ILLNESS BELIEFS REGARDING LOW BACK PAIN IN PATIENTS AND HEALTH CARE PROFESSIONALS

Universiteit Antwerpen

VRIJE UNIVERSITEIT BRUSSEL

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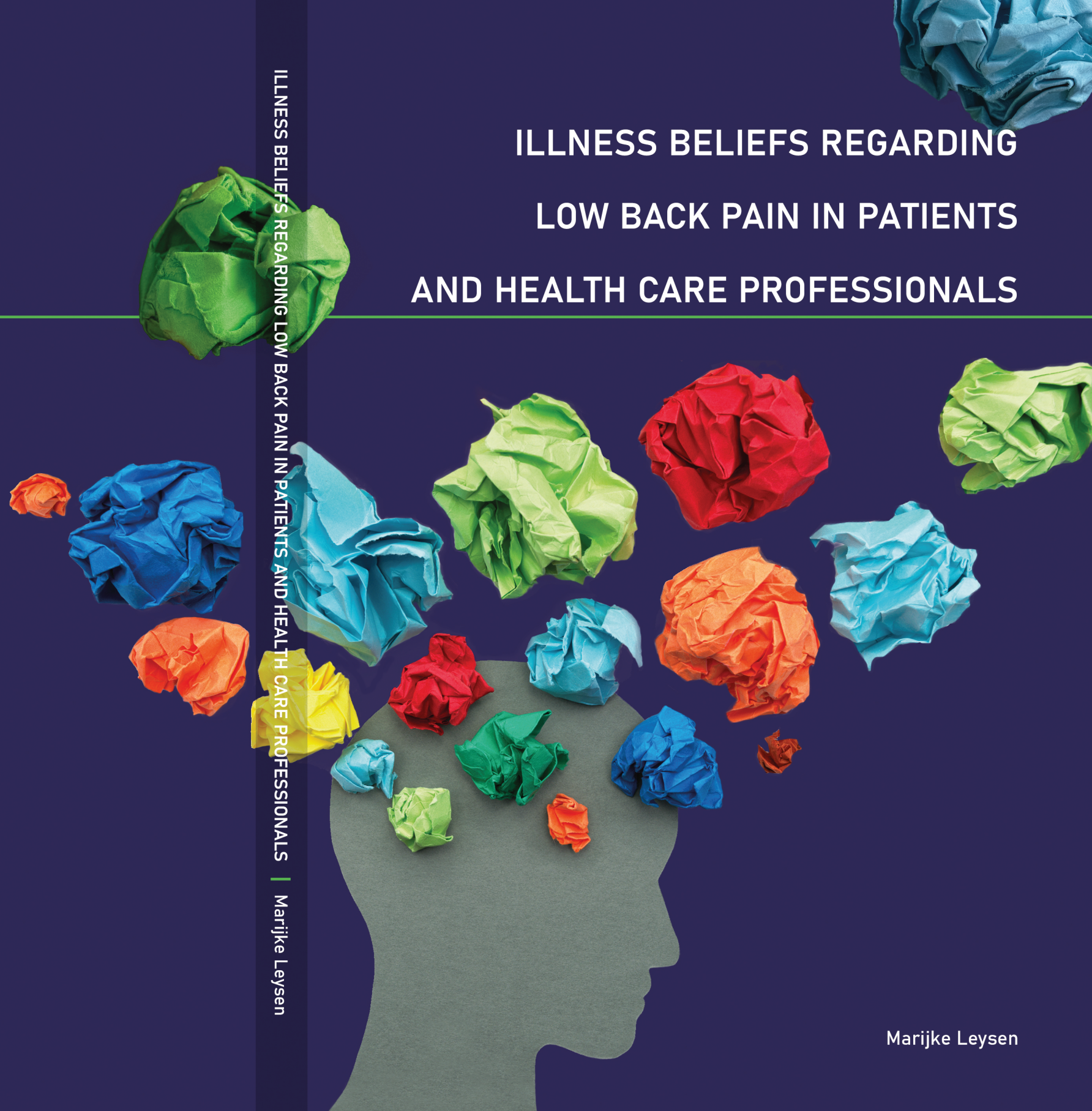
Faculteit Geneeskunde en Gezondheidswetenschappen Revalidatiewetenschappen en Kinesitherapie – MOVANT

Proefschrift voorgelegd tot het behalen van de graad van doctor in de medische wetenschappen aan de Universiteit Antwerpen en de graad van doctor in de revalidatiewetenschappen en de kinesitherapie aan de Vrije Universiteit Brussel te verdedigen door Marijke Leysen

Promotoren:
Prof. dr. Nathalie Roussel
Prof. dr. Jo Nijs
Prof. dr. Paul Van Wilgen

Antwerpen, 2023

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JURY

Chair	Prof. dr. Jef Michielsen
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	Prof. dr. Annick Timmermans
	dr. Davy Paap

CONTENT

"All our knowledge has its origin in our perceptions."

- Leonardo da Vinci -

SUMMARY

Low back pain is one of the most common health problems in the Western world. Normally, a patient with acute non-specific low back pain gradually increases activities and participation over time to the level before the onset. However, 4-20% will develop into a chronic condition.

Currently, evidence based guidelines recommend healthcare practitioners to evaluate and treat patients within a biopsychosocial framework, which states that social, psychological as well as biomedical factors have significant influences on pain and disability (1.2). Current guidelines advise patients to stay active, in physical activity, as well as in work. Therefore, an active coping strategy and the prevention of activity withdrawal should be stressed, even when the patient still experiences pain.

According to Leventhal's Common Sense Model, patients build cognitions and emotions as a response to their illness, based on former experiences, cultural background, interpretation of symptoms and provided information. These cognitions and emotions are called illness perceptions and are an important determinant of the patient's coping behaviour. This shows the need to evaluate the patient's illness perceptions, since they can be helpful or maladaptive to a certain desired behaviour (such as staying active).

The first part of this thesis focusses therefore on the illness perceptions of the patient, with 2 specific aims. First, we wanted to systematically review the clinimetric properties of the IPQ-R and the Brief IPQ, 2 questionnaires to measure a patient's illness perceptions (chapter 2). Given the focus of the present thesis, we limited the search to patients with musculoskeletal disorders. The results show that the IPQ-R is an appropriate instrument to explore illness beliefs in patients with musculoskeletal disorders. The clinimetric properties of the Brief IPQ are poor. Therefore, it should be used with caution in quantitative research, but still has its value in qualitative research or in clinical practice of combined with an elaborate interview.

Secondly, we aimed at exploring the added value of illness perceptions in explaining functional disability and habitual physical activity in patients with chronic low back pain.

The results show that functional disability is closely related to illness perceptions in patients with chronic low back pain, independent from established psychological correlates, such as fear of movement, depression and pain catastrophizing. However, in the present study, illness perceptions failed to explain the variance in habitual physical activity levels in chronic low back pain patients.

Evidence based practice guidelines should guide health care practitioners in their choice of clinical tests and treatment modalities, regardless of their education of background. Research shows however that the (prescription) behaviour of health care practitioners, referred to as attitudes in this thesis, differs between health care practitioners with a more biomedical versus a more biopsychosocial belief, with all its consequences.

Therefore, **the second part** of this thesis focusses on the attitudes and beliefs of health care practitioners regarding to low back pain. In chapter 4 it is shown that guideline adherence for low back pain is very low among 2nd and 4th grade physical therapy students in Belgium and the Netherlands, where 4th grade students show more biopsychosocial beliefs and provide more guideline adherent recommendations than 2nd grade students. It is demonstrated that biomedical beliefs are associated with poor adherence to evidence based guidelines. Our results show no relationship between a personal history of low back pain and one's beliefs or attitudes.

The last chapter explores the beliefs and guideline adherent attitudes in low back pain among physical therapists in Belgium. The results show that guideline adherence among physical therapists in Belgium is low and related to the therapist's beliefs concerning low back pain. Physical therapists with a longer time since graduation tend to display a stronger biomedical view compared to those with less time since graduation.

This doctoral thesis paves the way to look into proper guideline adherence strategies in educational programmes and at national level, to enhance efficiency and reduce medical costs for low back pain, as to build a well-developed quality-control system for physical therapists in Belgium.

SAMENVATTING

Lage rugpijn is een van de meest voorkomende gezondheidsproblemen in de westerse wereld. Binnen een normaal verloop verhoogt een patiënt met acute aspecifieke lage rugpijn na verloop van tijd geleidelijk zijn/haar activiteiten en participatie tot het niveau van voor de start. Echter, 4-20% ontwikkelt zich tot een chronische aandoening.

In de huidige evidence-based richtlijnen worden zorgverleners aangeraden patiënten te evalueren en te behandelen binnen een biopsychosociale context, dat stelt dat zowel sociale, psychologische als biomedische factoren belangrijke invloeden hebben op pijn en invaliditeit (1.2). De huidige richtlijnen adviseren patiënten actief te blijven, zowel in lichamelijke activiteit als in hun job. Daarom moet de nadruk worden gelegd op een actieve copingstrategie en het voorkomen van stopzetten van activiteiten, zelfs wanneer de patiënt nog steeds pijn ervaart.

Volgens het Common Sense Model van Leventhal bouwen patiënten cognities en emoties op als reactie op hun ziekte en symptomen, gebaseerd op vroegere ervaringen, culturele achtergrond, interpretatie van symptomen en verstrekte informatie. Deze cognities en emoties worden ziektepercepties genoemd en zijn een belangrijke determinant van het copinggedrag van de patiënt. Hieruit blijkt de noodzaak om de ziektepercepties van de patiënt te evalueren, aangezien deze zinvol of net nadelig kunnen zijn voor een bepaald gewenst gedrag (zoals actief blijven).

Het **eerste deel** van dit proefschrift richt zich daarom op de ziektepercepties van de patiënt met 2 specifieke doelstellingen. Ten eerste wilden we de klinimetrische eigenschappen van de IPQ-R en de Brief IPQ, 2 vragenlijsten om de ziektepercepties van een patiënt te meten, systematisch evalueren (hoofdstuk 2). Gezien de focus van dit proefschrift hebben we de zoektocht beperkt tot patiënten met aandoeningen van het bewegingsapparaat. De resultaten tonen aan dat de IPQ-R een geschikt instrument is om ziektepercepties bij patiënten met musculoskeletale aandoeningen te bevragen. De klinimetrische eigenschappen van de Brief IPQ zijn slechts matig. Daarom moet deze met enige voorzichtigheid worden gebruikt in kwantitatief onderzoek, maar heeft het nog steeds zijn

waarde in kwalitatief onderzoek of in de klinische praktijk in combinatie met een uitgebreid vraaggesprek.

Ten tweede onderzochten we de toegevoegde waarde van ziektepercepties bij het verklaren van functionele beperkingen en dagelijkse fysieke activiteit bij patiënten met chronische lage rugpijn. De resultaten laten zien dat functionele beperkingen nauw samenhangen met ziektepercepties bij patiënten met chronische lage rugpijn, onafhankelijk van gevestigde psychologische correlaten, zoals bewegingsangst, depressie en pijncatastrofering. In de huidige studie konden ziekteperceptie echter niet de variatie verklaren in dagelijkse fysieke activiteit bij patiënten met chronische lage rugpijn.

Evidence based praktijkrichtlijnen zouden zorgverleners moeten leiden bij hun keuze van klinische tests en behandelingsmodaliteiten, ongeacht hun opleiding of achtergrond. Uit onderzoek blijkt echter dat het (voorschrijf)gedrag van zorgverleners, in dit proefschrift attitudes genoemd, verschilt tussen zorgverleners met een meer biomedische versus een meer biopsychosociale overtuiging, met alle gevolgen van dien.

Daarom richt het **tweede deel** van dit proefschrift zich op de attitudes en overtuigingen van zorgverleners met betrekking tot lage rugpijn. In hoofdstuk 4 wordt aangetoond dat het naleven van de klinische richtlijn voor lage rugpijn zeer laag is bij 2e en 4e jaar kinesitherapiestudenten in België en Nederland, waarbij 4e jaarstudenten meer biopsychosociale overtuigingen vertonen en aanbevelingen geven die meer in lijn liggen met de klinische richtlijnen dan 2e jaarstudenten. Bovendien wordt aangetoond dat biomedische overtuigingen geassocieerd zijn met het minder goed naleven van evidence based richtlijnen. Onze resultaten laten geen verband zien tussen een persoonlijke geschiedenis van lage rugpijn en diens overtuigingen of attitudes.

Het laatste hoofdstuk (5) onderzoekt de overtuigingen en het naleven van de klinische richtlijnen rond lage rugpijn bij kinesitherapeuten in België. De resultaten laten zien dat deze slecht worden nageleefd en dat dit samenhangt met de overtuigingen van de therapeut ten aanzien van lage rugpijn. Kinesitherapeuten die reeds langere tijd zijn afgestudeerd, vertonen een sterkere biomedische overtuiging dan zij die recenter zijn afgestudeerd.

Dit proefschrift effent de weg om goede strategieën voor het naleven van klinische richtlijnen te onderzoeken binnen (universitaire) opleidingsprogramma's als ook op nationaal niveau, om de efficiëntie te verbeteren en de (medische) kosten met betrekking tot lage rugpijn te verminderen. Daarnaast vormt het een opening om een structureel systeem van kwaliteitscontrole hierrond uit te bouwen voor kinesitherapeuten in België.

1 GENERAL INTRODUCTION

1.1 LOW BACK PAIN

Low back pain (LBP) is one of the most prevalent health conditions in both men and women leading to a personal burden, as well as to high costs and work absenteeism [1-3]. In Belgium, the major cause of years lived with disability (YLDs) in 2016 in males and females was low back pain, followed by migraine and falls (males)/major depression (females) on rank 2 and 3 respectively. Concerning age-standardized years lived with disability (YLD), low back pain was ranked first in 2016 in Belgium, with a proportion of 11.2% of total YLD in males and 12.2% in females [4]. In fact, worldwide, low back pain is one of the leading causes of YLD in most countries and age groups [3]. In 2015, low back and neck pain were ranked the fourth leading cause of disability-adjusted life years (DALYs) globally [3]. In 2016 in Belgium, low back pain was ranked as third (males, 4.8% of total DALY's) and first (females, 6.7% of total DALY's) cause based on age-standardized Disability Adjusted Life Years (DALY) per 100 000.

In most cases, the normal course of LBP typically shows a gradual increase of activities and participation up to the level of before the onset of LBP. Often the pain will also decrease. This however does not mean that lower back pain always disappears completely. According to the Royal Dutch Society for Physiotherapy, one speaks of an abnormal course and a delayed recovery if there has not been a clear increase in activities and decrease in participation problems for 3 weeks [5].

Direct medical costs of low back pain account for 10% to 30% of the total cost for patient and society [6-10]. The global burden of low back pain in Belgium is therefore estimated at somewhere between €270 million and €1.6 billion [11]. Given the information from the

Socialist Mutuality and the data retrieved from the National Institute for Health and Disability Insurance (RIZIV/INAMI) nomenclature, the estimated costs for physiotherapy in low back pain are €8 531 817. The cost for history taking and follow-up with the general practitioner is not even accounted for in this amount, nor is rehabilitation after surgery included [11]. An estimated 15% of all physiotherapy referrals in Belgium are related to low back pain [12], which brings the above mentioned estimated cost for physiotherapy in low back pain to €19 312 615 [11].

Considering that 70-85% of all people experience low back pain at some time in their life and 4-20% of them will develop into a chronic condition [1,2], low back pain and especially chronic low back pain (CLBP) represents a major health problem and an economic burden for society. Most treatments only have limited effect sizes and/or short-term effects [13-16]. Perhaps the contributing factors for chronic low back pain can provide some clarification, since they remain poorly understood.

At best, we want to guide every single patient to full recovery or at least guide them to an appropriate self-efficacy. In reality, a major part of the low back pain population will never reach full recovery, some not even closely. Apparently, something goes wrong there, so it is important to take a look at all parties involved. Many factors can support, delay or even obstruct the natural healing process. Nowadays, it is recommended to evaluate and treat low back pain patients within a biopsychosocial framework (1.2 Biopsychosocial perspective). This distinguishes 3 influencing components: psychological, social and biomedical factors [17-22]. Within this dissertation, we have focussed on the psychosocial component within the process from two different sides. Moreover, many people are involved in the medical process surrounding low back pain, which even further complicates the whole process. Thus, within this dissertation, we distinguish two large components. On the one hand, we will zoom in on the low back pain patients and their illness perceptions (introduced 1.3.1), as one important factor in the natural or curative healing process of low back pain. On the other hand, we determine some issues on the health care professionals' (HCPs) side and look at their perceptions and behaviour, further introduced as beliefs and attitudes, respectively (introduced 1.3.2 Attitudes and beliefs of the HCP). Combining these two parties and their respective attitudes and beliefs within the

biopsychosocial framework, can be a step in the right direction to utilize the full capacity of physical therapy and the patient's own healing capacity.

1.2 BIOPSYCHOSOCIAL PERSPECTIVE

1.2.1 International Classification of Functioning (ICF)

As described above, many different factors are involved in the health condition of low back pain patients and nowadays the biopsychosocial model is widely accepted. The International Classification of Functioning, Disability and Health (ICF), launched in 2001, is a framework to describe a health condition in a broad bio-psycho-social context (Figure 1-1) [23]. It conceptualises functioning as a 'dynamic interaction between a person's health condition, environmental factors and personal factors' and provides an integrated multidimensional biopsychosocial model [24,25]. The ICF can be used as a tool for identifying and measuring possible barriers or facilitators or even efficacy or effectiveness of rehabilitation [24,25].

Figure 1-1: The ICF Model: Interaction between ICF components, taken and adapted from WHO 2001, 18. Functioning and disability are an interaction between the health condition and the contextual factors.
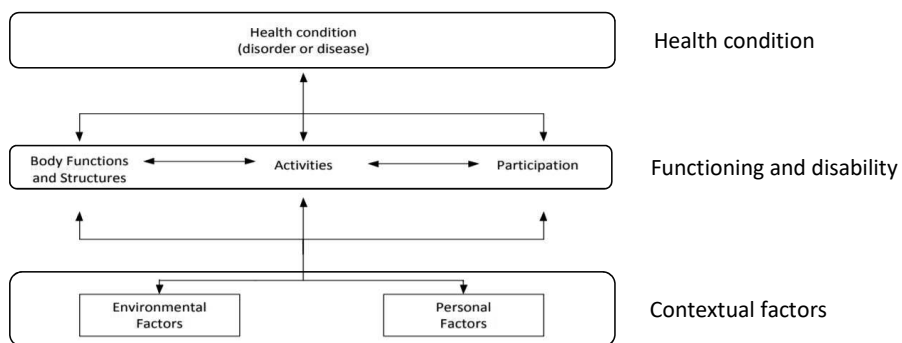
The physical, social and attitudinal environment, in which people live, influences their functioning in a substantial way. Each ICF-component can be expressed in both positive and negative terms, as can the environment be a barrier (hold the patient back) or a facilitator (beneficial to the patient) [25].

The ICF-model can be used in clinical practice to detect areas of needs, problems and strengths, to track changes along time or to plan a management strategy based on the

primary focus [25]. To help address patients' perspectives and enhance their participation in the decision-making process, the Rehabilitation Problem-Solving Form (RPS-form) was designed, based on the ICF-framework [26]. It elaborates on the patient's perceptions as well as on the HCP's perspective. It is important to describe the patient's perspective in his/her own words, without interpretation of the HCP. Afterwards, target problems and target mediators can be defined within an interdisciplinary meeting.

1.2.2   Evidence based guidelines

A purely biomedical diagnosis cannot be given for the majority – or perhaps for all- of low back pain cases. Currently, clinical practice guidelines for the management of low back pain (LBP) recommend healthcare practitioners to evaluate and treat patients within a biopsychosocial framework, which states that social, psychological as well as biomedical factors have significant influences on pain and disability [17-22]. This biopsychosocial framework is broadening of the traditional biomedical model, in which pain is largely considered a consequence of tissue damage. Therefore, guidelines postulate that LBP patients should be approached from a biopsychosocial perspective [17-22], in which psychosocial factors, such as illness perceptions (1.3.1), play an important role.

These guidelines should guide HCPs, such as physical therapists in their treatment choices. For example, the European guidelines for acute nonspecific low back pain encourage HCPs to evaluate and treat patients from a biopsychosocial perspective [18,21,22]. Besides managing psychosocial factors, HCPs should educate patients and advise them to stay as active as possible and continue normal daily activities, including work [22]. The European guidelines for chronic LBP, as well as the Belgian healthcare knowledge centre (KCE) guidelines, recommend the assessment of yellow flags, given their prognostic value, management of psychosocial factors and the implementation of supervised exercise therapy and multidisciplinary treatment [17,21,27]. Clinical guidelines encourage an increase in habitual physical activity as a therapy goal. Therefore, an active coping strategy and the prevention of activity withdrawal is stressed, even when the patient still experiences pain [17,18,27-30].
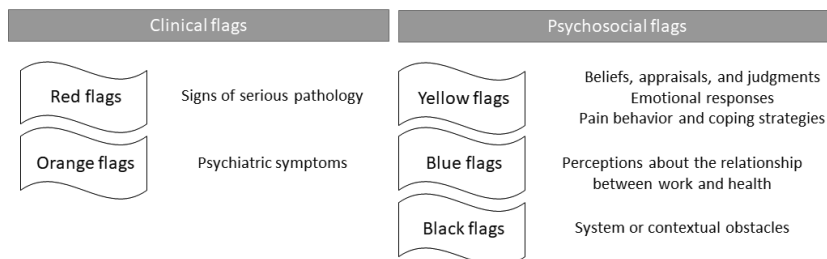
In 2016, the National Institute for Health and Care Excellence (NICE) launched updated recommendations for the assessment and management of low back pain and sciatica [20].

They advise to use a risk stratification tool to assess likely recovery outcomes, as well as psychosocial indicators of poor outcome, such as job dissatisfaction, pain/fear avoidance, low mood etc. If the patient is likely to improve quickly, less intensive support should be considered, namely reassurance, the advice to stay active and self-management strategies. A combined physical and psychological program should be looked into when the pain or sciatica persists and when there is a substantial psychosocial component, for example inappropriate illness beliefs [20]. Likewise, the Belgian KCE guidelines recommend identifying risk factors for persistent/chronic complaints after ruling out a specific cause. Furthermore, they advise a stratified approach afterwards [27].

The STarT Back Tool, as proposed in the NICE-guidelines, is a simple-to-use subgrouping tool for use in primary care [31-33]. LBP patients are being classified into 3 risk categories based on 9 questions concerning possible predictors of chronicity. Patients who score 3 or less are considered low risk of chronicity. For patients who score 4 or more, the sub score on the psychosocial questions determines if they are labelled medium risk (sub score ≤ 3) or high risk (sub score ≥ 4) of chronicity [31-33].

A flag-system has been developed to help physical therapists to keep a broad view and not to miss possible indicators of poor recovery or poor response to treatment [34]. These prognostic flags are musculoskeletal, psychological, psychiatric, contextual and work-related in nature (See Figure 1-2). They are integrated in the Belgian KCE Guidelines [27].

Figure 1-2: Adapted from Nicholas et al. "Early identification and managements of psychological risk factors ("Yellow Flags") in patients with low back pain: A reappraisal" [35].

Clinical flags		Psychosocial flags	
Red flags	Signs of serious pathology	Yellow flags	Beliefs, appraisals, and judgments Emotional responses Pain behavior and coping strategies
Orange flags	Psychiatric symptoms	Blue flags	Perceptions about the relationship between work and health
		Black flags	System or contextual obstacles

1.3   IMPACT OF THE PSYCHOSOCIAL COMPONENT IN THE BIOPSYCHOSOCIAL PERSPECTIVE

1.3.1   Illness perceptions of the patient

1.3.1.1   The Common sense model of self-regulation of health and illness of Leventhal

Leventhal's Common Sense Model (CSM) is a theoretical framework to describe cognitive and emotional responses to illness or symptoms. It helps in the evaluation and treatment of patients and it helps to understand why a person copes in a certain way. This model relates someone's perceptions as one of the important determinants of one's behaviour [36-38].

According to this parallel process model, health threats generate both emotional and cognitive responses [36]. Patients develop cognitions about their illness, based on former experiences, interpretation of symptoms and provided information. Former experiences include, for example, personal experiences with the disease or cultural background [39,40]. These cognitions are referred to as illness perceptions. In any condition, but especially when there is no clear diagnosis (e.g. no bodily cause of pain or medically unexplained symptoms), patients form their own interpretation of symptoms to explain the disorder [41]. The CSM also implies that illness perceptions can change over time when building new experiences or when processing new information.

Initially, the CSM defined 5 domains of cognitive illness perceptions [42].

- Identity refers to the questions: "what is going on? Which disease do I have? Which symptoms do I experience?"
- Timeline refers to the temporal features and expectations of the health threat.
- Causes refer to the diagnosed and perceived factors that caused the health threat. Different groups of causes can be defined, such as internal, external or behavioural causes.
- Consequences refer to anticipated, perceived and experienced effects of the health threat. Again, these consequences can vary in several domains of life: physical, psychological, social, and economic.
- Controllability refers to the expected or perceived possibility of controlling the health threat by themselves (control) or by others, such as health experts (cure).

The sixth domain, coherence, was added later [43]. This refers to the metacognition of the patient by means of understanding what is going on and the understanding of the correlation of different aspects of the health threat.

With these illness perceptions, a need for procedures to manage these health threats arises [36]. Illness perceptions will determine the patient's coping strategy [44] and then, these actions undertaken to minimize the emotional and cognitive threats are appraised for their efficacy (See Figure 1-3) [36].

Figure 1-3: adapted from Common Sense model of Self-regulation (Leventhal et al. 1984)
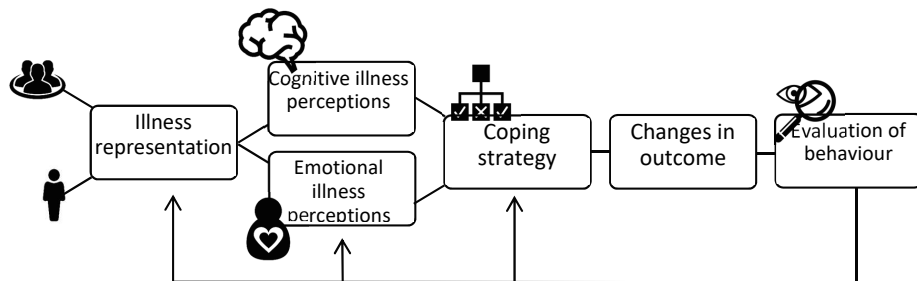
The efficacy evaluation, or evaluation of change, is subjective and comprises many different facets of one's life. Next to physical changes, compassion of a significant other, empathy of the chief, (mental) load reduction or financial compensation can all be examples of non-physical changes, which are often not seen by outsiders. These changes in outcome will be evaluated as positive or negative and thus, the patient will (or will not) alter their illness perceptions and behaviour according to the appraisal. Thus, again, illness perceptions are presented as a changeable concept.

Some patients will typically develop negative beliefs about their illness [41]. These misconceptions can include the patients' belief that the problem will last long, the patient relating all symptoms to their illness or the patient having weak beliefs about self-control and low confidence in performing activities despite their pain [45].

This model shows that illness perceptions play a role in the coping strategy and the appraisal of (change in) symptoms in patients. Therefore, it is important to include this concept, according to the evidence-based guidelines [17-22], in the history taking and assess the patient's illness perceptions thoroughly.

1.3.1.2 Measuring illness perceptions

The Illness Perceptions Questionnaire (IPQ) is a prominent questionnaire that tries to measure the whole concept of "illness perceptions" [46]. It is derived directly from the self-regulation model of Leventhal in his early work [46-48]. Refinement of the Common Sense Model of Self-regulation (CSM) led to the development of the revision of the questionnaire, the Illness Perceptions Questionnaire-Revised (IPQ-R) as used in this dissertation [43]. Table 1-1 provides a quick overview of the IPQ-R as proposed by Moss-Morris et al.[43]. In the illness identity domain, patients mark their perceived symptoms (originally a list of 14 symptoms) and their perceived relationship with the illness. The beliefs domain consists originally of 38 questions on different dimensions. The third domain originally lists 18 possible causes to which individuals attribute their condition. Patients rate their level of agreement (therefore it consists of "perceived effects") on a five-point Likert scale, ranging from 'strongly disagree' to 'strongly agree'.

Table 1-1: Overview of the items of the Illness Perceptions Questionnaire-Revised (IPQ-R) as proposed by Moss-Morris et al. 2002

Domain	Dimension	Subscale	Min – max score	Significance of high score
Illness Identity	Symptoms		-	-
	Relationship with pathology		-	-
Beliefs domain	Timeline	Acute/chronic	6-30	Negative beliefs
		Cyclical	4-20	Negative beliefs
	Consequences		6-30	Negative beliefs
	Control/cure	Personal	6-30	Positive beliefs
		Treatment	5-25	Positive beliefs
	Coherence		5-25	Positive beliefs
	Emotional response		6-30	Negative beliefs
Causal domain	Intern/extern		-	-
	Somatic/Psychological			

Legend: Min-Max = Minimum - Maximum. Note: negative beliefs can be more accurately interpreted as non-helpful beliefs and positive beliefs can me more accurately interpreted as beliefs that help the patient heal.

A short version of the IPQ-R has been developed in 2006, the 'Brief IPQ' (See Table 1-2) [49]. The aim was to construct a short and simple measure of illness perceptions for clinical use and to provide an alternative for the 5-point Likert scale approach. The maximum total score on the Brief IPQ is 80, since the scores are rated on a 10-point ordinal scale.

Table 1-2: Overview of the items of the Brief Illness Perceptions Questionnaire (Brief-IPQ)

Question	Dimension	Significance of high scores
1	Consequences	Threatening view of the illness
2	Timeline	Threatening view of the illness
3	Personal control	Positive view of the illness
4	Treatment control	Positive view of the illness
5	Illness identity	Threatening view of the illness
6	Concern	Threatening view of the illness
7	Coherence	Positive view of the illness
8	Emotions	Threatening view of the illness
List 3 causes	Causal domain	-

1.3.1.3 Importance of patients' illness perceptions

High levels of pain catastrophizing[a] [50-52] and low self-efficacy are both risk factors for development and maintenance of chronic low back pain [53]. Indeed, pain catastrophizing [54-58], fear avoidance and kinesiophobia [54,59-61] and depression [54,62] have extensively been studied in low back pain patients and are related to the prognosis. Besides these three psychosocial factors, patients' illness perceptions about pain have been identified as key perpetuating factors for pain and associated disability [63,64]. In a large prospective study with acute, sub-acute and chronic low back pain patients, the importance of assessing illness perceptions in patients with low back pain in primary care was stressed [45,54]. Patients with low back pain who expect their problem to last a long time, who perceive severe consequences of their back pain or who have a lower sense of controllability of their back problem, are more likely to have a poor clinical outcome 6 months after consultation [45]. Furthermore, in patients with non-specific low back pain, negative illness perceptions were better predictors of disability at 6 months than fear avoidance, catastrophizing or depression [54].

The impact and consequences of illness perceptions have been studied in a variety of pathologies, such as cardiovascular disorders [65]; Cancer [66,67], respiratory disorders [68] and musculoskeletal disorders [45,69-74] or sports injuries [75,76].

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[a] Nowadays, the term "pain catastrophizing" has been replaced, since the negative connotation.
From a motivational perspective, "pain related worrying" seems to be a term that is more patient-centered, reduces patient's stigma, and is better reflected in the measurement tools [(49-51)].

According to the CSM of Leventhal, illness perceptions will determine the patient's coping strategy, hence they play an extremely important role in the rehabilitation process [36,44]. Is the patient's coping strategy compliant with the treatment prescribed by the health care practitioner? If not, adherence issues can arise. Adherence, a complex and dynamic concept, is defined as the patient's follow-up to the prescriptions of the HCP to his treatment, pharmacological as well as modifications in habits or lifestyle. It implies the active engagement of the patient and his/her responsibility and commitment [77]. Patients can identify different needs when compared to their HCP's. These differences can lead to miscommunication, inappropriate treatment strategies or lack of adherence.

As introduced in 1.2.2 several guidelines emphasize the role of psychological, cognitive and social factors in chronic low back pain [14,78]. In low back pain, different psychosocial or 'yellow' flags have been identified to increase the risk of developing (or persisting) chronic pain and long-term disability with work-loss, such as inappropriate beliefs and attitudes, inappropriate pain behaviour, work related problems or compensation issues and emotional problems [34], which again highlights the importance of early detection of inappropriate illness perceptions.

1.3.2   Attitudes and beliefs of the HCP

Studies on clinical decision-making conclude that prescription behaviour is determined by healthcare practitioners' beliefs about the health problem [79]. The beliefs of the HCP can be seen in the light of Leventhal's Common Sense Model with the combination of emotions (i.c. how one feels towards LBP) and cognitions (i.c. what one thinks about LBP, how to understand it) (cf. 1.3.1.1) [36]. These beliefs, similar to illness perceptions of the patient, are influenced by many different factors, such as geographical region, ethnicity [80-82] and education [83,84].

Attitudes of the HCP refers to their personal choice of treatment modalities. Prescription behaviour significantly differs between HCPs with a biomedical versus biopsychosocial background. HCPs with a biomedical treatment approach, who have followed biomedical training courses and hold strong beliefs about strict relationships between pain, function and disability in chronic low back pain patients, generally adhere less to the clinical guidelines for the management of chronic low back pain [85-87]. Moreover, they advise their

patients to restrict work and physical/leisure activities [45,88,89]. We look at "attitude" as observable behaviour, thus it can be linked with adherence to the clinical guidelines, culminating in "guideline adherent care". Physical therapists' adherence to clinical guidelines is of major importance for better patient outcome [90,91]. Furthermore, physical therapists' compliance with evidence-based guidelines in clinical practice can also lead to reduced health care costs [90,92]. According to a study, Belgian physical therapists mainly question biomedical oriented illness perceptions, but do not sufficiently address psychosocially oriented illness perceptions during history taking [93], which is again not in line with the evidence based guidelines.

1.4 PHYSICAL THERAPY IN BELGIUM AND THE NETHERLANDS

The present research was conducted in Belgium and the Netherlands.

The 5-year academic program of Rehabilitation Sciences and Physiotherapy in Belgium is based on a scientific foundation. They have a long tradition of scientific research and are submitted to regular quality controls by authorized institutions [94]. The European Qualifications Framework for lifelong learning assigns an advanced qualification level 7 to the Master's programs [95].

In the Netherlands, one can practice physical therapy after a 4-year higher vocational education (HBO) program, which leads to a bachelor's degree of General Physical Therapy. Afterwards, these physical therapists can opt to continue studying a specified master's program (mostly 1 preparatory year and 2 years science education - WO) [96]. In terms of qualification levels of the European Qualifications Framework for lifelong learning, this can be presented as 6 (HBO bachelor's degree) or 7 (HBO-WO master's degree) [95]. Every 5 to 6 years public authorities evaluate the programs based on different quality requirements.

Since 2006, patients have direct access to physical therapy in The Netherlands. In other words, a prescription by a general practitioner or specialist is not necessary [96]. In 2019, 56% of patients visits the physical therapist via direct access [97].

In Belgium, the practice of physical therapy is subject to the Coordinated Law of 10 May 2015. It stipulates that a physical therapist can only evaluate or treat a patient if prescribed by a doctor [98].

1.5   STRUCTURE OF THIS DOCTORAL THESIS

The underlying rationale of this thesis can be found within the Common sense model of Leventhal (see 1.3.1.1). This model relates someone's perceptions as one of the important determinants of one's behaviour [36,37].

It is designed for understanding patient's cognitive and emotional responses to illness and their behaviour. Part A of this dissertation will therefore focus on patients, since they are the target audience and therefore the most logical starting point.

The research aims in part A are:

- to systematically review the clinimetric properties of the IPQ-R and the Brief IPQ in patients with musculoskeletal disorders (chapter 2).
- to explore the added value of illness perceptions in explaining functional disability and habitual physical activity in patients with CLBP (chapter 3).

However, as HCP's are also human beings, their behaviour is dependent on their perceptions as well. Moreover, given the incidence of low back pain (1.1), many HCP's have been a patient themselves. This might give an interesting perspective on conflicting perceptions in the role of a HCP. Illness perceptions refer to the personal beliefs of a patient about an illness of symptom. Part B of this dissertation will therefore focus on the attitudes and beliefs of HCPs.

The research aims in part B are:

- to examine the beliefs of physiotherapy students and their attitudes (i.c. their adherence to clinical guidelines in the treatment of patients with LBP) in Belgium and the Netherlands (chapter 4).
- to examine whether the beliefs and attitudes of physiotherapy students change from the 2nd to the 4th grade of education (chapter 4).
- to examine whether the beliefs of physiotherapy students are related to their adherence to clinical guidelines in the treatment of patients with LBP (chapter 4).
- to examine whether the beliefs and attitudes differ between physiotherapy students with or without a personal history of LBP (chapter 4).

- to explore the beliefs and guideline adherent attitudes concerning LBP among physical therapists in Belgium (chapter 5).

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2 CLINIMETRIC PROPERTIES OF ILLNESS PERCEPTION QUESTIONNAIRE REVISED (IPQ-R) AND BRIEF ILLNESS PERCEPTION QUESTIONNAIRE (BRIEF IPQ) IN PATIENTS WITH MUSCULOSKELETAL DISORDERS: A SYSTEMATIC REVIEW

"The measure of intelligence is the ability to change."

- Albert Einstein -

Abstract

Several questionnaires are available to evaluate illness perceptions in patients, such as the illness perception questionnaire revised (IPQ-R) and the brief version (Brief IPQ). This study aims to systematically review the literature concerning the clinimetric properties of the IPQ-R and the Brief IPQ in patients with musculoskeletal pain. The electronic databases Web of Sciences and Pubmed were searched. Studies were included when the clinimetric properties of the IPQ-R or Brief IPQ were assessed in adults with musculoskeletal pain. Methodological quality was determined using the COSMIN checklist. Eight articles were included and evaluated. The methodological quality was good for 3 COSMIN boxes, fair for 11 and poor for 3 boxes. None of the articles obtained an excellent methodological score. The results of this review suggest that the IPQ-R is a reliable questionnaire, except for illness coherence. Internal consistency is good, except for the causal domain. The IPQ-R has good construct validity, but the factor structure is unstable. Hence, the IPQ-R appears to be a useful instrument for assessing illness perceptions, but care must be taken when generalizing the results of adapted versions of the questionnaires. The Brief IPQ shows moderate overall test-retest reliability. No articles examining the validity of the Brief IPQ were found. Further research should therefore focus on the content and criterion validity of the IPQ-R and the clinimetric properties of the Brief IPQ.

2.1 INTRODUCTION

Recent guidelines advise health care personal to evaluate and treat patients with musculoskeletal pain from a biopsychosocial perspective [1,2]. In both medical and psychological literature, Leventhal's Common Sense Model (CSM) is often used as a theoretical framework for the evaluation and treatment of patients [3]. According to this model, patients develop cognitions about their illness, based on former experiences, interpretation of symptoms and provided information. These cognitions are often referred to as illness perceptions.

These illness perceptions have been studied in several pathologies such as cardiovascular disorders [4], respiratory disorders [5] and musculoskeletal disorders e.g. fibromyalgia [6], sports injuries [7,8], low back pain [9,10], chronic fatigue syndrome and rheumatoid arthritis [11]. Especially when there is no clear diagnosis (e.g. no bodily cause of pain or medically unexplained symptoms), patients form their own interpretation of symptoms to explain the disorder. Illness perceptions will determine the patient's coping strategy[12]. Some patients will typically develop negative beliefs about their illness [13]. These negative illness perceptions can include believing that the problem will last long, relating all symptoms to their illness or having weak beliefs about self-control and low confidence in performing activities despite their pain [10]. In a large prospective study with acute, sub-acute and chronic low back pain patients, negative illness perceptions were better predictors of disability at 6 months than fear avoidance, catastrophizing or depression [10,14]. In chronic pain patients, negative illness perceptions are associated with maladaptive illness behaviour, dysfunction, poor treatment adherence and treatment outcome [15,16].

In order to evaluate illness perceptions, the Illness Perceptions Questionnaire (IPQ) [17] was developed. Subsequent to publication of the IPQ, further evolvement of the tool was undertaken, leading to the creation of the IPQ-Revised (IPQ-R)[18]. The IPQ-R measures 9 dimensions of illness perceptions and consists of 3 domains. In the first domain, called illness identity, the perceived symptoms and their possible relation to the illness are evaluated. The second domain, the beliefs domain, covers 7 dimensions: the acute/chronic timeline as well as the cyclical character of the illness represent the first and second dimension. Consequences, as the third dimension, include perceived short- and long-term

effects on physical, psychological and social functioning. Controllability and curability refers to the extent to which a condition is perceived to be controllable or curable, while emotional representations, the sixth dimension, represent the emotions experienced as a result of their illness. Finally, illness coherence reflects an individual's understanding of their condition. For each dimension, responders rate their level of agreement on a five-point Likert scale, ranging from 'strongly disagree' to 'strongly agree'. The third domain lists 18 possible causes to which individuals attribute their condition, the degree to which individuals perceive themselves as responsible for the illness, as well as the responsibility individuals take for curing themselves. Again, patients rate their level of agreement on a five-point Likert scale, ranging from 'strongly disagree' to 'strongly agree' [19].

In 2006 Broadbent et al. constructed a briefer version from the IPQ-R, which is referred to as the Brief IPQ [20]. The aim was to construct a very short and simple measure of illness perceptions for clinical use and to provide an alternative for the 5-point Likert scale approach. The Brief IPQ is an eight-item instrument that measures the cognitive perceptions with respect to an illness on an ordinal scale (0–10). Eight areas are examined: consequences (item 1), timeline (item 2), personal control (item 3), treatment control (item 4), identity for describing the condition and symptoms (item 5), coherence (item 7), and concern and emotions (items 6 and 8). The maximal score on the Brief IPQ is 80, where higher scores reflect perceptions that are more negative.

Since the IPQ, IPQ-R and Brief IPQ are general questionnaires, researchers are allowed to substitute the term 'illness' with the name of the condition they are investigating [17,19]. Moreover, researchers should feel free to modify the causal and identity scales in order to suit particular illnesses, cultural settings or populations [18].

Because illness perceptions are measured in a variety of disorders, the questionnaires can be adapted in function of each condition, such as fibromyalgia [6] and hand injury [21]. However, information regarding the clinimetric properties of the (adapted versions of the) IPQ-R and Brief IPQ is lacking. The clinimetric approach is directed at the development of instruments to measure multiple constructs with a single index [22], which is often the case in clinical practice [23]. It is associated with rating scales that are used to describe or measure symptoms, physical signs and other distinctly clinical phenomena [24,25]. A summary of the

quality of the studies that have investigated IPQ-R or Brief IPQ will give perspective on how these articles can assist in directing approaches in clinical practice. Therefore, the aim of the present literature overview was to systematically review the clinimetric properties of the IPQ-R and the Brief IPQ in patients with musculoskeletal disorders.

2.2 METHODS

2.2.1 Search strategy

Full details of the search strategy can be found in the addendum. In brief, alongside adherence to the PRISMA guidelines, the PICOS model was used to list three groups of keywords: (P) patients with musculoskeletal pain, (I) IPQ-R or Brief IPQ and (O) clinimetric properties. No limits were added.

2.2.2 Methodological quality of the included articles

The methodological quality of the included articles was reviewed using the COSMIN checklist with 4-point rating scale, representing excellent, good, fair and poor methodological quality [26]. The COSMIN checklist is a standardized tool for assessing the methodological quality of studies on measurement properties. It contains a generalizability box and 9 separate boxes, each dealing with one measurement property, with 5-18 items per box about the design and statistical methods. This incorporates potential bias of individual studies. Two researchers independently scored the selected studies. After reviewing the articles, the results of both researchers were compared and differences were discussed until consensus was obtained. Subsequently, a methodological quality score per box is obtained by taking the lowest rating of any item in a box [27]. The results were evaluated using the quality criteria for measurement properties of health status questionnaires described by Terwee et al. [28].

2.2.3 Outcome measurements

For the purpose of this study reliability was analysed in terms of internal consistency and test-retest reliability [29]. **Internal consistency** is a measure of the extent to which items in a subscale are correlated, thus measuring the same concept [28]. To express the internal consistency of the different items in the domains of the IPQ-R, Cronbach's alphas can be

calculated. A Cronbach's alpha above 0.80 is considered to be acceptable [30]. **Reproducibility or test–retest reliability** over a period of time can be calculated using an intraclass correlation coefficient (ICC), a weighted kappa or Pearson correlation. To interpret the kappa statistics, values above 0.60 are considered substantial agreement [31]. For ICC, the threshold value of 0.75 for good reliability was used [32]. For Pearson's correlations, critical values are subject to the number of correlated items [32,33].

Validity will be presented as construct-, content- and criterion-related validity [29,34]. Construct validity refers to the ability of an instrument to measure a concept or construct. Convergence, discrimination, factor analysis, hypothesis testing and known groups method are procedures to gather information about the construct [32]. According to the COSMIN taxonomy, **construct validity** is divided into hypotheses testing, structural validity and cross-cultural validity [34]. **Content validity** is the degree to which the content of an instrument is an adequate reflection of the construct to be measured [34]. **Concurrent validity** is an aspect of criterion validity and measures the agreement between the results obtained by the IPQ-R and the results obtained by another instrument within the same population at the same time.

2.3 RESULTS

2.3.1 Search strategy

The initial search strategy identified 75 unique abstracts from the PubMed and Web of Science databases. Two articles were included by hand search. Based on the inclusion criteria, 65 abstracts were excluded. Figure 2-1 presents a flowchart of the search strategy. A detailed overview of the included articles is presented in Table 2-1. The full text version of all papers that met the inclusion criteria was retrieved for quality assessment and data extraction.

Eight studies were included (Table 2-1) and scored for their methodological quality (Table 2-2. The methodological quality of the different items of the studies varied from good [35,36] to fair [6,18,21,37-39] to poor [21,37].

Seven studies analysed the clinimetric properties of the IPQ-R [6,18,21,35,36,38,39]. Only one study administered the Brief IPQ [37]. To target a specific patient population, the IPQ-R was adapted in each article. These changes are presented in Table 2-3.

2.3.2 Methodological quality of the included articles

The assessment of methodological quality of the included articles is shown in Table 2-2. Agreement between the two researchers was 83%. Consensus was obtained on all items. The answers on the generalizability box of the COSMIN checklist of each article are presented in Table 2-1. The items with poor methodological quality will not be further discussed.

2.3.3 Reliability

The Pearson correlations for test-retest reliability varied between 0.50 and 0.87 for the beliefs domain, except for cyclical timeline, where a lower correlation was observed (0.35). For illness identity and the causal domain, the correlations varied between 0.24-0.57 and 0.53-0.85, respectively (Table 2-4). The ICC varied between 0.55 and 0.87 [39].

The test-retest reliability of the Brief IPQ over a one-week period was acceptable (ICC 0.72, 95% CI:0.53-0.82) [37].

Internal consistency of the beliefs domain of the IPQ-R among different patient populations was satisfactory, ranging between 0.51 and 0.87 (Table 2-4). Of the sub-domains within the causal domain, only psychological attributions presented an alpha ≥0.82. The sub-domain 'accident or chance' showed a very low internal consistency. No studies examined the internal consistency of the Brief IPQ.

The measurement error was evaluated in the Brief IPQ only [37]. Limits of agreement ranged from -25.3 to 17.1. No systematic trend was visible in the Bland-Altman plot. The standard error of the mean was 1.17 and the smallest detectable change was 42, compared to a maximum score of 80 [37].

2.3.4 Validity

Three articles tested different hypotheses on the construct validity of the IPQ-R [6,21,38] (Table 2-5).

Three studies established structural validity of the IPQ-R as an aspect of construct validity [18,35,36]. Moss-Morris et al. used an independent samples t-test to explore known group validity within acute versus chronic patients [18]. Chronic pain patients were significantly different from acute patients on all dimensions of the IPQ-R (p<.001), except for risk factor attributions (p<.01).

Two studies performed a factor analysis: one study used both an exploratory and confirmatory factor analysis [36] while the other used confirmatory factor analysis only [35]. Results are presented in Table 2-6.

No studies assessed the validity of the Brief IPQ.

2.4 DISCUSSION

The results of this review suggest that the IPQ-R is a reliable questionnaire, except for the illness coherence, with good internal consistency, except for the causal domain. The IPQ-R demonstrates good construct validity, but the factor structure is unstable. The Brief IPQ shows moderate overall test-retest reliability. There is a lack of articles studying the validity of the Brief IPQ used in musculoskeletal conditions.

2.4.1 Methodological quality of the included articles

The methodological quality of the different items of the included studies ranged from poor (N=3) to good (N=3). Methodological problems included an insufficient sample size, selection bias (e.g. convenience sampling), lack of description of handling with missing data or the lack of a priori formulated hypotheses. The items with poor methodological quality were eliminated from this literature review, since the precision of the results in these articles is doubtful. None of the selected articles obtained an excellent methodological score, implying that all included studies had methodological flaws.

2.4.2 Test-retest reliability

The results of the present study suggest that test-retest reliability of the IPQ-R and Brief IPQ is acceptable in the observed patient populations. Two out of three articles only

calculated Pearson correlations [6,18]. Pearson correlation coefficients are less accurate to measure reliability than ICC, because systematic differences are not taken into account [40]. The moderate ICC in one study evaluating orthopaedic patients [39] suggests that further research is necessary to improve the test-retest reliability.

To measure test-retest reliability, it is important to ensure the stability of the illness perceptions of the patients within the time frame. Therefore, it must be questioned whether illness perceptions remain stable over time if symptoms are fluctuating. The differences in test-retest reliability across studies might be explained by the time interval between the consecutive measurements, which was much longer (6 months) in the study by Moss-Morris et al. (2002) compared to the 3 weeks [6] or 4 days-time interval [39] in other studies.

The single study examining test-retest reliability of the Brief IPQ [37] suggests an acceptable test-retest reliability. In that study, the smallest detectable change was 42, which means that a change in the Brief IPQ overall score must exceed a value of 42 in order to reflect a true difference between test and retest scores. With a maximum overall score of 80, it can be suggested that the Brief IPQ is not suitable for detecting real individual changes. However, it can also be questioned if an overall score can be calculated in the Brief IPQ, for each question measures a different dimension of illness perceptions.

2.4.3 Internal consistency

The Cronbach's alphas for the beliefs domain of the IPQ-R showed good internal consistency (0.75-0.82). Two studies had lower scores on some of the subscales [6,38]. This may be related to the smaller sample size in comparison to the third study [35]. The latter had a good methodological quality. Furthermore, Albert et al. created a virtually new questionnaire by adding 26 items to the beliefs domain, making it hazardous to compare.

Illness identity consists of disparate symptoms, such as pain, fatigue, nausea and stiff joints. Some symptoms may be more relevant to particular illnesses than other symptoms (e.g. stiff joints is common for fibromyalgia, but less common for low back pain [6,9,35]). Therefore, the internal consistency of this scale is less relevant than in the other subscales. Symptoms and their frequency are presented as a checklist, therefore they are not supposed to measure a certain construct.

Within the causal domain, internal consistency is very good for the psychological attribution (0.82-0.90). The Cronbach's alphas for the other subscales in the causal domain are moderate (0.47-0.62), except for accident or chance, which are very low (0.00-0.14). By analogy with symptoms, causes can be very diverse between different pathologies. Again, some causes may be more relevant to particular illnesses than other (e.g. 'hereditary' is often cited as a cause in fibromyalgia, whereas it is not mentioned frequently by patients with low back pain [9,35]). This is supported by the unstable factor structure of the causal domain [36]. It is suggested that a satisfactory factor solution could be found if the list of causal items is sufficiently modified to relate more clearly to musculoskeletal pain patients, by removing items or including new items [36].

2.4.4   Construct validity

The significant differences in test results between acute and chronic patients on all dimensions reflect clear known group validity [18]. In patients with fibromyalgia, catastrophizing showed a negative relationship with illness coherence and a positive association with emotional representations and cyclical timeline [6], suggesting that patients who do not have a clear understanding of their situation have the tendency to catastrophize. This indicates that education and information play a key role in the treatment process.

However, pain intensity proves to be unrelated to the subscales of the IPQ-R in patients with musculoskeletal disorders which are absent from work [38]. In this particular patient population, pain intensity might be of less importance compared to functional limitations. This is reflected in the fact that a high illness identity endorsed by participants is more strongly associated with psychological distress than with pain intensity [38].

Structural validity of the IPQ-R was assessed in two articles with good methodological quality [35,36]. The factor structure of the beliefs domain as suggested in the original IPQ-R [18] could not be completely affirmed, nor could the causal domain. The factor structure of the original IPQ-R was calculated in 711 patients with a variety of disorders, such as rheumatoid arthritis, type II diabetes, asthma, chronic pain, acute pain, multiple sclerosis, myocardial infarction and HIV [18]. Comparison of the clinimetric properties of the questionnaires should ideally be calculated in a homogeneous patient group. For the

causal domain, this may be even more important, as attributions are probably disease specific. Another potential reason why the seven-factor model of the beliefs domain does not generally provide a good fit could be related to the presentation of the items. A mixture of positively and negatively worded items may confuse some respondents. There is some evidence that positively worded items are more highly correlated with each other than negatively worded items, and vice-versa [36].

There is a lack of studies with good methodological quality examining the measurement error and predictive validity of the IPQ-R. This would favour the use of this type of questionnaires in clinical practice. Furthermore, no studies with good methodological quality examined the criterion validity or content validity of the IPQ-R. Concerning the Brief IPQ, only one article met the inclusion criteria [37]. This suggests the need of future research to study the clinimetric properties of the Brief IPQ within musculoskeletal patients more closely.

2.4.5 Study limitations

Since the aim of present study was to identify clinimetric properties of the IPQ-R or Brief IPQ within musculoskeletal patients, the results of this review are only applicable to the included populations. Furthermore, it is uncertain whether clinimetric qualities of translated versions can be generalized to the original version. The results of the present study are therefore only applicable to the questionnaire and language used in a particular study (Table 2-1). It has to be noted that none of the included articles had an excellent score on the COSMIN checklist for methodological quality. Therefore the results of the articles should not be rejected, but one must be attentive to the interpretation. As the first and third domain (i.e. illness identity and causal domain) are adjustable by researchers, care must be taken when comparing or generalizing the results of adapted questionnaires. In the last question of the IPQ-R, patients are asked to describe the three most important causes for their illness. With this open-ended format, a wealth of information is obtained from the patients, but due to the design it is very difficult to objectify, measure or compare these results. Nevertheless, the latter is very interesting for clinical practice, given the fact that negative illness perceptions influence behaviour [3] and predict disability in low back pain patients [10,14].

2.4.6 Conclusion

The results of the present systematic review confirm that the IPQ-R is an appropriate instrument to explore illness beliefs in patients with musculoskeletal disorders. Since the questionnaire can be adapted to target a specific patient population, the factor structure remains a delicate issue. Further research should be conducted to optimise the clinimetric properties of the Brief IPQ in patients with musculoskeletal disorders.

Table 2-1: Included studies

Author Country	Patient Population Setting	N	Mean age (%male)	Questionnaire	Clinimetric Outcome
Moss-Morris (2002) **New Zealand**	RA hospital outpatient clinics Chronic pain (> 3months) hospital based chronic pain clinics Acute pain (< 6 weeks) private PT practice	76 63 35	59.0 (24%) 53.9 (41%) 35.7 (57%)	IPQ-R (English) PANAS Ambulatory Index SIP Fatigue Severity Scale	Test-retest reliability (RA) - Pearson's correlations Construct validity: Known group method (acute vs chronic) - independent samples t-test
Van Ittersum (2009) **The Netherlands**	FM PT treatment centre	196	49 (12%)	IPQ-R-FM (Dutch) VAS IPQ-R (English)	Internal consistency - Cronbach's α Construct validity: structural validity - MGM (CFA)
Van Wilgen (2008) **The Netherlands**	FM Dutch FM patient association	51	44 (8%)	IPQ-R-FM (Dutch) with 8 FM specific causes FIQ PCS	Internal consistency - Cronbach's α Test-retest reliability - Pearson's correlations Construct validity: hypotheses testing: Correlation with catastrophizing

					Pearson's correlations
Albert (2013) Canada	Musculoskeletal disorder with absence from work 3m-1y	43	41 (46.5%)	IPQ-R-WD (French) -> with new items TSK PCS PDI-14 PDI SERWS Pain beliefs and perceptions inventory Implicit models of illness questionnaire VAS	Internal consistency - Cronbach's alpha Construct validity: hypotheses testing - multiple regression analyses and Pearson correlation
Chan (2009) Ireland	Acute (1) hand injury, surgery required hospital	57	38.2 (21%)	IPQ-R-injury version DASH HISS	Internal consistency - Cronbach's alpha Construct validity: hypotheses testing: Correlation with objective severity and subjective disability - Pearson

Nicholls (2013) UK	Knee pain (OA)	393	63.5 (38%)	IPQ-R	Construct validity: structural validity:
	Hand pain	2113	65.4 (37%)		
	Non-specific LBP	1591	43.9 (41%)		CFA (5 domains) - Goodness of fit - Chi², goodness of fit
					index, Parsimony adjusted GFI, comparative fit index, RMSEA
					EFA (causes) - PCA with varimax rotation
Glattacker (2009) Germany	Orthopaedic 2 rehabilitation clinics	45	45.5 (33.3%)	IPQ-R (German) HADS-D	Test-retest reliability - ICC, Pearson correlation coefficient
Hallegraeff (2013) The Netherlands	Acute non-specific LBP < 6 weeks physical therapy providers	84	42 (43%)	Brief IPQ (Dutch) SF36 Health Survey	Internal consistency - Cronbach's alpha Test-Retest reliability - ICC Measurement error - Limits of agreement, Bland Altman Plot Criterion validity: Concurrent validity (Mental Health component of
					SF-36) - ICC and Pearson correlations

Legend: OA = osteoarthritis, RA = rheumatoid arthritis, FM = fibromyalgia
SIP = sickness impact profile, PANAS = Positive affect and negative affect scale, VAS = visual analogue scale, FIQ = fibromyalgia impact questionnaire, PCS = pain catastrophizing scale, TSK = Tampa scale of kinesiophobia, PDI = pain disability index, PDI-14 = psychological distress index, SERWS = self-efficacy with regard to work capacity, DASH =

disabilities of the arm, shoulder and hand, HISS = Hand injury severity score, HADS = Hospital Anxiety and Depression Scale, SF36 Health Survey = Short Form 36 Health Survey

MGM = multiple group method, CFA = confirmatory factor analysis, EFA = exploratory factor analysis, RMSEA = root mean square error of approximation, ICC = intraclass correlation, PCA = principal component analysis

Table 2-2: Assessment of methodological quality

Author	COSMIN box	Agreement	Clinimetric Outcome	Lowest score
Moss-Morris (2002)	E B	5/6 10/11	Construct validity: Structural validity: known group method (acute vs chronic) - independent samples t-test Test-retest reliability (RA) - Pearson's correlations	Fair Fair
Van Ittersum (2009)	A E	9/9 6/6	Internal consistency - Cronbach's α Construct validity: structural validity - CFA (MGM)	Good Good
Van Wilgen (2008)	A B F	8/9 9/11 10/10	Internal consistency - Cronbach's α Test-retest reliability - Pearson's correlations Construct validity: Hypotheses testing: Correlation with catastrophizing - Pearson's correlations	Fair Fair Fair
Albert (2013)	A F	9/9 10/10	Internal consistency - Cronbach's alpha Construct validity: hypotheses testing - Pearson correlation matrix, multiple regression analysis	Fair Fair
Chan (2009)	A F	9/9 10/10	Internal consistency - Cronbach's alpha Construct validity: Hypotheses testing: Correlation with objective severity and subjective disability - Pearson	Poor Fair
Nicholls (2013)	E	6/6	Construct validity: Structural validity: CFA (5 domains) - Goodness of fit - Chi², goodness of fit index, Parsimony adjusted GFI,	Good

			comparative fit index, RMSEA EFA (causes) - PCA with varimax rotation	
Glattacker (2009)	B	9/11	Test-retest reliability (Orth) - ICC, Pearson correlation coefficient	Fair
Hallegraeff (2013)	A B C H	6/9 5/11 5/11 3/6	Internal consistency - Cronbach's alpha Test-Retest reliability - ICC Measurement error - Limits of agreement, Bland Altman Plot Criterion validity: Concurrent validity (Mental Health component of SF-36) - ICC and Pearson correlations	Poor Fair Fair Poor

Legend: MGM= multigroup method, CFA = Confirmatory factor analysis, EFA = exploratory factor analysis, PCA = principal component analysis, GFI = goodness of fit index, CFI = comparative fit index, RMSEA = root mean square error of approximation, ICC = intraclass correlation, Orth = orthopaedic, RA= rheumatoid arthritis
A= internal reliability, B= reliability, C= measurement error, D= content validity, E=structural validity, F=hypotheses testing, G=cross cultural validity, H=criterion validity

Table 2-3: Adaptations of the IPQ-R in the included studies

Author (Year) Questionnaire	"My illness" was changed into…	Illness identity	Beliefs domain	Causes	Total
Moss-Morris (2002) IPQ-R (English)	/	14	50° 38°°	18	**70**
Van Ittersum (2009) IPQ-R-FM (Dutch)	My fibromyalgia	14	37	18	**69**
Van Wilgen (2008) IPQ-R-FM (Dutch)	My fibromyalgia	14	37	26	**77**
Albert (2013) IPQ-R-WD (French)	My current health condition	16*	52**	20***	**88**
Chan (2009) IPQ-R-injury version	My injury	14	38	18	**70**
Nicholls (2013) IPQ-R (English)	My hand/knee/back pain or problem	/	/	/	**/**
Glattacker 2009 IPQ-R (German)	/	14	32	18	**64**
Hallegraeff (2013) Brief IPQ (Dutch)	My low back pain	/	/	/	**8**
Legend: ° items in the first principle components analysis, °° remaining items * 5 items removed, 7 added ** 26 new items added ***3 items removed, 5 added					

Table 2-4: Internal consistency and test-retest reliability of the IPQ-R

			Internal consistency				Test-retest reliability			
			Cronbach's alpha				Pearson correlations			ICC
			IPQ-R			IPQ-R-WD adapted	IPQ-R			
			Van Ittersum et al. 2009	Van Wilgen et al. 2008	Albert et al. 2013		Moss-Morris et al. 2002	Van Wilgen et al. 2008		Glattacker et al. 2009
			FM, n=196	FM, n=51	work disability due to MSD, n=43		6 months, RA	3 weeks, FM		4 days, Orth
Illness identity	Identity	Identity	/	/	/	/	. 57***	.24	.66	.66
Beliefs domain	Timeline	Timeline cyclical	0.75	0.77	0.58	0.58	.55**	.69**	.87	.87
		Timeline acute/chronic	0.80	0.80	0.81	0.81	.35**	.77**	.66	.65

	Consequences	Consequences	0.77	0.64	0.59	0.77		.74***	.75**	.72	.71
	Control/cure	Personal control	0.77	0.83	0.59	0.68		.57***	.57**	.71	.69
		Treatment control	0.79	0.67	0.73	0.77		.50***	.72**	/	/
	Emotional representations	Emotional representations	0.81	0.86	0.81	0.87		.81***	.72**	.78	.78
	Illness coherence	Illness coherence	0.79	0.51	0.80	0.83		.53***	.55**	.56	.55
Causal domain	Causes	Psychological attribution	0.82	0.90				0.82***	.85**		
		Risk factors	0.55	0.48				0.72***	.69**		
		Immunity	0.62	0.47				0.58***	.73**		
		Accident or chance	0.14	0.00- 0.61				0.53***	.62**		

Legend: IPQ-R-WD = Illness Perception Questionnaire Revised Work Disability, FM = fibromyalgia, MSD = Musculoskeletal disorder, RA = rheumatoid arthritis, Orth = orthopaedics. ICC = intaclass coefficient. **p<0.01, ***p<0.001

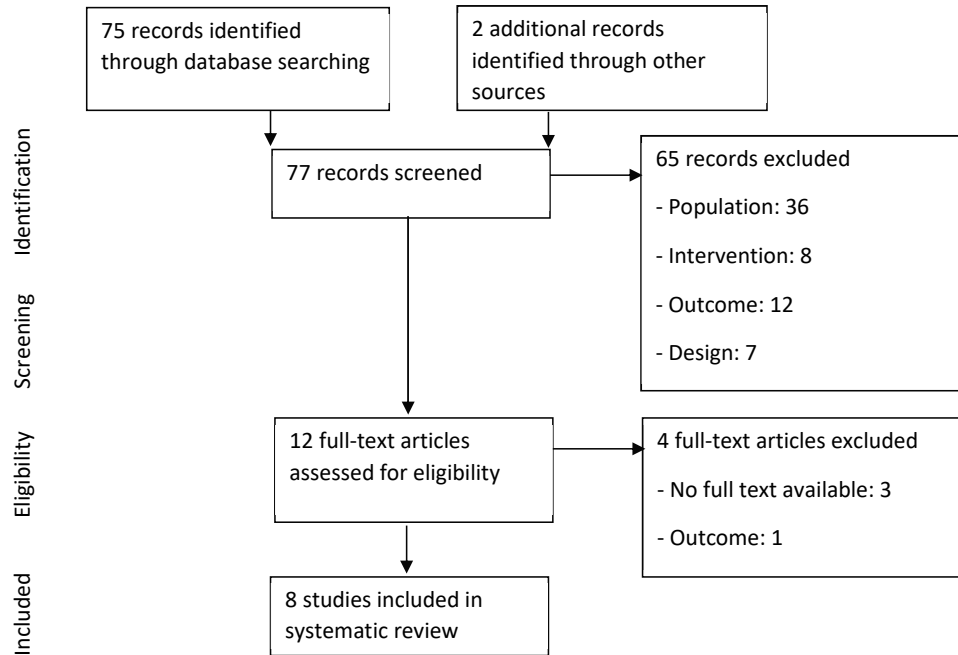*Table 2-5: Results of hypothesis testing for construct validity of the IPQ-R*

Article and population	Questionnaires	Relationship with	Results
Van Wilgen (2008) FM	IPQ-R-FM (Dutch) FIQ PCS	catastrophizing (Pearson's correlations)	- **Catastrophizing** related to a low understanding of the symptoms and positively related to the more cyclical nature of FM and an emotional representation - **Anxiety** was related to experiencing more consequences of FM, to an emotional representation of FM, and to more psychological attributions and more FM-specific attributions. - **Feeling depressed** was related to a low score for illness coherence, an emotional representation and more psychological attributions
Chan (2009) Acute hand injury, surgery required	IPQ-R-injury version DASH HISS	objective severity and subjective disability (Pearson Product Moment Correlations)	No significant correlation between DASH/HISS scores and all the components of IPQ-R

Albert (2013) musculoskeletal disorder with absence from work 3m-1y	IPQ-R-WD (French) -> with new items TSK PCS PDI-14 PDI SERWS PBPI IMIQ VAS	Convergent validity (multiple regression analyses and Pearson correlation)	Adjusted r² between .33 and .70 (p≤.001) Moderate to strong correlations for each dimension with six theoretically-related variables: TSK, PCS, PDI, PDI-14, PBPI, IMIQ No significant relation with VAS or SERWS

SERWS = self-efficacy with regard to work capacity, VAS = visual analogue scale, DASH = disabilities of the arm, shoulder and hand, HISS = Hand injury severity score, TSK = Tampa scale for kinesiophobia, PCS = pain catastrophizing scale, PDI = pain disability index, IMIQ = Implicit models of illness questionnaire, PDI-14 = psychological distress index, PBPI = pain beliefs and perceptions inventory

Table 2-6: Results of factor analysis for construct validity of the IPQ-R

Article Patient population	n	Method		Dimension (number of items)	Result
Van Ittersum (2009) FM	196	CFA	MGM	Beliefs domain (38) Causal (18)	7 factor-model: -> 55% of the variance 4 factor- model: -> 50% of the variance

Nicholls (2013)
  knee pain (OA)
  hand problem
  acute non-specific
LBP
	330
	1621
	1319
		CFA	Goodness of fit - Chi², GFI, Parsimony adjusted GFI, CFI, RMSEA	Beliefs domain (38)	7 factor-model: goodness-of-fit statistics were below the criteria

		EFA	PCA varimax rotation	Causal (18)	Knee: 5 factors -> 62% of the variance Hand: 4 factors -> 56% of the variance LBP: 3 factors -> 51% of the variance
Legend: CFA = Confirmatory factor analysis, EFA = exploratory factor analysis, MGM = multigroup method, PCA = principal component analysis, GFI = goodness of fit index, CFI = comparative fit index, RMSEA = root mean square error of approximation, OA = osteoarthritis, LBP = low back pain					

Figure 2-1: Flowchart of the selection process

75 records identified through database searching

2 additional records identified through other sources

77 records screened

65 records excluded

- Population: 36

- Intervention: 8

- Outcome: 12

- Design: 7

12 full-text articles assessed for eligibility

4 full-text articles excluded

- No full text available: 3

- Outcome: 1

8 studies included in systematic review

Identification

Screening

Eligibility

Included

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3 ILLNESS PERCEPTIONS EXPLAIN THE VARIANCE IN FUNCTIONAL DISABILITY, BUT NOT HABITUAL PHYSICAL ACTIVITY, IN PATIENTS WITH CHRONIC LOW BACK PAIN: A CROSS-SECTIONAL STUDY.

"Just believe in yourself.

Even if you don't, just pretend that you do and at some point, you will."

- Venus Williams -

Abstract

INTRODUCTION: Although the importance of psychosocial factors has been highlighted in many studies in patients with chronic low back pain (CLBP), there is a lack of research examining the role of illness perceptions in explaining functional disability and physical activity in patients with CLBP.

AIM: The aim of the study was to explore the value of illness perceptions in explaining functional disability and physical activity in patients with CLBP.

METHODS: Eighty-four participants with CLBP (> 3 months) completed a battery of questionnaires investigating psychosocial factors (pain catastrophizing scale (PCS), illness perceptions questionnaire revised (IPQ-R) and SF-36 mental health scale (SF-36_MH)) as well as the perceived pain intensity (VAS), Oswestry Disability Index (ODI) and Baecke questionnaire. The latter two were entered separately as dependent variables in a regression analysis.

RESULTS: The combined variables (VAS, PCS, SF-36_MH, IPQ-R) accounted for 62% of the variance in functional disability (ODI). The IPQ-R significantly increased the explained variance of ODI scores in CLBP patients, on top of the other 3 variables (VAS, PCS, SF-36_MH) with 18% (p<.01). Only 5% of the variance in the Baecke questionnaire was explained by the 4 combined variables. None of the single variables alone made a significant contribution to R^2.

CONCLUSIONS: Illness perceptions are an important factor for explaining functional disability, but not explaining habitual physical activity in CLBP patients.

3.1 INTRODUCTION

Chronic low back pain (CLBP) represents a major health problem and an economic burden for society, considering that 70-85% of all people have low back pain (LBP) at some time in their life and 4-20% of them will develop into a chronic condition [1,2]. Most treatments only have limited effect sizes and/or short term effects [3], since the contributing factors for CLBP remain poorly understood.

Several guidelines emphasize the role of psychological, cognitive and social factors in CLBP [4,5]. Pain catastrophizing [6-10], fear avoidance and kinesiophobia [6,11-13] and depression [6,14] have extensively been studied in LBP patients and are related to the prognosis. One of the theories combining these biopsychosocial factors is Leventhal's Common Sense Model [15]. According to this model, patients develop cognitions and emotions about their illness based on former experiences, interpretation of symptoms and provided information, called illness perceptions. Besides psychosocial factors such as kinesiophobia and pain catastrophizing, patients' attitudes and beliefs about pain have been identified as key perpetuating factors for pain and associated disability [16,17].

In a prospective study, Foster et al. [18] stressed the importance of assessing illness perceptions in patients with LBP in primary care. Patients with LBP who expect their problem to last a long time, who perceive severe consequences of their back pain or who have a lower sense of controllability of their back problem, are more likely to have a poor clinical outcome 6 months after consultation [18]. Furthermore, in non-specific LBP patients negative illness perceptions were better predictors of disability at 6 months than fear avoidance, catastrophizing or depression [6]. To measure these cognitive and emotional perceptions, the Illness Perception Questionnaire-Revised (IPQ-R) was developed [19]. However, the complex interactions between contributing factors and the specific value of every factor remain unclear.

Moreover, since clinical guidelines for LBP recommend increases in habitual physical activity levels as therapy goal besides just pain relief, an active coping strategy is encouraged, as is the early resumption of activities, even when still experiencing pain [20-23]. However, studies examining whether illness perceptions are associated with habitual physical activity levels in LBP patients are essentially lacking.

Likewise, to the best of our knowledge we are unaware of studies examining the specific role of illness perceptions in explaining disability in patients with CLBP, especially combined with other psychosocial influencing factors.

For the reasons outlined above, the present study aims at exploring the added value of illness perceptions in explaining functional disability and habitual physical activity in

patients with CLBP. It is hypothesized that illness perceptions contribute significantly to explaining the variance in disability and habitual physical activity in patients with CLBP, independent from established psychological correlates of CLBP disability such as fear of movement, depression and pain catastrophizing. The recent development of the IPQ-R, may contribute to the unravelling of these complex interactions of all these contributing factors.

3.2 MATERIALS AND METHODS

3.2.1 Participants

Eighty-four participants with CLBP were recruited in private practices as well as outpatient rehabilitation settings. The variety in settings for recruiting patients was chosen to increase the external validity of the study findings. The following inclusion criteria were applied: a diagnosis of non-specific CLBP (>3 months) made by a physician, referral by a physician for physiotherapy and having Dutch as a native language, since all questionnaires were in Dutch, as used in a previous research [24]. Patients with specific pathologies, trauma or pregnancy were excluded.

3.2.2 Study design

Prior to study participation, all subjects received written and oral information addressing the study nature and written informed consent was obtained. The study protocol was approved by the local ethical committee of UZ Brussel. Patients were asked to complete a battery of questionnaires, including several validated questionnaires and a general questionnaire, assessing demographic characteristics, current pain intensity (by means of a visual analogue scale (VAS)) and medical history of LBP. The procedures followed were in accordance with the Helsinki Declaration of 1975, as revised in 2013 [25].

3.2.3 Outcome variables

Oswestry disability index – The ODI attempts to quantify the functional disability in patients with LBP. Ten dimensions of daily functioning are measured: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sexual life, social life and travelling. For all the 10 items, patients select a score ranging from 0 (meaning 'no limitation') to 5 (suggesting great disability). The overall score (with a maximum of 50) is

doubled to obtain a percentage of functional disability. The Dutch version has good psychometric properties [26].

Baecke questionnaire – The Baecke questionnaire includes 16 questions, most with a 5 categories-response possibility, to measure a person's habitual physical activity, comprising 3 dimensions: work activities (8 questions), sports activities (4 questions) and leisure activities (4 questions), with higher scores indicating more physical activity [27]. Reliability and validity of the Dutch version were tested, as well as for LBP patients [28-31].

Illness perception questionnaire-revised - The IPQ-R is a questionnaire with good short and long term retest reliability, known group and predictive validity in a study population consisting of patients with a variety of diseases and especially with musculoskeletal pain [19,32]. The IPQ-R-LBP measures 9 dimensions of illness perceptions and consists of 3 domains. It is recommended to modify the causal and identity domain in order to suit particular illnesses, cultural settings or populations [19]. The Dutch version of the IPQ-R, obtained from the official website (http://www.uib.no/ipq/), was adapted for this study after consensus obtained from experts in the treatment of patients with LBP. Three symptoms were added to the first domain (energy surplus, weight gain and swelling), thus illness identity contains a total of 17 symptoms. The second domain, in particular beliefs domain, covers 7 dimensions with 38 questions: acute/chronic timeline, cyclical timeline, consequences, controllability, curability, emotional representations and illness coherence. The third domain lists possible causes to which individuals attribute their condition. Eight causes were added: 'Overuse', 'Hormonal changes', 'Blood flow', 'Psychological trauma', 'Muscle disorder', 'Sleeping disorders', 'Changes in neural system' and 'unknown'. In the last question of the IPQ-R, patients are asked to describe the three most important causes for their illness. Patients rate their level of agreement for all the items of the IPQ-R on a five-point Likert scale, ranging from 'strongly disagree' to 'strongly agree'. The minimum and maximum possible scores are presented in Table 3-1.

Pain catastrophizing scale – The PCS is a 13 item-questionnaire to objectify the patient's catastrophizing and consists of 3 factors: rumination (4 items), magnification (3 items) and helplessness (6 items). A 5-point Likert scale is used to indicate whether or not patients experience a particular thought. The Dutch version of this questionnaire was used [33].

Factor structure is stable and internal consistency, test retest reliability and concurrent validity is good, tested for the Dutch version [34,35] and the original version [36,37].

36-item short form health survey – The SF-36 is a multidimensional generic questionnaire assessing quality of life, which consists of 8 dimensions: physical functioning (10 items), role constraint caused by physical health problems (4 items), bodily pain (2 items), general health (5 items), vitality (4 items), social functioning (2 items), role constraint caused by emotional problems (3 items) and mental health (5 items) [38]. One item asks for change in health status. For each dimension, the scores are summed (raw scale score) and transformed to a percentage (transformed scale), with higher scores reflecting a better health condition [39]. For the purpose of this study, only the mental health transformed scale (SF-36_MH) will be used, which consists of 5 questions. Reliability and validity are of the Dutch version were satisfactory [40,41].

3.2.4 Statistical analysis

Statistical analysis was performed with Statistical Package for Social Sciences (SPSS) version 24.0. The strength of the correlation between ODI or Baecke questionnaire on the one hand and the scores from SF-36, PCS and IPQ-R on the other hand, was analysed using linear regression analysis. The scores obtained from ODI or Baecke questionnaire were entered separately as dependent variables. Scores obtained from the other questionnaires were entered as independent variables.

To analyse which subset of variables was most informative on the ODI or Baecke questionnaire, stepwise backward linear regression analysis was performed starting with a full model containing all scores. The resulting model will be the smallest model (with the least variables) that holds maximal information on the ODI or Baecke questionnaire, respectively. The R^2 describes the variance in the outcome (ODI or Baecke questionnaire) attributable to the variance in the questionnaire scores.

Multicollinearity was calculated by variance inflation factors (VIF). The general rule of thumb is that VIFs exceeding 10 are signs of serious multicollinearity problems, but some suggest even a lower flag of serious multicollinearity of 6 or 7 [42].

To quantify the relative importance of one particular variable in the presence of other variables in the regression model, the partial R^2 were recorded. For such analyses, subsets of variables were entered into the regression model in different sequences ("blocks").

3.3 RESULTS

3.3.1 Patients characteristics and questionnaire outcomes

Eighty-four patients with non-specific CLBP were recruited (Table 3-1). The scores on the beliefs domain of the IPQ-R are presented in Table 3-2.

3.3.2 Regression analysis

3.3.2.1 Low back pain disability as dependent variable

Overall, the scores of ODI were relatively low with a mean score of 22% (± 14) (Table 3-1). Linear regression analyses showed that 62% of the variance in ODI is explained by the 4 combined variables (Table 3-2). Stepwise backward linear regression was used to determine the subset of variables that most accurately predicted the variance in scores obtained from the ODI using the lowest number of variables. Table 3-3 shows the resulting model in terms of R^2 and adjusted R^2. Model 4 provides the highest explained variance for the lowest number of variables (R^2 0.62, adjusted R^2 0.58). The variance inflation factors (VIF) were all less than 2.81 (tolerance > 0.35) in the first model. In the final model all VIF were less than 2.40 (tolerance > 0.41).

Subsets of scores were combined and quantified to what extent some subsets of scores provide additional information. With PCS, current VAS and SF-36 mental health scale entered in the first block of the regression model, adding the IPQ-R in the second block holds 18% (p<.01) additional information on ODI not covered by the other three variables (Table 3-4). Conversely, if the IPQ-R is incorporated in the first block, only the SF-36 mental health scale increases the explained variance of ODI, albeit to a lesser extent (4% with p<.05, Table 3-4). Neither the current VAS, nor the PCS provide additional information on the variance of ODI.

3.3.2.2 Habitual physical activity level as dependent variable

The mean score of the Baecke questionnaire for habitual physical activity is presented in Table 3-1.

A maximal R² of 0.074 is reached when all variables are entered together into the linear regression model (Table 3-5). None of the variables explains a significant amount of the variance (R^2 change) in the level of habitual physical activity of the CLBP patients studied here (data not shown). Stepwise backward model building, starting from a model containing all variables, shows the highest adjusted R^2 (0.037), for model 8. The final model shows a R^2 of 0.049 (Table 3-5).

3.4 DISCUSSION

The results of the present study indicate that disability appears closely related to illness perceptions in patients with CLBP. Indeed, in this cross-sectional study illness perceptions explained partly the variance in ODI scores in a sample of CLBP patients, confirming our a priori hypothesis. Illness perceptions significantly increased the explained variance in functional limitation with 18% when the PCS, current VAS score and SF-36_MH were already entered. However, contrary to our other hypothesis, illness perceptions combined with pain catastrophizing, perceived pain intensity and mental health state explained little variance in the level of habitual physical activities of patients with CLBP (R^2 0.074). These data show the importance of monitoring a person's illness perceptions, as they are closely related to the current disability level of the CLBP patient.

Compared to previous studies, the CLBP patients studied here had a high score on illness coherence and a low score on emotional response [18,43]. All other scores of the IPQ-R were similar, with our sample having a slightly lower score on consequences and a higher score on personal and treatment control, which suggest somewhat better illness perceptions. These differences can be due to slightly different inclusion criteria, e.g. presence of activity limitation [43] and the recruitment within physiotherapy practices. The mean functional disability and mean score on PCS in this sample was relatively low (mean ODI = 22%, mean PCS = 16.8).

3.4.1 Low back pain disability as dependent variable

The scores obtained with the ODI were set as dependent variable, because it attempts to quantify the functional disability in patients with LBP [44].

Both regression analyses confirm that illness perceptions contribute substantially to explaining disability in CLBP patients. This finding supports the clinical importance of illness perceptions in patients with CLBP. Foster et al. claimed that illness beliefs are better predictors of disability than catastrophizing, although the latter is thought to be involved in delayed recovery too [10,16,18]. The results of the present study are in line with these results.

3.4.2   Habitual physical activity level as dependent variable

Only 7% of the variance of habitual physical activity in patients with CLBP was explained by all 4 variables combined. The most important variable in explaining the variance in habitual physical activity levels in patients with CLBP was the "personal control" scale of the IPQ-R, which accounts for 5% of the explained variance in habitual physical activity.

The very low overall explained variance can indicate that other factors contribute to self-reported habitual physical activity levels in patients with CLBP are missing. We focussed on psychosocial factors, whereas physical factors, environmental factors, work-related factors, even financial factors etc. can play an important role in the amount of physical activity in sports and leisure time. Another possibility of the low explained variance may be that we did not add a time constraint to the Baecke questionnaire. People might experience difficulties to recall certain activities when no period of time is indicated. The Baecke questionnaire is a self-administered questionnaire for habitual activity, therefore it is not a direct measurement, but subjective and subject to difficulties of recall. A lot of questionnaires add a time constraint to the questions as do 'past week physical activity questionnaires' or 'usual week physical activity questionnaires over the past 12 months'. This may prevent difficulties in recalling the activities and perhaps also socially favourable answers.

Further research should focus on the role of illness perceptions in habitual physical activity in CLBP patients, because from this study, we see that personal control is the most relevant factor of all perceptions. This makes sense, given the active coping strategy promoted by the clinical guidelines for LBP [22,23] and given the importance of self-efficacy beliefs in lifestyle change. Moreover, cognitive treatment of illness perceptions significantly

improved patient-relevant activity (Patient-Specific Condition questionnaire) in a CLBP group [43].

3.4.3   Study limitations

The results of this study should be seen in the light of its methodological limitations.

We relied on self-report for assessing functional disability and habitual physical activity levels, while accelerometers are available for real-time assessment of physical activity levels in humans [45]. Further research can include more biopsychosocial variables or different questionnaires to evaluate a broader range of possible predictors. The present results should also be tested against outcome variables which do not involve self-report, to obtain a more direct estimation of a person's functional limitation of behaviour.

As outlined above, the patients included in the present study show relatively low ODI and PCS scores, which might influence the outcome.

In conclusion, the results of the present study indicate that functional disability appears closely related to illness perceptions in patients with CLBP, showing the importance of monitoring a patient's illness perceptions in primary care. However, in the present study, illness perceptions failed to explain the variance in physical activity levels in CLBP patients. Given the limitations of this study however, further research should clarify the role of illness perceptions in habitual physical activity levels.

Table 3-1: Patient characteristics and questionnaire outcomes (n=84).

Variable			%
Gender	male		39
Variable		**Possible range**	**Mean ± SD**
Age	age (y)		47 ± 15
SF-36	mental health %	0-100	72 ± 16
ODI	total score %	0-100	22 ± 14
Baecke	total score	3-15	8.4 ± 1.4
PCS	total score	0-52	16.8 ± 10.4
IPQ-R	timeline	6-30	21.6 ± 5.3
	consequences	6-30	16.5 ± 5.0
	personal control	6-30	21.0 ± 4.1
	treatment control	5-25	18.9 ± 3.2
	coherence	5-25	19.2 ± 4.4
	cyclical timeline	4-20	13.4 ± 3.5
	emotional response	6-30	14.2 ± 4.6
LBP	duration of symptoms (months)		94 ± 111
	VAS current pain intensity %	0-100	31.6 ± 20.3

Legend: LBP = low back pain, VAS = visual analogue scale, SF-36 = short form 36-item health survey, ODI = Oswestry disability index, PCS = pain catastrophizing scale, IPQ-R = illness perception questionnaire revised, y = years, SD = standard deviation

Table 3-2: Beliefs domain of IPQ-R in patients with CLBP (n=84).

		Median	Mean
	TIMELINE ACUTE / CHRONIC (0-30)	**23**	**21.5**
1	*My complaint will last a short time*	4	3.6
2	My complaint is likely to be permanent rather than temporary	4	3.7
3	My complaint will last for a long time	4	3.9
4	*My complaint will pass quickly*	4	4.0
5	I expect to have My complaint for the rest of my life	4	3.7
18	*My complaint will improve in time*	3	3.0
	TIMELINE CYCLICAL (0-20)	**14**	**13.1**
32	I go through cycles in which My complaint gets worse and better	4	3.4
29	The symptoms of My complaint change a great deal from day to day	4	3.3
30	The symptoms of My complaint come and go	3	3.1
31	My complaint is unpredictable	4	3.6
	CONSEQUENCES (0-30)	**17**	**16.3**
6	My complaint is a serious condition	4	3.5
7	My complaint has major consequences in my life	3	3.1
8	*My complaint does not have much effect on my life*	4	3.3
9	My complaint strongly affects the way others see me	2	2.2
10	My complaint has serious financial consequences	2	2.3
11	My complaint causes difficulties for those who are close to me	2	2.3
	PERSONAL CONTROL (0-30)	**22**	**21.2**
12	There is a lot which I can do to control my symptoms	4	3.8
13	What I do can determine whether My complaint gets better or worse	4	3.6
14	The course of My complaint depends on me	3	3.0
15	*Nothing I do will affect My complaint*	4	3.6
16	I have the power to influence My complaint	4	3.5
17	*My actions will have no effect on the outcome of My complaint*	4	3.7
	TREATMENT CONTROL (0-25)	**19**	**18.7**
19	*There is very little that can be done to improve My complaint*	4	3.4
20	Treatment will be effective in curing My complaint	4	4.0
21	Negative effects of My complaint can be prevented by my treatment	4	3.8
22	Treatment can control My complaint	4	3.8
23	*There is nothing which can help My complaint*	4	3.9
	ILLNESS COHERENCE (0-25)	**20**	**19.1**
24	*The symptoms of My complaint are puzzling to me*	4	3.8
25	*My complaint is a mystery to me*	4	3.9
27	*I don't understand My complaint*	4	3.7
28	I have a clear picture or understanding of My complaint	4	4.1
26	I clearly understand My complaint	4	3.9
	EMOTIONAL REPRESENTATIONS (0-30)	**14**	**13.8**
33	I get depressed when I think about My complaint	2	2.2
34	When I think about My complaint I get upset	2	2.1
35	My complaint makes me feel angry	2	2.2
36	*My complaint does not worry me*	4	3.3
37	Having this complaint makes me feel anxious	2	2.2
38	My complaint makes me feel afraid	2	2.1

Legend: Italic script denotes items reverse scored to calculate the total score, CLBP = chronic low back pain

Table 3-3: Stepwise backward regression analysis for ODI (%) in patients with CLBP (n=84).

Model		Variables	R^2	Adjusted R^2	Constant	Unstandardized B	Tolerance	VIF
1	current VAS	total				0.118	0.82	1.22
	SF-36	mental health				-0.216	0.55	1.81
	PCS	Total				0.239	0.57	1.74
	IPQ-R	Timeline				-0.130	0.53	1.87
		Consequences				1.300	0.39	2.60
		personal control	0.62	0.56	51.454	-0.980	0.42	2.38
		treatment control				0.007	0.36	2.80
		Coherence				0.014	0.69	1.46
		cyclical timeline				-0.886	0.72	1.38
		emotional representation				-0.627	0.43	2.34
4	current VAS	Total	0.62			0.119	0.84	1.20
	SF-36	mental health				-0.218	0.71	1.42
	PCS	Total				0.250	0.59	1.70
	IPQ-R	Consequences				1.247	0.42	2.39
		personal control		0.58	49.283	-0.922	0.77	1.29
		cyclical timeline				-0.640	0.86	1.17
		emotional representation				-0.640	0.43	2.31

Legend: ODI = Oswestry Disability Index, CLBP = chronic low back pain, SF-36 = short form 36-item health survey, PCS = pain catastrophizing scale, VAS = visual analogue scale for pain intensity, IPQ-R = illness perception questionnaire revised, VIF = Variance Inflation Factor

Table 3-4: Summary of linear regression analysis for explaining the variances in scores obtained from the ODI (%) in patients with CLBP (n=84).

Variables entered		R²change	R²	Adjusted R²
Block 1	Block 2			
current VAS SF-36_MH PCS			0.44	
	IPQ-R	0.18**	0.62	0.56
SF-36_MH PCS IPQ-R			0.60	
	current VAS	0.02 *NS*	0.62	0.56
current VAS PCS IPQ-R			0.59	
	SF-36_MH	0.04*	0.62	0.56
current VAS SF-36_MH IPQ-R			0.60	
	PCS	0.02 *NS*	0.62	0.56

*Legend: CLBP = chronic low back pain, ODI = Oswestry Disability Index, VAS = visual analogue scale for pain intensity, PCS = pain catastrophizing scale, SF-36_MH= short form 36 health survey Mental Health (transformed) scale, IPQ-R = illness perception questionnaire revised. R² change: variance explained by the variable in the current block, not yet explained by the variables in the previous block. Asterisks indicate the significance of R² change *<.05 **<.01 'NS' = not significant*

Table 3-5: Stepwise backward regression analysis for the Baecke questionnaire in patients with CLBP (n=84).

Model		Variables	R²	Adjusted R²	Constant	Unstandardized B	Tolerance	VIF
1	current VAS	total				-0.004	0.822	1.216
	SF-36	metal health				0.008	0.554	1.806
	PCS	total				0.007	0.583	1.716
	IPQ-R	timeline				0.004	0.534	1.872
		consequences				-0.004	0.391	2.560
		personal control	0.074	-0.075	6.336	0.080	0.423	2.363
		treatment control				-0.005	0.358	2.797
		coherence				-0.023	0.685	1.460
		cyclical timeline				-0.022	0.719	1.391
		emotional representation				0.040	0.429	2.332
9	IPQ-R	emotional representation	0.063	0.037	6.085	0.035	0.969	1.032
		personal control				0.085	0.969	1.032
10	IPQ-R	personal control	0.049	0.036	6.728	0.078	1.000	1.000

Legend: CLBP = Chronic Low Back Pain, VAS = visual analogue scale of pain intensity, SF-36 = short form 36-item health survey (mental health (transformed) scale), PCS = pain catastrophizing scale, IPQ-R = illness perception questionnaire revised

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4 ATTITUDES AND BELIEFS ON LOW BACK PAIN IN PHYSIOTHERAPY EDUCATION: AN INTERNATIONAL STUDY

"Every man takes the limits of his own field of vision for the limits of the world."

- Arthur Schopenhauer -

Abstract

Background Although the presence of clinical guidelines, treatment modalities and patient outcomes in low back pain (LBP) remain variable.

Objective 1) to examine the beliefs of physiotherapy students and their adherence to clinical low back pain (LBP) guidelines in Belgium and the Netherlands; 2) to examine whether the beliefs and attitudes of physiotherapy students change during education; 3) to examine whether beliefs are related to guideline adherence; 4) to examine whether beliefs and attitudes differ with or without a personal history of LBP.

Methods A cross-sectional design was set up in the 2nd and 4th grade of physiotherapy education in 6 Belgian and 2 Dutch institutions. To quantify beliefs the Pain Attitudes and Beliefs Scale and the Health Care Providers' Pain and Impairment Relationship Scale were used, whereas a clinical case vignette to reflect their attitudes.

Results In total 1624 students participated. 1) Only 47% of physiotherapy students provide clinical guidelines' consistent recommendations for activity and 16% for work. 2) 2nd grade students score higher on the biomedical subscales and lower on the psychosocial subscale. 4th grade students make more guideline consistent recommendations about work and activity. 3) Students with a more (bio)psychosocial belief give more guideline adherent recommendations. 4) Personal experience with LBP does not relate to different beliefs or attitudes.

Conclusions A positive shift occurs from a merely biomedical model towards a more biopsychosocial model from the 2nd to the 4th grade of physiotherapy education. However, guideline adherence concerning activity and work recommendations remains low.

4.1 INTRODUCTION

Clinical guidelines concerning low back pain (LBP) recommend healthcare practitioners (HCPs) to evaluate and treat patients within a biopsychosocial framework, in which it is stated that social, psychological as well as biomedical factors have significant influences on pain and disability[1-4]. This biopsychosocial framework is broadening of the traditional biomedical model, in which pain is largely considered to be the consequence of tissue damage. As literature shows, a pure biomedical diagnosis cannot be given for the majority of LBP cases. For this reason guidelines postulate that LBP patients should be approached from a biopsychosocial perspective [1-4], in which psychosocial factors, such as illness perceptions, play an important role. Embracing a biopsychosocial perspective entails that HCPs explicitly take the role of psychosocial factors that are known to play a role in people with LBP into consideration during their clinical reasoning.

The Common Sense Model (CSM) of Leventhal is used as a theoretical framework to describe cognitive and emotional responses to illness and symptoms and how a person copes with these sensations. This model relates someone's perceptions as one of the important determinants of one's behavior [5]. Studies on HCPs' decision-making point out that prescription behavior is determined by the HCPs' beliefs about the nature of a specific health problem [6]. Prescription behavior significantly differs between HCPs with a biomedical versus a biopsychosocial background; HCPs with a biomedical treatment approach, who have followed biomedical training courses and hold strong beliefs about strict relationships between pain, function and disability in chronic low back pain (CLBP) patients, generally adhere less to the clinical guidelines for the management of CLBP [7-9]. Moreover they advise their patients to restrict work and physical/leisure activities [10]. Furthermore, according to recent research, Belgian physiotherapists mainly question biomedically oriented illness perceptions, but do not sufficiently address psychosocially oriented illness perceptions during history taking [11]. At this moment, it is not clear what the origin is of these counterproductive beliefs. One could speculate that professional training is important in building cognitive frameworks with which HCPs understand complex health problems like CLBP. The educational program lays the foundation of future HCPs in terms of beliefs and attitudes. Therefore, some studies investigate the beliefs of

health care students [7,12-14]. However, the impact of the beliefs on the clinical behavior, or in other words the link with their attitudes, remain unclear.

The CSM not only states that beliefs and attitudes are closely related, but also that perceptions are based on experiences and provided or acquired information [15]. Former experiences include for example personal experiences with LBP or cultural background [16,17]. The latter explains the need to investigate the beliefs of HCPs in different countries or regions. Moreover, the CSM implies that beliefs can change over time when building new experiences or that they can change as a consequence of processing new information. Indeed, studies showed that attitudes and beliefs of physiotherapists about LBP can change after a training session or lecture [13,18,19]. These findings amplify the urge to study the attitudes and beliefs of physiotherapy students during their education.

Therefore, the purpose of this study was fourfold: 1) to examine the beliefs of physiotherapy students and their attitudes (i.c. their adherence to clinical guidelines in the treatment of patients with LBP) in Belgium and the Netherlands; 2) to examine whether the beliefs and attitudes of physiotherapy students change from the second to the fourth grade of education; 3) to examine whether the beliefs of physiotherapy students are related to their adherence to clinical guidelines in the treatment of patients with LBP; and 4) to examine whether the beliefs and attitudes differ between physiotherapy students with or without a personal history of LBP.

4.2 MATERIAL AND METHODS

The STROBE recommendations were followed to increase the generalizability and the strength of the report [20]. The procedures followed were in accordance with the Helsinki Declaration of 1975, as revised in 2013. Ethics approval was acquired by an independent Commission of Medical Ethics linked to the University Hospital of Brussels.

4.2.1   Participants

Second and fourth grade physiotherapy students of 6 Belgian universities - 4 Flemish and 2 Walloon - and 2 Dutch institutions were recruited for this cross-sectional study. In Belgium the physiotherapy educational program consists of 5 grades: 3 bachelors and 2 masters. In the Netherlands the physiotherapy educational program consists of 4 grades. Since the 1st grade traditionally is characterized by a large drop-out, the 2nd grade was chosen for inclusion in this study. The 4th grade was chosen since these students were close to graduation and allowed studying students in both countries after a fixed number of education years.

4.2.2   Study design

A researcher collected the data from the participating students during the first semester. Students who agreed to participate, signed an informed consent prior to study participation. In order to avoid bias, all students were told that the procedure was not an examination and that there were no 'correct' answers, but that they were free to express their actual thoughts and beliefs about LBP. A researcher was present only to answer possible questions and to collect all completed forms, but no further information was given.

4.2.3   Outcome measures

All questionnaires used were validated in Dutch. For the Walloon universities, questionnaires were translated in French through a back and forth process by two translators based on the procedure described in literature [21]. At the end, consensus was reached on the French versions.

One questionnaire addressed the student's personal background (age, sex, personal history or presence of LBP and if relevant pain intensity by means of a visual analogue scale and followed treatment). This was pilot-tested on a sample that comprised physiotherapy

students, non-medical students and academic physiotherapy staff who did not take part in the study (n=22). Minor format modifications were made based on this pilot prior to administering the survey to the study cohort. The other questionnaires were:

- The pain attitude and beliefs scale (PABS) [6,8] - The PABS was developed to evaluate whether physiotherapists had a biomedical or behavioral approach towards the management of patients with CLBP. The biomedical subscale (10 items) had a satisfactory internal consistency, however the behavioral subscale (9 items) showed poor internal consistency [7]. After revision of the PABS in 2005, the internal consistency of the behavioral subscale improved. The items are scored on a six point Likert scale. The reliability and the validity was found to be adequate. The PABS has been developed and tested in Dutch [11]. This questionnaire has been used in research involving students before [7].

- The health care providers' pain and impairment relationship scale (HC-PAIRS) [22] - The HC-PAIRS (originally 15 items) evaluates the attitudes and beliefs of HCPs regarding functional expectations of patients with CLBP. Higher scores reflect stronger beliefs in the relationship between pain and impairment. Answers are marked on a seven point Likert scale. The HC-PAIRS was modified (13 items) following a factor analysis on a sample of Dutch therapists and appeared to be a reliable and valid measure of HCP's attitudes and beliefs about the relationship between pain and impairment [23]. This questionnaire has previously been used in a student population [7,12-14].

- A vignette [9] - A vignette is a clinical case scenario of a patient with LBP, providing information regarding symptoms, subjective evaluation & medical history and results of clinical examination [9]. The purpose was to evaluate treatment recommendations concerning activity restriction and work absenteeism. Rainville et al. developed 3 scenarios with different degrees of spinal pathology, symptoms and work requirements, without any evidence of structural damage or neurological compression that would require surgery [20]. In the present study, only the third vignette was used. This describes a factory foreman with persistent, severe back and leg pain after a motor vehicle accident and only minimal evidence of spinal degeneration on MRI. Participants were asked to rate the patient's ability to work and the need for activity restriction on

a 5-point scale. The reliability was found to be modest and internal consistency fair. It is difficult though to correctly determine the validity without a comparison with real patients.[5] This vignette was translated in Dutch [23]. Answers 1 or 2 in the vignette were defined as adequate recommendations for activity level (question 3) and work (question 4), which translates the scores into a dichotomous guideline consistent or inconsistent answer [18]. These answers relate to the European guidelines for the management of low back pain [1,2]. In this way, the vignette gives an indication about the student's attitudes.

4.2.4 Statistical analysis

For statistical analysis IBM SPSS Statistics 24 was used [24]. Group normality was analyzed by Q/Q'-plots. Group equality was examined by Student t-tests (PABS and HC-PAIRS) or chi-square tests (vignette). To enhance reliability, the total score of the HC-PAIRS or the PABS subscales was excluded from analyses when 2 or more answers were missing. To answer the question whether the beliefs of physiotherapy students are related to their adherence to clinical guidelines, an unpaired Student t-test was performed; The average scores of the group with a guideline adherent attitude was compared to the average scores of the group that had a guideline inconsistent attitude.

4.3 RESULTS

Four Flemish (University of Antwerp, Vrije Universiteit Brussel, University of Ghent and Catholic University of Leuven), two Walloon (Université Catholique de Louvain and Université de Liège) and two Dutch institutes (Hanze University of Applied Sciences Groningen and University of Applied Sciences Rotterdam) were contacted and agreed to participate. In the second grade a total of 929 students participated; in the fourth grade 695, which brings the total group of study participants at 1 624 students. In total 46% of the study participants experienced LBP at some point in their life, while 15% suffered from LBP at the time of study participation. There was a significant difference between students of the two grades regarding history of LBP, with more 4th graders who had already experienced LBP during their life (50% compared to 43%, Table 4-1). No difference between the groups was found in having LBP at the time of study participation (point prevalence).

Table 4-1: Results of the beliefs and attitudes of 2nd grade physiotherapy students compared to 4th grade physiotherapy students in Belgium and the Netherlands (n = 1.624).

		missing n (%)	2nd grade		missing n (%)	4th grade	
	n total	-	929		-	695	n (%)
	n male	2 (<1)	353 (38%)		4 (<1)	261 (38%)	
	with history of LBP**	5 (<1)	403 (43%)		4 (<1)	345 (50%)	
	with present LBP	4 (<1)	133 (14%)		3 (<1)	102 (15%)	
beliefs	age (years)**	4 (<1)	20 (2.1) *17-40*		6 (<1)	22 (2.0) *20-39*	mean (SD) *range*
	PABS-BIOM ** (min-max 10-60)	30 (3)	36.3 (5.4) *14-52*		12 (2)	30,9 (6.0) *11-46*	
	PABS-PS ** (min-max 9-54)	30 (3)	31.0 (4.3) *14-44*		12 (2)	32,5 (4.4) *20-48*	
	HC-PAIRS ** (min-max 13-91)	7 (<1)	52.8 (7.8) *28-77*		7 (1)	46.4 (8.5) *17-76*	
attitudes	guideline consistent activity recommendation **	1 (<1)	329 (36%)		4 (<1)	427 (62%)	n (%)
	guideline consistent work recommendation **	2 (<1)	90 (10%)		4 (<1)	164 (24%)	

Legend: PABS = Pain attitudes and beliefs scale, BIOM = Biomedical subscale, PS= psychosocial/behavioral subscale, HC-PAIRS = health care providers' pain and impairment relationship scale, SD = standard deviation, min-max = minimum-maximum score
*** p < .01*

4.3.1 Beliefs

Students of the 2nd grade scored significantly higher on the PABS biomedical subscale (PABS-BIOM) and on the HC-PAIRS (p <.01) compared to 4th grade students. On the PABS psychosocial subscale (PABS-PS), 2nd grade students scored significantly lower (p <.01) (Table 4-1). When exploring the results for all institutions individually, the same trend was observed for all questionnaires, except for the PABS-PS in only one institution.

Table 4-2 provides an overview of all questionnaire items separately. On every item of the HC-PAIRS and PABS-BIOM, 2nd grade students had a higher (or equal) mean and median score compared to 4th grade students. On each item of the PABS-PS, except item 13 and 14, students of the 2nd grade had a lower (or equal) mean and median score compared to 4th grade students.

Table 4-2: Mean and median scores on each item of the PABS and HC-PAIRS of 2nd grade physiotherapy students compared to 4th grade physiotherapy students in Belgium and the Netherlands (n = 1.624).

PABS-BIOM

	2nd grade		4th grade	
	Mean	Median	Mean	Median
3	3.5	4	3.0	3
6	3.8	4	3.2	3
8	2.8	3	2.3	2
9	4.4	5	4.2	4
10	3.6	4	3.3	3
11	4.3	4	4.0	4
12	3.5	4	2.6	2
15	3.5	4	2.9	3
16	3.2	3	2.2	2
19	3.9	4	3.3	3

PABS-PS

	2nd grade		4th grade	
	Mean	Median	Mean	Median
1	4.4	5	4.7	5
2	2.6	2	3.0	3
4	3.8	4	4.4	4
5	3.2	3	3.4	3
7	3.0	3	3.3	3
13	3.0	3	2.6	2
14	2.9	3	2.7	3
17	4.5	5	4.6	5
18	3.8	4	4.0	4

HC-PAIRS

	2nd grade		4th grade	
	Mean	Median	Mean	Median
1R	4.2	4	4.0	4
2	4.3	4	3.4	3
3	4.0	4	3.3	3
4	4.0	4	3.9	4
5	3.3	3	2.7	3
6R	4.8	5	4.7	5
7	4.3	4	3.8	4
8	4.5	5	3.6	3
9	4.1	4	3.4	3
10	4.3	4	3.6	4
11	3.8	4	3.2	3
12R	4.1	4	4.0	4
13	3.2	3	2.9	3

Legend: PABS = Pain attitudes and beliefs scale, BIOM = Biomedical subscale, PS= psychosocial/behavioral subscale, HC-PAIRS = health care providers' pain and impairment relationship scale, R depicts the reversed score.

4.3.2   Attitudes

On the questions about activity and work recommendations in the vignette, significantly more 4th grade students made guideline consistent recommendations (resp. 62% and 24%) than 2nd grade students (resp. 36% and 10% with p <.01). In total only 16% of all students answered in line with the current guidelines on the question about work recommendation (Table 4-1). In the 2nd grade the respectively mean and median score for activity recommendation is 2.99 and 3.00 and for work absenteeism 3.53 and 4.00. In the 4th grade the respectively mean and median score for activity recommendation is 2.47 and 2.00 and for work absenteeism 3.16 and 3.00.

4.3.3   Link between beliefs and attitudes

Table 4-3 shows the relationship between the scores on the beliefs-questionnaires (PABS and HC-PAIRS) and the answers on the last two questions of the vignette, i.e. those concerning activity and work recommendation. In general, students who give a recommendation that is in line with the current guidelines have lower scores on the biomedical scales and a higher score on the PABS-PS.

Table 4-3: Link between the beliefs and attitudes of 2nd grade and 4th grade physiotherapy students in Belgium and the Netherlands (n = 1624).

		activity recommendation					
		2nd grade			4th grade		
		guideline inconsistent	guideline consistent	level of significance	guideline inconsistent	guideline consistent	level of significance
mean scores	PABS-BIOM (min-max 10-60)	36.6	35.6	p<.01	31.1	30.8	NS
	PABS-PS (min-max 9-54)	30.7	31.5	p=.01	31.9	32.8	p=.01
	HC-PAIRS (min-max 13-91)	53.6	51.5	p<.01	47.9	45.5	p<.01
		work recommendation					
mean scores	PABS-BIOM (min-max 10-60)	36.4	34.9	p=.01	31.4	29.2	p<.01
	PABS-PS (min-max 9-54)	30.9	32.2	p<.01	32.2	33.4	p<.01
	HC-PAIRS (min-max 13-91)	53.2	49.5	p<.01	47.2	43.9	p<.01

Legend: PABS = Pain attitudes and beliefs scale, BIOM = Biomedical subscale, PS= psychosocial/behavioral subscale, HC-PAIRS = health care providers' pain and impairment relationship scale, min-max = minimum-maximum.

4.3.4 Relationship with personal history of LBP

Having a personal history of LBP or experiencing LBP at the time of study participation did not relate to different beliefs or attitudes (Table 4-4). No significant differences existed between the two groups regarding the PABS and HC-PAIRS scores, except for one item: in general, 2nd graders who had never experienced LBP in their life seem to score slightly higher on the PABS-BIOM compared to 2nd graders who had already experienced LBP themselves (p<.05). However, no significant difference was found in the recommendations they made.

Table 4-4: Differences based on personal experience with LBP in the past or at study participation in the beliefs and attitudes of 2nd and 4th grade physiotherapy students in Belgium and the Netherlands (n = 1624).

		HISTORY OF LBP			
		2nd grade		4th grade	
		Mean	Level of significance	Mean	Level of significance
PABS-BIOM	without LBP	36.6	p<.05	30.9	NS
	with LBP	35.8		30.9	
PABS-PS	without LBP	31.0	NS	32.5	NS
	with LBP	31.1		32.4	
HC-PAIRS	without LBP	52.9	NS	46.4	NS
	with LBP	52.7		46.3	
		n (%)	Level of significance	n (%)	Level of significance
Guideline consistent activity recommendation	without LBP	15 (34)	NS	208 (60)	NS
	with LBP	153 (38)		219 (64)	
Guideline consistent work recommendation	without LBP	52 (10)	NS	87 (25)	NS
	with LBP	38 (9)		77 (22)	
		PRESENT LBP			
		Mean	Level of significance	Mean	Level of significance
PABS-BIOM	without LBP	36.3	NS	31.0	NS
	with LBP	35.9		30.5	

PABS-PS	without LBP	30.9	NS	32.4	NS
	with LBP	31.3		32.7	
HC-PAIRS	without LBP	52.9	NS	46.6	NS
	with LBP	52.4		45.1	
		n (%)	Level of significance	n (%)	Level of significance
Guideline consistent activity recommendation	without LBP	280 (35)	NS	365 (62)	NS
	with LBP	48 (36)		62 (61)	
Guideline consistent work recommendation	without LBP	75 (10)	NS	136 (23)	NS
	with LBP	15 (11)		28 (28)	

Legend: LBP = low back pain, PABS = Pain attitudes and beliefs scale, BIOM = Biomedical subscale, PS= psychosocial/behavioral subscale, HC-PAIRS = health care providers' pain and impairment relationship scale, NS = not significant.

4.4 DISCUSSION

The general findings of the current study are: 1) only 47% of the 2nd and 4th grade physiotherapy students provide clinical guidelines' consistent recommendations for activity and only 16% for work; 2) compared to 4th grade students, 2nd grade physiotherapy students score higher on the biomedical subscales and lower on the psychosocial subscale; and the former group makes more guideline consistent recommendations about work and activity compared to the latter; 3) students with a more (bio)psychosocial belief regarding LBP, compared to a stronger biomedical belief, give recommendations that tend to be more in line with the current guidelines; and 4) personal experience with LBP of the students surveyed does not seem to relate to different beliefs or attitudes.

4.4.1 Beliefs

Compared to 2nd grade students, 4th grade students have more biopsychosocial beliefs regarding LBP. This conclusion applies to the overall group as well as to all participating institutions.

While the present cross-sectional design does not allow to identify a causal relationship, it can be concluded that the biopsychosocial perspective is more present in the final years of the educational program. These results confirm findings by Ryan et al. indicating that

physiotherapy students in their fourth year in Scotland had less biomedical beliefs, measured with HC-PAIRS, towards patients suffering from back pain in comparison to first year students [25]. These findings, as well as another study conducted by Morris et al., show the same phenomenon in non-medical students, which challenges the statement that a change in attitudes could be explained by the healthcare education [14]. However, in that study the change in beliefs from the 1st to the 4th year is considerably greater in physiotherapy students compared to non-medical students [25]. This strengthens the assumption that the healthcare-related curriculum contributes to students' further development of biopsychosocial beliefs.

In a general Dutch population (with and without CLBP) it was seen that people generally hold quite biomedical beliefs about LBP [26]. There was a difference in the focus of the biomedical thinking between people with or without CLBP, but in the end, the general population fails to see the influence of for example psychological issues. In the current study, this biomedical belief was reflected in the 2nd grade students, who were only at the start of their health care career. For the different institutions, it might be interesting to take these beliefs at the starting point into account when (re)constructing the curriculum.

4.4.2 Attitudes

Alongside the beliefs, the overall attitude of 4th grade students also appears to be more in line with current guidelines compared to 2nd graders. From the latter group 36% of the students make guideline consistent recommendations about activity and only 10% about work. However, guideline adherence is relatively low in all students. Less than half of the students (47%) follow the guidelines concerning activity recommendations and only 16% answer according to the guidelines concerning work absenteeism. This means that 84% of all students would advise this patient to stay (partially) at home or to limit his job only to light loads. There can be numerous reasons why guideline adherence is so low. A possibility is that the educational curriculum still has a strong biomedical focus. The need for physical activity and activation is perhaps more present in the curriculum than the focus on consequences such as work. In Belgium, physical therapy is on referral by a physician, in contrast to the Netherlands where patients have direct access. Especially in Belgium, the physician is the only qualified person to prescribe work absenteeism. Beliefs and attitudes

are not learned intentionally, so the indirect message of an educational program can influence someone's attitudes and beliefs. Previous research among 2nd grade physiotherapy students showed that relatively short biopsychosocial training sessions can positively influence the attitudes and beliefs of this group [18]. This intervention showed significant results with a shift to more guideline consistent recommendations. However, in the present study eight independent institutions were included to minimize any bias of a single educational track. Traditionally, education is still mainly about teaching new knowledge and less about reflecting on student's current knowledge and reframing those thoughts. Perhaps we lack a step in the curriculum to translate the student's biopsychosocial beliefs into interventions. Further research will be necessary to identify possible causes of this non-adherence and to tackle these barriers during the educational curriculum.

The findings that recommendations concerning work absenteeism are even less consistent with current guidelines compared to recommendations made on activity level is consistent with previous research [18]. The mean scores of the 2nd grade physiotherapy students in the study of Domenech et al. are comparable to the scores in the present study (activity recommendation respectively 2.77 compared to 2.99, work absenteeism 3.37 compared to 3.53) [18]. A possible explanation can lie in the doctor-patient relationship which is perceived to be in jeopardy when making decisions regarding sick leave [27]. Possibly HCPs are currently more aware of the fact that the patient should stay active, regardless of their beliefs, while a more hesitant attitude towards work recommendations makes them more dependent on beliefs and personal factors. Further research is necessary to identify the low guideline adherence towards both recommendations.

4.4.3   Link between beliefs and attitudes

Students who make guideline-consistent recommendations based on the vignette have lower HC-PAIRS scores, higher PABS-PS scores and lower PABS-BIOM scores (except 4th grade). This implies that students with a more biopsychosocial orientation adhere more to the current clinical guidelines concerning work and activity levels of LBP patients. These findings are in line with initial expectations that a person's beliefs influence one's behavior

[15] and with the existing evidence provided by previous studies conducted on students and general practitioners in other countries [18,28].

4.4.4 Relationship with personal history of LBP

Having a personal history of LBP, currently or in the past, did not relate to changes in students' attitudes or beliefs, which is in accordance with previous research findings [12-14,18,29]. This is somewhat surprising given the fact that the CSM states that perceptions are based on former experiences [15]. Perhaps this partly questions the theory of Leventhal et al. or perhaps a HCP can empathize in different roles, where the perceptions of the person as a physiotherapist (being the job) are separated by the perceptions of the person as a patient. One reason can be that the level of LBP or the impact it had on their life was quite minimal, since no cut-off was used. All students who answered positive on the question about LBP, where classified as having personal experience with LBP, regardless of the pain score, the duration or the impact. Further research should explore this in more detail.

4.4.5 Study limitations and strengths

This study had a cross sectional design so no causal relationships can be drawn. In order to investigate the long term effect of education on the future approach of these physiotherapy students a longitudinal design is indicated and more information about educational factors of the curriculum should be integrated. Participants of the current study were only given the third vignette. Additional vignettes would provide more and stronger data. However, given the fact that the bundle already contained several questionnaires, expansion could lead to data loss with decreasing concentration.

The questions accompanying the vignette had five possible answers for participants to choose from, however for the purpose of the current study, answers were treated dichotomously. Furthermore, questionnaires and a vignette remain fictional. Future research should compare the current results with the observation during real life situations to evaluate actual clinical behavior, since the match between vignettes and real life situations can be questioned [30].

The study also had several strengths. These include the large sample size (n=1624), the large number of institutions involved (n=8), the international and multilingual setting, the

use of tools that generate reliable and valid data and the large participation rate among the students.

4.4.6   Conclusion

A shift occurs from a merely biomedical model towards a more biopsychosocial model from the 2nd to the 4th grade of physiotherapy education. However, guideline adherence concerning activity and work recommendations remains low among physiotherapy students.

Further research is necessary to establish the cause of low guideline adherence and to identify a possible causal relationship with the physiotherapy educational system. In addition, an effective method to enhance guideline consistent behavior in physiotherapy students should be identified and examined.

Ethical Approval

Ethics approval was acquired by an independent Commission of Medical Ethics linked to the University Hospital of Brussels. File number 2013/097.

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5 PHYSIOTHERAPISTS' ATTITUDES AND BELIEFS REGARDING LOW BACK PAIN: GUIDELINE ADHERENCE IS FAILING

(Not submitted)

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"Everything we hear is an opinion, not a fact.

Everything we see is a perspective, not the truth."

- Marcus Aurelius -

5.1 INTRODUCTION

Low back pain (LBP) is one of the most prevalent health conditions in both men and women leading to a personal burden, as well as to high costs and work absenteeism [1,2]. As LBP presents a major challenge in health care [3], evidence-based clinical guidelines have been developed to guide health care practitioners, such as physiotherapists (PTs), in their treatment choices [4,5]. For example, the European guidelines for acute nonspecific LBP encourage health care practitioners to evaluate and treat patients from a biopsychosocial perspective [5-7]. Besides managing psychosocial factors, health care providers should reassure patients and advise them to stay as active as possible and continue normal daily activities, including work [7]. Even more so, the European guidelines for chronic LBP recommend the assessment of yellow flags, given their prognostic value, management of psychosocial factors and the implementation of supervised exercise therapy and multidisciplinary treatment [4,5]. In spite of the presence of these clinical guidelines, treatment modalities and patient outcomes remain variable.

So, do PTs adhere to these clinical guidelines? 'Attitude' refers to the personal choice of treatment modalities PTs make; it can vary among PTs and is influenced by different factors, such as perceptions, which comprises emotions (i.c. how one feels towards LBP) and cognitions (i.c. what one thinks about LBP, how to understand it) [8]. Therefore, beliefs or in other words the orientation of the health care practitioner will be a strongly related variable to the treatment of choice. For example, health care practitioners with a biomedically oriented belief provide more restrictive recommendations regarding physical activity and work activities (which are not in line with clinical guidelines) than practitioners with a more (bio)psychosocial belief [9-11]. Attitude is observable behaviour, thus can be linked with adherence to the clinical guidelines, culminating in "guideline adherent care".

PT's adherence to clinical guidelines is of major importance for better patient outcomes [12,13]. Furthermore, PTs' compliance with evidence-based guidelines in clinical practice can also lead to reduced health care costs [12,14]. Since beliefs affect treatment behaviour and therefore guideline adherence, exploring these beliefs is important. Furthermore, studies have shown that beliefs can differ based on geographical region and ethnicity [15-17].

Hence, the aim of the present study is to explore the beliefs and attitudes (behaviour) concerning LBP among PTs in Belgium. This study was deemed of prime importance to assess whether Belgian PTs adhere to the available evidence-based guidelines for the treatment of LBP and hence to identify possible targets for implementation work.

5.2 METHODS

The STROBE recommendations were followed to increase the generalizability and the strength of the report [18]. The procedures followed were in accordance with the Helsinki Declaration of 1975, as revised in 2013. Ethics approval was acquired by an independent Commission of Medical Ethics linked to the University Hospital of Brussels.

5.2.1 Participants

This cross-sectional study was conducted between 2014 and 2016 among graduated PTs in the Dutch-speaking part (Flanders) and French-speaking part (Wallonia) of Belgium. They were recruited by phone call, by practice visits (convenience sample), or at lectures. Sample size estimates were calculated post-hoc (see further).

5.2.2 Study design

PTs who agreed to participate, signed an informed consent prior to study participation. After agreement, participants were invited to fill in a battery of questionnaires. In order to avoid bias, all PTs were told that there were no 'correct' answers and that they were free to express their actual thoughts and beliefs about LBP.

5.2.3 Outcome measures

The battery of questionnaires included the following questionnaires.

- A questionnaire about the PT's socio-demographic background (age, sex, graduation). This questionnaire was pilot-tested in Dutch on a sample that comprised physiotherapy students, non-medical students and academic physiotherapy staff who did not take part in the study (n=22). They were invited by e-mail to fill in the questionnaire for evaluation. At the end 2 questions were asked: "Is this questionnaire clear to you?" and "Do you have any comments about the formulation of certain questions?" Unclarities of all kind were to be written down. Based on these answers, minor format

modifications were made prior to administering the survey to the study cohort. The initial as well as the final questionnaire is added in attachment (see Appendix 7.1).

- The pain attitude and beliefs scale (PABS) [19,20] - The PABS was developed to evaluate whether PTs had a biomedical or behavioural approach towards the management of patients with LBP. The biomedical subscale (10 items) has a satisfactory internal consistency, however the behavioural subscale (9 items) showed poor internal consistency [19]. After revision of the PABS in 2005, the internal consistency of the behavioural subscale improved. The items are scored on a six point Likert scale. The reliability and the validity of the subscales were found to be adequate. The PABS has been developed and tested in Dutch [21,22].

- The health care providers' pain and impairment relationship scale (HC-PAIRS) [23] - The HC-PAIRS (originally 15 items) evaluates the attitudes and beliefs of health care providers regarding functional expectations of patients with LBP. Higher scores reflect stronger beliefs in the relationship between pain and impairment. Answers are marked on a seven-point Likert scale. The HC-PAIRS was modified (13 items) following a factor analysis on a sample of Dutch therapists and appeared to be a reliable and valid measure of the attitudes and beliefs about the relationship between pain and impairment [24].

- One of the vignettes developed by Rainville et al. [25] - This vignette describes a factory foreman with persistent, severe back and leg pain after a motor vehicle accident and only minimal evidence of spinal degeneration on MRI [25]. The purpose was to evaluate treatment recommendations concerning activity restriction (question 3 of the vignette) and work absenteeism (question 4) in order to define the PTs' attitudes. Rainville et al. developed 3 scenarios with different degrees of spinal pathology, symptoms and work requirements, without any evidence of structural damage or neurological compression that would require surgery (19, 20). In the present study, only the third vignette was used to limit drop-out due to lengthy questionnaires. This vignette was translated in Dutch [24]. Answers 1 or 2 in the vignette were defined as adequate recommendations for activity level (i.e. 1-no activity limitations, 2-avoid only painful activities) and work (1-full time, full duty; 2-full time, moderate duty), which

translates the scores into a dichotomous guideline consistent or inconsistent answer [26].

All questionnaires were available in Dutch and had already been validated in this language. As there was no French version of the questionnaires available, they were translated through a validated back and forth process based on the procedure described in international standards for translating questionnaires [27].

5.2.4   Statistical analysis

For statistical analysis IBM SPSS Statistics 25 was used. Group normality was analyzed by Q/Q'-plots. Group equality was examined by Student t-tests (PABS and HC-PAIRS) or chi-square tests (vignette). The total score of the HC-PAIRS or the PABS subscales was excluded from analyses when 2 or more answers were missing. Pearson's correlation coefficients were calculated if needed. Post-hoc power analyses were calculated using G*Power 3.1 and entering the observed data to calculate the effect sizes (one-tailed with α .05).

5.3   RESULTS

In total, 565 PTs participated: 280 Flemish and 285 Walloon PTs. In total, 244 (43%) male and 315 (56%) female physiotherapists participated. Table 5-1 shows the characteristics of the participants. Of the 565 PTs, 16% was following a postgraduate course at the time of study participation. The mean age was 35 (±12) years.

Table 5-1: Characteristics and beliefs of 565 physiotherapists in Belgium.

	Mean ± SD (Min-Max)		
Age	35 [21-70]	±	12
Years since graduation	11 [0-51]	±	12
PABS-BIOM (possible range 10-60)	31 [13-53]	±	7
PABS-PS (possible range 9-54)	33 [19-50]	±	5
HC-PAIRS (possible range 13-91)	46 [19-79]	±	10

Legend: PABS = Pain attitudes and beliefs scale, BIOM = Biomedical subscale, PS= psychosocial/behavioural subscale, HC-PAIRS = health care providers' pain and impairment relationship scale, SD = standard deviation

The vignette results analysis indicated that in total 59% and 34% of all PTs gave recommendations that are in line with current guidelines concerning the patient's activity and work situation, respectively (Figure 5-1: Attitudes of 565 physiotherapists in Belgium based on the vignette responses.). This implies that 41% of participating Belgian PT's did not comply with current best evidence guidelines regarding activity recommendations for patients having LBP, and 66% did not adhere to best evidence guidelines regarding returning to work recommendation for patients having LBP.

Figure 5-1: Attitudes of 565 physiotherapists in Belgium based on the vignette responses.
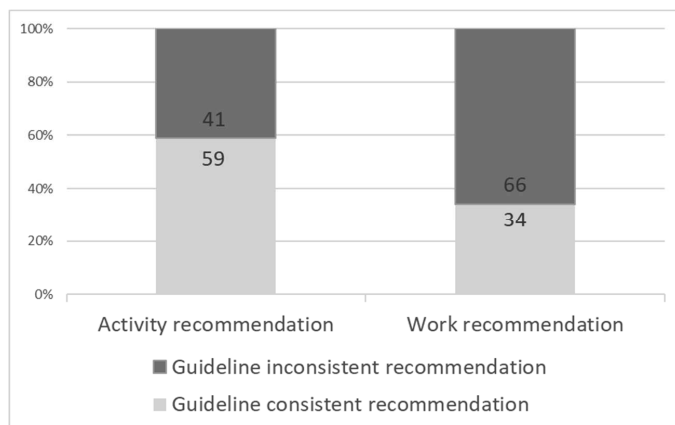
5.3.1 Link between beliefs and attitudes

Overall, PTs with higher scores on the biomedical scales (HC-PAIRS and PABS-BIOM) gave less guideline adherent recommendations (vignette). PTs who gave guideline adherent recommendations regarding work (vignette) scored significantly higher on the psychosocial subscale, lower on the biomedical subscale of the PABS and lower on the HC-PAIRS. PTs who gave guideline adherent recommendations regarding activity generally scored lower on the biomedical scales (Figure 5-2).

Post-hoc power calculations on the link between the beliefs and the activity recommendation of PTs provided a power estimate of 1.00 (PABS-BIOM), 0.59 (PABS-PS) and 1.00 (HC-PAIRS). On the link between the beliefs and the work recommendation of PTs the observed power calculated was 1.00 for all three questionnaires.

Figure 5-2: Link between the beliefs and attitudes of 565 physiotherapists in Belgium.
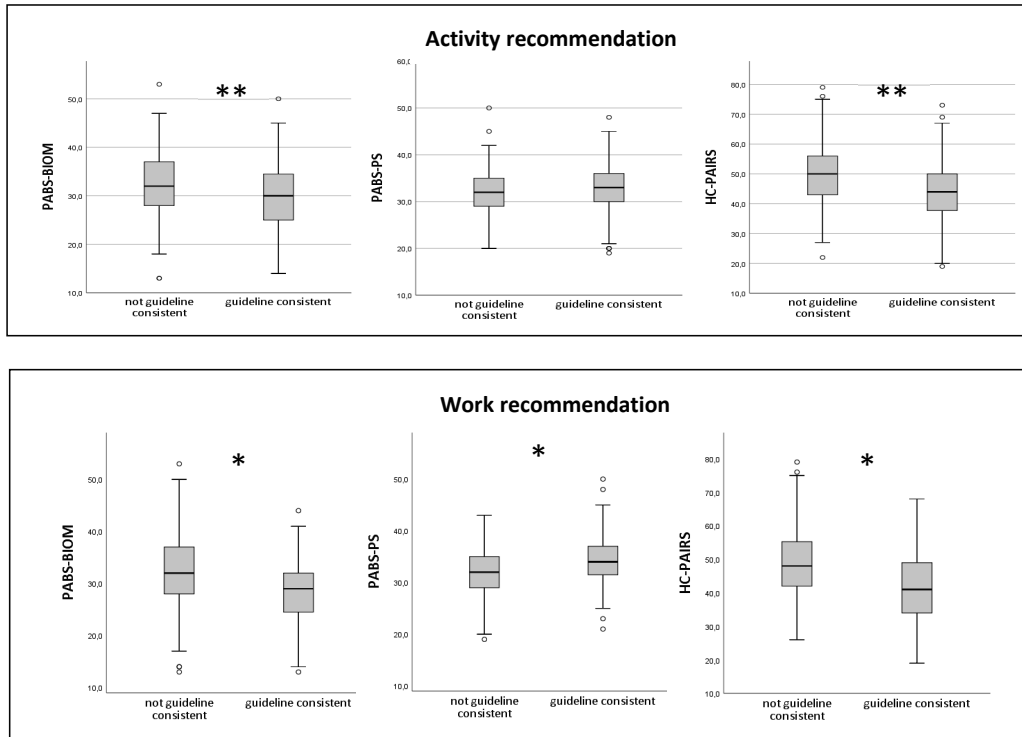
Legend: PABS = Pain attitudes and beliefs scale, BIOM = Biomedical subscale, PS= psychosocial/behavioural subscale, HC-PAIRS = health care providers' pain and impairment relationship scale, with higher scores reflecting stronger beliefs in the relationship between pain and impairment. ** p<.01

5.3.2 Time since graduation

Significant positive associations were found between time since graduation and the PABS-BIOM (r .297, p<.01) and the HC-PAIRS (r .278, p<.01). On the contrary, time since graduation and PABS-PS displayed a negative association (r -.116, p<.01). PTs that make guideline adherent recommendations for activities were graduated more recently compared to the group of PTs that do not adhere to the guidelines concerning activity recommendations (respectively mean 10.6 ± 11.2 years and 12.7 ± 12.6 years with p<.05). No significant difference was found in work absenteeism recommendation in relation to age.

5.3.3 Socio-cultural differences

Dutch speaking PTs showed a significant higher mean score on the PABS-BIOM (32) and the HC-PAIRS (47) and a significant lower score on the PABS-PS (32) compared to French speaking PTs (30, 45 and 34 respectively). This direction is confirmed in the work recommendations, where in general Dutch PTs make less guideline adherent recommendations concerning work absenteeism compared to French speaking PTs (23% and 45%). The activity recommendations show the opposite direction, since Dutch speaking PTs gave more guideline adherent recommendations about the patient's activities compared to French speaking PTs (70% and 50%).

5.4 DISCUSSION

The aim of the present study was to explore the beliefs concerning LBP among PTs in Belgium and their adherence to the evidence-based clinical guidelines for the treatment of LBP. Overall, Belgian PTs retain a quite biomedical perspective and the overall guideline adherence is poor. Less than 2/3rd of the sample of Belgian PTs advises the patient to stay active (59%), and only 1/3rd advises the patient to continue working (34%).

In a study in Belgium where patients with LBP were questioned, similar poor results were found. In this study, 23% of all LBP respondents reported having received advice from their general practitioner or from the immediate social environment to rest in bed, and only 14% received advice to stay active [28]. This failure of the health care provider to comply with the evidence based clinical guidelines may have a major impact on the patient's long term outcome of low back pain. Indeed, it has been shown that higher percentages of

guideline adherence are related to a greater improvement in physical functioning and lower heath care utilization [13]. The amount of non-compliance with the existing clinical guidelines for the treatment of LBP remains massive with all its consequences for the patient and the health care system.

5.4.1   Link between beliefs and attitudes

As stated above, perceptions of PTs will influence their behaviour [8]. Thus, the belief of PTs will influence their treatment recommendations [9,26,29]. With the present study, literature findings in other countries about the relationship between beliefs and professional behaviour are confirmed in Belgium[26,29]. PTs who have a strong biomedical view adhere less to clinical guidelines concerning work and activity recommendations in LBP compared to PTs who have a less biomedical orientation[11,19,22,25]. This is in line with the study by Rainville et al. [25], which concluded that the beliefs of healthcare providers, measured with HC-PAIRS, can explain up to 22% of the variance in their work recommendations to a LBP patient.

5.4.2   Time since graduation

The results of the present study point out that PTs who graduated a long time ago generally hold more biomedical beliefs with higher scores on the PABS-BIOM and the HC-PAIRS compared to PTs who obtained their degree more recently. Besides, the latter generally score higher on the psychosocial subscale. Our findings are in accordance with the study of Pincus et al. [30]. They stated that PTs with more years in practice held a more biomedical orientation. In contrast, in a group of Chinese health care practitioners (mixed profession sample) it was found that practitioners older than 40 hold more positive beliefs (measured with the Back Beliefs Questionnaire) than the younger groups [31]. On one hand, the different measurement tools used across studies make it hard to compare study findings. On the other hand, the results will undoubtedly differ between countries, because of cultural differences in health care organization and utilization [15-17].

5.4.3   Socio-cultural differences

Belgium is a complex country, since it is composed of three Communities: the Flemish (60%, Dutch speaking), French (40%) and German (<1%) community. This forms a complex political system where "Education" is the responsibility of the different communities.

However, education cannot be pointed out for the depicted differences, because of the research design and the presence of multiple confounders.

Overall, in the present study PTs of the French Community show a less biomedical view and a greater adherence to the biopsychosocial model compared to PTs of the Dutch Community. The recommendations, however, indicate a more ambiguous picture with more guideline adherent recommendations concerning activities made by Dutch PTs compared to French PTs, but the opposite direction accounts for work recommendations. Some issues in the composition of the two groups must be addressed. Firstly, the Dutch group is slightly older in general than the French group, where the former also shows greater variation in age. Secondly, the Dutch group in general is graduated a longer time ago than the French groups, where, again, the former also shows greater variation in years since graduation. Lastly, 25% of the Dutch PTs are currently following a postgraduate course, compared to only 8% of the French PTs. This depicts the different composition of both groups, which complicates comparison. Although the ambiguous results, the beliefs (i.c. the scores on the 2 questionnaires) do relate with the attitudes (i.c. the recommendations). This means that overall, the PTs with higher scores on the biomedical scales give less guideline adherent recommendations and vice versa, as stated earlier.

5.4.4   Limitations and future research

Literature shows that attitudes and beliefs of physiotherapists can change following an educational intervention [26,32-34]. Partly due to common maturation, partly due to the (health) educational program followed; as it has been shown that physiotherapy students become more (bio)psychosocially oriented during their educational program compared to non-medical students of the same age [35].

Therefore, the next step is to take a critical look at the individual educational programs to improve the beliefs of physiotherapy students towards a more biopsychosocial framework and the attitudes towards more guideline adherent recommendations. Focus groups can provide in depth information about the different reasons for non-adherence, apart from the beliefs, to further tailor the intervention strategies to improve guideline adherence.

In addition to the slightly different composition of the Dutch and French group, there are other limitations to be addressed. Although the chosen questionnaires are frequently

tested on clinimetrics, nor the responsiveness, nor cut off scores are currently known. Besides, the use of questionnaires always holds limitations that are subject to this kind of research. Real-life, in practice, case analyzing would be the gold standard for evaluating physiotherapist's attitudes [5]. However, vignettes are inexpensive and more manageable and appear to be of acceptable validity to measure guideline adherence among large groups of physiotherapists [36]. The reliability of the score was found to be modest and internal consistency fair. Furthermore, no subgroups of physiotherapists were identified, e.g. based on relevant experience with LBP patients or specialized courses followed. In depth information gathering, as well as focus groups can provide a clear picture.

5.5 CONCLUSION

The present study provides evidence that guideline adherence among PTs in Belgium is low and related to the PT's beliefs concerning LBP. PTs with a longer time since graduation tend to display a stronger biomedical view compared to PTs with less time since graduation.

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"The customer's perception is your reality."

- Kate Zabriskie -

6 GENERAL DISCUSSION

Overall, with this dissertation we wanted to gain insight into the role of illness perceptions in low back pain and to explore the attitudes and beliefs of physical therapy students and health care practitioners in Belgium and the Netherlands.

Table 6-1 provides a short summary of the main findings in this doctoral thesis.

Table 6-1: Summary of the main findings of this doctoral research.

Part		Research question or aim	Summary of the findings
PART A Illness perceptions in patients with low back pain	1	**Aim**: To systematically review the clinimetric properties of the IPQ-R and the Brief IPQ in patients with musculoskeletal disorders	- The IPQ-R is an appropriate instrument to explore illness beliefs in patients with musculoskeletal disorders. The factor structure remains a delicate issue. - The clinimetric properties of the Brief IPQ are poor.
	2	**Aim**: Exploring the added value of illness perceptions in explaining functional disability and habitual physical activity in patients with CLBP. **Hypothesis**: illness perceptions contribute significantly to explaining the variance in disability and habitual physical activity in patients with chronic low back pain, independent from established psychological correlates of CLBP disability such as fear of movement, depression and pain catastrophizing.	Functional disability is closely related to illness perceptions in patients with CLBP, providing evidence for the importance of monitoring a patient's illness perceptions in primary care. However, in the present study, illness perceptions failed to explain the variance in habitual physical activity levels in CLBP patients.
PART B Attitudes and beliefs of health care practitioners on low	3	**Aims**: 1) to examine the beliefs of physiotherapy students and their attitudes (i.c. their adherence to clinical guidelines in the treatment of patients with LBP) in Belgium and the Netherlands	1) Guideline adherence for low back pain is very low among 2nd and 4th grade physical therapy students.

		2) to examine whether the beliefs and attitudes of physiotherapy students change from the 2nd to the 4th grade of education	2) Fourth grade students show more biopsychosocial beliefs and provide more guideline adherent recommendations than 2nd grade students provide.
		3) to examine whether the beliefs of physiotherapy students are related to their adherence to clinical guidelines in the treatment of patients with LBP	3) Biomedical beliefs are associated with poor adherence to evidence based guidelines.
		4) to examine whether the beliefs and attitudes differ between physiotherapy students with or without a personal history of LBP	4) A personal history of low back pain does not relate to one's beliefs or attitudes.
	4	**Aim**: Exploring the beliefs and guideline adherent attitudes concerning LBP among physical therapists in Belgium	Guideline adherence among physical therapists in Belgium is low and related to the therapist's beliefs concerning LBP. Physical therapists with a longer time since graduation tend to display a stronger biomedical view compared to those with less time since graduation.

Legend: LBP = low back pain, CLB = chronic low back pain, IPQ(-R) = Illness perceptions questionnaire (-revised).

6.1 PART A: ILLNESS PERCEPTIONS IN PATIENTS WITH LOW BACK PAIN

6.1.1 Measuring illness perceptions

To manage maladaptive illness perceptions of patients, we first have to know which perceptions the patient holds and to what extent they are helpful or not. Since the construct "illness perceptions" is very comprehensive, many different questionnaires are available to measure the whole concept or parts of it (Appendix 7.2). The Illness Perceptions Questionnaire-revised (IPQ-R) is explained in the introduction (1.3.1.2).

We reviewed the clinimetric properties of the IPQ-R (chapter 2). The reliability and validity were sufficient for several (language/illness) versions[1-7]. The IPQ-R can therefore be safely used in scientific research or clinical practice for patients with musculoskeletal disorders. The questionnaire is responsive to change[8,9], but the minimal clinically important

difference or minimal detectable change has not been studied. Therefore, we cannot translate the desired clinical change into numbers.

The results of the systematic review show that the clinimetric properties of the Brief IPQ are not yet well known. An acceptable test-retest reliability was found but a smallest detectable change of 42 on a maximum of 80 was observed (chapter 2). At this point, the Brief IPQ can therefore not be recommended for research purposes in musculoskeletal patients. However, in clinical practice the Brief IPQ can play an important role for a first pre-assessment view on a patient's perception, which can open up a conversation with the physical therapist. Relying solely on questionnaires filled out by patients can be tricky. They are not personalised and patients can mostly choose from standardised answers. For such personal topics, one should therefore talk to the patient: in clinical practice by means of an interview, in research by means of qualitative research. Questionnaires are after all not the only way to get information on the patient's illness perceptions. A structured interview with the patient will proof useful in practice[10]. The questionnaire can be an initial screening tool, but the interview should provide more clarity on the severity and the exact content of the various items. In that way, the physical therapist can maximise the outcome of the treatment by treating the individual patient and not solely the pathology.

To guide an interview in clinical practice, the flag-system[11] and the STarT Back Tool [12-14] (1.2.2) ask for different areas. If the questionnaire or observation, which can be seen as an indirect display of illness perceptions, or the interview shows that there are prominent (yellow) flags present, a structured interview is the way to go [15,16]. As a reminder, it is proposed to use the acronym ABCDEFW.

- **A**ttitudes/Beliefs
- **B**ehaviour, in relation to, for example, fear avoidance.
- **C**ompensation
- **D**iagnosis/Treatment
- **E**motions
- **F**amily
- **W**ork

6.1.2 Changing illness perceptions

The importance of addressing illness perceptions has been stated in the introduction (1.3.1.3). In our study (chapter 3), we found that illness perceptions were related to perceived disability in chronic low back pain patients[17]. It is therefore crucial to address the maladaptive illness perceptions in order to ameliorate the outcome of the patient. The 'readiness' or 'willingness' of the patient to adopt new beliefs and coping responses to pain, may predict response to inducing self-efficacy strategies, multidisciplinary or cognitive-behavioural pain treatments, such as pain neuroscience education, graded exposure and graded activity [18,19].

Findings support that illness perceptions can change based on a multidisciplinary pain management program, with inclusion of a cognitive-behavioral intervention[20,21]. Changes in maladaptive illness perceptions (pain signifies harm, low personal control over pain etc.) are associated with changes in perceived disability, highlighting the importance of addressing illness perceptions[20].

The major goal of cognitive behavioural therapy is to replace maladaptive patient coping skills, cognitions, emotions and behaviours with more adaptive ones [22]. Compared to no treatment or other guideline-based active treatments, cognitive behavioural therapy leads to long-term improvement in pain experience, such as pain intensity, disability and quality of life [23]. Cognitive behavioural therapy is however, not recommended as stand-alone therapy, but as a valuable component of a multimodal approach [24-26]. It comprises a wide variety of treatments, such as self-instructions, relaxation and/or biofeedback, development of adaptive coping strategies, changing maladaptive beliefs about pain and goal setting [22].

Influencing contextual factors should be addressed, such as physical activity, stress and conflicts. Stress can have a major impact on pain experience [27-29]. Ongoing stress from work or social conflicts can contribute to pain exacerbation and persistence, since it triggers certain neural and/or hormonal protective processes[28]. Stress reduction and acceptance, for example through mindfulness-based therapy, are therefore thought to be helpful in the treatment of (chronic) low back pain[30]. Furthermore, interpersonal interactions and relationships are known to have an effect on the subjective course of low back pain in both

ways, with positive support or negative isolation [31-33]. Hostility in relationships may lead to greater pain behaviour and disability [32,33].

It is the responsibility of the physical therapist to address such influencing factors and to refer the patient to their family physician or specialized health care practitioners if necessary. For example, it is known that depressive symptoms can make back pain worse and increase the induced disability. Referral of these patients is necessary [34]. Therefore, the importance of a multimodal, multidisciplinary approach has been highlighted, where exercise therapy (*bio*-) is combined with a psychological (*psycho*-) or social/work (*social*) component [35-37]. Especially in the long run, a behavioural psychological component adds value to pain reduction [35,38,39]. A 5-step approach, the "representational approach to patient education", based on the CSM has been proposed to help physiotherapists assess and treat misconceptions, such as pain-related fear and the accompanying coping behaviour [40-42]. First clinicians need to encourage patients to describe their condition along the different dimensions of illness perceptions [40-42]. As proposed in the current thesis, this conversation can be guided by the (Brief) IPQ-R. Secondly, patients should be encouraged to think about the reasons of their misconceptions; why do they believe this and why are some experiences that important to them? In the third step, the HCP and patient discuss on previously detected gaps, confusions, or misconceptions and how they elicit undesirable consequences. This creates an opportunity to provide the patient with new information, clarifications or insights in step 4. Step 5 is then the summary, where possible benefits from acting on this new information is presented and the altered representation is reinforced [40-42]. As seen, allowing self-reflection is critical in this process. Note that this stepwise approach in reality is a more moving, back-and-forth process between the key-elements[41].

Pain neuroscience education aims to decrease the threat value of pain by increasing the patient's knowledge about pain and by reconceptualising pain [43]. With Leventhal's Common sense model in mind, it can be assumed that by gaining knowledge, the patient's illness perceptions are altered, for illness perceptions are based on former experiences, interpretation of symptoms and provided information[44]. Moreover, it is shown that pain neuroscience education can reduce, for example, kinesiophobia in the short term [45]. It can

therefore 'prepare' patients and their illness beliefs for the active treatment to come (and thus encourage the patient to climb the ladder in terms of readiness to change). A better understanding of their problem can reassure patients, reduces the threat associated with the task [46], and therefore make them more susceptible to an active treatment approach. There is evidence suggesting that patient education can provide long-term reassurance and reduce pain-related distress in patients with (sub)acute low back pain [47]. Patient education puts the patient in the driver's seat to make an informed decision about their health-related behaviour [48]. Moreover, it can alter pain beliefs and attitudes, and in their turn alter physical performance, even when there is no opportunity to be physically active[46]. This implies that motor performance might be directly limited by pain beliefs.

It is clear that patients with different illness perceptions demand a different approach concerning education and counselling [49].

In addition, the patient-HCP relationship is important. Some studies have shown the importance of empathy and emotional support, in addition to merely offering information and knowledge [50-52]. It includes elements of respect and acceptance[53]. It is suggested that "the feeling of being understood", being able to be heard without any judgement, gives the patients more space to engage in the treatment (6.2.4.2).

To top it off, there have been several studies with mass media campaigns to alter the global illness perceptions. These media campaigns are used to deliver health messages with the aim to influence population attitudes, beliefs, and health-risk behaviours [54-56]. Overall, the outcomes regarding back pain were mixed, although back beliefs were positively influenced with an increase of patient satisfaction and decrease of health care utilisation and reduction in sick leave or compensation costs [55-58].

Important to know is that evidence shows that the beliefs of HCPs are transferable to their patients [59-64]. Thus, they are extremely important to take into account when talking about changing the illness perceptions of the patient.

6.2   PART B: ATTITUDES AND BELIEFS OF HEALTH CARE PRACTITIONERS ON LOW BACK PAIN

6.2.1   Overall discussion on the attitudes and beliefs

The results of this dissertation show that there is plenty of room for improvement in the attitudes and beliefs of health care practitioners on LBP in Belgium.

A large part of physiotherapy students as well as physiotherapists (PTs) in the field holds biomedical beliefs about low back pain [65]. Consequently, guideline adherence concerning work and activity is poor. Less than 1/2nd of the students and less than 2/3rd of the sample of Belgian physiotherapists follow the guidelines concerning activity recommendations and therefore advise the patient to stay active [65]. Only 16% of the physiotherapy students and 34% of the Belgian PTs answer according to the guidelines concerning work absenteeism and therefore advise the patient to continue working [65].

Different factors have been examined in our research project in the scope of their influence on the attitudes and beliefs.

6.2.1.1   The point at which HCP's find themselves within the vocational competence ladder is an important factor in relation to their attitudes and beliefs.

Figure 6-1 provides an overview of the attitudes concerning work and activity towards LBP patients in this dissertation. For more detailed information and results, please refer to chapter 4 and 5.

In our study, 4th grade physiotherapy students hold more biopsychosocial beliefs regarding low back pain and their attitude is more in line with the current evidence based guidelines compared to 2nd grade students [65]. The attitude of physiotherapists in Belgium in our sample is comparable to the 4th grade students concerning activity recommendations [65]. However, the former gave recommendations that were more in line with current existing evidence concerning work compared to the student population. Please note that this comparison is only exemplary, as both populations are geographically distinct; the sample of physiotherapists is Belgian, whereas the population of students is Dutch and Belgian. Although the results are on the rise throughout the vocational competence ladder, the percentage of guideline adherent recommendations remains poor[65]. Moreover, we noticed that physiotherapists who graduated a long time ago hold more biomedical beliefs with higher scores on the PABS-BIOM and the HC-PAIRS and lower scores on the

psychosocial subscale compared to physiotherapists who obtained their degree more recently.

These findings are supported by research from several other countries. It was found that physiotherapists with more years in practice held a more biomedical orientation [66]. In contrast, in a mixed profession sample of Chinese health care practitioners, it was found that practitioners older than 40 hold more positive beliefs than the younger groups [67]. On one hand, the different measurement tools used across studies make it hard to compare study findings. On the other hand, the results will undoubtedly differ between countries, because of cultural differences in health care organization and utilization [68-70].

Figure 6-1: Overview of the attitude concerning work and activity towards LBP patients in physiotherapy students and physical therapists. For more detailed information and results, please refer to chapter 4 and 5.
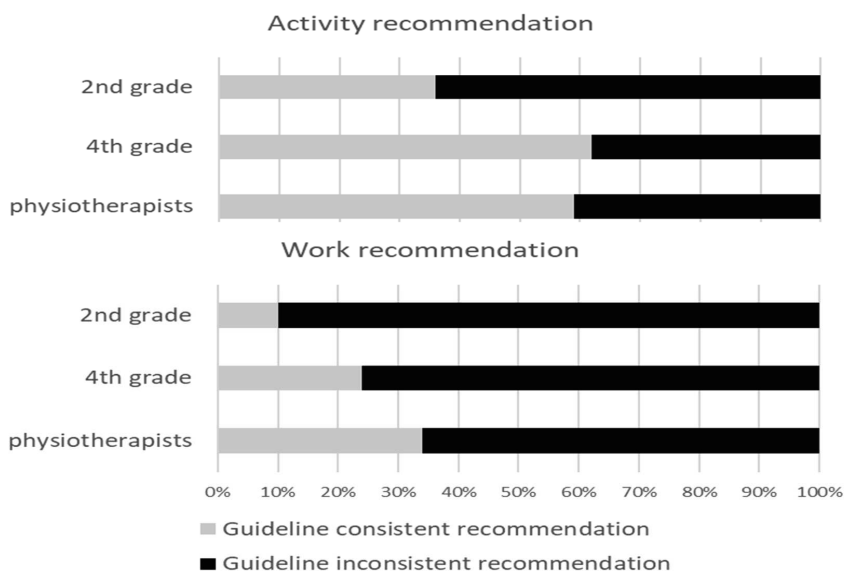
Possibly maturation and experience play a role in the development of this biopsychosocial perspective. Nevertheless, it is assumed that the health-care related curriculum contributes to the further development of these cognitions and skills [71,72]. When (re-)constructing the curriculum of physiotherapy education, the relative failure of this psychosocial perspective should be taken into account. After all, it is known that

perceptions are prone to change, since they are based on information and experiences among others [73].

Since no minimal clinically important difference or minimal detectable change is known in the questionnaires used, we searched for other ways to express the clinical impact of our findings. The easiest way is to state the difference as a percentage, where there is a difference of 8 and 11% in biomedical perspective between the 2nd and the 4th grade (resp. HC-PAIRS and PABS-BIOM), but only 3% difference in the PABS-PS. Another way is to adopt the method of Domenech et al., where they took a difference in HC-PAIRS scores of half the standard deviation as clinically relevant [73]. This means that a change of 4.1 points would be considered as clinically relevant in our study among students, where we found a mean difference in HC-PAIRS scores of 6.4 points. According to this method, the difference in biomedical scales between 2nd and 4th grade and between 2nd grade and working physiotherapists can be considered as clinically relevant.

6.2.1.2   *A personal history of low back pain does not influence the attitudes and beliefs.*

Attitudes and beliefs are not influenced by a personal history of low back pain. This finding is supported by most and most recent research [73-77], but not all [72,78-80]. The latter studies, in which a difference was found, are not unanimous in the direction of the difference. It is suggested that a highly disabled low back pain population of health care practitioners perhaps would respond differently, in a way that they would hold more negative beliefs about low back pain [74]. It is important to mention that most of these studies used different measurement tools, so comparison is difficult. However, the statement that training is key in the ability to remain objective towards a patient is often mentioned [74,76].

6.2.1.3   *Attitudes and beliefs are prone to sociocultural differences.*

As stated in the introduction (1.3.1.1), the Common Sense Model of Leventhal describes the development of cognitive and emotional perceptions based on former experiences, such as cultural background for example [44,81,82]. Previous studies do confirm that back pain beliefs differ between people of different cultures and thus that the recommendations given by HCPs might differ consequently between cultures [72,74,77,83]. Our results also suggest cultural differences, but the design does not allow us to draw causal conclusions, neither was the study designed to examine such cultural influences or differences.

6.2.1.4 Guideline adherent care (attitude) is associated with the beliefs of the HCP.

The present studies show that physiotherapists (chapter 5) and physiotherapy students (chapter 4) with strong biopsychosocial beliefs are more likely to adhere to the clinical guidelines, compared to those with a strong biomedical belief.

This is in line with previous research in other countries [60,73,84,85] and it ties in nicely with the assumption that beliefs will influence behaviour [44,73,84,86,87], such as the content of information they provide to patients. Rainville et al. revealed that the low back pain beliefs of HCPs could explain up to 22% of the variance in their work recommendations [85]. It is acknowledged in the present and previous studies that the beliefs that HCPs hold on low back pain, will determine the nature of the recommendations they make. Physiotherapists with a more biomedical orientation, or more fear avoidant beliefs are more likely to approve bed rest as an appropriate treatment for patients with nonspecific (chronic) low back pain [60]. They are more likely to advise patients to limit activities and to be careful with respect to workload.

6.2.2 Missing data

The total score of the HC-PAIRS or PABS-subscales was excluded from analyses when 2 or more answers were missing. It is striking that one question stands out in blank answers. No less than 55 students (over 3%) and 14 physical therapists (2.5%) did not fill in the next statement: "Pain is a nociceptive stimulus, indicating tissue damage." This statement is part of the biomedical subscale, which means that a high score on this question (max 6 = totally agree) accounts for a biomedical belief on LBP, with a direct relationship between pain and tissue damage. In the light of the development of the biopsychosocial model (1.2), where psychosocial components are known to influence one's health and/or health behaviour, a merely biomedical perspective is too restrictive. Moreover, in chronic low back pain, tissue damage cannot be indicated as cause of persistent pain [88]. This statement can serve as a clear example to illustrate the lack of knowledge or the uncertainties among physical therapists. As stated earlier, evidence based clinical guidelines agree on the importance of the biopsychosocial model in the evaluation and treatment of patients with LBP. This means that the psychosocial context of a patient plays a role - to a greater or lesser extent - in the onset and maintenance of the complaints, as it does in the case of pain. Tissue damage is not necessary to experience pain and therefore, pain does not equal

tissue damage [89,90]. In many situations, no clear bodily diagnosis can be found. The core objective of the explaining pain approach is to shift one's conceptualization of pain from that of a marker of tissue damage or disease to that of a marker of the perceived need to protect body tissue, as Mosely and Butler stated [91].

To put it in another way, over 18% of the physiotherapy students agreed with the statement "Pain is a nociceptive stimulus, indicating tissue damage." On top of this 18%, comes another 3% who did not fill in this particular question. Of course, we can only guess why they let this question blank. Anyway, they were not convinced enough to circle 'do not agree'. Similarly, 17% of PTs agreed (score 5 or 6 = agree or totally agree) with statement 3 that pain indicates tissue damage, with a 2.5% on top who were not confident enough to mark 'do not agree'.

The second question that was filled in least by the students (n=33, which equals 2%) was statement 8 "Back pain indicates the presence of organic injury", which relates closely to our previous findings on the direct biomedical relationship between pain and tissue damage.

6.2.3   Measuring attitudes and beliefs

Beliefs are the set of cognitions and emotions, similar to illness perceptions in patients, on a certain topic or pathology held by a HCP. In literature, the beliefs of HCPs are often referred to in a dichotomous way: a more biomedical or a more biopsychosocial belief. As indicated, there are different measurement tools for the beliefs and attitudes of HCPs. A number of common questionnaires used in scientific research to assess the beliefs of HCPs can be found in the Appendix 7.3.

Attitudes refer to the clinical decisions HCPs establish, such as intervention strategies, outcome measures or advice and information given to patients. It originates normally from conscious and subconscious items and holds a weighing of relevant aspects [92]. Different methods to measure attitudes of HCPs are:

- Surveys can be done in different forms, but are very distinct in outcome and reliability [93-96].

- Vignettes (for example from Rainville et al.[85] as used in the present study) describe a clinical case scenario, which reflects the clinical practice as much as possible [97]. According to a study in 2005 on physiotherapists in the Netherlands, back pain vignettes are an acceptable, inexpensive and manageable instrument to measure guideline adherence [95]. In the present doctoral thesis, the scoring of the vignette into a dichotomous 'guideline adherent' or 'guideline non-adherent' answer was based on a study by Domenech et al.[73]. In the COMPLeMENT-trial in the United Kingdom, a similar procedure was used, but they were slightly less strict in the work recommendations [98].

- Measurement by direct observation of clinical behaviour is difficult to apply in research, expensive and time-consuming and is potentially subject to a Hawthorne-effect. Moreover, ethical issues arise [95,99-101]. Standardized patient actors do not solve all of these problems [99].

6.2.4 Changing attitudes and beliefs

Why maladaptive beliefs (so called white flags – KCE report 295 [102]) and attitudes of HCPs need to be addressed is explained in the introduction (1.3.2). The HCP's beliefs influence their clinical decision-making and thus the adherence to clinical guidelines. Scores on the HC-PAIRS were the only significant predictor of recommendations for work and physical activity when controlling for possible confounders including gender, years of experience in the treatment of back pain, judgments of severity of symptoms, and judgments of severity of pathology [103]. Besides their own behaviour, the beliefs and attitudes of HCPs also affect the illness perceptions and coping behaviour of the patients. The gap between the two can disrupt communication and the trust-relation between the two parties involved and therefore influence the outcome of the patient. Altering the beliefs of HCPs regarding back pain can result in reduction of disability, compensation costs and medical costs [56].

It has been shown in literature that beliefs of HCPs and students are subject to change [56,75]. In chapter 4 is even change suggested from the 2nd to the 4th year of physiotherapy education. Beliefs are however influenced by many different factors, such as geographical region, ethnicity [68-70] and education [73,104], which cannot all be changed. Interestingly, in a Japanese study, the authors found that only the level of pain neurophysiology knowledge

was a significant contributing factor of the biopsychosocial perspective in physical therapists, but not the length of clinical experience, nor whether or not you obtained a postgraduate degree [105]. In chapter 5, the year since graduation was related to the biomedical or biopsychosocial belief of the Belgian physical therapists. However, we couldn't draw a causal conclusion. It should be noticed that 'the year since graduation' and 'length of clinical experience' are not the same measurements. Moreover, the cultural background, as well as the education of both study populations is very distinct.

The impact of pain physiology education on the beliefs and attitudes is in line with previous findings as suggested in patients (6.1.2).

Tailored educational or informational programs have indeed shown to be able to alter the beliefs of HCPs. Active, multifaceted implementation strategies with more than 1 session are found to be able to improve guideline adherence [94,97]. A study on physiotherapy students for example, showed that biopsychosocial sessions (2x3 hours) could diminish fear-avoidance beliefs and pain-impairment beliefs and improve the work and activity recommendations, whereas biomedical sessions (2x3 hours) did the opposite [73]. A specific tailored peer-assessment strategy, with space for self-reflection and in the presence of an expert, seems more effective in increasing knowledge and guideline adherence compared to a routine case-based discussion [97].

Perhaps one of the reasons for the success of an active approach is that it implies that HCPs need to think about their own perspective, for previous research has shown that the uptake of guidelines is related to the HCP's beliefs [59,106]. Nevertheless, even printed educational material seems to be able to shift physiotherapists' attitudes and beliefs towards a more guideline adherent approach after 6 months [98].

Similar to population-based programs, mass media campaigns with television commercials, starring medical experts, sporting and television personalities, supported by a printed campaign may influence HCPs and affect their beliefs, knowledge and management strategies [56].

6.2.4.1 So why is guideline adherence still low?

In the KCE-report of 2017 on low back pain (KCE reports 295 [102]), is stated that HCPs follow the clinical recommendations if they are in line with their own beliefs: regarding the (biomedical) nature of the illness [107,108], regarding their own knowledge and skills and regarding their professional role and identity [109,110]. It is suggested that physicians either do not know or simply reject the existing scientific evidence, that they have a tendency to discount the efficacy of competing treatments or that they follow a certain therapy trend to excess [111]. Furthermore, the preference of the patient is also known to contribute to non-adherence, as well as other patient related factors, such as age or duration of the symptoms [112,113]. As stated in 6.1.2 the relationship between the patient and the HCP is important [114], which is enhanced by effective communication. Patients value helpful and empowering skills of HCPs [115]. Other factors mentioned for guideline non-adherence, especially with regard to the overuse of medical imaging, are fear of missing a pathology [116], the desire to diagnose a tissue problem (and incapability of dealing with and communicating diagnostic uncertainty to patients) [107,108,114], hoping that imaging will reassure the patient [114] or a financial compensation [117]. It Is noteworthy, however, that what one does or does not test or prescribe also has an impact on the patient's perceptions, even in a maladaptive, perhaps not intended way. In that way, HCPs themselves add to the problem that they seek to address. In low back pain, biomedical or psychosocial beliefs will be reflected in important initial decisions during patient care encounters. Prescribing medical imaging or performing certain patho-anatomical tests for example, could give the impression that physical factors for causation and perpetuation are emphasized, instead of the need to change perceptions of the condition and solve associated problems [66].

In a systematic review on barriers of guideline adherence, clinicians reported to rely on experience, clinical judgement and accepted practice among their peers over the use of guidelines [110]. This complies with the peer feedback approach discussed and stresses the need to incorporate peer discussion when we want to improve guideline adherence [97]. Guidelines can be perceived as restrictive and limiting and not all physiotherapists know how guidelines are created [109]. Furthermore, time constraints to master the (new)

information overload of guidelines are well known to play a major role too in continuing doing what you are used to [109].

Good communication skills are gaining in importance. Especially to enhance self-esteem and to guide HCPs through conversations on diagnostic uncertainty and conflicts in beliefs and expectations with patients [110].

6.2.4.2 Effective communication – two-way street

Inappropriate attitudes and beliefs of HCPs affect the management of low back pain, not only with inappropriate content of recommendations or explanations, but also with the formulation of the messages [102]. Patients who have pain want a satisfactory explanation for their pain [118]. It is the responsibility of the physiotherapist (or HCP in general) to provide a sufficient explanation, even in the absence of a clear biomedical diagnosis. In a previous paragraph we talked about "The representational approach to patient education" [40-42]. It seems clear that this requires very specific and advanced communication skills from the HCP. The thing we have addressed thoroughly in the present thesis is that the content of the proclaimed message is not (yet) appropriate and that this is, obviously, very important to tackle. HCPs do not always explore patient's perceptions, nor their own, so addressing the myths about back pain in patients starts there. The tailoring of the treatment strategy starts with communicating, which means listening to the patient's beliefs, concerns, fears etc. and discussing them to come to a collaborate decision on the treatment plan. Indeed, it is shown that low back pain patients value a HCP with good communication skills and shared-decision making, who provides information on their specific symptoms and tailored to the individual [119,120]. The HCP should be comfortable addressing and discussing psychosocial topics and training might improve the outcome [47].

The shift to tele-rehabilitation during the COVID-19 pandemic pushed many physiotherapists out of their comfort zone and highlighted again the value of interpersonal communication, education and active self-management in the guideline-based care [121]. Interpersonal and communication skills have already been identified as key elements by both patients and HCPs, as has the individualised patient-centred care [122].

O'Sullivan et al. developed some videos that can help train HCPs to communicate effectively with their patients [123]. It is key in health communication, to use the illness

perceptions of the patient as a starting point for an effective consultation to understand their situation and needs. HCPs need to be aware not to try immediately replacing the misconceptions with their own medical beliefs [124]. Furthermore, significant others can be involved, since their perceptions will have direct effects on the coping behaviour of the patient [124]. The congruence of the perceptions of the HCP and the patient – and if necessary of a significant other- as a shared view, indicate that improved patient outcomes may come from better communication and a shared approach to problem-solving and coping [124].

It becomes clear that a multimodal patient-centred lifestyle approach, tailored to the preferences, beliefs and needs of the individual, expects continuous (non-)verbal communication. Education is key with patient-defined goals, empowerment and a HCP who is capable in knowledge, as well as in social and interpersonal skills [26,125].

6.3   LIMITATIONS, STRENGTHS AND FUTURE RESEARCH

The limitations of the present research have been stated in the different chapters. The CSM of Leventhal on which the present doctoral thesis is based is well grounded, well studied and well established in medical and psychological scientific literature [126-130].

In general, the results of the present research are only applicable to the included population and therefore limited to Belgium and the Netherlands. It was indeed meant to target this specific social-cultural region. Future research can compare the current results with observations or measurements during real life situations to evaluate the actual clinical behaviour. The patient's disability and –more importantly- habitual physical activity level, as well as the physiotherapist's attitudes and beliefs were measured by means of self-assessment. Bias regarding social desirability can therefore not be ruled out completely, especially given the presence of published guidelines (part B), which provide a recognised standard of care [131]. However, this entails a possible overestimation of guideline adherence, which make the results of the present B-section regarding guideline adherence even more shocking and even underestimates the problem [101,132]. The questionnaires used in this doctoral research project (IPQ-R, HC-PAIRS, PABS and Rainville's vignette) were all thoroughly tested on psychometric characteristics and

frequently used in scientific literature, even in similar populations. To our knowledge however, no cut-off scores are introduced, nor are results regarding minimal clinically important difference or minimal detectable change known. This would of course require a discussion on another level, but would certainly add to educational intervention studies.

The design of the present study on HCPs (part B) does not allow causal relationships to be established. This research project however was the first to evaluate on a large scale the attitudes and beliefs in students in Belgium and the Netherlands. No less than 8 institutions and 1624 students, across 2 countries and 2 linguistic areas, took part. This implies a relative high external population validity or transferability. With a possible reconstruction of the curriculum in different institutions, a longitudinal design can be set up. Ideally, over several years, one that continues until they are active physiotherapists in the field. It is to suggest that this research setting can be anchored in the curriculum as part of the student survey at the beginning or the end of each year.

6.4 CLINICAL IMPLICATIONS AND TAKE HOME MESSAGES

Based on the current doctoral thesis, **institutions** can take a critical look at the educational programs of musculoskeletal rehabilitation. On the one hand, to better incorporate the importance of illness perceptions in the evaluation and treatment of patients with low back pain. On the other hand, to take the beliefs and attitudes of HCPs into account, for the students will one day become the physiotherapists of tomorrow. The attitudes and beliefs of HCPs must be an integral part of the curriculum, with plenty of space for self-reflection and communication skills training, not just in a 2 hour-course, but repeatedly throughout the years.

Since beliefs and attitudes are culturally determined, qualitative research on the different reasons of non-adherence should be undertaken in Belgium and the Netherlands. This will prevent overspending or money loss due to over-treating, undertreating or restricting activities and work. Afterwards, **guideline implementation** or **guideline adherence strategies** can be defined tailored to the specific population both in form and in content.

The **quality promotion of physiotherapists** in Belgium is still in its infancy. Given the data of the present doctoral thesis, there is an urgent need to introduce proper quality control and quality indicators to improve adherence to evidence based practice guidelines and revalue the profession.

The present doctoral thesis provides evidence that…

…monitoring the illness perceptions of patients with chronic low back pain is key, as they are closely related to the patient's disability level. The use of the IPQ-R is recommended for its wide range of psychosocial input, since the level of pain and pain catastrophizing alone appear too narrow in explaining the disability level. We have demonstrated that the IPQ-R can be safely used in patients with musculoskeletal disorders. The Brief-IPQ is not recommended to use in scientific research nor to measure change in patients with musculoskeletal complaints, but can be a useful tool in guiding the intake conversation with patients.

…guideline adherence among physiotherapy students in Belgium and the Netherlands, and among physiotherapists in Belgium is low and is related to their beliefs concerning low back pain. Biomedical beliefs are associated with poor adherence to evidence based guidelines. This is shown in the present doctoral thesis and is supported by previous [64] and recent [133] literature. Physiotherapists with a longer time since graduation tend to display a stronger biomedical view compared to those with less time since graduation. The same direction is observed in 2nd grade students compared to 4th grade students. A personal history of low back pain does not necessarily affects the attitudes or beliefs of physical therapists nor students.

The biopsychosocial approach starts from the very first encounter and is subsequently woven into the history taking, clinical examination and treatment. A consensus must be reached between the patient's illness perceptions and the therapist's attitudes and beliefs, in which both the verbal and non-verbal communication of the physical therapist play a major role. This will affect the adherence of the patient to therapy, the patient-HCP relationship, the illness perceptions of the patient and the further rehabilitation process and outcome and thus health care usage and costs.

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7 APPENDIX

7.1 PILOT-TESTING OF THE SOCIO-DEMOGRAPHIC QUESTIONNAIRE (DUTCH)

7.1.1 Initial socio-demographic questionnaire

Beste collega,

Vooreerst danken wij u voor uw medewerking aan dit onderzoek. Om een beter inzicht te krijgen in uw activiteiten en ervaring, willen wij u voorstellen om onderstaande vragen te beantwoorden.

1. Naam en e-mail: …………………………………………………………………..............

2. Geboortedatum: …………………………………………………………….............

3. U bent een

- o Man

- o Vrouw

4. In welk jaar bent u afgestudeerd als kinesitherapeut? _____
Bij welke universiteit of hogeschool hebt u uw diploma behaald?
_____

5. Sinds hoeveel jaar behandelt u patiënten met chronische klachten? *(slechts 1 antwoord aankruisen)*

- ☐ 0-5 jaar

- ☐ 6-10 jaar

- ☐ 11-15 jaar

- ☐ Meer dan 15 jaar

- ☐ Ik heb vroeger patiënten met chronische klachten behandeld (expertise : ………….
  Jaar), maar nu niet meer

- ☐ Ik heb nooit patiënten met chronische klachten behandeld.

6. Waar bent u momenteel werkzaam? *(slechts 1 antwoord aankruisen)*

- ☐ Enkel in een academische context (geen klinisch actief werk)

- ☐ Combinatie academisch werk + klinisch werk :

Het klinisch werk gebeurt:

- o In een ziekenhuis/instelling/rust & verzorgingstehuis

- o In een privé-praktijk

- o Zowel in een ziekenhuis ziekenhuis/instelling/rust é verzorgingstehuis als in een privé-praktijk

- o Andere

7. Gelieve aan te geven indien u één van de volgende opleidingen gevolgd hebt :

JA

Osteopathie	☐
Manuele therapie	☐
McKenzie	☐
Ergonomische bijscholingen	☐
Bijscholing over chronische pijn	☐
Andere	☐ Specifieer :_____

8. Heeft u ooit zelf lage rugklachten ervaren?

- o Neen (dan mag u de rest van de vragen op deze pagina overslaan)

- o Ja:

  - ▪ Geef op onderstaande schaal aan hoeveel pijn u nu, op dit moment hebt.

    ```
    0                                        10
    ```
    ergst denkbare pijn
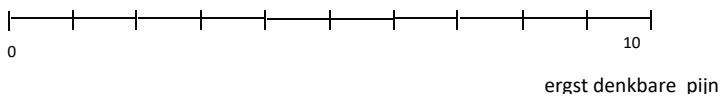
  - ▪ Geef aan op onderstaande schaal wat de minimale, gemiddelde en maximale pijn was tijdens de klachten.

    Minimaal
    ```
    0                                        10
    ```
    ergst denkbare pijn

    Gemiddeld
    ```
    0                                        10
    ```
    ergst denkbare pijn

    Maximaal
    ```
    0                                        10
    ```
    ergst denkbare pijn
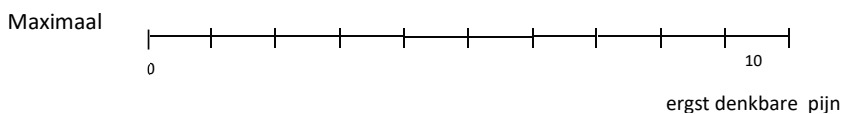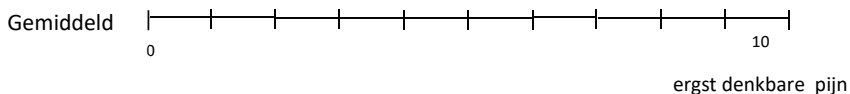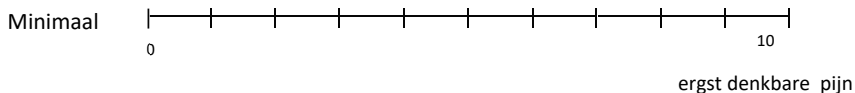
- Hoe lang hebben de klachten geduurd?.....................................

- Hoe lang is dit geleden…………………………..

9. Bent u voor deze lage rugklachten in behandeling geweest

- Neen

- Ja: welke behandeling hebt u ondergaan (meerdere antwoorden zijn mogelijk):

  - Bezoek arts/specialist

  - Medicatie: welke………………………………………………………………….

  - Homeopathie

  - Kinesitherapie/manuele therapie

  - Osteopathie

  - Accupunctuur

  - Andere:………………………………

7.1.2   Final socio-demographic questionnaire after pilot-testing

Beste collega,

Vooreerst danken wij u voor uw medewerking aan dit onderzoek. Om een beter inzicht te krijgen in uw activiteiten en ervaring, willen wij u voorstellen om onderstaande vragen te beantwoorden.

1. Leeftijd: …………………………………………………………..............

E: mail: …………………………………………………….....................
telefoonnummer: ……………………………………………………………….

Deze gegevens zijn louter ter controle en zullen verder niet gebruikt of openbaar gemaakt worden.

2. U bent een:

- o   Man

- o   Vrouw

3. In welk jaar bent u afgestudeerd als
kinesitherapeut? ....
Bij welke universiteit of hogeschool hebt u uw diploma
behaald? ....

Sinds hoeveel tijd bent u werkzaam als kinesitherapeut?
………………………………………………………………….

4. Gelieve aan te geven indien u één van de volgende bijkomende opleidingen gevolgd hebt

- o   Osteopathie

- o   Manuele therapie

- o   McKenzie

- o   Ergonomische bijscholingen

- o   Bijscholing over chronische pijn

- o   Acupunctuur

- o   Sport

- o   Trainingstherapie/Oefentherapie

- o   Andere: Specifieer :..

5. Heeft u ooit lage rugklachten gehad?

- o Neen (*u mag dan rechtstreeks naar vraag 9 gaan*)

- o Ja:

6. Hebt u momenteel lage rugklachten?

- o Neen (*u mag dan rechtstreeks naar vraag 8 gaan*)

- o Ja:

  - ▪ Geef op onderstaande schaal aan hoeveel pijn u <u>nu, op dit moment</u> hebt.

Pijn op dit moment

├─┼─┼─┼─┼─┼─┼─┼─┼─┼─┤
0   10
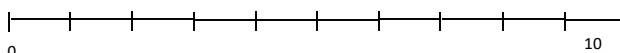
ergst denkbare pijn

  - ▪ Geef aan op onderstaande schaal wat de <u>minimale en maximale pijn</u> was tijdens de klachten tijdens <u>de afgelopen week</u>.

Minimale Pijn

├─┼─┼─┼─┼─┼─┼─┼─┼─┼─┤
0   10
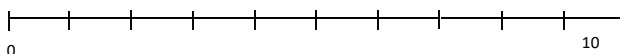
ergst denkbare pijn

Maximale Pijn

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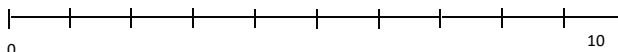
ergst denkbare pijn

7. Wanneer zijn uw klachten ontstaan?: ………………………………………….

Hoe lang hebben uw klachten geduurd?......................................

8. Bent u voor deze lage rugklachten in behandeling geweest?

- o Neen

- o Ja: welke behandeling hebt u ondergaan (meerdere antwoorden zijn mogelijk):

  - o Bezoek arts/specialist

  - o Medicatie: welke…………………………………………………………………….

  - o Homeopathie

  - o Kinesitherapie/manuele therapie

  - o Osteopathie

   o Acupunctuur

   o Andere:……………………………….

9. Waar bent u momenteel werkzaam? *(meerdere opties mogelijk)*

   o In een ziekenhuis

   o In een rust- & verzorgingstehuis

   o In een revalidatiecentrum

   o In een privépraktijk

   o Andere: …………………………………………………………….

10. Sinds hoeveel jaar behandelt u patiënten met chronische musculoskeletale klachten?...

7.2 MEASURING ILLNESS PERCEPTIONS

In this appendix, other questionnaires than the IPQ-R, are mentioned that try to measure illness beliefs, but are not directly derived from the CSM, nor cover the whole width of the concept of "illness perceptions" (Figure 7-1). It is not the intention to be exhaustive, given the extensive number of questionnaires. It is, however, the intention to highlight some frequently used questionnaires to measure illness perceptions in patients (not coping strategies).

Figure 7-1 adapted from Common Sense model of Self-regulation (Leventhal et al. 1984)
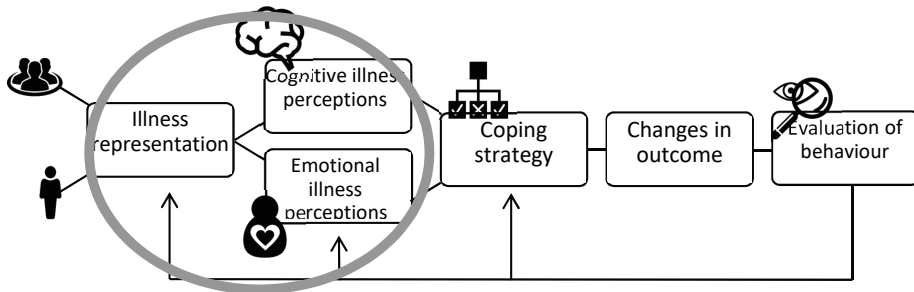
Illness Behaviour Questionnaire (IBQ) [1]: A generic dichotomous questionnaire lying on the line between illness perceptions (mostly emotional representations) and coping strategies. It has 7 dimensions: general hypochondria, disease conviction, psychological versus somatic perception of the disease, affective inhibition, affective disturbance, denial and irritability.

Fear avoidance beliefs questionnaire (FABQ) [2]: A questionnaire that targets patient's fear-avoidance beliefs on how physical activity (5 questions) and work (11 questions) affect and contribute to their (low back) pain. It is scored on a 6-point Likert scale [2]. The questionnaire focusses mainly on cognitive representations. Fear avoidance beliefs are perceptions, but with a specific and direct link to behaviour [3,4].

Tampa Scale of Kinesiophobia (TSK) [5]: A 17-item questionnaire based on evaluation of pain-related fear and fear avoidance. It is scored on a 4-point Likert scale. The short version with 11 items is also considered valid and reliable [6]. It consists of an "Activity avoidance"

subscale and a "Somatic focus" subscale. Fear avoidance beliefs can be seen as a very specific part of illness perceptions.

The Survey of Pain Attitudes (SOPA) [7]: an instrument to assess (chronic pain) patients' attitudes and beliefs about pain. Patients indicate their level of agreement with 57 statements using a 5-point Likert scale. The SOPA consists of 7 scales, divided into 2 domains; The Adaptive Beliefs Domain (control scale, emotion scale) and the Maladaptive Beliefs Domain (disability, harm, medication, solicitude and medical cure scale). The SOPA-R (revised) [8] is a 35-item questionnaire and the SOPA-Brief has been developed, which contains 30 items [9].

Pain Beliefs Questionnaire (PBQ) [10]: A 20-item questionnaire covering beliefs about the cause and treatment of pain, with an "Organic Beliefs" subscale and a "Psychological Beliefs" subscale. This questionnaire has been revised into a Pediatric Pain Beliefs Questionnaire.

Pain beliefs and perceptions inventory (PBPI) [11,12]: The 3-factor inventory ("Pain as a mystery", "Time", "Self-blame") has been revised into a 4-factor inventory ("Pain as a Mystery", "Pain as a constancy", "Pain as permanent", "Self-blame"). Patients rate their degree of agreement with 16 statements using a 4-point Likert scale. This questionnaire is mainly focused on cognitive perceptions.

Beliefs about Pain Control Questionnaire (BPCQ) [13]: A 13-items questionnaire with 3 subscales measuring beliefs about internal or personal control of pain, about the controllability of pain by powerful others (for example doctors), and about the controllability by chance events.

Örebro Musculoskeletal Pain Questionnaire = Acute Low Back Pain Screening Questionnaire (ALBPSQ) [14]: a 24-item 'yellow flag' screening tool that tries to predict long-term disability and failure to return to work when completed in the first 4 to 12 weeks. It

involves, among others, some cognitive and emotional perceptions. Three items are covered orally, where the remaining 21 items are scored on a 10-point scale.

Back Beliefs Questionnaire (BBQ) [15]: a 14 item questionnaire to assess a patient's beliefs towards consequences (i.e. return to work) of low back trouble. Patients rate their agreement on a 5-point Likert scale. It consists of cognitive perceptions.

Back Pain Attitudes Questionnaire (Back-PAQ) [16]: It comprises a 34-item or 10-item questionnaire with 5 factors ("Psychological influences on recovery", "prognosis of back pain", "relationship between back pain and injury", "activity participation during back pain" and "vulnerability of the back") scored on a 5-point Likert scale. It assesses patients' cognitive perceptions.

The Pain and Impairment Relationship Scale (PAIRS) developed by Riley et al. specifically attempted to measure patients' beliefs about the relationship between pain and functional impairment [17].

Some specific, narrower questionnaires are the Pain Catastrophizing Scale[18], the Beliefs about Medication Questionnaire (BMQ)[19] and the (Chronic) Pain Self-efficacy Scale[20] for example. They assess a focused part of the patient's illness perceptions.
On the other hand, some questionnaires are much more extensive than merely measuring illness perceptions, but they have included some interesting statements on cognitive or emotional beliefs, for example the Roland Morris Disability Questionnaire[21,22] or 36-Short Form Health Survey[23,24].

7.3   MEASURING ATTITUDES AND BELIEFS

The **"Health care providers' pain and impairment relationship scale" (HC-PAIRS) [25]** is derived from the patient's "Pain and impairment relationship scale" (PAIRS) [17]. The original HC-PAIRS consists of 15 items in 4 dimensions: functional expectations, social expectations, need for cure and projected cognitions. The HC-PAIRS was modified into 13 items and retested on clinimetric properties following a factor analysis on a sample of Dutch therapists [26]. The internal consistency reliability measure improved after the modification. The modified HC-PAIRS [26] was found the strongest predictor of work and

activity recommendations, to be responsive to change [27]. Earlier, the HC-PAIRS showed already a correlation with the Tampa scale of Kinesiophobia (TSK) [5] and the Photographic series of daily activities (PHODA)[28]. It is this modified Dutch questionnaire that was used in chapter 4 and 5.

The **"Pain attitudes and beliefs scale for physiotherapists" (PABS-PT)[29]** assesses 2 possible orientations: the biomedical perspective (14 items PABS-BIOM) and the behavioural or biopsychosocial perspective (6 items PABS-PS). It consists of new statements, as well as statements coming from the TSK, BBQ and FABQ for patients. It was modified into a biomedical subscale with 10 items and a behavioural subscale with 9 items, which was used in the present studies. Items are scored on a 6-point Likert scale[30]. The internal consistency measure improved, but was still only 'satisfactory'.

In every sample in the present doctoral thesis, the PABS-PS scores were the least 'clear' or most difficult to explain in terms of results. Perhaps this 9-item questionnaire was too limited to establish strong differences, as it was the only included questionnaire to gain insight into the psychosocial beliefs of the physical therapists, whereas the PABS-BIOM was backed-up by the HC-PAIRS, both probing for a biomedical belief. Indeed, the results showed that these questionnaires were associated with each other in each sample. Looking at the clinimetrics of the PABS, the behavioural scale has a history of being less clear, since the original PABS-PS (internal consistency Cronbach's α 0.54)[29] has been revised in order to strengthen the behavioural subscale (Cronbach's α 0.68)[30]. The PABS was found to be associated with the TSK for HCPs, the BBQ and HC-PAIRS in anticipated directions and to be predictive of the PHODA[30].

The **Illness perceptions questionnaire-revised (IPQ-R)** [31] has been the base in some studies for more or less adaptations to fit the HCPs' population [32-34]. To our knowledge, this has not been used in HCPs concerning low back pain. In 2016 an adaptation was made to develop the IPQ-R HP (health care professionals) with 7 dimensions (without illness identity and the causal domain). The goal was to adapt the general IPQ-R to fit a healthcare professional, in order to make it possible to identify the gap between the patient's perspective and the HCP's perspective [35].

The **"Fear avoidance Beliefs Questionnaire" (FABQ)** [36] was very slightly adapted from the patient's version [2]. It consists of 11 items divided into 2 dimensions: physical activity and work and is rated on a 7-point Likert scale.

Attitudes to Back Pain Scale for musculoskeletal practitioners (ABS-mp)[37] was designed especially for clinicians with a specialization in musculoskeletal therapy to examine the impact of practitioners' attitudes on clinical practice, training needs and outcome. Notice that the word "attitudes" is used here, whereas we use the word "beliefs". All 19 items are scored on a 7-point Likert scale. The questionnaire consists of 2 domains:

- Personal interaction: 13 statements on limitation on sessions, psychological state of the patient, connection to the health care system and clinical limitations and confidence.
- Treatment orientation: 6 items on re-activation and biomedical items.

The **"Fear avoidance tool"** [38] consists of items adapted from patient's fear avoidance questionnaires. The statements are rated on a 6-point scale. Naturally, it covers only 1 aspect of the HCPs' beliefs, namely fear avoidance.

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(C)LBP	(Chronic) Low back pain
YLD	Years lived with disability
DALY	Disability adjusted life years
ICF	International classification of functioning
HCP(s)	Health care practitioner(s)
KCE	Federaal kenniscentrum voor de gezondheidszorg
NICE	National institute for health and care excellence
HBO	Hoger beroepsonderwijs
WO	Wetenschappelijk onderwijs
IPQ(-R)	Illness perception questionnaire (-revised)
PT(s)	Physical therapist(s)
PABS-BIOM	Pain attitudes and beliefs scale – biomedical subscale
PABS-PS	Pain attitudes and beliefs scale – psychosocial subscale
HC-PAIRS	Health care providers' pain and impairment relationship scale

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Tot slot, Benny, Simon en Sam. Mijn man en 2 schatten van kinderen. Simon is geboren bij de start van mijn doctoraat. De eerste keer mama worden en een doctoraat starten, laten we zeggen dat ik het allemaal niet al te best kon inschatten toen, wat dat zou betekenen. Maar wat ben ik trots op jou, Simon. Met het grootste gemak dans jij door je schoolcarrière en al je hobby's heen. Graag gezien door iedereen en altijd aandachtig voor de gevoelens van anderen. Ik ben benieuwd waar het je naartoe brengt, maar ik ben er zeker van dat jij alles aankan als je er maar zelf in gelooft. Sam, ons mopje, die graag een prinses wil worden die ook mama én juf én ballerina is. Wel, lieve schat, dit idee heeft me gesterkt de laatste jaren: dat ik probeer om een voorbeeld voor je te zijn dat je inderdaad mag zijn wie je wil zijn. Dat je niet een deel van jezelf moet wegcijferen of een bepaalde rol moet opgeven en dat je je niet moet laten tegenhouden door wat of wie dan ook. Jij bent zacht en toch fel. Jong, maar ook wijs. Klein, maar zo dapper. Blijf vooral in je dromen geloven, sterke meid. En zo kom ik bij Benny. Bedankt om met mij mee te gaan: soms te snel, soms te traag, zelden op exact het juiste tempo. Maar dat maakt het interessant. Bedankt om geduld met mij te hebben en me vrij te laten om mijzelf te zijn, elke denkbare kant van de rusteloze veelhoek die ik ben. We hebben de laatste weken weer veel geleerd en ik ben oprecht trots dat we elkaar nog elke dag beter leren kennen en begrijpen. Als je omkijkt, dan hebben we een ongelofelijke weg afgelegd, dus bedankt om die achtbaan samen met mij aan te gaan.