REVIEW

Identification of prognostic factors for chronicity in patients with low back pain: a review of screening instruments

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Abstract Low back pain (LBP) is currently the most prevalent and costly musculoskeletal problem in modern societies. Screening instruments for the identification of prognostic factors in LBP may help to identify patients with an unfavourable outcome. In this systematic review screening instruments published between 1970 and 2007 were identified by a literature search. Nine different instruments were analysed and their different items grouped into ten structures. Finally, the predictive effectiveness of these structures was examined for the dependent variables including "work status", "functional limitation", and "pain". The strongest predictors for "work status" were psychosocial and occupational structures, whereas for "functional limitation" and "pain" psychological structures were dominating. Psychological and occupational factors show a high reliability for the prognosis of patients with LBP. Screening instruments for the identification of prognostic factors in patients with LBP should include these factors as a minimum core set.

Résumé La lombalgie (LBP) est un problème important notamment sur le poste des dépenses dans nos sociétés modernes. Sur le plan évolutif, il est primordial de pouvoir dépister des facteurs pronostics négatifs de ces patients. entre 1970 et 2007, un certain nombre d'éléments permettant cette analyse ont été identifiés dans la littérature. Ces instruments d'analyse nous semblent importants de façon à déterminer la limitation fonctionnelle, les possibilités de travail et la douleur.

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l'élément de prévision le plus important pour la poursuite d'un emploi est psychosocial, de ce fait l'élément important pour apprécier le pronostic de limitation fonctionnelle ou de douleur est plutôt psychologique. les facteurs psychologiques et sociaux permettent de faire le pronostic des lombalgies, il s'agit d'un tronc commun des éléments de dépistage, devant inclure tous ces facteurs.

Introduction

Low back pain (LBP) is the most prevalent and costly musculoskeletal problem in today's economically advanced societies, and may lead to long-term disability combined with frequent use of health services [2, 8, 14]. In Germany, a lifetime prevalence of LBP of 80%, an annual prevalence of 60%, and a point prevalence of 30–40% lead to economic overall costs of 16–22 billion Euro p.a. [20]. Comparable figures are stated for the UK, the Netherlands, Sweden, and the USA. Of these costs, 30% are direct costs accounting for medical treatment and 70% are due to indirect costs as loss of production. In Germany, LBP causes 4% of all loss of production [2].

In its natural course, nonspecific LBP is self-limiting within a few weeks whereas 3–10% of patients develop persisting LBP [21]. Although this is only a small group of patients the socioeconomic burden significantly exceeds that for the treatment of acute LBP [10].

Therefore, it is of high importance to identify patients at risk for developing persisting LBP at an early stage. To detect these patients, prognostic factors of chronicity must be known. According to the biopsychosocial model the influence of different factors has to be taken into account [5, 24].

Screening instruments are needed to assess these influencing factors and to foretell the course of LBP. This review provides a survey of these instruments, analysing and classifying them according to specific aspects. Structures are evaluated following Waddell and Burton [28] and a compilation of all aspects, structures, and their predictive effectiveness is given.

Materials and methods

The strategy of the literature search was based on the "method guidelines for systematic reviews in the Cochrane Collaboration Back Review Group for spinal disorders" [27] and comprised three steps. First, the data-bases MEDLINE/Pubmed, ISI Web of Knowledge, and PsychINFO were searched with the terms "screening tool", "screening instrument", "risk assessment", or "questionnaire and back pain". The queries in ISI Web of Knowledge

and PsychINFO were limited to publications between 1970 and 2007; the search in MEDLINE/Pubmed was not restricted. In addition, references of two key publications were included [28, 29]. Second, references of identified articles were searched with the same terms as in the first step. Third, after identification of screening instruments a final query was performed combining the name of the respective instrument with the search term "back pain".

This literature search entailed looking into screening instruments based on studies already completed at the time of the search. Data analysis was performed in a retrospective approach.

We applied broad inclusion criteria to ensure that the spectrum of screening instruments and patients included represent the spectrum seen in routine settings. Inclusion criteria of the instruments considered were study samples of patients with unspecific acute, subacute, or chronic LBP according to the definition of the "COST B13: European guidelines for the management of low back pain" [1].

The search resulted in thirteen articles containing nine different instruments (Table 1):

1. Acute Low Back Pain Screening Questionnaire (ALBPSQ) [3, 6]
2. Vermont Disability Prediction Questionnaire (VDPQ) [4]
3. Örebro Musculoskeletal Pain Questionnaire (ÖMPSQ) [11]
4. Screening Questionnaire for Predicting Outcome in Acute and Subacute Back Pain [12]
5. HFK-R 10 [15]
6. Fear-Avoidance Beliefs Questionnaire (FABQ) [16, 23, 29]
7. LBP Patient Perception Scale (PPS) [18]
8. INTERMED Questionnaire [19, 25]
9. Chronic Pain Coping Inventory (CPCI) [26]

In order to compare the effectiveness of items of the identified instruments, these items were grouped into ten structures (Table 2). Whereas some of these structures have already been established and are widely used (e.g. fear-avoidance beliefs), others have been designed by the authors by combining similar aspects. Therefore, a meta-analytic comparison of structures is not possible.

Table 2 lists all structures and their aspects. Furthermore, the predictive effectiveness of structures is given, differentiating between the dependent variables "work status", "functional limitation", and "pain". "Work status" summarises "capacity to work", "disability days", "future sick absenteeism", "days off-work", "return to work", "return to full-time work within three months", "working/not working three months after", and "work loss" from different studies. "Functional limitation" merges "activity limitations", "functional limitation", "disability", "disability in activity

of daily living", "function", "functional status", and "bed rest". "Pain" entails "pain", "chronicity", and "pain severity".

Structures were reviewed according to the following four aspects:

1. Number of quoting articles
2. Instruments listing the structure
3. Number of instruments in which structure is effective
4. Effectiveness of structure or aspect of structure

Evidence of structures was evaluated as strong, moderate, limited or without evidence following the scale introduced by Waddell and Burton [28]. The evidence for the independent variable was reduced by one level if the dependent variable was listed but not examined in half of all articles (in odd numbers of articles one article less than half) or evaluated by one article only.

Results

Twelve out of thirteen publications investigated the influence of structures on the dependent variable "work status", seven publications studied the influence on "functional limitation", and six on "pain". Each of the ten structures were analysed with respect to the above-introduced four aspects and evaluated regarding its evidence.

Six articles investigated instruments containing *socio-demographic factors*. These instruments were ALBPSQ, ÖMPSQ, Screening Questionnaire for Predicting Outcome in Acute and Subacute Back Pain, VDPQ, and HKF-R 10. ALBPSQ, ÖMPSQ, and Screening Questionnaire for Predicting Outcome in Acute and Subacute Back Pain will be summarised to ALBPSQ due to their significant overlap of questions. Limited evidence could be demonstrated for an influence of this structure on "work status" and "pain" as dependent variables.

Five authors examined instruments comprising *work characteristics and work related attitudes*. These instruments were ALBPSQ and VDPQ. Strong evidence existed with regard to an influence of this structure on "work status", with limited evidence on "functional limitation" as dependent variables.

Six articles evaluated three different instruments (ALBPSQ, CPCI, PPS) addressing *physical functioning/ activities of daily living*. Limited evidence was noted for an influence of this structure on "work status", with moderate evidence for "functional limitation" and "pain" as dependent variables.

Nine publications analysed five different instruments (ALBPSQ, HKF-R 10, INTERMED, PPS, VDPQ) regarding *aspects of pain*. Influence of this structure on all dependent variables was of limited evidence.

Four authors examined three different instruments (HKF-R 10, VDPQ, INTERMED) in consideration of *medical aspects*. Moderate evidence was demonstrated for influence of this structure on "work status" and limited evidence on "pain" as dependent variables.

Five studies considered two instruments (ALBPSQ and HKF-R 10) for the structure *depression*. Limited evidence was shown for influence on "work status" and "functional limitation", with moderate evidence on "pain" as dependent variables.

Eight trials evaluated four instruments (ALBPSQ, HKF-R 10, INTERMED, PPS) for *negative psychological states*. Moderate evidence was found for "work status" and "pain", limited evidence for "functional limitation" as dependent variables.

Nine publications investigated five instruments (ALBPSQ, CPCI, HKF-R 10, INTERMED, PPS) containing *coping strategies/reaction to pain*. Limited evidence could be demonstrated for influence of this structure on "work status" and "functional limitation", with moderate evidence on "pain" as dependent variables.

Seven authors examined instruments comprising of *fear-avoidance beliefs* (ALBPSQ and Fear-Avoidance Beliefs Questionnaire). Strong evidence referred to influence of this structure on "work status" and moderate evidence on "functional limitation" as dependent variables.

Four articles evaluated three different instruments (ALBPSQ, CPCI, VDPQ) addressing *emotional and social support system/psychosocial aspects*. Moderate evidence was noted for influence of this structure on "work status", with limited evidence for "functional limitation" and "pain" as dependent variables.

Reliability and prognostic validity of screening instruments investigated are shown in Table 1 including frequencies, percentages, *p* values, and coefficients if appropriate. Further details on different aspects of structures and their influence on the three dependent variables are listed in Table 2.

Discussion

The pattern analysis of the ten structures (Table 2) identified predictors of the three dependent variables "work status", "functional limitation", and "pain" in patients with LBP. There are unspecific predictors as "physical functioning/ activities of daily living" and "depression" being effective for all three dependent variables. Other predictors such as "fear-avoidance beliefs" and "emotional and social support system/ psychosocial aspects" are specific for "work status" and "functional limitation". "Fear-avoidance beliefs about work" and "perceived chance of being able to work" could be revealed as the strongest predictors of "work status" whereas

Table 1 Screening instruments for the identification of prognostic factors for chronicity in patients with LBP

Study	Screening-instrument	Study components	Items	Dependent variables and predictors	Reliability	Prognostic validity
1. Hurley et al. (2001) **Country** U.K.	**Name** Acute Low Back Pain Screening Questionnaire (ALBPSQ) **Format** self- administered measure of biopsychosocial factors	**Objective** - to investigate potential associations between the ALBPSQ and relevant variables at 1-year-follow-up in a cohort of patients who had received treatment for LBP **Participants** - inclusion criteria were referral by a medical practitioner for physiotherapy treatment of LBP - no data to the state of LBP (acute, subacute, chronic) **Theoretical model** - biopsychosocial model - fear-avoidance beliefs	24 Items reflecting different types of data: - demographic factors - aspects of pain - coping with pain - fear-avoidance-beliefs - anxiety - depression - patients perception of work-related issues **Additionally** - Pain level (McGill Pain Questionnaire ((MPQ-PRI) Melzack, 1975)) - Disability (Roland Morris Disability Questionnaire (RMQ), Roland and Morris (1983) - Patient-centered questionnaire constructed by the researchers	**DV** pain, functional disability, recurrence rate, current effect of LBP on daily activities, current self-rated general health status, additional health care received for LBP in the previous year, analgesic medication use for LPB in the previous week, work loss due to LBP, leisure time physical exercise participation in the previous year **Predictors** ALBPSQ total score is positively correlated with patients level of pain and functional disability and is able to classify some degree of work loss	No data available	Results showed significant positive correlations between the ALBPSQ and pain (MPQ-PRI: [tau] = 0.225, p = 0.003) and functional disability (RMDQ: [tau] = 0.307, p = 0.000) ALBPSQ classified all patients correctly reporting some degree of work loss (but had minimal predictive strength for the other patient-centred variables)
2. Grotle et al. (2006) **Country** Norway	**Name** Acute Low Back Pain Screening Questionnaire (ALBPSQ) See also original study from Linton und Hallden (1998), frequently referenced by Grotle, Vollestad and Brox (2006) **Format** self- administered measure of biopsychosocial factors	**Objectives** - to test a Norwegian version of the ALBPSQ in terms of test-retest reliability, internal consistency, and the construct validity - and to evaluate the abilities of the ALBPSQ in predicting pain and disability **Participants** Two groups of participants 1. Patients with acute LBP, less than 3 weeks duration (recruited from primary health care) 2. chronic LBP, at least 3 months duration (had been referred for examination at the Back Clinic at Ostfold Hospital) **Theoretical model** - biopsychosocial model - fear-avoidance beliefs	25 Items reflecting different types of data: - demographic factors - aspects of pain - coping with pain - fear-avoidance beliefs - anxiety - depression - patients perception of work-related issues **Additionally:** - disability, assessed by Roland Morris Disability Questionnaire (RMQ), Roland and Morris (1983) - disability days: how many days restricted from participating in daily work	**DV** pain, activity limitations, disability days **Predictors** - for "pain": sick leave, current pain, depression, limitations in walking, limitations in sleeping - for "activity limitations": tense/anxious, depression, limitations in sleeping - for "long term disability days": sick leave, depression, chance working, limitations in sleeping	Chronic sample: - *Test-retest reliability and internal consistency of the questionnaires test-retest reliability, expressed by* ICC (1,1): 0.90 (0.80, 0.95) -*Internal consistency, expressed by Cronbach's alpha:* 0.95	The structure was analyzed in a factorial analysis → 3 Factors (1.pain and psychological aspects- items, 2.disability items, 3.fear-avoidance beliefs and job satisfaction items) → The 3-factor solution explained a total of 49% of the variance *Discriminative and predictive validity:* - the mean ALBPSQ score was significantly lower in the acute sample than in the chronic sample - the analyses indicate that the ALBSPQ discriminate between groups with different levels of disability in acute and chronic sample
3. Hazard et al. (1996) **Country** USA	**Name** Vermont Disability Prediction Questionnaire (VDPQ) **Format** self-report-questionnaire	**Objectives** - to develop a simple, brief and accurate questionnaire for predicting chronic disability after occupational low back injury - to test this Vermont	33; 28 of the questions were derived form the predictive risk model (Cats-Baril & Frymoyer, 1991) 28 factors are comprised into 8 categories: job,	**DV** chronic disability, measured by work status 3 months after injury: working, not working because of back pain, not working because of other reasons	No data available	11 of the 33 VDPQ questions met the inclusion criteria of kappa > 0.1

Table 1 (continued)

Study	Screening-instrument	Study components	Items	Dependent variables and predictors	Reliability	Prognostic validity
		Disability Prediction Questionnaire **Participants** People with work-related injuries completing this questionnaire within 15 days (acute sample) **Theoretical model** The Vermont Rehabilitation Engineering Center predictive model (Cats-Baril & Frymoyer, 1991)	psychosocial, injury, diagnostic, demographic, medical history, health behaviour and anthropometric characteristics 11 VDPQ questions met the inclusion criteria → the items of this questionnaire are used for table 2	**Predictors** - for "chronic disability" (see the 11 VDPQ questions): marriage, previous back problems, surgery, hospitalization, medical visits, blaming, current pain, biomechanical load of work, perceived chance of being able to work, social support, anticipation of future functional limitations		
4. Linton and Boersma (2003) **Country** Sweden	**Name** Örebro Musculo-skeletal Pain Questionnaire (ÖMPSQ) **Format** self-administered instrument	**Objective** - to test the predictive utility of the Örebro Musculoskeletal Pain Screening Questionnaire in identifying patients at risk for developing chronic back pain **Participants** - Patients with acute or subacute pain - less than 6 months of accumulated sick leave during the past year - recruited from primary care clinics **Theoretical model** - biopsychosocial model - fear-avoidance beliefs	25 Items compromised in - patients background - previous days off work - experienced tension, anxiety, depression - experience of pain (site, intensity, duration, frequency) - physical functioning, activities of daily living - fear-avoidance beliefs - work - coping strategies - patients perception of the likeliness to recover see Linton and Hallden (1998)	**DV** - Absenteeism due to sickness: no sick leave, short-term leave, long-term leave, see also Linton and Hallden (1998). - function and pain: recovered, non recovered **Predictors** - for "function": sleep, sick leave, pain site and the patient's perceived chance of being able to work - pain: sleep and average pain - for "sick leave": sex, previous sick leave, difficulties in doing shopping - total score good predictor for function and absenteeism, not for pain	Overall test-retest score for questionnaire: - 0.80 - According to the authors results comparable with original study (Linton & Hallden, 1998)	Sick leave: 68% correctly classified patients by following three items: sex, previous sick leave, difficulties in doing shopping Functional ability: 81% correctly classified patients by following four items: sleep, sick leave, pain site and the patient's perceived chance of being able to work Pain: 71% correctly classified patients by following main items: sleep and average pain
5. Linton and Halldén (1998) **Country** Sweden	**Name** Screening Questionnaire for Predicting Outcome in Acute and Subacute Back Pain **Format** self-administered screening instrument	**Objectives** - to determine the value of psychosocial variables in evaluating risk for developing chronic back pain - to develop a screening methodology to identify patients likely to have a poor prognosis **Participants** - patients with acute or subacute pain (back or neck) - fewer than 4 months off work during the last year - recruited from health care clinics	21 Items reflecting different types of data: - patients background - function (ADL's) - pain (current pain intensity, average intensity, number of pain sites, duration and frequency) - psychological variables (coping, stress, depression, perceived chance of pain becoming persistent, perceived chance of being able to work in 6 months) - fear-avoidance beliefs - previous sick leave - monotonous or heavy work, job satisfaction	**DV** future sick absenteeism: no sick leave (0 days), short-term leave (1-30), long-term leave (>=31 days), accumulated for 6 months **Predictors** - fear-avoidance work beliefs - perceived chance of working in 6 months - light work - stress - previous sick leave	Test-retest-reliability in a pilot study - Pearson product moment on the total score of 0.83 (range=.63-.97)	73% correctly classified patients by - fear-avoidance work beliefs - perceived chance of working in 6 months - light work - stress - previous sick leave

Table 1 (continued)

Study	Screening-instrument	Study components	Items	Dependent variables and predictors	Reliability	Prognostic validity
		Theoretical model - biopsychosocial model - fear-avoidance beliefs	revised form without following items -year of birth, gender, nationality			
6. Neubauer et al. (2006) *Country* Germany and Switzerland	*Name* HKF-R 10 (questionnaire developed in this study) *Format* self-report questionnaire	*Objective* - to develop a questionnaire to assess the risk for chronicity for LBP *Participants* The most important criteria for the participants were acute LBP for less than six months *Theoretical model* - biopsychosocial model	167 Items; self- report questionnaire at baseline, derived from established prognostic models The final model consisted of nine factors (see strongest predictors) → all nine items were implemented in a newly designed questionnaire: HKF-R 10 One item was added upon request of the practitioners without predicting value	*DV* chronicity (defined as back pain persisting for longer than six months) *Predictors* - intensity + acceptance of pain - duration of pain - educational level - other locations of pain than LBP - depression - positive effect of massage - female gender - catastrophizing - helplessness	No data available	78% correctly identified for chronicity by: - intensity and acceptance of pain - duration of pain - educational level - other locations of pain than LBP - depression - positive effect of massage - female gender - catastrophizing - helplessness → representative for patients in primary care
7. Pfingsten (2004) *Country* Germany	*Name* Fear-Avoidance Beliefs Questionnaire (FABQ) → German translation *Format* self-report-questionnaire	*Objectives* 1. to verify the factorial structure as well as parametric properties of the German version of the FABQ 2. to investigate the prognostic relevance for treatment outcomes *Participants* Patients attending the pain clinic Göttingen with acute or chronic LBP. Only patients were included being on sick-leave before the begin of the treatment. *Theoretical model* fear-avoidance beliefs	16 items on the correlation between activity, work status and LBP *Additionally* - demographic data - medical history - pain intensity - Allgemeine Depressionsskala (ADS), Hautzinger and Bailer (1993) - Funktionsfragebogen Hannover for LBP paitents (FfbH-R), Kohlmann and Raspe (1994)	*DV* Return to work *Predictors* - 2. subscale of FABQ (prognosis of ability to work) - duration of prior sick leave - grade of depression → note: the higher the grade of depression the higher the treatment effects (discriminant analysis shows classification rate of 76%)	*Internal consistency, expressed by Cronbach's alpha:* 0.91 *Split-half-reliabilität:* split-half coefficient: $r_{tt}=0.78$ *Test-retest reliability:* product moment correlation of all items: $r_{12}=0.87$	*Factor analysis:* → 3 factors; total variance explained: 64.1% 1. factor: beliefs about relationship between LBP and work 2. factor: beliefs about return to work 3. factor: beliefs about relationship between physical activity and LBP
8. Staerkle et al. (2004) *Country* Switzerland	*Name* Fear-Avoidance Beliefs Questionnaire (FABQ) → German translation *Format* self-report-questionnaire	*Objectives* - to provide a cross-cultural German adaptation of the FABQ and - to investigate its psychometric properties (reliability, validity) and - to test predictive power in a sample of Swiss-German LBP-Patients *Participants* - patients with subacute and chronic LBP (duration of at least one month), including surgically treated patients - recruited from spine centres of orthopaedic hospitals and from chiropractic clinics *Theoretical model* fear-avoidance beliefs	16 items in two domains: - fear-avoidance beliefs about work - fear-avoidance beliefs about physical activity *Additionally* - Present Pain Index (Exner, 1998), - pain duration, - Roland and Morris Disability Questionnaire (Roland & Morris, 1983) - Zung Depression Scale (Zung, Richards & Short, 1965b) - Modified Somatic Perception Questionnaire (Main, 1983; Mannion, Muntener, Taimela & Dvorak 1999) - work absence (Patrick, Deyo, Atlas, Singer, Chapin & Keller, 1995)	*DV* disability in ADL's, work loss, days off-work *Predictors* - for "disability" and "work loss": → FABQ1 and FABQ2; in cross-sectional analysis - for "days off-work": → FABQ work beliefs (not statistically significant); in longitudinal prediction	*Test-retest reliability:* - the average kappa for all 16 items: 0.54 (range 0.34-0.68) - the average weighted kappa statistic: 0.76 (range 0.48-0.89)	*Factorial analysis:* → 2 factors: total variance explained: 57.68% - FABQ1: concerns fear-avoidance beliefs about the relationship between LBP and work - FABQ2: concerns fear-avoidance beliefs about the relationship between physical activity and LBP

Table 1 (continued)

Study	Screening-instrument	Study components	Items	Dependent variables and predictors	Reliability	Prognostic validity
9. Waddell et al. (1993) **Country** Scotland (UK)	**Name** Fear-Avoidance Beliefs Questionnaire (FABQ) **Format** The final format was a self-report questionnaire	**Objectives** - to develop a questionnaire to measure fear-avoidance beliefs about physical activity and work suitable for routine clinical use in patients with LBP - to use the above questionnaire to investigate the relationship between LBP, fear-avoidance beliefs and chronic disability in activities of daily living (ADL's) and work loss **Participants** - The main study (aim 2) was of patients with LBP referred to various hospital out-patients departments. - Mean duration of the present attack of LBP 13.7+/-19.8 months (chronic sample) **Theoretical model** FABQ based on - fear theory - fear-avoidance cognitions - concept of disease conviction (Pilowsky & Spence 1975, Pilowsky & Spence,1983) - concepts of somatic focussing and increased somatic awareness (Main, 1983)	16 Items reflecting fear-avoidance beliefs in work and physical activity **Additionally** - work status: still working, off work because of back pain, lost job because of back pain - pain: severity, assessed by a visual analogue scale (Waddell, 1987), total duration, duration present episode - psychological distress: Modified Somatic Perception Questionnaire (MSPQ), Main (1983), and modified Zung Depressive Inventory (Zung, 1965a; Main, Wood, Hollis, Spanswick & Waddell, 1992)	**DV** - disability: ADL's, present work loss, work loss in the past year **Predictors** - for "disability in ADL's": severity of pain, FABQ1-work beliefs, FABQ2-activity beliefs, depressive symptoms - for "work loss in past year": time pattern of pain, FABQ1-work beliefs, depressive symptoms	*Test-retest stability* - the average level of k for all 16 items: 0.74 *Internal consistency (Cronbach's alpha) of* - fear-avoidance beliefs about work: 0.88 - fear-avoidance beliefs about physical activity: 0.77	*Factorial analysis:* → 2 factors: total variance explained: 60.2% - FABQ1: concerns fear-avoidance beliefs about the relationship between LBP and work - FABQ2: concerns fear-avoidance beliefs about the relationship between physical activity and LBP *Regression analysis:* - 23% of the variance of disability in ADL's is explained by FABQ1-work beliefs, 9% by FABQ2-activity beliefs. - 26% of the variance of work loss in the past year is explained by FABQ1-work beliefs
10. Reis et al. (2007) **Country** Israel and USA	**Name** Patient Perception Scale (PPS) **Format** can be used as self-report (PPS-pt) for the patient or as an external observation method (PPS-doc) for the doctor	**Objectives** - to describe a new tool designed to capture patients perception of their LBP episodes - to test its ability to predict episode outcomes **Participants** low back pain patients recruited by family physician **Theoretical model** biopsychosocial model	5 Patient pain perception scale components - worried: an affective component - coping: a behavioural one - affects "what's most important": a meaning, integrative component - feels limited: functional capacity (behavioural) - expect quick relief: expectation component **Additionally** - socio-demographic characteristics - health related measures - LBP history - current episode	**DV** chronicity (persistence of pain 4 months later), disability, functional limitation, pain severity, bothersomeness, hospitalization, bed rest, sick leave **Predictors** - PPS-pt result is predictive for all variables except sick leave (this result goes into Table 2) - PPS-doc result is predictive to a lower degree than the PPS-pt (no exact data available) - combined doctor-patients PPS (PPS-com) has good predictive properties (no exact data available)	No data available	- PPS-pt result is predictive for all variables except sick leave - PPS-doc result is predictive to a lower degree than the PPS-pt (no exact data available) - combined doctor-patients PPS (PPS-com) has good predictive properties (no exact data available)

Table 1 (continued)

Study	Screening-instrument	Study components	Items	Dependent variables and predictors	Reliability	Prognostic validity
11. Scerri et al. (2006) **Country** Switzerland	**Name** INTERMED questionnaire **Format** - assessment and clinical classification tool - clinicians administered questionnaire	**Objective** - to determine whether the INTERMED score helped to prevent work disability due to non-specific LBP, by identifying those patients likely to benefit from a multidisciplinary rehabilitation program **Participants** - patients were examined by a primary-care physician, and then referred to one of the specialists at the Spine and Rehabilitation Unit. - at least 7 weeks' sick leave at referral, or at least 3 months' total sick leave over the last 2 years. **Theoretical model** biopsychosocial and health-care related aspects of disease	25 Items; INTERMED synthesizes data from 4 systems: the biological, the psychological, the social and the health care system assessed in the context of time (history, current state and prognosis) **Additionally** - pain severity: on a visual analogue scale (VAS) - sick leave duration: Krause classification, (Krause & Ragland, 1994)	**DV** return to full-time work within 3 months **Predictors** INTERMED score and sick leave duration	No data available for reliability in this study For reliability of the INTERMED see Huyse et al. (1999)	- INTERMED scores were significantly associated with work outcome (p<0.001 in uni- and multivariate analysis) - pre-treatment sick leave duration was correlated to success in the univariate analysis (p<0.001) and in the multivariate analysis (p=0.03) - adding sick leave duration to the INTERMED score improved the predictive performance of the model
12 Stiefel et al. (1999) **Country** Netherlands, Switzerland and USA	**Name** INTERMED questionnaire **Format** - assessment and clinical classification tool - clinicians administered questionnaire	**Objective** - to test the utility of the INTERMED in patients with low back pain: The INTERMED was examined regarding its capacity to identify patients with a disabling course of LBP and to predict treatment outcome (3-weeks functional rehabilitation program) **Participants** - patients with a diagnosis of benign low back pain (without infectious, neoplastic, or inflammatory causes and without neurologic impairment) - chronic sample **Theoretical model** biopsychosocial and health-care related aspects of disease	20 Items; INTERMED synthesizes data from 4 systems: the biological, the psychological, the social and the health care system assessed in the context of time (history, current state and prognosis) **Additionally** - medical history (comorbidity) and examinations - first appearance and duration of pain - duration of sick leave - degree of disability - number of medical outpatient consultation	**DV** capacity to work and the number of medical outpatient consultations for low back pain six months after the treatment. Three groups of patients: 1.group: unchanged or decreased capacity to work and an increased number of medical consultations, 2. group: unchanged capacity to work and unchanged number of medical consultations. 3. group: returned to work within 6 months **Predictors** INTERMED score	No data available for reliability in this study For reliability of the INTERMED see Huyse et al. (1999)	Two distinct clusters emerged from a hierarchical cluster analysis: - cluster 1 consisted of patients with a lower degree of case complexity and lower INTERMED scores, cluster 2 of patients with a higher degree of case complexity and higher INTERMED scores. - 66% of less complex patients but only 20% of more complex patients returned to work or decreased medical consultations after the program
13. Truchon and Côté (2005) **Country** Canada	**Name** Chronic Pain Coping Inventory (CPCI) **Format** self-report measure	**Objectives** - to verify: 1. the capacity of the CPCI scales to predict the adjustment to the LBP at the subacute stage (T1) 2. the capacity of coping to predict employment status 3. the complementarity of the Coping Strategies Questionnaire (CSQ: Rosenstiel & Keefe, 1983) catastrophizing scale to the CPCI	64 Items measuring 8 ways of coping: guarding, resting, asking for assistance, relaxation, task persistence, exercise/stretch, coping self-statements, seeking social support **Additionally** - disability (RMDQ (Roland & Morris, 1983)) - pain (NRS-101(Jensen, Karoly & Braver, 1986))	**DV** disability, pain intensity, depressive mood, work status (returned to work or not) **Predictors** - for "disability": - guarding and intensity of perceived pain, at T2 (six months later) - coping at T1 predicts it at T1 and at T2, for T2 the best predictor is the	No data available for reliability in this study For reliability of the CPCI see Jensen, Turner Romano and Strom (1995)	Most important results: - significant group difference (returned to work vs. still compensated) was confirmed for the guarding-scale (p<0.001), asking-scale (p=0.028) and the CSQ catastrophizing scale - correlations between the coping scales and the outcomes (functional

Table 1 (continued)

Study	Screening-instrument	Study components	Items	Dependent variables and predictors	Reliability	Prognostic validity
		Participants workers on sick leave after a work accident to the lower back region inclusion criteria: - sick leave between 3 and 12 week (subacute state) - first or new episode of LBP in the last 12 months ***Theoretical model*** - coping strategies - biopsychosocial model	- depressive mood (HADS (Zigmond & Snaith, 1983)) - catastrophizing (CSQ: Rosenstiel & Keefe 1983)	disability observed atT1 *- for "pain intensity":* - T1: coping - T2: pain intensity T1 and catastrophizing *- for "depressive mood":* - T1: pain intensity, catastrophizing and guarding - T2: depressive mood at T1 *- for "work status":* - guarding and catastrophizing are associated with an prolonged sick leave, while exercise/stretch seems to favour return to work		disability, pain, depressive mood): guarding, resting, asking for assistance and exaggerating scales were the most consistently related to concurrent and future outcomes

DV Dependent Variable

"sleep" and "fear-avoidance beliefs" were found to be the strongest predictors of "functional limitation". "Intensity, duration, and frequency of pain" and "coping strategies/reaction to pain" were specified as the strongest predictors of "pain". When building screening instruments this pattern analysis should be taken into consideration using those predictors which are specific for the patient group.

Limitations of this review are the relatively small number of studies investigated, different patient samples regarding the duration of LBP, varying methodology, and insufficient data on patient samples (e.g. when attending a physician for the first time, LBP history). Furthermore, when grouping items into structures we were not able to include all of the items.

There is a great diversity of items in the literature describing a large number of influencing factors in patients with LBP. The ten structures developed in our review show the spectrum of the biopsychosocial model. Although there is consensus in the literature about abandoning the bio-medical approach and focussing on the biopsychosocial model [5, 24], the impact of individual factors is rated differently among authors.

Our findings are supported by results of three other reviews on prognostic factors in patients with LBP [17, 22, 24].

Pincus et al. point out the influence of psychological factors with regard to the correlation between psychological distress/depressive mood and increased risk of chronicity [17]. This endorses the relevance of our structures "depression", "negative psychological states", "coping strategies", "fear-avoidance beliefs", and "emotional and social support system/psychosocial aspects".

Shaw et al. list these factors as significant: "low workplace support", "personal stress", "shorter job tenure", "prior episodes", "heavier occupations with no modified duty", "delayed reporting", "severity of pain and functional impact", "radicular findings", and "extreme symptom report" [22]. Comparing these data with our findings illustrates the limitations of comparability of both reviews. Only some items reported by Shaw et al. can be assigned to one of the ten structures of our review. Whereas we considered "low workplace support", "personal stress", and "heavier occupations with no modified duty" as predictors as well, "severity of pain and functional impact" and "extreme symptom report" have no prognostic influence according to our results; the allocation of the remaining factors is ambiguous.

Steenstra et al. characterised the following factors as predictors for a longer duration of sick leave in patients with LBP: "specific LBP", "higher disability levels", "older age", "female gender", "more social dysfunction and more social isolation", "heavier work", and "receiving higher compensation" [24]. "More social dysfunction and more social isolation" and "heavier work" were also evaluated as predictors in our review. However, results by Steenstra et al. with respect to socio-demographic factors as being predictive did not match our findings.

Table 2 Structures and their predictive effectiveness for the dependent variables "work status", "functional limitation", and "pain"

Structures and their aspects	Study	Indicator of effectiveness for			
		DV: Work status	DV: Functional limitation	DV: Pain	Sample
1. Socio-demographic factors					
a) Educational level/employment status	Grotle et al. [2] b,c,d	-	-	-	a, ch
	Hazard et al. [4] e	+(e)	DV: n. m.	DV: n. m.	a
	Hurley et al. [6] b,c,d	+ (main score)	+(main score)	+(main score)	-
	Linton and Boersma [11] a,b,c,d	+(b)	DV: n. m.	-	a, sa
	Linton and Halldén [12] b,c,d	-	DV: n. m.	DV: n. m.	a, sa
	Neubauer et al. [15] a,b	DV: n. m.	-	+(ab)	a, sa, ch
b) Gender					
c) Year of birth					
d) Nationality					
e) Marital status					
2. Work characteristics and work related attitudes					
a) Biomechanical load	Grotle et al. [3] a,b,c,d,e	+(e)	DV: n. m.	-	a, ch
	Hazard et al. [4] a,e	+(a,e)	+(main score)	DV: n. m.	a
b) Job satisfaction	Hurley et al. [6] a,b,c,d,e	+(main score)	+(e)	+(main score)	-
c) Days of activity limitation	Linton and Boersma [11] a,b,d,e	+(d)	DV: n. m.	-	a, sa
d) Previous days off work	Linton and Halldén [12] a,b,d,e	+(a,e)	+(e)	DV: n. m.	a, sa
e) Perceived chance of being able to work					
3. Physical functioning/activities of daily living					
a) Ability to do light work	Grotle et al. [3] a,b,c,d,e	+(e)	+(e)	+(b,e)	a, ch
b) Walk for an hour	Hurley et al. [6] a,b,c,d,e	+(main score)	+(main score)	+(main score)	-
c) Do household chores	Linton and Boersma [11] a,b,c,d,e	+(d)	DV: n. m.	+(e)	a, sa
d) Weekly shopping	Linton and Halldén [12] a,b,c,d,e	-	+(main score)	DV: n. m.	a, sa
e) Sleep	Reis et al. [18]	+(f)	-	+(main score)	-
f) Exercise	Truchon and Côté [26] f	-	-	-	sa
4. Aspects of Pain					
a) Current pain	Grotle et al. [3] a,b,c,d,	+(a)	DV: n. m.	+(a)	a, ch
	Hazard et al. [4] a	+(main score)	+(main score)	DV: n. m.	a
b) Average pain	Hurley et al. [6] a,b,c,d	-	+(d)	+(main score)	a, sa
c) Intensity, duration and frequency of pain	Linton and Boersma [11] a,b,c,d	DV: n. m.	DV: n. m.	+(b)	a, sa
d) Location of pain	Linton and Halldén [12] a,b,c,d	-	DV: n. m.	DV: n. m.	a, sa, ch
e) Other locations of pain	Neubauer et al. [15] c,e,f	+(main score)	+(main score)	+(c,e,f)	-
f) Acceptance of pain	Reis et al. [18] g,h	+(main score)	DV: n. m.	+(main score)	sa, ch
g) Limitation through pain, pain impacts life quality	Scerri et al. [19] c	+(b)	DV: n. m.	+(main score)	ch
h) Expected development of pain	Stiefel et al. [25] c	DV: n. m.	DV: n. m.	+(main score)	a
5. Medical aspects					
a) Diagnosis	Hazard et al. [4] b	+(main score)	DV: n. m.	DV: n. m.	a, sa, ch
	Neubauer et al. [15] c	+(main score)	DV: n. m.	+(c)	sa, ch
	Scerri et al. [19] a,b,c	+	DV: n. m.	DV: n. m.	ch
b) Medical history: Premorbidity, Polymorbidity (psychological and physical)	Stiefel et al. [25] a,b,c	+(main score)	+	DV: n. m.	a, ch
c) Treatment	Grotle et al. [3]	-	+(main score)	+	-
6. Depression	Hurley et al. [6]	DV: n. m.	-	+(main score)	a, sa
	Linton and Boersma [11]		DV: n. m.	-	a, sa
	Linton and Halldén [12]		DV: n. m.	DV: n. m.	a, sa, ch
	Neubauer et al. [15]			+	

7. Negative psychological states:
Anxiety, stress, threats, worries, helplessness

Author				
Grotle et al. [3]	-	+	+	a, ch
Hurley et al. [6]	+(main score)	+(main score)	+(main score)	-
Linton and Boersma [11]	-	-	-	a, sa
Linton and Halldén [12]	+	DV: n. m.	DV: n. m.	a, sa
Neubauer et al. [15]	DV: n. m.	DV: n. m.	+	a, sa, ch
Reis et al. [18]	-	+(main score)	+(main score)	-
Scerri et al. [19]	+(main score)	DV: n. m.	DV: n. m.	sa, ch
Stiefel et al. [25]	+(main score)	DV: n. m.	DV: n. m.	ch

8. Coping strategies/reaction to pain:
Coping with pain, catastrophizing, coping resources, guarding, resting, asking for assistance, exercise, relaxation, task persistence, coping self-statement, seeking social support

Author				
Grotle et al. [3]	-	-	-	a, ch
Hurley et al. [6]	+(main score)	+(main score)	+(main score)	-
Linton and Boersma [11]	-	-	-	a, sa
Linton and Halldén [12]	DV: n. m.	DV: n. m.	DV: n. m.	-
Neubauer et al. [15]	+	DV: n. m.	+	a, sa, ch
Reis et al. [18]	+(main score)	+(main score)	+(main score)	-
Truchon and Côté [26]	-	+	+	sa
Scerri et al. [19]	+(main score)	DV: n. m.	DV: n. m.	sa, ch
Stiefel et al. [25]	+(main score)	DV: n. m.	DV: n. m.	ch

9. Fear-avoidance beliefs
a) About work
b) About physical activity

Author				
Grotle et al. [3] a,b	-	-	-	a, ch
Hurley et al. [6] a,b,	+(main score)	+(main score)	+(main score)	-
Linton and Boersma [11] a,b	-	-	-	a, sa
Linton and Halldén [12] a,b	+(a)	DV: n. m.	DV: n. m.	a, sa
Pfingsten [16] a,b	+(a)	DV: n. m.	DV: n. m.	ch
Staerkle et al. [21] a,b	+(ab)	+(ab)	DV: n. m.	sa, ch
Waddell et al. [29] a,b	+(a)	+(ab)	DV: n. m.	ch

10. Emotional and social support system/psychosocial aspects

Author				
Hazard et al. [4]	+	+	DV: n. m.	a
Scerri et al. [19]	+(main score)	DV: n. m.	DV: n. m.	sa, ch
Stiefel et al. [25]	+(main score)	DV: n. m.	DV: n. m.	ch
Truchon and Côté [26]	-	+	+	sa

DV dependent variable, *DV n. m.* dependent variable not measured, *a* acute (≤6 weeks), *sa* subacute (>6 weeks and ≤12 weeks), *ch* chronic (>12 weeks), + structure is effective (when an additional letter is given in brackets only this part of the structure is effective), +*(main score)* main score of screening instrument—including this structure—is effective, - construct or measured part of construct is not effective

If the complete structure is not included in the screening instrument, letters behind the authors' names show which part of the construct is measured. Non-effective items listed here are not mentioned in the results chapter

In conclusion, this systematic review has found psychological and occupational factors to have the highest reliability among prognostic factors of patients with LBP. To optimise the decision-making process of physicians these factors should be included in future screening instruments for the identification of prognostic factors at an early stage. Furthermore, psychological and occupational factors should be part of a minimum core set in future prospective studies as referred to in an ongoing study of the authors' looking into predictors of the transition from acute to chronic LBP, including the impact of different health care systems [13].

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