjusting) the house, special clothing and aids - see table 5.

Table 5

In total CBPD patients pay about 830 NLG every year. Control patients pay less. The ratio is 2.34.

Indirect Non-Health Care Costs

Table 6

Compared to direct costs, the difference between indirect cost is far greater. As can be observed from table 6 production loss at work is more than 5000 NLG per patient per annum for CBPD patients, while controls experience losses of about 500 NLG. The ratio is 9.36. For household activities the difference is even larger: 9207 NLG per CBPD patient per annum versus 669 NLG per annum for controls, resulting in a ratio of almost fourteen (13.76). In the group of CBPD patients, one in five (19.2%) has costs concerning work and household activities, 11.6% has costs concerning work only, 34.8% has costs concerning household activities only, while the remaining group (34.5%) did not have costs concerning work nor household activities. There are also

differences between men and women. The costs for absenteeism are greater for men than for women (9231 NLG versus 3488 NLG) while the costs for household activities are greater for women than for men (11370 NLG versus 3488 NLG).

Conclusions and discussion

This study investigated the direct and indirect costs of CBPD patients with matched controls. Compared to controls, CBPD patients have much higher direct and indirect costs. The ratio for direct costs is about 4 and for indirect costs the ratio is about 20. Indirect costs constitutes the largest financial consequence of CBPD patients, far more than direct costs.

In order to assess financial burden of various diseases, cost-of-illness have become quite popular this last decade. Costs-of-illness studies mostly rely on data sources like national registries, reports of health care authorities, and so on. A necessary condition of costs-of-illness studies is of course that disorders are entities in classification systems like the ICD or the ICPC. This is clearly not the case in for chronic benign pain disorders (CBPD). Only the DSM IV has a separate coding for chronic pain. Although the ICPC has a code for unspecified pain, this code is only used when pain is not localized. If someone feels for instance pain in his or her shoulder, the complaint is classified in a very broad category as “symptoms/complaints of shoulder”. But of course, not all symptoms or complaints of the shoulder relate to pain. The most widely used International Classification of Diseases does not have a code for pain. Furthermore, the distinctions between ‘chronic’ or ‘acute’ is never made. A cost-of-illness of chronic benign pain disorders is not possible.

Our study, with data directly obtained from patients, has given insight in various cost components. Indirect costs are calculated with respect to absenteeism for professional work and also for household activities. The costs for household activities exceed the costs for work, although the cost of one day lost on household activities is 140 NLG, while the costs of one day lost for professional work is generally higher. This is because of the friction costs approach. According to Friction Cost Method, production losses will be confined to the period needed to replace a sick worker: the so-called friction period. In 1998 the maximum friction period was 123 days. So production losses for work is maximized. But production losses for household activities are not maximized to 123 days. For household activities the number of days lost can be 365 for persons who indicated that they couldn't perform household chores the entire year. So the smaller costs are multiplied by more days lost. It must be noted that costs determined using the friction costs method are related to a given level of unemployment. If unemployment declines, the average time required to fill vacancies will become higher, leading to higher costs. In general, estimates based on the Friction Cost Method are lower than those based on for instance, the human capital approach (Koopmanschap et al 1995). For example the results of a study on chronic low back pain (in 1991 in The Netherlands) showed that the short-term indirect costs estimated by the human capital method were more than three times as high as the indirect costs estimated by the friction cost method (Hutubessy et al. 1999).

The direct costs of health care for CBPD patients are much higher than for controls. Patients use a lot of health services because chronic pain is not a symptom that exists in isolation, but tends to create a cluster of related problems such as chronic fatigue, sleep disturbance, excessive rest and withdrawal from activities, comprised immune function and mood disorder (). Two health care services are especially more costly: counseling and physiotherapy. Chronic pain is often associated with depression or other kinds of psychological distress (Smith et al. 1999). This is likely the reason that a relatively large number of CBPD patients are visiting a counselor or psychologists at the mental health care institutions. Furthermore, a wide range of psychological techniques has been shown to be beneficial in management of chronic pain, particular in improving function and quality of life (Flor et al. 1992, Aronoff et al.1983). Chronic benign pain is also often located in the musculoskeletal system. That is why many CBPD patients visit a physical therapist and the costs for physiotherapy are consequently high. In the Netherlands, the majority of patients are referred by GPs (Kerssens & Groenewegen 1989) to small private outpatient practices (Hingstman & Boon 1989). Most of them are treated in a series of therapy sessions which last almost half an hour each (Dekker et al. 1993, Valk et al. 1995) The standard number of sessions is 9, that is the number the public health insurance companies is willing to remunerate in one year. But 95% the patients have supplementary insurance for another series of 9 (18 in total).

Health care utilization of the participating patients is quite high and also quite constant. In the course of three years we did not observe any decrease of health care utilization. Probably because our inclusion criteria 3,4 and 5, based on the DSM-IV, (pain is the most prominent aspect in the clinical presentation; pain is serious enough to justify clinical attention; and pain has led to obvious discomfort and disabilities in daily life) has focused the attention on very severe chronic pain patients, in contrast to other studies where patients are "often troubled by pain" (Crook et al. 1984), or using the term "chronic" without any specification (Mäkälä and Heliövaara 1991, Andersen 1994).

Compared to direct costs, the difference between patient and controls for indirect cost is far greater, we observed a ratio of more than 9 for work related costs and more than 14 for household related costs. The cost structure with high indirect costs has been found in studies of low back pain and neck pain as well (VanTulder et al. 1995, Borghouts et al. 1999). From an economic point of view it is important to prevent patients from becoming chronic.

References

- Aaronson NK, Muller M, Cohen PD et al. Translation, validation, and norming of the Dutch language version of the SF-36 Health Survey in community and chronic disease populations. *J of Clinic Epid.*, 51 (1998) 1055-1068
- Bartelds AIM. Validating of Sentinel Data. *Gesundh Wes.* (1993) 55, 3-7.
- Borghouts JAJ, Koes BW, Vondeling H, Bouter LM. Cost-of-Illness of neck pain in the Netherlands in 1996. *Pain.* 1999; 80: 629-36.
- Castles I. Unpaid work and the Australian economy 1992. Canberra: Australian Bureau of Statistics; 1994.
- Christenson JL. Chronic pain: dynamics and treatment strategies. *Perspectives in Psychiatric Care* 1993;29:13-7.
- Aronoff, G.M., Evans, W.O., Enders, P.L. A review of follow-up studies of multi disciplinary pain units. *Pain*, 16, (1983) 1-11
- Claas EC, de Jong JC, Bartelds AIM, et al. Influenza types and patient population. *Lancet* (1995), 346, 263-7.
- Croft PR, Macfarlane GJ, Papageorgiou AC, Thomas E, Silman AJ. Outcome of low back pain in general practice: a prospective study. *Br Med J* 1998; 316: 1356-1359.
- Crook, J., Rideout, E., & Browne, G. The prevalence of pain complaints in a general population. *Pain*, 18, (1984) 299-314.
- Drummond MF, Stoddard GL, Torrance GW. Methods for economic evaluation of health care programmes. Oxford; Oxford publications, 1997.
- Dworkin SF. Somatization, distress and chronic pain. *Quality of Life Research* 1994;3 Suppl 1:S77-83.
- Evers et al.
- Flor H, Fydrich T, Turk DC. Efficacy of multidisciplinary pain treatment centers: a meta-analytic review. *Pain.* 1992; 49: 221-230.
- Goldschmidt-Clermont L. Unpaid work in the household, a review of economic evaluation methods. Geneva: International Labour Office; 1982.
- Hingstman L, Boon H. Regional dispersion of independent professionals in primary health care in the Netherlands. *Soc Sci Med.* 1989;28:121-131.
- Hutubessy RC, van Tulder MW, Vondeling H, Bouter LM. Indirect costs of back pain in the Netherlands: a comparison of the human capital method with the friction cost method. *Pain* 1999; 80: 201-7.
- James FR, Large RG. Chronic pain and the use of health services. *New Zealand Medical Journal* 1992; 105: 196-8.
- Kerns RD, Turk DC, Rudy TE. The West-Haven-Yale Multidimensional Pain Inventory (WHYMPI). *Pain.* 1985; 23: 345-356.
- Knorrning LV, Ekselius L. Idiopathic pain and depression. *Qual.Life Res.* 1994; 3: s57-s68.
- Koopmanschap MA, Rutten FFH, VanIngeveld BM, VanRooijen L. The friction cost method for measuring indirect costs of diseases. *Jornal of Health Economics* 1995; 14: 171-189.

Koopmanschap MA, Rutten FFH. A practical guide for calculating indirect costs of diseases. *Pharmacoeconomics* 1996; 10: 460-466.

Lipowski ZJ. Chronic idiopathic pain syndrome. *Annals of Medicine* 1990;22:213-7.

Loeser JD, Melzack R. Pain: an overview. *The Lancet* 1999; 353(9164): 1607-9

Lousberg R, Groenman N, Schmidt A. Profile characteristics of the MPI-DLV clusters of pain patients. *J Clin Psychol.* 1996; 52: 161-7

Magni G, Marchetti M, Moreschi C, Merskey H, Rigatti-Lunchini S. Chronic musculoskeletal pain and depressive symptoms in the National Health and Nutrition Examination I. Epidemiologic Follow-up study. *Pain.* 1993; 53: 163-168.

McGrady A, Lynch D, Nagel R, Zsembik C, Brasseur L. Application of the high risk model of threat perception to a primary care patient population *Revue des therapeutiques pharmacologiques actuelles de la douleur. Journal of Nervous and Mental Disease* 1999;187:369-75.

Mäkelä, M. & Heliövaara, M. Prevalence of primary fibromyalgia in the Finnish population. *British Medical Journal*, 303, (1991) 216-219.

Oostenbrink J.B., Koopmanschap M.A., Rutten F.F.H. Handleiding voor kostenonderzoek: methoden en richtlijnprijzen voor economische evaluaties in de gezondheidszorg. Amstelveen: College voor zorgverzekeringen, 2000.

Posnett J, Jan S. Indirect cost in economic evaluation: the opportunity cost of unpaid inputs. *Health Econ* 1996;5:13-23.

Rudy TE. Multiaxial assessment of pain. Multidimensional pain inventory. University of Pittsburgh, Pittsburgh, USA, 1989.

Sheehan J, McKay J, Ryan M, Walsh N, O'Keeffe D. What cost chronic pain? *Irish Medical Journal* 1996;89:218-9.

Smith BH, Hopton JL, Chambers WA. Chronic pain in primary care. *Family Practice* 1999; 16: 475-482.

Smith K, Wright K. Informal care and economic appraisal: a discussion of possible methodological approaches. *Health Econ* 1994;3:137-48.

Turk DC, Rudy TE, Benjamin S. Neglected factors in chronic pain treatment outcome studies--referral patterns, failure to enter treatment, and attrition *Psychological treatment of chronic pain: a selective review. Pain* 1990;43:7-25.

Turk DC, Rudy TE, Sorkin BA. Neglected topics in chronic pain treatment outcome studies: determination of success. *Pain* 1993;53:3-16.

Valk RWA, Dekker J, Baar ME van. Physical therapy for patients with back pain: a description. *Physiother.* 1995;81:345-354.

VanTulder MW, Koes BW, Bouter LM. A cost-of-illness study of low back pain in the Netherlands. *Pain.* 1995; 62: 233-40.

Verbrugge LM. Health diaries. *Medical Care.* 1980; 18: 73-95.

Verhaak PFM, Kerssens JJ, Dekker J, Sorbi M, Bensing JM. Prevalence of chronic benign pain disorder. A review of the literature. *Pain*. 1998; 77: 231-9.

Verhaak PFM, Kerssens JJ, Bensing JM, Sorbi M, Peters ML, Kruise DA.. Medical help-seeking by different types of chronic pain patients. *Psychology and Health* [Accepted].

VanderZee, K., Sanderman, R., Heyink, J. De psychometrische kwaliteit van de MOS 36-item Short Form Health Survey (SF-36) in een Nederlands populatie. *Tijdschrift voor Sociale Gezondheidszorg*. 1993; 71: 183-191.

Vonkorff M. Epidemiological and Survey methods: chronic pain assessment. In: Turk DC, Melzack M. *Handbook of pain assessment*. The Guilford Press; New York, 1992, 391-408.

VWS (Ministry of Public Health, Welfare and Sports). *Pharmaceutical Reimbursement System*. Rijswijk, 1997.

Ware JEt, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care*. 1992; 30: 473-83.

Table 1. Unit prices for direct cost components

	DFL
General practitioner	37.48
Medical specialist	154.74
Hospital - diagnostic procedures	
laboratory	15.68
images	
x ray	80.16
scan	404.2
echo	99.20
function	90.69
Hospital admission	689.00
Physical therapist	38.05
Counselor / Psychologist	121.31
Alternative practitioner	73.82

Table 2. Unit prices (DFL per day) for indirect costs for employees

	Male	Female
<= 19	69.11	54.47
> 19 and <= 24	163.41	134.95
> 24 and <= 29	224.39	167.47
> 29 and <= 34	265.04	162.60
> 34 and <= 39	290.24	159.35
> 39 and <= 44	313.01	162.60
> 44 and <= 49	324.39	169.11
> 49 and <= 54	315.45	160.16
> 54 and <= 59	308.13	157.72
> 59 and <= 64	305.69	147.97
> 64	0	0

Table 3. Mean costs per patient per year of different kinds of medical services for Chronic Benign Pain Disorder patients compared to a group of matched controls

	CBPD patients (N=336)	Controls (N=371)	
	DFL	DFL	ratio
General practitioner	98.72	27.28	3.62
Medical specialist	171.56	60.06	2.83
Hospital - diagnostic procedures			
laboratory	5.88	2.48	2.38
images	56.09	18.5	3.03
function	11.84	2.75	4.31
Hospital admission	300.05	120.71	2.49
Physical therapist	232.49	28.92	8.3
Counselor / Psychologist	82.69	4.91	16.84
Alternative practitioner	59.17	6.57	9.01
Total	748.21	184.84	4.05

Table 4. Mean cost of medication per patient per year in for CBPD patients and controls.

	CBPD patients (N=336)	Controls (N=371)	
	DFL	DFL	ratio
General practitioner	66.96	32.82	2.04
Medical specialist	19.35	13.68	1.41
Alternative practitioner	4.71	1.5	3.14
Medication OTC	45.19	20.08	2.25
Total	136.21	68.08	2.00

Table 5. Mean direct non-health care cost per patient per year for CBPD patients and controls.

	CBPD patients (N=336)	Controls (N=371)	
	DFL	DFL	ratio
Rebuilding /adjusting house	561.00	138.86	4.04
Clothing	99.81	3.13	31.89
Aids / supportive devices	171.14	36.11	4.74
Total	831.95	178.10	4.67

Table 6. Mean indirect non-health care costs per patient per year for CBPD patients and controls

	CBPD patients (N=336) DFL	Control patients (N=371) DFL	ratio
Work	5025	537	9.36
Household	9207	669	13.76
Total	14232	1206	11.80

