The challenge of low back pain management: strategies to transpose scientific knowledge in clinical practice

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Abstract

Low back pain (LBP) is a very common symptom present in all populations, and it is the first cause of years lived with disability worldwide. Despite the tremendous evolution of the scientific knowledge regarding pain, the burden of this musculoskeletal disorder is projected to increase in the years to come. This major public health problem is a challenge and requires urgent efforts and initiatives.

Physiotherapists are first line actors in the evaluation and management of LBP. Sadly, there is evidence that physiotherapists don't follow guidelines for the management of LBP and have difficulties to evaluate patients using a bio-psycho-social framework. Moreover, attitudes and beliefs of HCPs could impact the prognosis of the patients by negatively influencing their cognition, emotions and coping strategies.

The main objective of this thesis was to develop and evaluate interventions to transpose scientific knowledge concerning a guideline-adherent approach to manage LBP in clinical practice. We developed and evaluated two different e-learning interventions to enhance the knowledge, attitudes and beliefs of physiotherapists managing patients with LBP.

The results showed that an experimental e-learning designed to be interactive and to give concrete examples on how to practically integrate content of the guidelines, such as efficient communication to reassure the patient and the importance of screening psycho-social factors led to a significant improvement in attitudes, beliefs and recommendations concerning return to work in physiotherapists in comparison to a traditional online lecture.

Enhancing attitudes and beliefs, as well as clinical behavior, of physiotherapists is still an enormous challenge. It is crucial to continue to evaluate strategies to target this problematic. The ultimate goal is to have first-line practitioners able to manage patients on the basis of evolving scientific knowledge, to meet the challenge of low back pain and offer patients the best available treatments.

Beknopte samenvatting

Lage rugpijn (LRP) is zeer veelvoorkomend symptoom in alle bevolkingsgroepen en het is de belangrijkste oorzaak jaren geleefd met een functionele beperking wereldwijd. Ondanks de enorme evolutie van de wetenschappelijke kennis met betrekking tot pijn, wordt verwacht dat de last van deze musculoskeletale aandoening in de komende jaren zal toenemen. Dit aanzienlijk volksgezondheidsprobleem is een uitdaging en vereist dringende inspanningen en initiatieven.

Kinesitherapeuten zijn eerstelijns zorgverleners in het evalueren en behandeling van LRP. Helaas zijn er aanwijzingen dat kinesitherapeuten de klinische richtlijnen voor de behandeling van LRP niet volgen en moeite hebben om patiënten te evalueren met behulp van het biopsychosociaal kader. Bovendien kunnen attitudes en overtuigingen van zorgverleners de prognose van patiënten beïnvloeden door hun cognitie, emoties en copingstrategieën negatief te beïnvloeden.

Het hoofddoel van deze thesis was om interventies te ontwikkelen en te evalueren die wetenschappelijke kennis, met betrekking tot een richtlijnconforme aanpak van LRP, overbrengen naar de klinische praktijk. We hebben twee verschillende e-learning interventies ontwikkeld en geëvalueerd om de kennis, attitudes en overtuigingen van kinesitherapeuten die patiënten met LRP behandelen te vergroten. De resultaten toonden aan dat een experimentele e-learning, ontworpen om interactief te zijn met concrete voorbeelden hoe de inhoud van de richtlijnen praktisch geïntegreerd kunnen worden (zoals efficiënte communicatie om de patiënt gerust te stellen en het belang van het screenen van psychosociale factoren), leidde tot een significante verbetering in attitudes, overtuigingen en aanbevelingen met betrekking tot terugkeer naar het werk bij kinesitherapeuten in vergelijking met de traditionele online lezing.

Het verbeteren van attitudes en overtuigingen, evenals klinisch gedrag, van kinesitherapeuten is nog steeds een enorme uitdaging. Het is cruciaal om verder te blijven gaan met het beoordelen van strategieën om dit probleem aan te

kaarten. Het uiteindelijke doel is om eerstelijns zorgverleners te hebben die in staat zijn om patiënten te behandelen op basis van de voortschrijdende wetenschappelijke kennis, om de uitdaging van lage rugpijn aan te gaan en patiënten de best beschikbare behandelingen aan te bieden.

Contents

Preface

The motivation to start a PhD came from my clinical experience with patients and their stories. For this reason, I would like to introduce the reader to one of these. This patient had an acute episode of low back pain and visited a healthcare practitioner (HCP). After several physical tests the HCP told the patient that it was incredible she was still able to walk and that her pain was normal, based on what was visible on medical imaging. The HCP added that she would need a wheelchair in the near future and that she should prepare herself, for example by being very careful when rotating the spine to avoid luxation of a lumbar vertebrae.

The patient described her return home with the following sentence:

"*I felt so angry and stressed at the same time. I had the feeling my doctor considered me as an object. I refused to believe my future would be as described by this HCP, but at the same time I was so afraid to move or hurt myself. My pain increased after the appointment. I was lost and did not know what to do. I am very cautious now and stopped rotating my spine.*"

This patients' experience is just one example of many reflecting the widespread myth related to structural fragility of the spine, particularly in people suffering from low back pain.

The experience of this patient drove my motivation as a physiotherapist to dive into this new role of researcher, to bring solutions to enhance the management of patient care in healthcare.

Chapter 1

Introduction

1.1 Low back pain, an individual and societal challenge

LBP is a common symptom that can result from different known or unknown abnormalities or diseases. It is defined by pain localization (between the lower rib margins and the buttock creases) and is sometimes associated with pain in one or both legs with or without neurological symptoms [1, 2]. The mean prevalence is higher in high-income countries than low- and middle-income countries [3].

This neuromusculoskeletal disorder is the first cause of years lived with disability worldwide [1, 3] and the most common reason for certified sick leave in Europe [1, 4], illustrating the important societal impact of LBP, as it is mainly prevalent in the active (i.e. working) population. Moreover, despite the importance of early return to work for a positive prognosis of LBP, tailored return to work system is often not in place or dependent of the HCPs and willingness of the employer [1]. It was shown that 20% of people with acute low back pain will develop persistent symptoms [1]. It was concluded from a review of qualitative studies that people living with LBP reduce or do not achieve their social expectations and that clinicians should consider social factors in their outcome measures [5]. In high-income countries it is suspected that the current healthcare approaches to manage LBP contribute to the overall burden and cost rather than reducing it [6]. Despite the increasing body of evidence to support appropriate management of LBP, disability and costs are projected to increase in the future [3]. It is forecasted that in 2050 that more than 800 million people will suffer from LBP

worldwide [7].

In the majority of LBP patients, it is not possible to identify a single patho-anatomical cause. These patients are classified as "non-specific LBP". Some potential nociceptive sources could be suspected, such as intervertebral discs, facet joints or vertebral endplates but it not possible to accurately define which potential structure is involved in the pain experience. Indeed, clinical tests are unable to accurately identify the tissue source of most non-specific LBP. Moreover, it would not change the conservative treatment approaches recommended in first-line care for these patients. In fact, patients' pain cognitions, beliefs and emotions are major factors contributing to the development of persistent and disabling chronic LBP.

This illustrates the need of an adapted model of care integrating the multifactorial contributors to persistent and disabling LBP, such as the bio-psycho-social model [8] (more information at the end of the introduction chapter "The rise of the biopsychosocial model"). This model was described in the early 80's but there are still barriers to its implementation. Often, the psycho-social aspect of this model is under evaluated and under managed [9, 10]. The scientific knowledge related to LBP management has shifted towards a better integration of these factors in the treatment, such as positively impact patient's beliefs and behaviors. This is why evaluation and management of psychosocial factors are fundamental to take care of patients with LBP.

The current challenge is to transpose this scientific knowledge in clear and practical clinical recommendations that could be used by HCPs to manage patients with LBP in the most effective way.

1.2 Low back pain, a challenge for healthcare practitioners

To assist clinicians in their management and treatment, clinical guidelines for the management of LBP were developed [11, 12]. These guidelines promote the bio-psycho-social model for patient's management with initial non-pharmacological treatment, evaluation of psycho-social factors, empowering self-management, reassurance and promotion of movement (see Figure A.1 in Chapter A for a visual summary of the guidelines).

The first step of the recommendations - focusing on the "bio" - is the diagnostic triage. This consists of identifying the potential presence of a specific spinal pathology causing LBP (e.g., fracture, tumor, or infection). Despite the low occurrence of these specific spinal pathologies ($< 1\%$) it is an important skill

for first-line clinicians to be able to suspect these pathologies based on alarm signals or red flags [13]. However, the sensitivity and specificity of these red flags is low. In addition, clinical guidelines are not clear or lack information about which red flags or group of red flags should be evaluated, leading to differences between clinical guidelines. This might lead to uncertainty in the clinical decisions: suspicion of a specific spinal pathology when it's not -causing unnecessary fear - or false reassurance when there is a serious pathology [14].

As said previously, in 90% of people with LBP, it is not possible to identify a patho-anatomical origin of the pain and these patients are classified with "non-specific" LBP [1]. To favor optimal management of these patients it is recommended to evaluate their psycho-social factors – also called yellow flags – as they are known to be risk factors for persistent or chronic pain. This includes the evaluation of the perspectives of the patient such as their beliefs, cognition and emotions concerning their symptoms. Previous research showed that clinician lacked skills to assess these factors or underestimate their importance [9, 10, 15].

Besides possible uncertainty to exclude a specific underlying pathology (because of low sensitivity and specificity of red flags) and lack of skills to assess psychosocial risk factors, also inadequate knowledge of clinical guidelines probably contribute to the lack of their implementation. In a recent call for actions, Buchbinder and colleagues urged researchers to identify and implement effective solutions to reduce low value – and extremely costly – care and improve guideline-consistent care for LBP [16]. More specifically, two of the proposed actions were to "determine how best to put existing knowledge and evidence to use" and "[...] widespread and inaccurate beliefs about LBP among [...] healthcare professionals should be challenged" [16]. Hence there is a need to develop clinician-friendly tools aiming to favor guideline implementation in clinical practice.

Tools such as e-learning have been developed and evaluated on healthcare professionals [17–32], sometimes with better results than a traditional lecture [33]. However, the superiority of these e-learning in comparison with traditional learning remains unclear and could be similar. The key advantage of e-learning is the possibility to reach a large number of healthcare professionals at a limited cost and with the flexibility of time and location [17]. These intrinsic qualities could contribute to the widespread sharing and learning of low back pain guidelines among healthcare professionals.

E-learning interventions could be a cost-effective and practical tool to favor guidelines implementation and enhance knowledge, attitudes and beliefs of HCPs.

In this thesis, a pilot study was implemented to test the feasibility of an experimental e-learning intervention in physiotherapists.

1.3 The challenge of communication and the use of adequate terminology in the management of low back pain

Another challenge in the evaluation and management of patients with LBP relates to the used terminology and the communication toward the patient. In some patients the pain radiates from the lower back into the leg, often called "low back related leg pain". However, a plethora of terms exists to describe low back related leg pain such as "sciatica", "radicular syndrome", "pseudoradicular" pain or "neurogenic pain". The use of these terms can be confusing. Often, patients with low back related leg pain fear that a lesion or disease of the nervous system is present (neuropathic pain). But in the majority of the patients with low back related leg pain, this can be caused by somatic non-nervous structures such as muscles or joints (classified as nociceptive pain and not neuropathic pain). The confusion about the origin of the low back related leg pain might have negative impact on the patient, such as worrying, but also on the treatment, such as providing inappropriate advice.

Overall, it is essential to acknowledge the challenges of LBP evaluation and use clear and precise terminology to promote optimal patient care.

Terminology related to LBP management is confusing. In this thesis, an editorial paper based on the latest scientific evidence and proposing concrete tools to differentiate the predominant pain mechanism in low back related leg pain was published to help HCPs and teachers in practice.

1.4 Low back pain, the challenge of a non-specific diagnosis

The difficulty in patients with non-specific LBP is that the pain is labeled as "medically unexplained", which is perceived by patients as pain "without any causes" [34]. The latter is not the case since the pain in these patients is explained by a combination of different factors (biological, psychological and social).

Despite the available evidence and recommendations to use the bio-psycho-social model to manage LBP, many HCPs still treat their patients in a biomedical model, which is inconsistent with the guidelines. The biomedical model was the dominant vision in healthcare until the 80's. It assumes that a pathology correspond to a deviation of the norm of measurable biological variables [8]. The biomedical model focused on the pathology and failed to propose a patient-centered treatment which includes patients' perspective, shared-decision making, and adapted communication to reinforce therapeutic alliance [35].

A contemporary example is the current management integrating an overuse of medical imaging – to highlight deviations of the norm – in a vast majority of LBP patients [36]. It is known that receiving medical imaging in case of non-specific LBP increases healthcare utilization (e.g., future surgery), creates higher medical costs and increases absence from work [36, 37]. Moreover, imaging reports could provoke anxiety and favor misconceptions in patients leading to beliefs that their spine is damaged or vulnerable [36, 38].

This research of biological deviations to explain non-specific LBP reflects a larger problem: the myth of structural fragility of the back. Messages related to fragility are seen in medias, information website, advertising, preventive campaigns in companies and even in medical education [39–42]. These messages promote caution, avoidance of "wrong" movement, limitation of activity participation and protection of the back. Unfortunately, these messages are associated with the beliefs of many HCPs who continue to promote the myth of structural fragility.

1.5 The challenge of knowledge and beliefs about pain

The fact that knowledge, attitudes and beliefs of HCPs managing LBP are inadequate was highlighted in many publications [43–49]. HCPs' beliefs were associated with clinical recommendations to avoid movements, protect the back and a management based primarily on passive treatment strategies, which are guideline-inconsistent [48]. Moreover, it seems that HCPs' attitudes and beliefs impact those of their patients [50]. The messages from HCPs negatively influence their patient's understanding, reinforcing patient's perception that their back is vulnerable and in need of protection [51]. This is a major problem because these beliefs impact the patient's own psychosocial factors. The patient's psychosocial factors include cognitive, emotional and behavioral dimensions. After a consult with an HCPs, a patient could think her/his back is damaged (cognition), feeling sad (emotion), and stop to participate in some activities (behavior). These

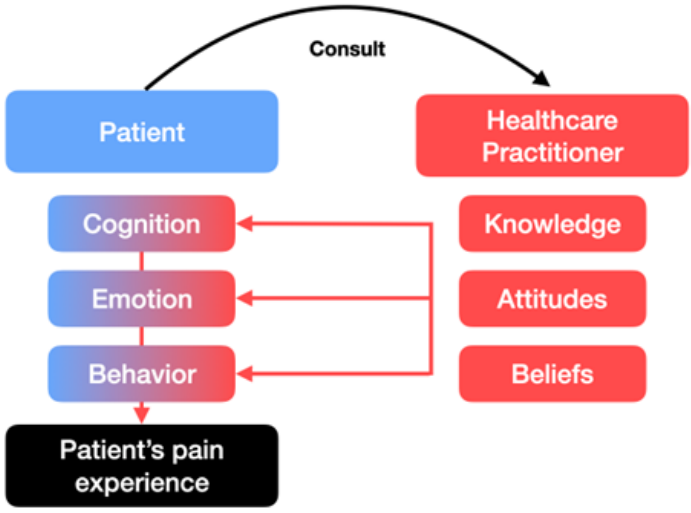

Figure 1.1: The association of the knowledge, attitudes and beliefs of HCPs with the patient's psycho-social factors and pain experience.

negative psycho-social factors are known to participate to symptoms persistence and favor a negative prognosis for patients. Moreover, it was shown that the pain experience and intensity rely on context, meaning these messages from HCPs could reinforce patient's pain intensity [52–55].

An interaction with a patient is an important opportunity to positively influence their beliefs, but has also the potential to influence them negatively [40]. Hence, HCPs should be aware of their own knowledge, attitudes and beliefs, but also those of their patients, because those influence their treatment and prognosis.

This is why the evaluation and improvement of physiotherapists' knowledge, attitudes and beliefs was the main objective of this thesis, as they have an impact on what the patient thinks, and therefore on its pain experience and prognosis.

Data is lacking concerning which messages are likely to reinforce adequate knowledge, attitudes and beliefs of physiotherapists. In this thesis, a randomized-controlled trial was used to compare the impact of two e-learning interventions on the knowledge, attitudes and beliefs of physiotherapists. Both e-learning were based on the guidelines for the management of LBP and presented the same themes with a different emphasis on the content explored and the design.

The rise of the biopsychosocial model

"All medicine is in crisis."

These few words were written in a paper by George Engel in 1977. At that time, the model of care was based on "disease" in terms of somatic parameters. The disease was systematically believed to be caused by a deviation from the norm of measurable biological variables. Moreover, it meant that psychological, social and behavioral factors were not integrated in the reasoning and management of physicians. This reductionism model is named the biomedical model. Despite the evolution of scientific knowledge, this model of care was a well-established dogma for different reasons such as economic interests [8]. Sadly, this model is still around in healthcare today.

The biomedical model is limited to explain many conditions. Patients living with persistent pain were (and are still often) labelled "patient with imaginary pain". Often in these patients it is not possible to highlight precise somatic parameters causing the pain experience. It leaves the patient confused and stigmatized. That's why Engel described a new model of health and illness applicable to all fields in medicine: the bio-psycho-social model. Pain is a complex phenomenon and many factors contribute to patient's pain experience [56].

Later, this model was proposed for the evaluation and treatment of low back pain and made his entrance in the sphere of the management of neuromusculoskeletal conditions [57]. The model is relevant at all the stages and promotes consideration and evaluation of biological, psychological and social determinants of patient's health [8, 35, 57].

Despite this recommended holistic approach, the model has some limitations. Clinicians are not guided on which specific features of each domain should be evaluated. The clinician is free to choose from various tests or tools, with risk of bias [57]. Moreover, guidelines for the management of LBP promote the use of this model but clinicians are often too much bio-oriented or psycho-social oriented.

To propose a tailored management to each individual patient, clinicians should encompass correctly all the aspect of the model which is still a major challenge today.

"In a free society, outcome will depend upon those who have the courage to try new paths and the wisdom to provide the necessary support" – Engel 1977"[8]

Objectives

Despite the evolution of scientific knowledge on the management of LBP, there is a major gap with the current management in clinical practice. Clinical guidelines for the management of LBP are available but not widely implemented. Urgent calls were made in several scientific publications to develop and test cost-effective interventions to transpose scientific knowledge in clinical practice and challenge attitudes and beliefs of physiotherapists managing LBP.

The general aim of this thesis is to improve knowledge, attitudes and beliefs of physiotherapists managing LBP and propose cost-effective interventions (e-learning) to achieve this.

These are the specific objectives of this thesis:

Aim 1: To clarify and describe the terminology related to the underlying pain mechanism of low back related leg pain and help clinicians differentiate these mechanisms by using clinical based scenarios (Chapter II).

This editorial paper described the challenges in the evaluation of low back related leg pain and gave concrete examples to help clinicians in practice.

Aim 2: To develop an interactive e-learning intervention concerning the management of LBP and to evaluate the feasibility of its implementation in HCPs (Chapter III).

It was hypothesized that this e-learning intervention would be feasible in HCPs but that some themes could be improved to increase adhesion of practitioners.

Aim 3: To examine the current knowledge, attitudes and beliefs of physiotherapists about a guideline-adherent approach to LBP and to assess the ability of physiotherapists to recognize signs of a specific LBP (Chapter IV).

It was hypothesized that a majority of physiotherapists are not familiar with guidelines related to LBP management.

Aim 4: To develop two different e-learning interventions based on (inter)national guidelines for the management of LBP and evaluate their effectiveness to improve the knowledge, attitudes and beliefs of physiotherapists (Chapter V).

It was hypothesized that the experimental e-learning intervention would be more efficient to enhance knowledge, attitudes and beliefs than a traditional one.

Chapter 2

Challenges of clinical reasoning concerning low-back related leg pain

Low-back related leg pain: is the nerve guilty? How to differentiate the underlying pain mechanism.†

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Abstract

Low back pain (LBP) that radiates to the leg is not always related to a lesion or a disease of the nervous system (neuropathic pain): it might be nociceptive (referred) pain. Unfortunately, patients with low-back related leg pain are often given a variety of diagnoses (e.g. "sciatica"; "radicular pain"; pseudoradicular pain"). This terminology causes confusion and challenges clinical reasoning. It is essential for clinicians to understand and recognize predominant pain mechanisms. This paper describes pain mechanisms related to low back-related leg pain and helps differentiate these mechanisms in practice using clinical based scenarios. We illustrate this by using two clinical scenarios including patients with the same symptoms in terms of pain localization (i.e. low-back related leg pain) but with different underlying pain mechanisms (i.e. nociceptive versus neuropathic pain).

†This chapter is, with minor adaptations, a copy of the following article: Fourré, A., Monnier, F., Ris, L., Telliez, F., Michielsen, J., Roussel, N., & Hage, R. (2023). Low-back related leg pain: is the nerve guilty? How to differentiate the underlying pain mechanism. *Journal of Manual & Manipulative Therapy*, 31(2), 57-63.

2.1 Introduction

Patients with low back pain (LBP) commonly experience pain that radiates to the leg. Approximately two-thirds of patients consulted for LBP in primary and secondary care have associated leg pain [58, 59]. Healthcare Professionals (HCPs) often use terms such as “sciatica”, “radiculopathy”, “radicular pain”, “pseudo-radicular pain” and “referred pain” to refer to these symptoms [60–65]. However, a similar clinical picture may have different and overlapping underlying pain mechanisms (see Figure 2.1) [66]. This variety in terminology and overlap in pain mechanisms is not only confusing for patients and HCPs, but it also makes the process of clinical reasoning more challenging and complicated. The aims of this paper are therefore to (1) clarify and describe the underlying pain mechanisms as defined by the International Association of the Study of Pain (IASP) [58] and (2) help clinicians differentiate the predominant pain mechanism by using clinical scenarios.

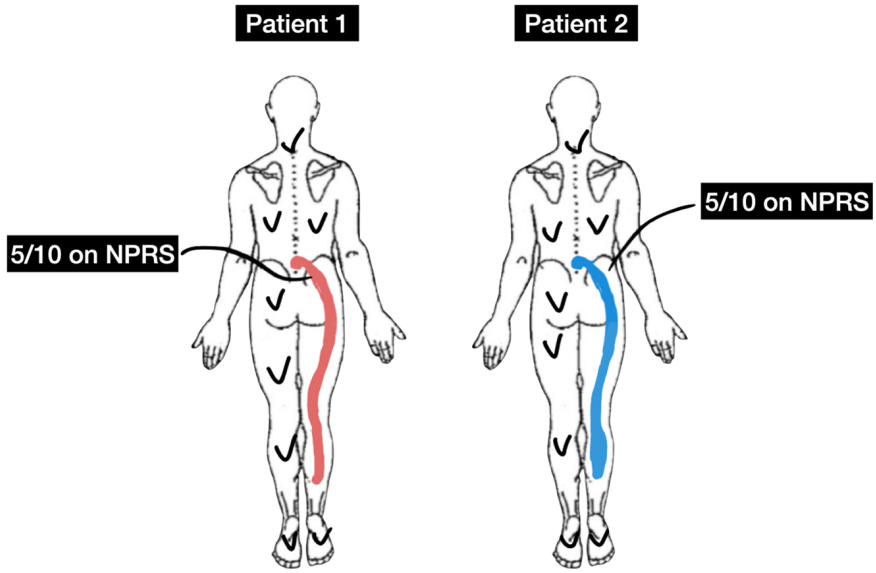

Figure 2.1: Description of two body-charts.
Patient 1 & patient 2: These patients describe similar pain topography, localized in the lower back and irradiating in the buttock and the leg. The present pain intensity for both patients is 5/10 on the numeric pain rating scale (NPRS).

2.2 Definition of Nociceptive and Neuropathic Pain

While the pain experience is extremely common, there is no scientific consensus to define this pain experience. This is not surprising, given the complexity of pain and the multiple influencing factors. However, the authors used the terminology from the IASP to describe underlying pain mechanisms. This organization proposed distinct pain definitions to differentiate nociceptive and neuropathic pain [67]. Both types of pain mechanisms can explain low-back related leg pain.

2.2.1 Nociceptive Pain

Nociceptive pain is defined by the IASP as "pain that arises from actual or threatened damage to non-neural tissue and is due to the activation of nociceptors. Nociceptors are triggered by mechanical, chemical, or thermal stimuli arising from all innervated structures" [68, 69].

Nociceptive LBP stimulation of lumbar spine innervated structures (e.g the zygapophyseal joints, spinal ligaments or muscles, or the outer part of the lumbar disc) can induce the transduction of a noxious stimulus into an electric signal in the nervous system. This signal, often referred to as an warning signal, will be processed in the central nervous system with significant brain excitements [70] and can lead to pain [62, 71, 72]. In the case of nociceptive pain, the somatosensory nervous system functions normally [73].

In some patients, the pain is also felt in the leg, from a region that is topographically different from the source of nociception [64]. This phenomenon is considered as referred pain and might be explained by the convergence of nociceptive afferents on second-order neurons. Most often, the pain is perceived in regions that have the same segmental innervation. Moreover nociceptive referred pain can also extend as far as the foot in some cases [62].

2.2.2 Neuropathic Pain

The IASP defines neuropathic pain as "pain caused by a lesion or a disease of the somatosensory nervous system" [69, 74].

Neuropathic pain is a syndrome caused by various diseases or lesions. The most common cause of neuropathic pain in patients with LBP is related to compression of neural structures (e.g. disc herniation) leading to inflammation

or degeneration of nerve fibers [75–77]. The nervous system is affected by the generation of ectopic discharges that bypass transduction [66]. These disturbances may affect the nerve function resulting in sensory and motor deficits.

These patients often report that the pain in the leg is lancinating and radiates downwards in a specific root distribution [78]. The pain in the leg is usually worse than the pain in the back [78].

2.3 How to differentiate Nociceptive Referred Pain and Neuropathic Pain

It is crucial for clinicians to determine which mechanism is predominant in the buttock and/or leg. Failure to differentiate mechanisms of radiating pain in the assessment of LBP patients leads to inappropriate investigations and treatment [75, 79]. Pain in the leg does not always imply a lesion or disease of the nerve roots or the peripheral nervous system [80–82]. Predominant nociceptive or neuropathic pain management differs from patient to patient [83]. The next part will thus detail how to distinguish between these pain mechanisms.

Differentiating predominant neuropathic pain from nociceptive referred pain is a clinical challenge. While there is currently a paucity of standardization in the diagnosis, neuropathic pain is commonly identified on the basis of clinical criteria [84, 85]. Quantitative sensory testing (QST) could be a useful tool, but it is mainly used in research studies [84]. It consists of several tests designed to quantify somatosensory function (gain or loss) in individuals, but is not sufficient alone for the diagnosis of neuropathic pain [86, 87]. QST is not widely implemented by first-line practitioners, such as physiotherapists, for several reasons: it is time-consuming, extremely costly and there is a lack of standards in utilization and interpretation [87]. The diagnosis of neuropathic pain in first-line care is difficult to establish but some elements from the patient's history can suggest the presence or absence of neuropathic pain. None of them are pathognomonic, but clustering history elements from subjective and objective examination is the best way to reduce the risk of a wrong diagnosis [88]. Clinicians should primarily base their diagnostic strategy on predominant pain mechanism identification. The next part of this narrative review will cover the theoretical aspect of a subjective (SE) and objective (OE) examination, accompanied with a clinical assessment from the patients presented in Figure 2.1.

2.3.1 Subjective Examination (SE)

The symptoms described by the patient are the first step in theorizing the predominant pain mechanism. Listening to the patients is important in the differentiation process, as the words used by the patients to describe their pain will be variable between patients with neuropathic and nociceptive pain [84]. Figure 2.2 lists the most common clinical descriptions of neuropathic and nociceptive pain expressed by patients.

Neuropathic pain is generally referred in a dermatomal or cutaneous distribution [89]. The most common descriptors used by patients are burning, lancinating, and is accompanied by unusual tingling, crawling, or an electrical shock or shooting in the leg [66, 83, 84]. The description of a patient with neuropathic pain is often characterized by specific neurological symptoms, such as positive (hyperalgesia and/or allodynia) and negative (loss of function) sensory signs [73, 90]. The patient may experience various sensations, such as paresthesia, mechanical or thermal hypersensitivity. Neuropathic pain is also characterized by spontaneous (arise without stimulation), evoked (abnormal responses to stimuli) or paroxysmal (sudden recurrences and intensification) pain [89, 91].

These symptoms contrast with the description of patients suffering from nociceptive (referred) pain. Pain is usually localized to the area of injury/dysfunction (with or without referred pain) [89]. The symptoms are commonly described as intermittent and sharp with movement. The pain is proportional and in direct relation to pain and easing/aggravating factors [89].

To further refine the reasoning in the SE, a number of self-completion questionnaires with, or without, limited clinical examination (e.g., DN4, LANSS, PDQ) [84, 91–93] have been developed to detect the presence of neuropathic pain, each with condition-specific discriminatory characteristics [94]. The “Douleur Neuropathique en 4 questions” (DN4) questionnaire (sensitivity 0,83; specificity 0,9) has been developed to differentiate neuropathic pain from nociceptive pain and seems to have specific discriminative features for low back pain [95]. The questionnaire is short, containing only 10 items, which gives a score, if greater than or equal to 4, indicates the probable presence of neuropathic pain. Seven items are used as a self-report questionnaire of sensory descriptors and 3 items are scored based on the OE. The speed and ease of administration of a questionnaire such as the DN4 make it a valuable complementary tool for clinicians. However, questionnaires should not replace a detailed subjective and objective examination. Although many screening tools have good sensitivity and specificity, they reportedly fail to diagnose 10 - 20% of patients diagnosed with neuropathic pain [94].

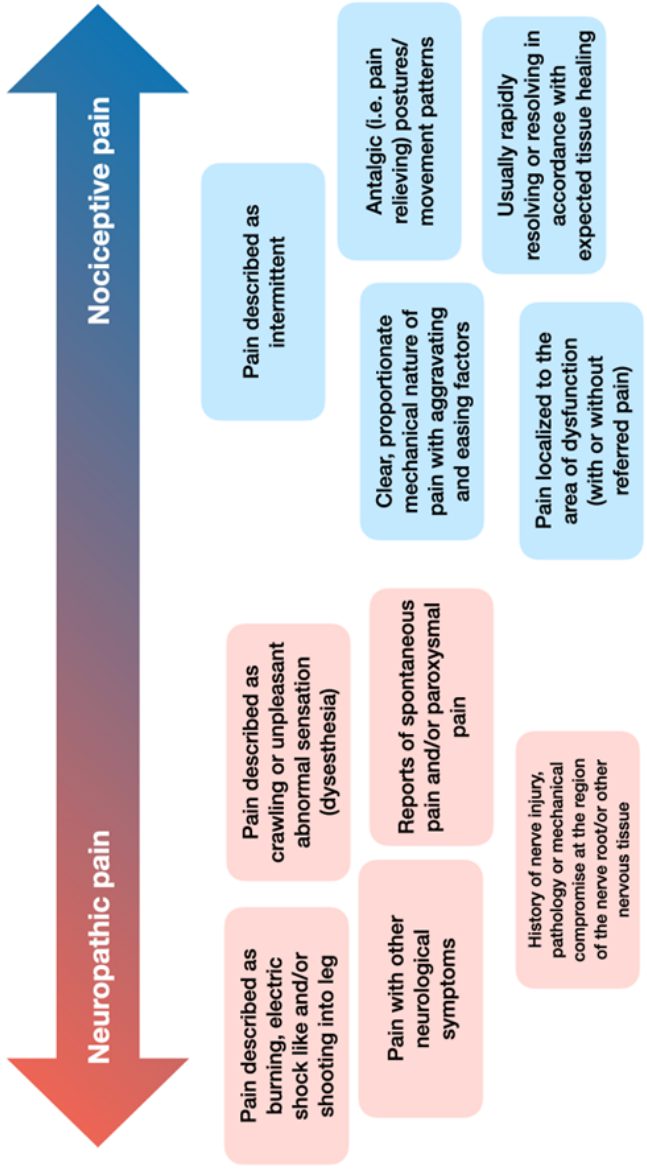

Figure 2.2: Consensus of clinical descriptors for neuropathic and nociceptive pain based on Mistry et al., 2020 [96] and Smart et al., 2011 [97].

Interpretation of the Clinical Scenario

When asking patient 1 about the symptoms quality, the patient mentions pain in the buttock that radiates in the leg associated with painless sensations, such as burning, tingling and pins and needles in the calf. The patient further specifies that these sensations tend to increase when pain increases in the buttock. Concerning the aggravating or easing factors the patient explains that pain is aggravated when getting out of the car with their neck bent. The patient also notices that the pain is easily provoked and takes longer to decrease. The pain is described as "unpredictable" and may reappear spontaneously. The presence of positive neurological signs, the description of symptoms, and the fact that patient 1 describes the pain as unpredictable supports the hypothesis of predominant neuropathic pain [98].

When asking patient 2 about the quality of symptoms, the patient mentions pain mainly localized in the buttock but radiating in the leg to the calf. The pain is described as sharp and dull. Concerning the aggravating or easing factors, the pain worsens in all sitting positions with lumbar flexion. The pain increases in the transition from sitting to standing or standing to sitting. Patient 2 noticed that the intensity of pain quickly decreased in general and especially if lumbar flexion is avoided (e.g. when resting on the couch in a lying position). The presence of clear and proportionate symptoms, associated with aggravating and easing factors, and the fact that patient 2 does not describe any neurological positive or negative symptoms support the hypothesis of predominant nociceptive mechanism [89]. Although the subjective evaluations of patient 1 and patient 2 provide useful information to help define the underlying predominant pain mechanism, it is obvious that this is not sufficient to draw a definite conclusion regarding the pain mechanism. OE elements, such as neurological and neurodynamic testing, are necessary to further refine the hypothesis established during SE and lead clinicians to a differential diagnosis.

2.3.2 Objective Examination (OE)

A complete OE is carried out with observation, examination of active movements and examination of passive physiological and accessory movements. If a neuropathic pain mechanism is suspected, clinicians should conduct OE with caution and include a neurological evaluation of the patient's sensory, motor and autonomic functions to identify potential neurological dysfunction (including hypoesthesia and brushing testing from the DN4) [64]. In this instance, the neurological examination could highlight neuroanatomical pain distribution, positive and/or negative signs and symptoms (altered reflexes, sensation and

muscle power) [96]. The presence of hyperalgesia/allodynia and/or other sensory abnormalities could indicate the presence of neuropathic pain.

Moreover, a neurodynamic examination should be integrated in the OE to assess the nervous system mechano-sensitivity [99, 100]. A neurodynamic test is positive when at least reproducing the patient's symptoms and a change in these symptoms with a positive structural differentiation [101–103]. The most common lower limb test is the passive straight-leg raise test (SLR) [100]. The slump test is another neurodynamic test with a high sensitivity (0.9) to identify neuropathic pain in the lower limb [101]. It should be noted that, although most neurodynamic tests have good sensitivity, they generally have low specificity and should not be used independently [104]. However, it is possible to increase diagnostic accuracy by combining several neurodynamic tests [104, 105]. More research is needed to determine the most relevant combination of neurodynamic tests for detecting neuropathic pain in LBP.

If there is no evidence during neurological and neurodynamic examinations to suggest the presence of neuropathic pain and in presence of consistent and proportional symptoms, then the predominant mechanism is probably nociceptive (referred) pain [97].

Interpretation of the Clinical Scenario

Since the SE of patient 1 suggests a predominant neuropathic pain mechanism, the OE should include a thorough neurological and neurodynamic examination. During the neurological examination, the patient describes a loss of sensation to light touch in the right calf and foot, as well as hyperalgesia on pinprick in comparison with the left leg. Concerning the neurodynamic evaluation, given the pain experienced when the neck is bent, the slump test is well suited to assessing mechano-sensitivity. The test is positive in patient 1 with symptoms reproduction and a positive structural differentiation. Information from SE and OE of patient 1 suggests the presence of a predominant neuropathic pain mechanism.

Elements gathered from the SE of patient 2 suggest the presence of a predominant nociceptive pain mechanism. Giving the elements from the SE, an OE including active movements and passive physiological and accessory movements should be performed. During active movements, the pain of patient 2 increased when bending forward and the range of motion is limited. The pain decreased quickly when returning in the starting position. This pattern is similar during the physiological movements. The pain is reproduced in a precise location (L4-L5) with unilateral posterior-anterior mobilization and decreased quickly after.

Information from SE and OE of patient 2 suggests the presence of a predominant nociceptive pain mechanism. Even if a predominant neuropathic pain is not suspected, a neurological examination should be performed when a patient presents pain to confirm a normal function of the nervous system. Clinicians should remain attentive to any changes in symptomatology and perform further examinations if neuropathic components appear during the patient's follow-up appointment.

The OE in clinical practice is not described extensively in this paper as the main objective is to help clinicians differentiate between two predominant pain descriptors. The management of the patient should rely on a dynamic and patient-centered biopsychosocial (BPS) framework, including the different aspects of the International Classification of Functioning (ICF) model [57, 106].

2.3.3 Predominant Pain Mechanism

The elements of SE and the OE of patients 1 and 2 suggest the presence of a predominant neuropathic pain mechanism and nociceptive referred pain mechanism, respectively (see Figure 2.3). The clinical examples presented are rather clear and easy to differentiate. However, in clinical practice the differentiation between the two is not so easy and the clinical reasoning is sometimes very complex for patients with low back related leg pain. Clinical descriptors, signs and symptoms could be confusing and might overlap. Although distinction is essential for effective management, neuropathic and nociceptive pain have several features in common. Pure nociceptive pain and pure neuropathic pain may in fact be very rare in practice [60, 107, 108]. Both share the same neurotransmitters, ascending spinal pathways, supraspinal signal processing regions and descending modulatory pathways [66]. The traditional view that these two mechanisms are completely separate entities is questioned by some experts and may be due to our propensity to classify items. In most instances, it is probably a combination of the two mechanisms with, depending on the case, a neuropathic or nociceptive predominance. Clinicians should be aware that this predominance can change over time (see Figure 2.2) and assess the patient repeatedly over consecutive sessions.

2.4 Discussion and Conclusion

The aim of this paper was to discuss pain mechanisms underlying low back-related leg pain and help clinicians to differentiate these mechanisms in clinical practice. The distinction between neuropathic and nociceptive pain is essential

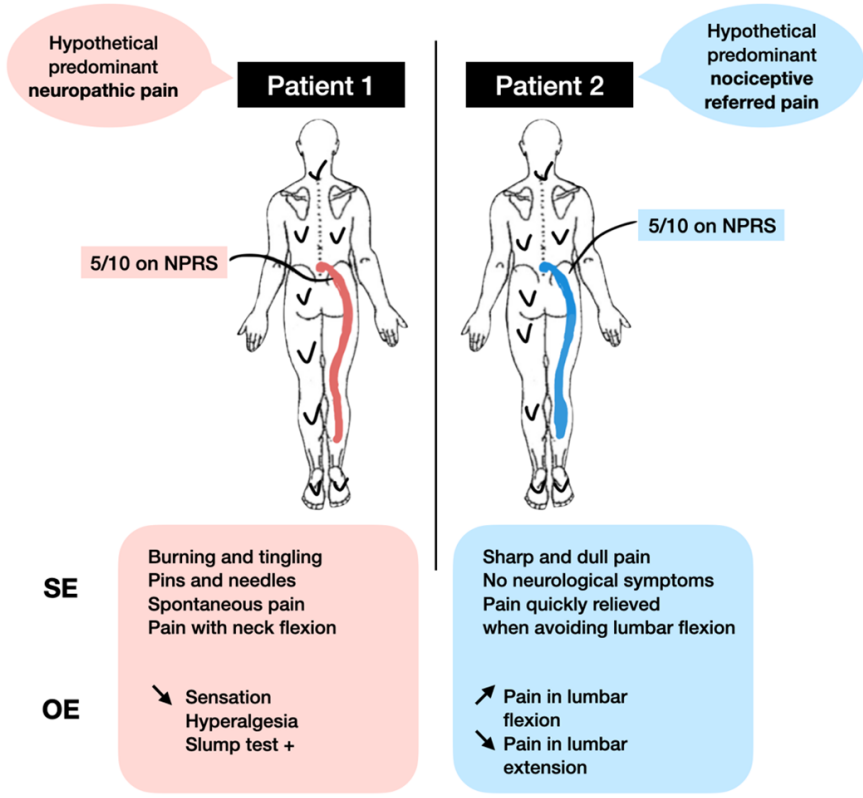

Figure 2.3: Body chart of patient 1 and patient 2 after a complete subjective and physical examination.

in establishing adapted and patient-centered management. If the clinician simply assesses the topography of the pain (e.g. irradiation in the buttock) these two pain mechanisms are easily confused and can lead to inappropriate investigations and management [62, 79]. While the symptoms topography could be similar, description and behavior of pain completed by a thorough objective examination should be used to differentiate the predominant pain mechanisms. However, the terminology used in the literature seems difficult to translate from research to clinical practice. Moreover, clinical practice is complex, and sometimes this differentiation seems too simplistic and insufficient for the patient's condition. These pain mechanisms should not be considered as distinct entities [66]. Overlap exists between these two pain descriptors and could explain the difficulties in implementing treatment based on mechanism

[66]. Some patients display predominantly nociceptive components but can simultaneously display symptoms suggesting a neuropathic component. A patient's condition is not fixed in time and should be assessed repeatedly in the follow-up with a combination of subjective and objective examination to decide the predominant underlying pain mechanism. This is clinically important because the prognosis of a patient with neuropathic pain is worse than a patient with nociceptive pain and should lead the clinician to an adapted management [59]. Hence the management of a patient with predominant neuropathic pain includes specific medication [109], adapted passive treatments [99, 103, 110], an appropriate dosage of exercises [111] and education about the function of the nervous system [103]. Moreover, the clinician must be aware of the potential changes in the patient's symptomatology to prevent the aggravation of a potential serious condition [14]. Further research is necessary to better define diagnosis, prognosis and pathways of patients with low-back related leg pain.

Chapter 3

Development and feasibility of an experimental e-learning intervention in healthcare professionals

An interactive e-learning module to promote bio-psycho-social management of low back pain in healthcare professionals: a pilot study.[†]

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Abstract

Low back pain (LBP) is ranked as the first musculoskeletal disorder considering years lived with disability worldwide. Despite numerous guidelines promoting a bio-psycho-social (BPS) approach in the management of patients with LBP, many health care professionals (HCPs) still manage LBP patients mainly from a biomedical point of view. The purpose of this pilot study was to evaluate the feasibility of implementing an interactive e-learning module on the management of LBP in HCPs. In total 22 HCPs evaluated the feasibility of the e-learning module with a questionnaire and open questions. Participants filled in the Back Pain Attitude Questionnaire (Back-PAQ) before and after completing the module to evaluate their attitudes and beliefs about LBP. The module was structured and easy to complete (91%) and met the expectations of the participants (86%). A majority agreed that the module improved their knowledge (69%). Some participants (77%) identified specific topics that might be discussed in more detail in the module. HCPs knowledge, beliefs and attitudes about LBP significantly improved following module completion ($t = -7.63, p < .001$) with a very large effect size ($d_s = -1.63$). The module seems promising to change knowledge, attitudes and beliefs of the participants. There is an urgent

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need to develop and investigate the effect of educational interventions to favor best practice in LBP management and this type of e-learning support could promote the transition from a biomedical to a bio-psycho-social management of LBP in HCPs.

3.1 Introduction

Low back pain (LBP) represents a major health issue worldwide and is one of the leading causes of disability [1, 112, 113]. In most cases the pain cannot be attributed to a specific underlying pathology, hence the term non-specific LBP [1, 114]. LBP is often defined as a multidimensional condition, involving biological, social and psychological factors. Despite the recommended biopsychosocial (BPS) approach in the management of patients with LBP [11, 115–117], many healthcare professionals (HCPs) still manage patients mainly from a biomedical point of view [115]. Their search for a biomedical explanation for LBP is reflected by overuse of medical imaging and medication [118], advice to restrict work and activities [50], and insufficient attention towards psychosocial risk factors during actual consultations [9], which is all guideline discordant. HCPs' beliefs and attitudes might influence patient's beliefs [119] and negatively affect their prognosis [120]. Interestingly HCPs can also have a positive influence on patient's beliefs. For example, explaining the multidimensional cause of pain, reassuring the patient about the prognosis, giving advice to stay active and return to work as fast as possible, will help the patient understand his condition and to better cope with it [40, 121–124]. A first step in the process of change is to make sure that HCPs' beliefs and attitudes are in line with the evidence-based guidelines.

Different interventions with as purpose to change HCPs' beliefs and attitudes have been carried out but with marginal effects only [24, 125–127]. These interventions most often consisted of passive e-learning modules, lectures and/or information brochures [24, 125–127]. One study asked HCPs to attend a traditional lecture regarding the BPS approach of LBP. After the study the patients did not perceive a difference in HCPs' clinical behavior [128]. This lack of effectiveness can be attributed to the fact that listening to a lecture or reading a brochure is a rather passive method, which seems not helpful to change the HCP's behavior. A change in used methodology to train the HCPs is needed. Growing evidence confirms the complexity of LBP which explains the disappointing progress of LBP research and defies researchers to think more broadly and creatively [129]. Active strategies seem necessary to change the behaviour of a professional and the used methodology should include interaction and feedback [130]. Using e-learning is an easy way to promote interactivity (e.g. questions with feedback), repetition and spacing between the different activities, or controllable navigation [131]. The latter allows participants to control the progression in their learning [132]. Besides, the use of role-plays, standardized patients and interactive demonstrations of key skills in action are recommended as they increase this interactivity [133, 134]. For example a study integrated in their e-learning several clinical scenarios and case descriptions for which the

participant needed to give a clinical evaluation [135]. The authors observed significant improvement on HCPs' attitudes, knowledge and comprehension of communication skills following the intervention [135]. Another study used mixed training activity integrating traditional lectures and practical lessons (functional exercise and communication skills). The results showed that these active methods significantly improved attitudes and beliefs of physiotherapy students about LBP after the module [48].

E-learning modules have already been used in several healthcare domains [28, 136–139] with positive results, sometimes even better than face-to-face instruction [132]. Some HCPs have difficulties to follow continued education to update their knowledge and skills because of lack of time [25]. E-learning modules allow HCPs to complete them with a certain flexibility in the time and location [30, 138, 140].

We developed an interactive e-learning module to enhance HCPs' knowledge, attitudes and beliefs regarding the management of patients with LBP from a BPS approach. This pilot study will investigate the feasibility of an interactive e-learning module by examining its content, structure and presentation, length and access, and the change regarding HCP's knowledge and beliefs.

3.2 Methods

3.2.1 Study Design and Ethical Aspects

A pilot study was conducted to investigate the feasibility of an interactive e-learning module about the knowledge, beliefs and attitudes in the management of LBP in a sample of HCPs. The study was approved by the ethical commission of the University Hospital on January 13, 2020.

3.2.2 Participants

A small sample of convenience of HCPs ($n = 17$) and medical or physiotherapy students ($n = 5$) was recruited (see Table 3.1). The module was open to several health care professions such as general physicians, orthopaedists, physiotherapists, psychologists, nurses and occupational therapists. The students included were in their last year of physiotherapy or medicine.

HCPs and students were eligible if they were aged between 23 and 65 years old and took care of patients suffering from LBP in their daily clinical practice

or internships. The exclusion criteria were: not being in possession of an Internet-connected device, or non-French speaking professionals.

3.2.3 Procedure

The enrolment took place between February and April 2020 in Belgium and France. HCPs and students were recruited by phone calls. They were told they would be asked to follow an interactive e-learning module on the management of LBP and fill in different questionnaires. A single appointment was planned (one session of one hour) with each participant. Participants were aware that no financial compensation was provided for their time and effort spent in the study.

For the nine first participants a physical appointment was made with the researcher in a location chosen by the participant (e.g. clinical practice). The participants first filled in a written informed consent and the Back-PAQ questionnaire on an online platform. The researcher installed the e-learning module on the personal device of the participant. Then the researcher explained how to navigate in the e-learning. The researcher was available in case of technical difficulties. After completing the module, participants were asked to fill in the Back-PAQ for post-evaluation and a feasibility questionnaire on the same online platform. Because of the COVID-19 pandemic physical appointments with the next participants were not possible. After the phone recruitment, the next thirteen participants received a link by email to fill in the online questionnaires and follow the interactive e-learning module remotely on an online platform and in a personal location.

3.2.4 Interactive e-learning module

The main objective of this pilot study is to examine the feasibility of an e-learning intervention regarding the management of LBP. The e-learning intervention included written parts, voice-overs and clinical encounter videos.

Development Process
The interactive e-learning module has been jointly developed by a multidisciplinary team of researchers and clinicians with complementary expertise. This international team (Belgium and France) involved professions such as physiotherapists, physicians (both general practitioners and specialized physicians), sociologists and professors in prevention of musculoskeletal disorders.

Its content is based on recent guidelines from different countries for the management of LBP (e.g. Belgium, United Kingdom) [11, 141, 142].

Access
The interactive e-learning module, the Back-PAQ and the feasibility questionnaire were available in French. The module could be completed from home, work or any other place with an internet connected device of participant's choice. The module was only available for the duration of the study.

Structure and Content
The interactive e-learning module consisted of one session structured on 4 topics (see Figure 3.1). The planned duration was 60 minutes. In total, it included 61 slides with written information, voice-overs, 4 face-cam videos explanations, and 2 clinical encounter videos of respectively 6 and 8 minutes.

The interactive e-learning module provided information about the adequate management of the LBP patient. The e-learning module was structured around four main themes:

1. **Introduction**: The module provided an introduction of the burden of LBP and the need for a multidimensional and patient-centred approach for the management of LBP [1, 6, 143].
2. **Triage and evaluation**: In this part, the assessment of a patient suffering from LBP was discussed with as main focus a diagnostic triage (to differentiate between specific spinal pathologies, radicular symptoms and non-specific LBP), and a yellow flag screening and risk stratification according to the STarT Back Tool [58, 144].
3. **First line care**: First line management consists of reassurance about the symptoms and giving advice about the importance of staying active. This must be proposed to all patients (low, medium and high risk). HCPs were briefly informed about the neurophysiology of pain (e.g. the difference between nociception and pain, etc.), how to communicate and reassure their patients (e.g. the benign aspect of LBP) (4 face-cam videos).
4. **Second line care**: This last part of the module explored the non-pharmacological management of LBP. Additional therapies (exercises, manual treatments and psychological interventions oriented by the physiotherapist) were discussed for patients at low risk for developing chronic/persistent pain not responding to education and to medium risk patients. In case of failure, a multidisciplinary approach is recommended. This last approach is also suggested for high-risk patients.

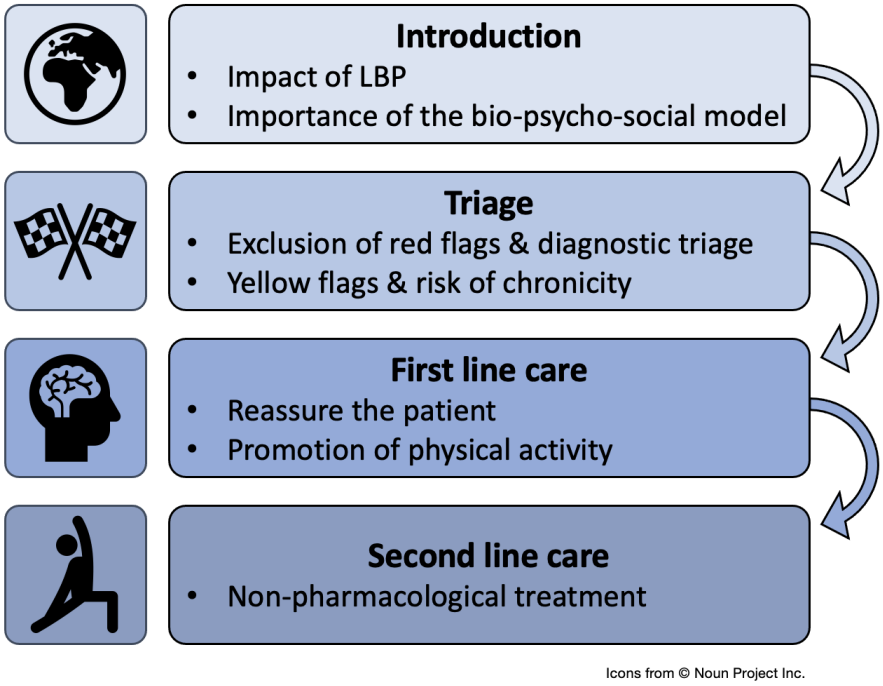

Figure 3.1: Structure of the interactive e-learning module.

At the end, the module consisted of two short clinical encounter videos summarizing the content of the full module. The first video displayed a consult between a general practitioner and a patient suffering from acute LBP. The second one presented the same consult with a patient suffering from chronic LBP. The two videos included examples of how to reassure patients about their condition.

3.2.5 Human Involvement, Co-interventions and Prompts

An investigator was present for the nine first participants during the completion of the module for technical support but no other support or intervention (involving information about the content) was provided. The thirteen other participants could contact the investigator by mail or by phone for any technological issues. There were no co-interventions or prompts.

3.2.6 Feasibility Questionnaire

A questionnaire was developed to assess the feasibility of this module. In total, 20 items were included based on previous feasibility studies [24, 25, 27, 31, 135, 138, 139, 145–149]. Likert Scales ($n = 15$) and open questions ($n = 5$) were both used to record HCPs' opinions. The open questions were audio recorded for the first nine participants and the thirteen others gave written answers online.

The focus of this feasibility study was to investigate HCPs' opinions about the module, including their suggestions about how to improve this module. Therefore, most of the items were related to the participants satisfaction about the content, structure and presentation, length and access of the module. Demographic data was also collected through this questionnaire.

3.2.7 Back Pain Attitudes Questionnaire (Back-PAQ)

Before and after the module, participants filled in the validated French version of the Back-PAQ questionnaire (34 items version) [150]. This questionnaire assesses attitudes and underlying beliefs about back pain on a 5-point Likert scale. The scoring of the answers ranges from -2 to $+2$. A negative score reflects beliefs that are unhelpful and vice-versa [51]. All items were written in the second person to personalise the questionnaire. The purpose of this personalisation is that HCPs or students present their own beliefs rather than projecting their beliefs onto people with LBP or presenting their beliefs about people with LBP [51]. It allowed us to investigate the potential change of beliefs about their own back induced by the interactive e-learning module.

3.2.8 Statistical Analysis

All statistical analysis were realised with Microsoft Excel 16.43 and RStudio 1.3.959-1 (RStudio Team 2020).

Sociodemographic data
Means and standard deviations (SD) were calculated for continuous variables and counts (age, years of practice, number of patients with LBP per week) and percentages for categorical variables (gender, nationality, work).

Feasibility data
Data were retrieved from the feasibility questionnaire. The Likert scales were analysed using median and minimum – maximum or counts and percentages. Open questions were used to support the results obtained from the Likert scales.

Back-PAQ
Changes between pre- and post-module measures were compared using a 2-sided paired Student t-test with a significance level of .05. The effect size between pre- and post-module measures was calculated using Cohen's d_s [151]. Interpretation of effect size was: small ($d_s = 0.2$), medium ($d_s = 0.5$), large ($d_s = 0.8$), very large ($d_s = 1.2$), and huge ($d_s = 2.0$) [152]. A negative Cohen's d_s indicate an improvement of the Back-PAQ score after the module.

3.3 Results

3.3.1 Socio-demographic Results

In total, 22 participants (9 men and 13 women) took part in this pilot study. Mean age ± SD was 37 ± 13.5 years old. Regarding the health disciplines, 45.5% were physiotherapists, 27% physicians, 23% last year students in medicine or physiotherapy and 4.5% nurses. Participant's experience ranged from 0 (i.e., the students) to 38 years with a mean of 13.5 ± 13 years. They treated a mean of 15 ± 26 patients suffering from LBP per week (see Table 3.1).

3.3.2 Feasibility Results

Changes in knowledge and beliefs
About 69% of the participants agreed that the module improved their knowledge while 23% strongly disagreed. A total of 54% agreed that their beliefs changed whereas 41% disagreed. Up to 86% of the participants intend to use their new skills in their clinical practice (see Table 3.3 and Figure 3.2).

Contents of the module
About 73% of the participants agreed that the content of the module was attractive and stimulating. A total of 86% agreed that the module met their expectations. Most of the participants (91%) found that this interactive e-learning module was able to enhance knowledge of HCPs (see Table 3.3 and Figure 3.3). According to the participants, a beneficial aspect of the module

Table 3.1: Results of socio-demographic data

Participant	Age (year)	Gender[1]	Nationality[2]	Healthcare Professionals[3]	Years of practice	LBP patients per week
1	46	M	B	P	20	6
2	44	F	B	N	22	5
3	43	M	B	P	20	30
4	50	M	B	B	20	80
5	59	F	B	GP	34	18
6	61	M	B	P	38	100
7	44	F	B	P	20	5
8	31	F	B	P	2	10
9	23	F	B	P	2	6
10	22	F	B	P	2	3
11	54	F	B	P	30	20
12	24	M	B	P	1	15
13	24	F	B	S	0	5
14	48	F	F	GP	25	4
15	24	F	F	S	0	0
16	29	F	B	P	4	8
17	23	F	B	S	0	0
18	44	M	B	GP	18	3
19	50	M	B	GP	25	5
20	25	M	B	GP	2	7
21	23	F	B	M	0	0
22	23	M	B	S	0	0

[1] M: Male - F: Female
[2] B: Belgian - F: French
[3] P: Physiotherapist - N: Nurse - B: Back surgeon - GP: General practitioner - S: Student in physiotherapy - M: Medical student

Table 3.2: Summary of the socio-demographic data

	Mean (SD)	n (% of total)
Participants	-	22 (100%)
Age	37 (13.5)	-
Gender		
Male	-	9 (40.9%)
Female	-	13 (59.1%)
Nationality		
Belgian	-	20 (90.9%)
French	-	2 (9.1%)
Healthcare Professionals		
Physicians	-	6 (27.3%)
Physiotherapists	-	10 (45.5%)
Students	-	5 (22.7%)
Nurse	-	1 (4.5%)
Years of practice	13 (13)	-
LBP patients per week	15 (25.6)	-

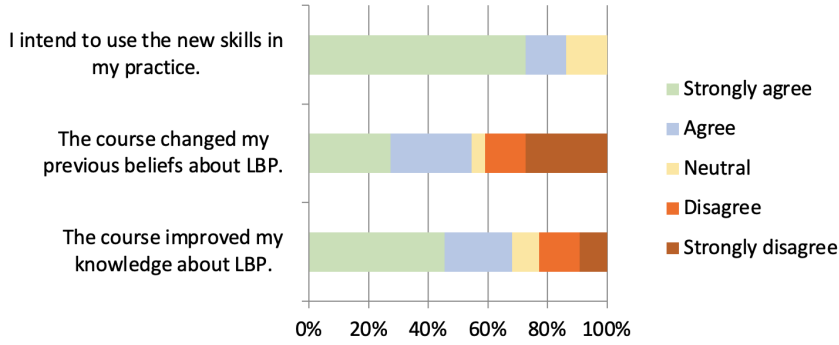

Figure 3.2: Feasibility results about the change in knowledge and beliefs.

Table 3.3: Results of the feasibility questionnaire

	Possible range	Mean (SD)	Median (min-max)	Mode
Content				
Sufficiency	1-5	4.5 (1)	5 (1-5)	5
Attractiveness	1-5	4.1 (1)	4.5 (1-5)	5
Meetings of expectations	1-5	4.3 (1)	5 (1-5)	5
Structure and Presentation				
Attractiveness	1-5	4.4 (0.7)	4.5 (3-5)	5
Clarity	1-5	4.8 (0.4)	5 (4-5)	5
Structure	1-5	4.6 (0.8)	5 (2-5)	5
Changes in knowledge and beliefs				
Improvement in knowledge	1-5	3.8 (1.4)	4 (1-5)	5
Change in beliefs	1-5	3.1 (1.6)	4 (1-5)	5
Time (minutes)				
		37.6 (9.6)	39.5 (20-60)	40

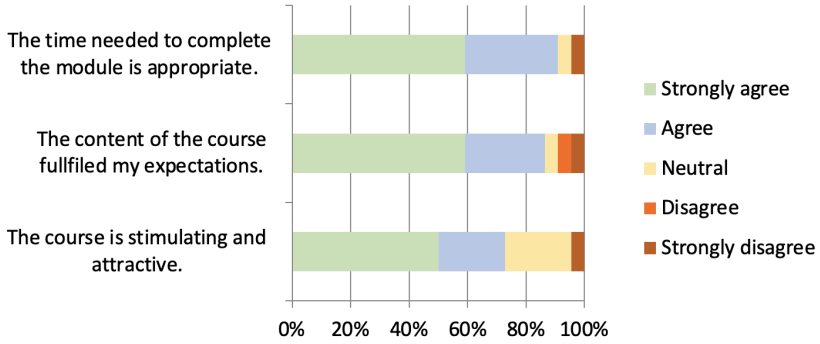

Figure 3.3: Feasibility results about the content and time.

was its capacity "to re-contextualize and to look at LBP from a different point of view" However, up to 77% of the participants identified some topics such as the psychological aspects of LBP or the type of exercises to prescribe that might be discussed more in detail in a revised version of the module. The opinions about the clinical encounter videos content diverged. While 25% of the participants mentioned that the short clinical encounter videos "were too long and theoretical" or found them "a waste of time", other participants said that it was "a nice way to summarize the module and to see practically how to interact with a patient".

Structure and presentation of the module
A total of 78% of the participants agreed that the presentation sustained their learning. Indeed, 91% of the participants found the module structured and easy to complete. About 91% of the participants agreed with the appeal of the presentation (see Table 3.3 and Figure 3.4)

Length of the module
Participants took 36.6 $\pm$ 10 minutes to complete the module. A total of 91% of the participants found the time frame adequate (see Table 3.3 and Figure 3.3).

Access
A total of 76% did not encounter technical problems and 91% of the participants were comfortable with the use of a computer (see Figure 3.5). Some participants

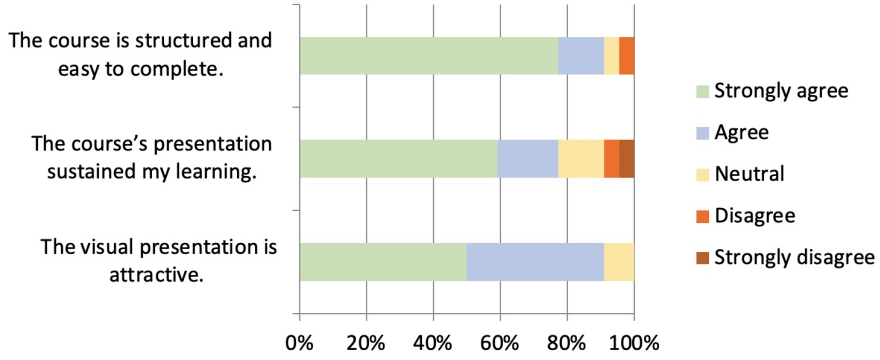

Figure 3.4: Feasibility results about the structure and presentation.

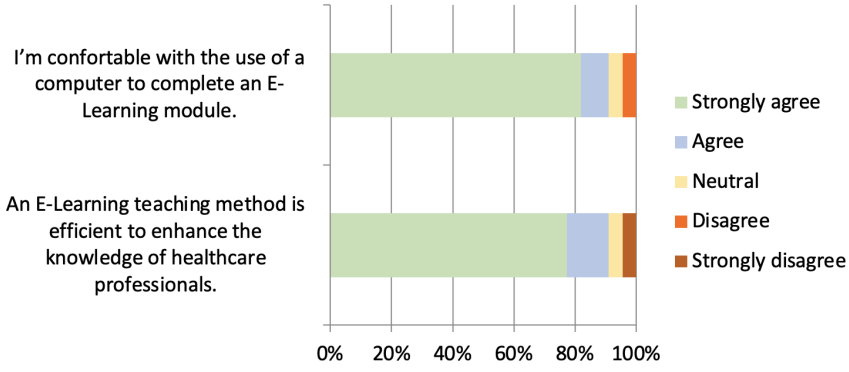

Figure 3.5: Feasibility results about the access.

mentioned that one of the most beneficial aspects of the interactive e-learning was "the freedom offered to complete it whenever or wherever you want".

Back-PAQ

A significant improvement was seen in the Back-PAQ scores (see Figure 3.6) after the participation in the module ($t = -7.63, p < .001$) with a very large effect size ($d_s = -1.63$). Participants have been sub-grouped according to the years of practice experience (Student with no years of experience ($n = 5$); < 20 years ($n = 7$); between 20 and 29 years ($n = 7$); ≥ 30 years ($n = 3$)). All sub-groups showed a significant difference in their pre- and post-module scores (see Figure 3.7) : the student's group with no years of experience

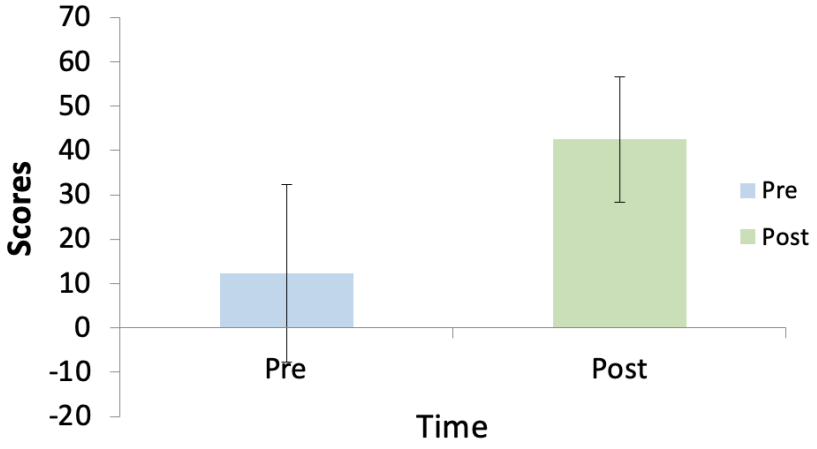

Figure 3.6: Back-PAQ results before and after the completion of the e-learning module.

($t = -6.12, p = 0.003$), the group < 20 years ($t = -3.12, p = 0.02$), the group between 20 and 29 years ($t = -5.16, p = 0.01$) and the group ≥ 30 years ($t = -8.32, p = 0.01$). A very large effect size was observed in the group < 20 years ($d_s = -1.18$) while a huge effect size was observed in the student's group ($d_s = -2.74$), the group between 20 and 29 years ($d_s = -1.95$) and the group ≥ 30 years ($d_s = -4.8$).

3.4 Discussion

The results of this pilot study reveal that the interactive e-learning module was highly appreciated by the majority of the participants.

Participants found the content of the intervention sufficient and clear. They estimated the module to be efficient to explore the management of LBP. "Patient's reassurance about the benign aspect of LBP is essential", "Clear explanations that medical imagery does not correlate with the symptoms", "Reconsidering our absolute truths", "Promoting conservative care management and movement" were the principal strengths. Some suggestions were made to improve the module. For example, some participants suggested to discuss the

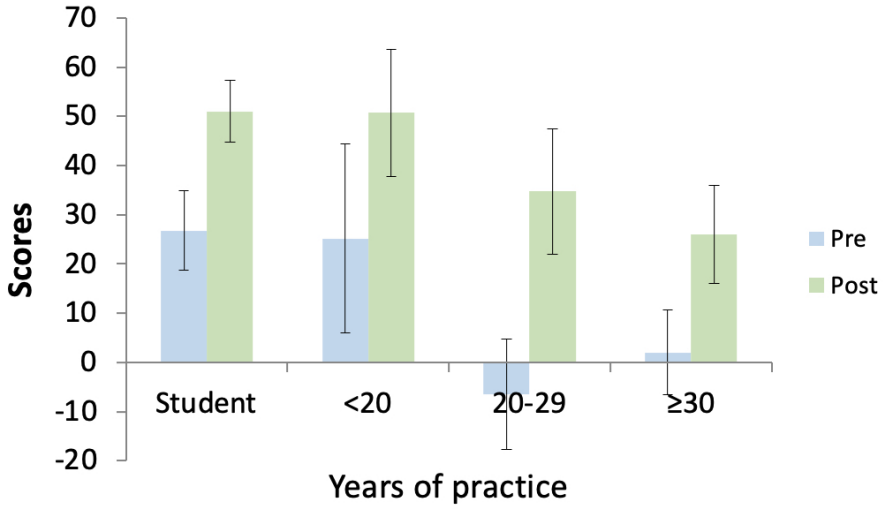

Figure 3.7: Back-PAQ results sub-grouped by years of practice before and after the completion of the e-learning module.

psychological aspects of LBP more in detail as well as the role of psychologists. "The psychological and emotional aspects of LBP often play a primordial role in the development of LBP; it might be interesting to explore it more deeply". These results confirm previous research revealing that physiotherapists may lack confidence to deliver a psychologically informed approach to their patients [153] and that this approach should be better integrated into the physiotherapy training curriculum, at least in French-speaking Belgium and France. Other participants highlighted the importance of exercise and wondered whether information regarding the type of exercises could be more elaborated in the module. The type and examples of exercises are not elaborated in the guidelines and the recommendation is to use a time-contingent approach [11, 141, 142].

Participants were satisfied by the module's presentation and structure. Participants said: "the structure was very clear", "the module was interactive, clear and interesting". We believe therefore that it sustained their learning process.

The majority of the participants was satisfied with the length and the time to complete the interactive e-learning module. Participants took less than one hour (time originally estimated) to complete it.

3.4.1 Effectiveness

The results of the feasibility questionnaire suggest that a majority of HCPs found an e-learning teaching method able to enhance their knowledge. Similar results have been found in several studies. It is known that e-learning is an effective way to improve knowledge in health care area [24, 138, 146, 154]. Participants mentioned that its accessibility and flexibility were its greatest advantages. Indeed, they had the control of the time and location of the module's completion. Those results have been reported in other studies [24, 138, 146].

According to the Back-PAQ questionnaire, the interactive e-learning module might be promising to change HCPs' or students' knowledge and beliefs about their back. These results are in accordance with studies who report a significant change in beliefs about back pain following an educational intervention [48, 155–157]. Interactive e-learning modules have already been used to improve HCPs' knowledge and self-confidence in their communication skills [140, 146, 154]. Furthermore, it has been suggested that biopsychosocial-based content are more effective in reducing negatives beliefs in HCPs than biomedical ones [115, 158, 159]. However, a Cochrane review on e-learning modalities showed little or no difference in HCPs' knowledge compared to traditional learning [17]. This pilot study did not compare the e-learning module with other learning modalities. The results of the Back-PAQ questionnaire showed that clinicians with less years of clinical practice had better scores pre- and post-module. It could indicate an enhancement in the teaching of the BPS management of LBP in higher education. Nonetheless, even though the Back-PAQ scores showed a significant improvement after the intervention, half of the participants did not have the feeling that their beliefs had changed after completing the module. It might be explained by two different phenomena: confirmation bias and cognitive dissonance [160, 161]. Confirmation bias is the tendency to search for information that confirms or strengthens prior personal beliefs opposed to looking for data that challenge those beliefs [161]. Cognitive dissonance is a well-known psychosocial theory. It is experienced in situations involving conflicting attitudes, beliefs or behaviors. When confronting conflicting beliefs, we feel a mental discomfort leading to an alteration in one of the attitudes, beliefs or behaviors to reduce the discomfort [160]. In our case, participants may have been confronted to beliefs that contradicted their previous ones. It created discomfort that led them to adjust their prior personal beliefs unconsciously. The difference between the HCPs perception of change and the quantitative results from the Back-PAQ could also be explained by the sensitivity of the measurement tools. The perception of the change in beliefs of HCPs was measured by using a question rated on a Likert scale, probably not as sensitive as the validated Back-PAQ questionnaire.

3.4.2 Strengths and Limitations

This study had a small sample size, as only 22 participants were recruited. Because of the COVID-19 pandemic, nine participants followed the module in presence of an experimenter whilst thirteen completed it online without assistance. For the first nine participants we were able to record their answers for the open questions. It allowed more complete answers and feedbacks to enhance the module, which was not the case for the other participants. Because of the pandemic the recruitment has been limited and some professions are not represented in our sample (e.g. psychologists and occupational therapists). Selection bias due to convenient sampling could also influence the results. The results concerning the change in attitude and beliefs of the participants regarding the effectiveness of this e-learning module are preliminary and should be interpreted with caution. Further studies should evaluate the updated version of this e-learning module in a large randomized controlled trial.

This study has several strengths as well. First, the heterogeneity of participants' health disciplines allowed us to record diversified feedbacks. Second, none of the participants dropped out during the module's completion. Third, the module used role-modelling videos and interactivity, which was mostly appreciated by the participants and could participate in a change in knowledge and beliefs. Finally, the module was developed based on several recent evidence-based guidelines for LBP management.

3.5 Conclusion

This interactive e-learning module seems feasible and promising to change knowledge and beliefs in a majority of HCPs or last year students in medicine or physiotherapy. Participants evaluated it positively: it was attractive, structured and clear. Moreover, the module was accessible and easy to follow. The content was sufficient and met the expectations of the participants. Some suggestions have been made to improve it such as investigate more deeply the emotional and psychological impact of LBP. There is an urgent need to develop and investigate the effect of educational interventions to favor best practice in LBP [16, 48] and this type of e-learning support could promote the transition from a biomedical to a bio-psycho-social management of LBP in HCPs. Future studies should evaluate the effects of a revised version of the e-learning on larger samples and with experimental designs that will reveal the relative effectiveness of different e-learning modalities.

Chapter 4

Knowledge, attitudes and beliefs of physiotherapists

Management of low back pain: do physiotherapists know the evidence-based guidelines?†

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Abstract

Background: Clinical practice guidelines promote bio-psycho-social management of patients suffering from low back pain (LBP).
The objective of this study was to examine the current knowledge, attitudes and beliefs of physiotherapists about a guideline-adherent approach to LBP and to assess the ability of physiotherapists to recognise signs of a specific LBP in a clinical vignette.
Methods: Physiotherapists were recruited to participate in an online study. They were asked to indicate whether they were familiar with evidence-based guidelines and then to fill in the Health Care Providers' Pain and Impairment Relationship Scale (HC-PAIRS), Back Pain Attitudes Questionnaire (Back-PAQ), Neurophysiology of Pain Questionnaire (NPQ), as well as questions related to two clinical vignettes.
Results: In total, 527 physiotherapists participated in this study. Only 38% reported being familiar with guidelines for the management of LBP. Sixty-three percent of the physiotherapists gave guideline-inconsistent recommendations regarding work. Only half of the physiotherapists recognised the signs of a specific LBP.
Conclusions: The high proportion of physiotherapists unfamiliar with guidelines and demonstrating attitudes and beliefs not in line with evidence-

†Fourré, A., Vanderstraeten, R., Ris, L., Bastiaens, H., Michielsen, J., Demoulin, C., Darlow, B. & Roussel, N. (2023). Management of Low Back Pain: Do Physiotherapists Know the Evidence-Based Guidelines?. *International Journal of Environmental Research and Public Health*, 20(9), 5611.

based management of LBP is concerning. It is crucial to develop efficient strategies to enhance guideline knowledge among physiotherapists and increase their implementation in clinical practice.

4.1 Introduction

The leading cause of disability worldwide is low back pain (LBP) [1, 16]. All clinical guidelines for the management of LBP recommend diagnostic triage to differentiate LBP presentations into those with features of underlying serious pathology (such as infection or cancer), those with features of specific LBP (such as radiculopathy or spinal stenosis) and those with non-specific LBP [11–14]. However, there is a lack of studies exploring the skills of first-line healthcare practitioners (HCPs) to suspect the presence of an underlying pathology. Yet, although most patients suffer from non-specific LBP, the ability to recognize the possibility of serious spinal pathologies is crucial, as the management of patients with specific LBP will be completely different [14]. Although non-specific LBP is explained by a combination of biological, psychological and social factors, many HCPs still consider LBP to be the result of one single (biomedical) factor [1], and focus care on this biomedical factor. Yet, clinical guidelines underline the importance of evaluating psychosocial factors, as these could lead to an increased risk of chronicity [58, 144, 162]. Optimal management in patients with non-specific LBP include explanation, reassurance, promotion of movement, return to work and self-management. However, many HCPs, especially those with a biomedical orientation [163], do not follow these recommendations [163–165] and manage patients with LBP in a guideline-inconsistent way. This approach is associated with increased use of diagnostic imaging, opioids, spinal injections and surgery, contributing to persistent disability and enormous costs for society [16, 36, 166]. Therefore, the objectives of this study were (1) to question physiotherapists about their knowledge of evidence-based guidelines for the management of LBP and their application in clinical practice; (2) to examine their knowledge, attitudes and beliefs concerning LBP and the association with their self-reported knowledge of the guidelines; (3) to assess their recommendations about activity and work and their ability to suspect or detect a specific cause of LBP in a clinical vignette.

4.2 Material and Methods

4.2.1 Design

This cross-sectional study reports baseline assessment from a randomized controlled study registered on clinicaltrials.gov (NCT05284669). The study was approved by the local ethical committee. The results of this study are reported using the STROBE guidelines for observational studies [167].

4.2.2 Setting

This study was carried out using an online setting. Participants accessed an internet platform (`https://qualtrics.com`) detailing study information using their own internet device (e.g. computer, tablet or smartphone). After providing informed consent, participants were invited to complete the online survey.

4.2.3 Participants

Licensed Dutch and French speaking physiotherapists in Belgium and France were informed about the possibility to participate in an online study. Various strategies were used [168] to contact clinically active physiotherapists in Belgium and France. Invitations were shared in two languages (Dutch and French) in broad networks such as national associations (e.g. Axxon, Domus Medica, etc.), local networks of university departments and hospitals, registered physiotherapy associations, etc. Eligibility criteria were French-speaking or Dutch-speaking graduated physiotherapists working in Belgium or France. Exclusion criteria were no management of patients with low back pain and not being in possession of an internet connected device. Recruitment took place between August 2021 and December 2021.

4.2.4 Outcomes

This study included 5 questionnaires: A self-developed socio-demographic questionnaire, the Health Care Providers' Pain and Impairment Relationship Scale (HC-PAIRS) [169, 170], the 10-item version of the Back Pain Attitudes Questionnaire (Back-PAQ-10) [51, 150], the revised Neurophysiology of Pain Questionnaire (NPQ) [171, 172] and questions relating to two clinical vignettes (one about a patient with non-specific LBP [173] and one about a patient with a specific LBP). All questionnaires were available in the language of the participant (French and Dutch) (see Appendix B). The Back-PAQ and the NPQ were translated in Dutch using a back-and-forth translation process using Beaton's guideline with four translators (two French speaking and two Dutch speaking) [174]. The HC-PAIRS and the vignette (non-specific LBP) translated in a previous study with the same process were used for the French-speaking participants [175].

4.2.4.1 Sociodemographic

This questionnaire was developed for this study. It included several items related to personal factors (age, gender, region, clinical occupation and settings) of participants. Two questions (Yes or No answer) were asked, one about the confidence in their own knowledge of guidelines for the management of LBP and the second about their application of guidelines in clinical practice.

4.2.4.2 Health Care Providers' Pain and Impairment Relationship Scale (HC-PAIRS)

The HC-PAIRS assesses attitudes and beliefs concerning physical impairments for patients with chronic LBP [47]. It consists of 13 statements that are rated on a seven-point Likert scale, ranging from "totally disagree" to "totally agree". The total score ranges from 13 to 91. A high score on the HC-PAIRS reflects there is a belief with a strong relationship between pain and impairment [169]. The good psychometric properties of this questionnaire have been established in graduated HCPs including physiotherapists [47, 169, 176].

4.2.4.3 Back Pain and Attitudes Questionnaire (Back-PAQ)

The Back-PAQ questionnaire (10 items version) [51] assesses attitudes and underlying beliefs about back pain on a 5-point Likert scale. The scoring of the answers ranges from $+2$ to -2. Items $6 - 7 - 8$ have reversed score. The total score ranges from -20 to $+20$. A negative score reflects beliefs that are unhelpful and vice-versa. To interpret the Back-PAQ, five themes are related to the items: "the vulnerability of the back", "the relationship between back pain and injury", "activity participation while experiencing back pain", "psychological influences on recovery" and "the prognosis of back pain". All items were written in the second person to personalize the questionnaire. The purpose of this personalization is that responders present their own beliefs rather than projecting their beliefs onto people with LBP or presenting their beliefs about people with LBP [51].

4.2.4.4 Neurophysiology of Pain Questionnaire (NPQ)

The Neurophysiology of pain questionnaire (NPQ) assesses how an individual conceptualizes biological mechanisms underpinning pain [171]. The NPQ includes 19 questions with three response options (true; undecided; false). The scoring is 1 for a correct answer and 0 for a wrong or undecided

answer. Higher scores reflect better knowledge of the pain neurophysiology. This questionnaire was included to evaluate if physiotherapists accurately understand the neurophysiology of pain [172, 177] as pain education could improve kinesiophobia and pain catastrophizing in patients with chronic LBP [124].

4.2.4.5 Clinical vignettes

Two clinical vignettes were used in this study. The first vignette was one of the three vignettes developed by Rainville et al. [173]. It describes a patient with non-specific LBP. Participant is asked to give his/her opinion on the appropriate level of activity for the patient, with choices ranging from 1 (no limitations on activity) to 5 (limit all physical activity) and assess the patient's ability to work, from 1 (full-time) to 5 (remain out of work). If the score of the participant was between 1 and 2 it was considered guideline-consistent [175]. If the score was between 3 and 5 it was considered guideline-inconsistent [175]. The total score ranging from 2 to 10 was calculated using the sum of the 2 items. A second vignette was developed to analyze the capacity of physiotherapists to suspect a specific underlying spinal pathology (i.e. to evaluate the skills of the diagnostic triage) and describe the symptoms of a patient with a specific cause of LBP (lumbar spinal stenosis). The methodology of Jette et al. was used to develop this vignette [178]. Participants answered an open question "In your opinion, what are the causes/contributing factors to the pain of this patient?". Answers of the participants were scored on two criteria: "ability to suspect a specific LBP" and "ability to detect the correct specific LBP". Participants were scored 1 ("yes") if they suspected or detected the specific LBP in the vignette and 0 ("no") if they don't.

4.2.5 Statistical methods

Data were downloaded from Qualtrics and sorted using Microsoft Excel (16.57). IBM Statistics 28 was used to perform statistical analyses. Only participants with complete data (i.e. all questionnaires completed) were included in the statistical analyses. Descriptive statistics were used for all the questionnaires and vignettes. Normality tests of outcomes results were performed (Kolmogorov–Smirnov Test). Kruskall–Wallis and Mann–Whitney tests with a significance of 0.05 were used to compare the total score of the questionnaires with the knowledge of the guidelines, groups of physiotherapists seeing less (<15) or more (15–20) patients with LBP per month and the ability to suspect or detect the specific diagnosis of LBP. Both vignettes were analysed using descriptive statistics to determine the number of physiotherapists giving

guideline-inconsistent recommendations and being able to suspect or detect a specific cause of LBP.

4.3 Results

In total 2447 HCPs opened the questionnaire online. After exclusion of participants (see Figure 4.1) 527 physiotherapists from two countries (59% females and 41% males, see Table 4.1) were included in the data analysis.

Their clinical occupation was mainly full-time (81%). Two-third of the physiotherapists (63%) reported seeing at least 10 new patients with LBP per month. The majority (63%) of the physiotherapists reported they were uncertain or did not know the content of guidelines on the management of LBP and only 31% reported applying them in clinical practice.

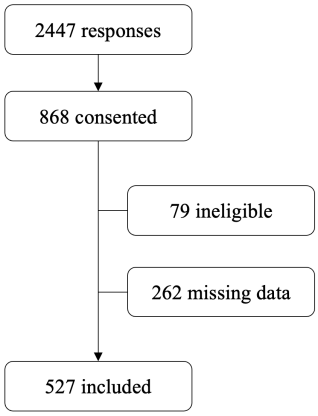


Figure 4.1: Flow diagram concerning the recruitment of physiotherapists

Table 4.1: Descriptive statistics for sociodemographic questionnaire results.

	Mean (SD)	*n* (% of total)
Number of participants		
Belgium (french-speaking)	-	150 (28%)
Belgium (dutch-speaking)	-	277 (53%)
France	-	100 (19%)
Total	-	527 (100%)
Age (year)	35 (11)	-
22-32	-	304 (58%)
33-43	-	105 (20%)
44-54	-	70 (13%)
55-65	-	42 (8%)
> 66	-	6 (1%)
Gender	-	
Female	-	312 (59%)
Male	-	215 (41%)
Years of practice	12 (11.16)	-
Work setting (multiple answers allowed)		
Self (alone)	-	160 (30%)
Self (in a group with same profession)	-	238 (45%)
Multidisciplinary	-	103 (20%)
Medical house	-	38 (7%)
Hospital	-	100 (19%)
Disability sector	-	19 (4%)
Clinical workload		
1	-	428 (81%)
0,75	-	58 (11%)
0,5	-	29 (6%)
0,25	-	12 (2%)

Continued on next page

Table 4.1: Descriptive statistics for sociodemographic questionnaire results (*continued*).

	Mean (SD)	n (% of total)
LBP patients per month		
< 5	-	152 (29%)
5 - 10	-	42 (8%)
10 - 15	-	103 (19%)
15 - 20	-	193 (37%)
> 20	-	37 (7%)
Self-reported knowledge of the guidelines		
Yes	-	197 (37%)
Uncertain	-	312 (59%)
No	-	18 (4%)
Self-reported application of guidelines in practice		
Yes	-	163 (31%)
Sometimes	-	325 (62%)
No	-	39 (7%)

4.3.1 Knowledge, attitudes and beliefs of physiotherapists

Descriptive statistics are detailed in Table 4.2. No significant differences were found in the scores of the questionnaires between physiotherapists seeing less (< 5) or more ($15 - 20$) patients with LBP per month except for the Back-PAQ ($p = 0.02$). No significant differences were found between Belgium and France for these questionnaires (data not shown).

The results of the Back-PAQ were analyzed by themes and are detailed in Table 4.3. The worse scores were related to the theme "vulnerability of the back" with 43% of physiotherapists having neutral or negative beliefs.

Physiotherapists were sub-grouped based on the self-reported knowledge of guidelines for the management of LBP. The scores of participants reporting they know the guidelines were significantly better (i.e. more guideline-consistent)

Table 4.2: Descriptive statistics for the HC-PAIRS, Back-PAQ and NPQ.

	n	Median [Q1, Q3]	Minimum	Maximum
HC-PAIRS (13-91)[a]	527	42 [36, 48]	13	69
Back-PAQ (-20-20)[b]	527	12 [7, 16]	-8	20
NPQ (0-19)[c]	527	13 [11, 15]	0	19

[a] HC-PAIRS interpretation: a high score on the HC-PAIRS reflects there is a belief with a strong relationship between pain and impairment and vice-versa
[b] Back-PAQ interpretation: a negative score reflects beliefs that are unhelpful and vice-versa
[c] NPQ interpretation: higher scores reflect better knowledge of the pain neurophysiology and vice-versa

for the HC-PAIRS, Back-PAQ and NPQ ($p < .001$) compared to those who reported to be unfamiliar (see Figure 4.2).

4.3.2 Vignettes

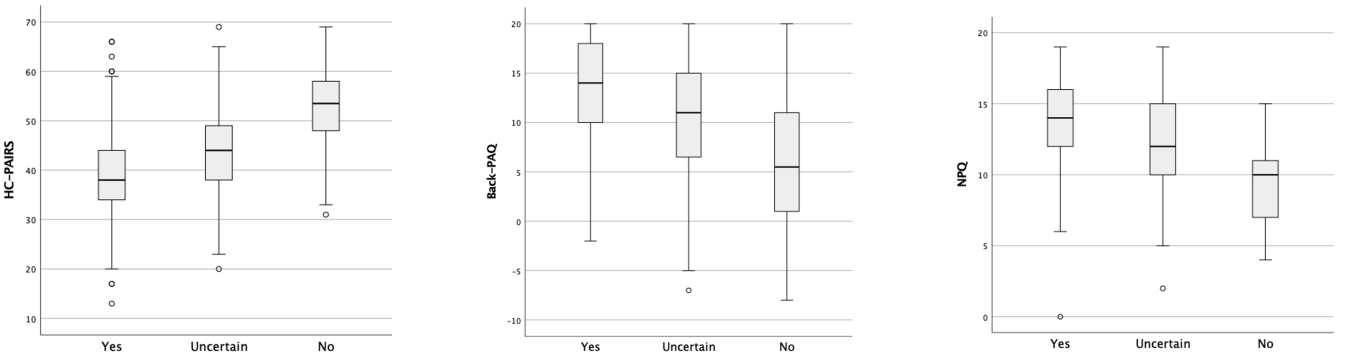
The descriptive results of the vignette describing a patient with non-specific LBP are presented in Table 4.4. Most of the physiotherapists (63%) gave guidelines-inconsistent recommendations for work. Concerning activity, 24% of the physiotherapists gave guidelines-inconsistent recommendations.

A significant difference between the self-reported knowledge of the guidelines and the vignette's total score was found ($p = .009$). No significant difference was found between the self-reported application of the guidelines and the vignette's total score ($p = .079$). The descriptive results of the vignette describing a case with specific LBP are presented in Table 4.5. Fifty-four percent of the physiotherapists suspected the presence of a specific underlying cause of LBP in this vignette, and only 30% of them mentioned the correct spinal pathology. Participants who suspected the presence of a specific cause of LBP had significantly better scores to NPQ ($p = .037$). Participants who detected the specific cause of LBP (spinal stenosis) had significantly better scores to the Back-PAQ and NPQ ($p = .004$).

Table 4.3: Summary statistics of the scores of the Back-PAQ sub-grouped by themes

	Theme				
	Vulnerability of the back	Relationship between pain and injury	Activity participation while experiencing back pain	Psychological influences on recovery	Prognosis of back pain
Score distribution (% of total)					
-2	15.6	1.4	0.6	2.9	2.9
-1	19.2	13.1	0.7	4.3	4.3
0	7.8	6.4	0.8	8.3	8.3
1	16.7	20.1	10.1	44.3	44.3
2	40.8	59	88	40.1	40.1
Median [Q1, Q3]	1 [-1, 2]	2 [1, 2]	2 [2, 2]	1 [1, 2]	1 [0, 2]
Mean (SD)	0.5 (1.5)	1.2 (1.1)	1.8 (0.5)	1.1 (0.9)	1 (1.1)

Back-PAQ interpretation: a negative score reflects beliefs that are unhelpful and vice-versa



(a) **(b)** **(c)**

Figure 4.2: Boxplots representing the relation of the HC-PAIRS (a), Back-PAQ (b) and NPQ (c) according to self-reported knowledge of the guidelines.

Table 4.4: Descriptive statistics for the clinical vignette (non-specific LBP) developed by Rainville [173].

	I would recommend to this patient that he does	Score	*n* (%)
Activity			
Guideline-consistent	Not limit any activities	1	79 (15)
	Avoid only painful activities	2	324 (61)
Guideline-inconsistent	Limit activities to moderate exertion	3	87 (17)
	Limit activities to light exertion	4	37 (7)
	Limit all physical activities	5	0
Work			
Guideline-consistent	Work full time, full duty	1	17 (3)
	Work moderate duty, full time	2	179 (34)
Guideline-inconsistent	Work light duty, full time	3	157 (30)
	Work light duty, part time	4	164 (31)
	Remain out of work	5	10 (2)
		Total	**527 (100)**

Table 4.5: Scores of the HC-PAIRS, Back-PAQ and NPQ sub-grouped by the suspicion and detection of a specific cause of LBP.

		HC-PAIRS	Back-PAQ	NPQ
	n (%)	Median [Q1, Q3]	Median [Q1, Q3]	Median [Q1, Q3]
Suspicion of a specific cause of LBP				
No	243 (46)	43 [36, 48]	12 [7, 15]	13 [10, 15]
Yes	284 (54)	41 [36, 48]	13 [7, 16]	13 [11, 15]
		$p = .172$	$p = .058$	$p = .037$
Detection of the specific cause of LBP				
No	369 (70)	42 [36, 49]	12 [7, 15]	12 [10, 15]
Yes	158 (30)	41 [35, 47]	13 [9, 17]	14 [11, 15]
		$p = .081$	$p = .004$	$p = .004$

4.4 Discussion

The results of this study revealed that a low proportion of physiotherapists in Belgium and France report knowing or using LBP guidelines. Physiotherapists not familiar with the guidelines were more likely to have attitudes indicating a strong relationship between pain and impairment, beliefs about LBP that are unhelpful, inadequate knowledge on the neurophysiology of pain and guideline-inconsistent recommendations regarding work. Half of the physiotherapists in this study did not suspect a specific cause of LBP in a clinical vignette.

4.4.1 Physiotherapy in Belgium and France

In both countries, patients need a referral prescription from a physician to have access to physiotherapy and to be reimbursed by the health social security system [179]. In Belgium, the number of sessions is limited to 18 sessions. Direct access to physiotherapy is not yet implemented in Belgium but an experimental study is currently performed to evaluate the (cost-)effectiveness of direct access [180]. In France, direct access is allowed for specific cases (acute LBP and ankle sprain in multidisciplinary centers) but it is not widely implemented. The results of this study found that knowledge, attitudes and beliefs of physiotherapists are equivalent in Belgium and France.

4.4.2 Knowledge of the guidelines and questionnaire scores (HC-PAIRS, Back-PAQ and NPQ)

The low proportion of physiotherapists reporting to know guidelines for the management of LBP is striking, as significantly more guideline-inconsistent attitude and behavior (i.e. reflected by significantly worse scores on HC-PAIRS, Back-PAQ, NPQ, recommendations based on clinical vignette) was observed in physiotherapists uncertain or not knowing clinical guidelines. This proportion is significantly higher compared to a study in Australia where only 19% of physiotherapists were uncertain with clinical guidelines recommendations [181]. These differences might be explained by a combination of reasons: undergraduate education [182], promotion of guidelines (media campaigns, professional bodies, insurance/funder) [155], health system design [183, 184] and a cultural shift toward evidence based care. However, our results are in line with previous studies: one reported that only 12% of physiotherapists were aware of clinical guideline recommendations [185] and another one reported that only 52% of physiotherapists used guidelines in clinical practice [186]. A systematic review found that physiotherapists questioned the relevance of guideline recommendations (such as assessing cognitive, psychological and social factors of patients) or felt they had inadequate clinical skills [10]. A recent study found that the proportion of physiotherapists providing guideline-recommended treatment is still low and has not increase since 1990 [187]. It is relevant to report that a high proportion of physiotherapists (30%) in this study were working as solo practitioners. Working in isolation could have an impact on the development of clinical expertise and implementation of evidence-based care. These results are highly concerning and reveals the urgent need to develop better strategies to implement evidence-based guidelines. Concerning the HC-PAIRS, recent studies using the 13-item version in physiotherapists in USA [188] and New-Zealand [176] found lower scores (i.e. median of 31 compared to 42 in our study) suggesting a more biopsychosocial orientation of participants in these countries. Higher scores on the HC-PAIRS are not only associated with a more biomedical treatment orientation, but this can negatively influence health attitudes and behaviour of the patients [189]. It is known that HCPs' beliefs about LBP might be associated with the beliefs of their patients [50]. While this study did not investigate the effective management of physiotherapists during actual consultations, the high scores on the HCPs in clinically active physiotherapists are nevertheless concerning, as it might suggest that these physiotherapists provide predominantly biomedical management to their patients. Self-reflection strategies should be implemented in the education of physiotherapists to understand how their beliefs about pain align with evidence and the negative effects that biomedically focused care can have on patient outcomes [190]. The short version of the Back-PAQ (10-item) with -2

to +2 scoring was chosen in this study to facilitate the interpretation. Negative scores represent beliefs that are not helpful concerning LBP. Physiotherapists in this study seeing more patients (15-20) per month had significantly better beliefs concerning LBP compared to those seeing less (< 5). The clinical expertise of physiotherapists working with more patients with LBP could have influenced this result, but it is important to note that no difference was observed for the other questionnaires (HC-PAIRS and NPQ). On average physiotherapists presented positive scores meaning they have beliefs more aligned with helping recovery. Similar results were found in recent studies [48, 49]. Nevertheless, there was a lot of room for improvement. The analysis of the Back-PAQ themes showed that 43% of physiotherapists had negative or neutral answers concerning the items related to the vulnerability of the back. This means that many physiotherapists believed that it is easy to injure the back and that caution is needed. These beliefs related to the need of protection reflect guideline-inconsistent beliefs related to the biomedical model. In other countries some studies presented lower (worse) scores for the Back-PAQ in physiotherapists [176, 191]. These results highlight the urgent need to develop interventions aiming to enhance beliefs of physiotherapists as they can influence the prognosis of the patient [120]. The knowledge about the physiology of pain in physiotherapists was explored in this study with the NPQ. The mean score of 66% (12.6 ± 3.2) cannot be considered as good for graduated physiotherapists. Our results are higher than those observed in studies from Meeus et al. [192] and Moseley [177] with respectively a mean of 56% (10.71 ± 3.08) and 55% (10.45 ± 3.61). Nevertheless, recent studies from Stern et al. [193] and Lane et al. [194] (using a shorter version of the NPQ (12-item) [171]) showed higher scores in physiotherapists with a mean score of respectively 75% (9 ± 1.5) and 80% (9.6 ± 1.1). Even with these higher scores Stern et al. concluded physiotherapists had limitations in pain science [193]. Pain neuroscience education is an approach to reconceptualize how pain works [195]. However, this is relatively new, and one hypothesis might be that some physiotherapists in our study did not benefit from these new insights since graduation. Reassurance about the pain experience is recommended in the clinical guidelines and could positively influence pain ratings, disability, limitations in movement of the patient [196]. In one study, a NPQ mean score of 90% was required for practitioners to be included and deliver pain neuroscience education [197, 198]. Unfortunately, barriers to implementation in practice exists and the evolution of knowledge in pain science may not be delivered appropriately to physiotherapists and patients [199–201].

4.4.3 Clinical Vignettes

The results of the non-specific vignette developed by Rainville [173] showed that a majority of physiotherapists' (63%) gave guideline-inconsistent recommendations concerning return to work and guideline-consistent recommendations when advising the patient about activities. These results are comparable to other studies who showed guideline-inconsistent recommendations concerning work in 76% [175] and 50% [48] of physiotherapists. In another study, physiotherapists gave guideline-consistent recommendations concerning work and activity (60% and 88% respectively) [186]. In comparison, our proportion of physiotherapists giving guideline-inconsistent recommendations for work is high. These results are concerning given the fact that physiotherapists follow their patients for multiple sessions and could potentially implement unhelpful beliefs related to work, favour a worse prognosis and increase long-term disability in patients with LBP. This major difference between recommendations for activity and work could be explained for different reasons. Firstly, return to work is a topic seldom included in curricula of physiotherapists and in post-graduate training, while the opposite is true for activity recommendations. Physiotherapy curricula are mainly based on the promotion of movement and activity in patients to recover their health. Secondly, physiotherapists in Belgium and France can discuss return to work with patients but the final decision is made by the physician. Inter-disciplinary discussions about return to work are not implemented in usual private practice. Thirdly, a clinical vignette is completely different than an interview in a clinical setting and could influence the given recommendations. Current clinical vignettes lack the integration of psychosocial factors. New clinical vignettes should be developed to allow a better evaluation of the situation and context by health professionals. Finally, half of the physiotherapists did not suspect the presence of a specific type of LBP in a clinical vignette despite clear indicators of a neurological condition that should arise suspicion or concerns and influence clinical decision-making. Only 30% of the participants detected the correct underlying specific pathology (lumbar spinal stenosis). These results are highly concerning and are similar to other studies [178, 202, 203] where only half of the physiotherapists recognized the specific pathology and had clinical decision-making. Even more concerning, the attribution of the cause of LBP was often wrongly attributed to the patient's age or behavioural factors (e.g. "the patient don't follow the treatment correctly"). These results could be explained by the fact that guidelines are not consistent about which features that would indicate a specific diagnosis and led to confusion and inconsistency in management of patients [14]. This confusion could also have influenced physiotherapy curriculum. Given our results, caution is needed before allowing direct access in Belgium or France. To avoid mismanagement of patients, strategies to better implement the diagnostic triage [142] and the suspicion of

specific pathologies underlying musculoskeletal disorders should be developed.

4.4.4 Limitations and strengths

This study had some limitations. The psychometric characteristics of the translated version of the Back-PAQ and NPQ in Dutch were not studied. Moreover, the second clinical vignette (specific low-back pain) was developed for the purpose of this study and not validated. Their validity and psychometric characteristics should be analyzed in future studies. To help the recruitment procedure, volunteers were sought using broad advertising and accreditation points were given to physiotherapists when they finished their participation to the study. This point attribution could have biased the sample of physiotherapists recruited. Volunteers' physiotherapists could be more aligned with knowledge creation and use. Nevertheless, offering "free" accreditation points may have encouraged those who generally don't follow learning opportunities. It is also important to acknowledge that this study only measure explicit attitudes and beliefs and not implicit orientation of physiotherapists in a clinical setting. Implicit attitudes and beliefs could also greatly influence patient's outcome because spontaneous and every-day clinical management is not always driven by deliberate analysis [169]. This study had several strengths as well. The recruitment of physiotherapists took place in two countries and the sample of participants was large. This allowed to have gather up-to-date data on knowledge, attitudes, and beliefs of physiotherapists in these countries. To our knowledge this is the first study to analyze the ability of physiotherapists to suspect the presence of a specific pathology causing LBP using a clinical vignette in Belgium and France. The variety of outcomes measure included in this study allowed to have extensive results concerning the current knowledge, attitudes, and beliefs of physiotherapists in these countries.

4.5 Conclusion

This study found that a high proportion of physiotherapists in France and Belgium were unfamiliar with guidelines related to LBP management and did not apply these in practice. This lack of knowledge concerning guidelines is reflected by attitudes that there is a strong relationship between pain and impairment, beliefs about LBP that are unhelpful and inadequate knowledge on the neurophysiology of pain. A majority of physiotherapists gave guideline-inconsistent recommendations concerning return to work that are known to negatively influence the prognosis of patients. Half of the physiotherapists in this study did not suspect the presence of a specific cause of LBP in a clinical

vignette with features of spinal stenosis and neurological compromise. Future studies should develop and evaluate interventions aiming to better implement best practice and guidelines-oriented management of LBP in physiotherapists. These future interventions should include all the aspect of clinical guidelines and the bio-psycho-social model including important topics such as the capacity to suspect a specific cause of LBP, the evaluation of psychosocial factors and clinical tools to effectively reassure the patient about his condition.

Chapter 5

Evaluation of the effectiveness of two different e-learning interventions

Effect of two different e-learning interventions on knowledge, attitudes and beliefs of physiotherapists managing low back pain: a randomized controlled trial.

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Abstract

Introduction: Many physiotherapists still manage their patients mainly from a biomedical point of view. The purpose of this study was to analyze the effect of two different e-learning interventions on knowledge, attitudes and beliefs of physiotherapists managing low back pain (LBP).
Methods: Physiotherapists were allocated (1/1) either to an experimental or a traditional e-learning. Baseline and post-intervention assessment included the Health Care Providers' Pain and Impairment Relationship Scale (HC-PAIRS), Back Pain Attitudes Questionnaire (Back-PAQ), Neurophysiology of Pain Questionnaire (NPQ) and a clinical vignette. Participants had two weeks to complete the post-intervention assessment. Statistics were processed using ANCOVA and Fisher's t-tests.
Results: 419 physiotherapists were included in the analysis. Mean scores of HC-PAIRS, Back-PAQ and NPQ significantly improved post-intervention in both groups. There was a significant effect of the intervention type (experimental or traditional) on the scores of HC-PAIRS ($p < .001$; $\eta_p^2 = .243$) and Back-PAQ ($p < .001$; $\eta_p^2 = .135$), but not on NPQ scores. Return to work recommendations assessed with the clinical vignette were significantly more guideline-consistent in the experimental group ($p < .001$) post-intervention.
Conclusion: An interactive e-learning intervention focusing on patient's reassurance, self-management and importance of psycho-social factors seems the most promising way to enhance physiotherapists' attitudes, beliefs and work recommendations regarding LBP.

5.1 Introduction

Low back pain (LBP) is a common, complex and multidimensional condition. It is the leading cause of disability worldwide [1, 113]. International guidelines have promoted a bio-psycho-social management approach [11, 12], but implementation of these guidelines remains a challenge [185, 186]. Many healthcare professionals (HCPs) continue to manage their patients using an outdated biomedical model [115]. This is reflected by a guideline-inconsistent approach consisting of focusing on specific structural impairments [119], over-use of medical imaging [204, 205], restrictive activity and work recommendations [50, 175], and early prescriptions of opioids [206]. Moreover, studies have found that clinicians question the relevance of guidelines and might lack clinical skills in the management of psychosocial factors or patient's illness perceptions [9, 10]. HCPs' own attitudes and beliefs towards LBP are known to influence patient's beliefs and behaviors [40, 119] that leads to negatively affect their prognosis [120].

There is an urgent need to develop cost-effective strategies to implement guideline-consistent care in clinical practice by targeting HCPs' knowledge, attitudes and beliefs [1, 48]. Traditional lectures or passive dissemination of guidelines seem to only marginally improve HCPs' knowledge, attitudes and beliefs, indicating that different educational strategies are needed [24, 125–127]. Despite implementation strategies, theoretical guidelines on the management of LBP are difficult to integrate in clinical practice The lack of interactive format does not permit HCPs to understand how to integrate the recommendations into practice and the guidelines themselves do not contain detailed information to be used for an individual patient. For example, guidelines recommend that patients are reassured about their condition, but do not provide specific examples of how this is achieved.

E-learning interventions allow participants to engage with a range of media that may best support their learning, such as videos with clinical examples (e.g., clinical example of a patient-therapist communication). E-learning education is also accessible (e.g., from everywhere with an internet-connected device) and flexible (e.g, time and location of the learning) for HCPs [207]. Moreover, interactive e-learning interventions allow participants to control their learning (e.g., menus and arrows to navigate back and forward) and spend more time on content that is relevant to them. Studies have shown that e-learning interventions could be a promising solution to improve knowledge in HCPs but more research is needed to evaluate their effectiveness [18, 24, 138, 140, 146, 154, 207]. There is however a lack of knowledge concerning which messages from the guidelines could lead to an efficient shift in knowledge, attitudes and beliefs concerning LBP management.

Therefore, the objective of this study was to develop and evaluate the effectiveness of two different e-learning interventions, based on (inter)national guidelines and recommendations. Both the content and the didactical approach differed between the interventions to evaluate the effectiveness of an experimental (interactive environment) versus a traditional (classical online lecture, without interactivity) e-learning intervention on the knowledge, attitudes and beliefs of physiotherapists in the management of LBP. It was hypothesized that the experimental e-learning intervention would be more efficient to enhance knowledge, attitudes and beliefs than the traditional one.

5.2 Methods

5.2.1 Trial design

The design of this study was a randomized, controlled, double blinded and web-based trial. The CONSORT statement for randomized controlled trial was used to report the data [208]. This study took place between August 2021 and August 2022 using an online setting. A local ethical committee approved the study. The study was registered on clinicaltrials.gov.

5.2.2 Participants

Various strategies [168] were used to recruit physiotherapists in two countries (Belgium and France). Invitations to this study were shared in two languages (French and Dutch) by national associations (e.g. Axxon, Domus Medica, etc.), local networks of university departments and hospitals, registered physiotherapy associations. Eligibility criteria were French-speaking or Dutch-speaking active graduated physiotherapists from Belgium or France. Exclusion criteria consisted of physiotherapists not managing patients with LBP or not being in possession of an internet connected device.

5.2.3 Settings

Physiotherapists willing to participate in the trial received an internet link to connect on an online platform (`https://qualtrics.com`). After reading the information concerning the study, they were asked to sign an online informed consent and to enrol in the study. In case they enrolled, they were asked to complete a baseline assessment, complete an e-learning package, and then to

complete a post-intervention assessment using the online platform. Participants had two weeks to finish the e-learning and two weeks to complete the post-intervention assessment. An automatic e-mail was sent one week after enrolment to remind participants to complete the study. Participants could contact the research team by email if they experienced technical problems with the process or the e-learning.

5.2.4 Interventions

Two e-learning interventions (experimental and traditional) were jointly developed by a multidisciplinary international team of researchers and clinicians with complementary expertise in the management of LBP. This team involved physiotherapists, physicians (both general practitioners and specialized physicians), sociologists, a psychologist and professors in prevention of musculoskeletal disorders. Both e-learning interventions were available in French and Dutch. The content of the two e-learning interventions was developed based on recent guidelines for the management of LBP [11, 12] and a previous pilot study [207]. Each e-learning intervention was divided in 3 thematic modules covering the main content from the guidelines (the duration of each module was 30 minutes). The first and second module were entitled "Triage and evaluation of LBP" and "Management of LBP". The third module "Understanding the complexity of pain" was developed to deliver information regarding the recommendation "reassure the patient concerning the benign nature of LBP" [11]. Each e-learning package presented the same theme, but with a different emphasis on the content explored (see Figure 5.1 and Appendix C). Moreover, the design of both e-learning was different.

Experimental e-learning intervention
The experimental e-learning intervention was designed to be interactive with the inclusion of menus, videos, simulated clinical situations, metaphors, voice-overs, and quiz (see Figure 5.2). Participants were able to evolve towards a controllable e-learning (play, pause, or going back in specific chapters if necessary). The purpose of the e-learning was to be as pragmatic as possible to help physiotherapists to integrate guidelines in their daily practice. During the e-learning the following topics were developed in more detail: the importance of screening psychosocial factors, the reassurance of the patient and the understanding the pain experience from a clinical point of view (e.g., stories and metaphors) [53, 54, 121, 196, 198]. The e-learning was designed using PowerPoint and transformed in an interactive e-learning using the H5P plugin.

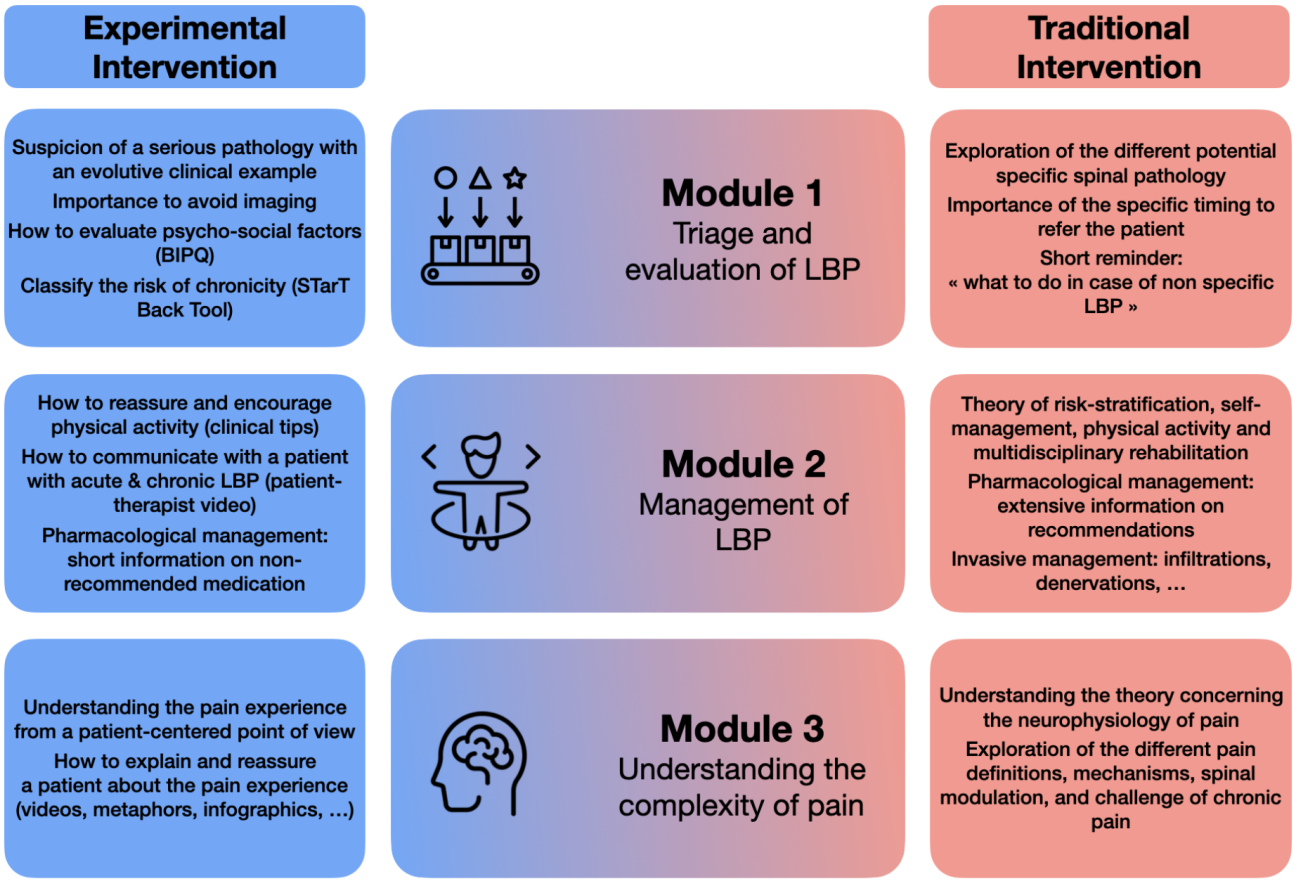

Figure 5.1: Different emphasis of the same theme in the experimental and traditional e-learning intervention

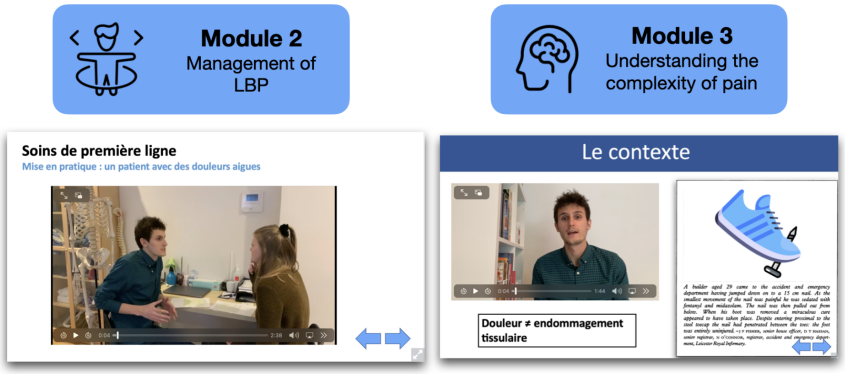

Figure 5.2: Illustration of the experimental e-learning, designed as an interactive environment (videos, simulated clinical situations, metaphors, controllable interface) (module 2 & 3)

Traditional e-learning
The traditional e-learning intervention was designed to be a classical online lecture without interaction or clinical examples (see Figure 5.3). Participants were not able to control the e-learning, they were only able to watch a recorded video. The focus of the e-learning was set on the following content of the guidelines: the importance of a first screening to exclude a specific underlying cause of LBP, the stepwise approach to implement physical activity, pharmacological treatment and the theoretical approach to understand the pain experience, including the neurophysiology of pain [11, 12]. The e-learning was designed using a PowerPoint presentation with voices exported as a video.

5.2.5 Outcomes

Five questionnaires were used (see Appendix B): A self-developed socio-demographic questionnaire, the Health Care Providers' Pain and Impairment Relationship Scale (HC-PAIRS) [169, 170], the Back Pain Attitudes Questionnaire (Back-PAQ) [51, 150], the revised Neurophysiology of Pain Questionnaire (NPQ) [171, 172] and a clinical vignette (about a patient with non-specific LBP [173]). All questionnaires were available in the language of the participant (French and Dutch). The Back-PAQ and the NPQ were translated in Dutch using a back-and-forth translation process with four translators (two French-speaking and two Dutch-speaking) [174]. The HC-PAIRS and the clinical vignette translated in a previous study with the same process were used for the

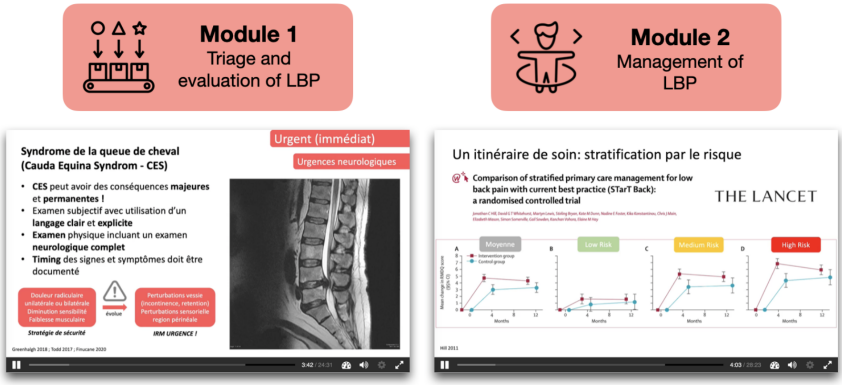

Figure 5.3: Illustration of the traditional e-learning, designed as a classical online lecture without interactivity (module 1 & 2)

French-speaking participants [175]. Two additional questions were asked, one about the confidence in their own knowledge of guidelines for the management of LBP and the second about their application of guidelines in clinical practice (Yes or No answer).

Socio-demographic questionnaire

This self-developed questionnaire included several questions related to personal factors (age, gender, region, clinical occupation, and settings) of participants.

Health Care Providers' Pain and Impairment Relationship Scale (HC-PAIRS)

The HC-PAIRS assesses attitudes and beliefs concerning physical impairments for patients with chronic LBP [47]. It consists of 13 statements that must be rated on a seven-point Likert scale, ranging from "totally disagree" to "totally agree". The total score ranges from 13 to 91. A high score on the HC-PAIRS reflects a belief with a strong relationship between pain and impairment [169]. Good psychometric properties of this questionnaire have been established in physiotherapists [47, 176].

Back Pain and Attitudes Questionnaire (Back-PAQ)

The Back-PAQ questionnaire (10 items version) [51] assesses attitudes and underlying beliefs about back pain on a 5-point Likert scale. The scoring of the answers ranges from -2 to $+2$. Items 6-7-8 have reversed score. The total

score ranges from −20 to 20. A negative score reflects beliefs that are unhelpful and vice-versa. All items were written in the second person to personalize the questionnaire. The purpose of this personalization is that responders present their own beliefs rather than projecting their beliefs onto people with LBP or presenting their beliefs about people with LBP [51].

Neurophysiology of Pain Questionnaire (NPQ)
The Neurophysiology of pain questionnaire (NPQ) assesses how an individual conceptualizes biological mechanisms underpinning pain [171]. The NPQ includes 19 questions with three answer options (true; undecided; false). The scoring is 1 for a correct answer and 0 if the participant was wrong or undecided. Higher scores reflect better knowledge of the pain neurophysiology. This questionnaire was included to evaluate PTs' knowledge of the neurophysiology of pain [172, 177] as pain education could improve kinesiophobia and pain catastrophizing in patients with chronic LBP [124].

Clinical vignette
A vignette describing a patient with non-specific LBP (i.e. third vignette developed by Rainville) was used [173]. Participants were asked to give their opinion on the appropriate level of activity HCP should recommend to the patient, with choices graded from 1 (no limitations on activity) to 5 (limit all physical activity) and assess the patient's ability to work, from 1 (full-time) to 5 (remain out of work). If the score of the participant was between 1 and 2 it was considered guideline-consistent [175]. If the score was between 3 and 5 it was considered guideline-inconsistent [175].

5.2.6 Randomization

The online platform automatically randomized participants with a 1/1 allocation in each intervention after the baseline assessment. Participants received an access to the attributed e-learning.

5.2.7 Blinding

This study was double-blinded. Participants did not know they were following either the experimental or traditional e-learning intervention. Researchers assessed anonymous dataset files and were not involved in the randomization process.

5.2.8 Statistical methods

Data were downloaded from the online platform (Qualtrics) and sorted using Microsoft Excel (16.57). IBM Statistics 28 and R core team 22 were used to perform statistical analyses. Only participants with complete data (i.e. all questionnaires completed) were included in the statistical analyses. Student t-test was used to measure the effect of the e-learning intervention in each group. ANCOVA test was used to control the effect of baseline scores and measure the effect of the intervention type on the scores difference between groups post-intervention. The effect size was calculated using partial eta squared (η_p^2). Interpretation (magnitude) of effect size was small ($\eta_p^2 = 0.01$), medium ($\eta_p^2 = 0.06$), or large ($\eta_p^2 = 0.14$) [151, 209]. Fisher's exact t-tests were used to compare the results of the vignette at baseline and post-intervention between the two groups.

5.3 Results

In total 2720 HCPs opened the link to participate to the study. Of the 737 physiotherapists who completed the baseline assessment and were randomly assigned to either intervention, 419 (57%) completed the post-intervention assessment and were included in the analysis (see Figure 5.4). No significant differences in baseline scores were found between participants who dropped-out and participants included in the analysis in each group, except for the NPQ in the experimental group with slightly lower scores for the drop-out group (mean difference = 0.77; $p = .003$), but not clinically relevant (MCID: 0.9) [171, 210].

The baseline characteristics of all participants are detailed in Table 5.1.

Table 5.1: Socio-demographic results for the experimental and traditional group as n (percentage of total) or median [Q1 - Q3].

	Experimental e-learning	Traditional e-learning
Number of participants		
Belgium (french-speaking)	57 (26%)	50 (25%)
Belgium (dutch-speaking)	140 (64%)	129 (65%)
France	23 (10%)	20 (10%)

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Table 5.1: Socio-demographic results for the experimental and traditional group as n (percentage of total) or median [Q1 - Q3] (*continued*).

	Experimental e-learning	Traditional e-learning
Total	220 (100%)	199 (100%)
Age (year)	31 [26-44]	31 [26-45]
Gender (Male or Female)		
Female	131 (60%)	125 (63%)
Male	89 (40%)	74 (37%)
Years of practice	6 [2-22]	7 [2-22]
Clinical occupation		
100%	173 (79%)	157 (79%)
75%	29 (13%)	27 (14%)
50%	13 (6%)	11 (6%)
25%	5 (2%)	4 (2%)
Work setting (multiple answers allowed)		
Self-employed	71 (32%)	56 (28%)
Self-employed (in a group with same profession)	96 (44%)	97 (49%)
Multidisciplinary	33 (15%)	39 (20%)
Medical house	17 (8%)	11 (6%)
Hospital	53 (24%)	42 (21%)
Disability sector	11 (5%)	5 (3%)
LBP patients per month		
1-5	67 (30%)	53 (27%)
5-10	23 (10%)	11 (6%)
10-15	38 (17%)	46 (23%)
15-20	80 (36%)	75 (38%)
20+	12 (5%)	14 (7%)
Self-reported knowledge of the guidelines		
Yes	85 (39%)	65 (33%)

Continued on next page

Table 5.1: Socio-demographic results for the experimental and traditional group as n (percentage of total) or median [Q1 - Q3] (*continued*).

	Experimental e-learning	Traditional e-learning
Uncertain	128 (58%)	122 (61%)
No	7 (3%)	12 (6%)
Self-reported application of guidelines in practice		
Yes	63 (29%)	63 (32%)
Sometimes	142 (65%)	117 (59%)
No	15 (7%)	19 (10%)

Figure 5.5 includes results of baseline and post-intervention assessments. Mean scores of HC-PAIRS, Back-PAQ and NPQ were similar between the experimental and traditional group at baseline and significantly improved post-intervention in both groups ($p < .001$). A larger effect was observed in the experimental group post-intervention for HC-PAIRS and Back-PAQ but not for NPQ.

When controlling for baseline scores, there was a significant effect of the intervention type (EXP vs TRAD) on the HC-PAIRS (large effect) and Back-PAQ (medium effect) scores, but this was not the case for the NPQ (Table 5.2) These results confirm the visual interpretation of Figure 5.5.

Table 5.2: ANCOVA results of HC-PAIRS, Back-PAQ and NPQ. F = between-groups variance divided by within-groups variance.

Variable	Effect	F	p-value	η_p^2	Magnitude
HC-PAIRS	Baseline score	366	$p < .001$	.468	Large
	Intervention type	133	$p < .001$	.243	Large
Back-PAQ	Baseline score	347	$p < .001$	.455	Large
	Intervention type	65	$p < .001$	.135	Medium
NPQ	Baseline score	430.1	$p < .001$	.508	Large
	Intervention type	3.84	$p = .05$	.009	Small

Results of the vignette are presented in Table 5.3. At baseline assessment, the large majority of both groups gave guideline-inconsistent recommendations

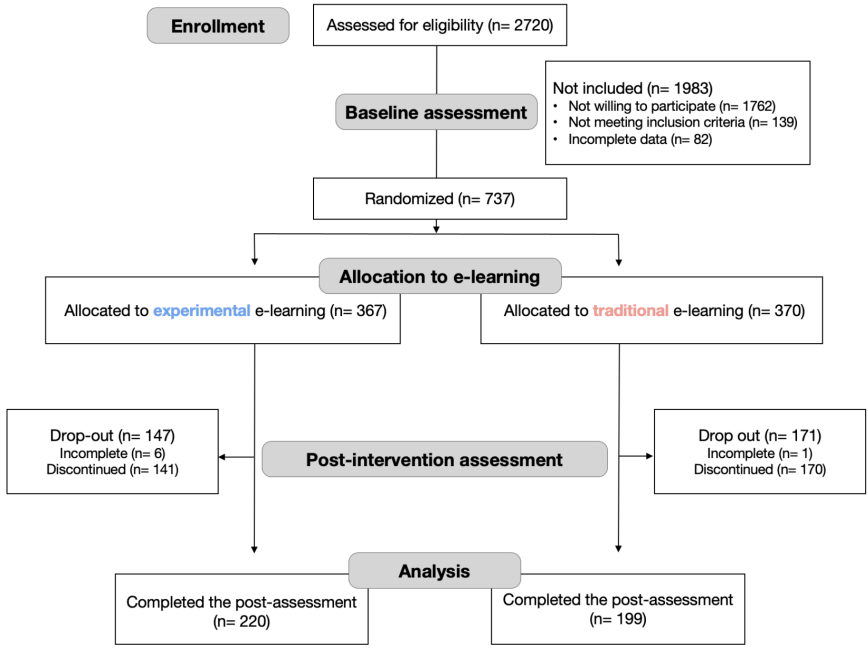


Figure 5.4: CONSORT flow diagram of the study

regarding work, whereas the percentage of guideline-consistent recommendations concerning work largely increased post-intervention in the experimental group ($p < .001$).

5.4 Discussion

This randomized controlled study compared physiotherapists' knowledge, attitudes, and beliefs following completion of either an experimental e-learning (interactive and using clinical examples) or a traditional e-learning (classical lecture without interaction) intervention. Beliefs and attitudes about pain and impairment improved significantly more in physiotherapists following the experimental e-learning intervention compared to physiotherapists who received the traditional intervention. However, pain neurophysiology knowledge was not influenced by either intervention despite the fact that both groups received pain education content. The experimental e-learning intervention led to a larger

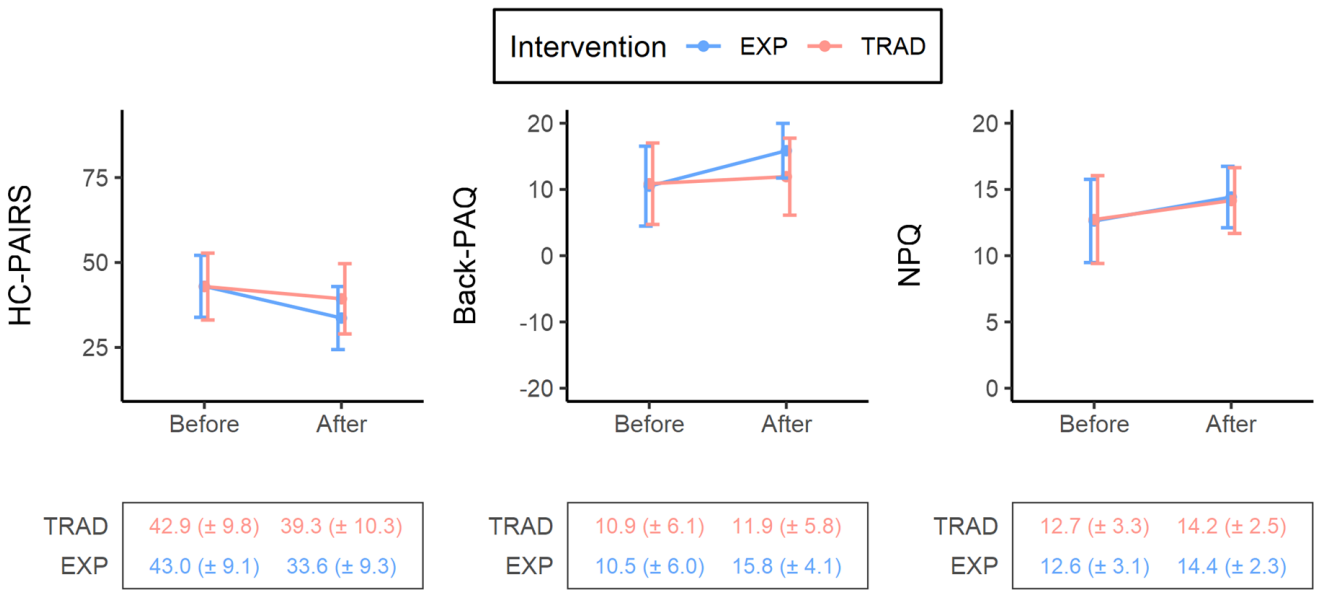


Figure 5.5: Mean scores and standard deviation of HC-PAIRS, Back-PAQ and NPQ at baseline and post-intervention assessment in the experimental (EXP) and traditional (TRAD) group

Table 5.3: Fisher's exact t-test for the vignette's score concerning recommendations about activity and work before and after the intervention. G.I. stands for "Guideline-inconsistent", while G.C. stands for "Guideline-consistent".

	Baseline			Post-intervention		
Group	G.I. (%)	G.C. (%)	Two-sided p-value	G.I. (%)	G.C. (%)	Two-sided p-value
Activity						
EXP	26.4	73.6		21.8	78.2	
TRAD	23.6	76.4	$p = 0.57$	29.1	70.9	$p = 0.09$
Work						
EXP	61.8	38.2		35.9	64.1	
TRAD	72.9	27.1	$p = .02$	61.3	38.7	$p < .001$

increase of guideline-consistent recommendations concerning return to work compared to the traditional intervention.

5.4.1 Comparison of the findings with other studies

Few studies evaluated the efficiency of e-learning interventions on the knowledge, attitudes and beliefs of licensed physiotherapists concerning LBP management. Our results are similar to other studies who showed that emphasizing a bio-psycho-social approach in e-learning interventions for the management of LBP was effective to reduce negative beliefs of HCPs [140, 146, 154, 158]. Our results concerning pain neurophysiology knowledge differ from a study which found that a focused pain education module increased pain knowledge (measured by the NPQ) but also strengthened beliefs that pain justifies impairment (HC-PAIRS) of medical students [211]. Return to work recommendations were positively influenced by the experimental e-learning intervention. This is an important finding, as return to work is a challenging topic in the management of LBP [154] and efficient return to work strategies are difficult to implement because of multiples variables (e.g., etiology of illness or psychosocial factors) [212]. Given the time they spend with patients, physiotherapists have an important role and could positively influence return to work processes [213]. Our results are promising but future studies should also measure practitioners activity and work recommendations during actual consults [214].

Baseline scores of this randomized controlled trial were discussed in a previous paper and were considered concerning [215]. This study found that a high proportion of physiotherapists (63%) were unfamiliar with guidelines and that was associated with inadequate knowledge, attitudes and beliefs concerning LBP management highlighting the need to develop interventions to enhance knowledge, attitudes and beliefs of physiotherapists [215]. The minimal clinically important difference (MCID) was set to 6 for Back-PAQ, 4.2 or 4.6% for HC-PAIRS and 0.9 or 7.3% for NPQ in previous studies [171, 191, 210]. Hence, the results of the experimental group post-intervention could be considered as clinically relevant for HC-PAIRS and NPQ. The mean difference for the Back-PAQ is lower (5.3) than the 6-point change needed to be considered clinically relevant. Despite the efficiency of the experimental e-learning there is room for improvement.

5.4.2 Improved performance of the experimental e-learning intervention

Until now, it is unknown which messages are likely to reinforce positively knowledge, attitudes and beliefs of HCPs. Hence, both interventions were based on the main content of the guidelines and presented the same themes, but main messages were emphasized differently in each intervention (see Figure 5.1). This approach was chosen to explore how these different messages may affect the HCPs and impact their knowledge, attitudes and beliefs. The experimental intervention emphasized the importance of promoting self-management, reassurance of the patient and the screening of psychosocial factors in non-specific LBP. Concrete examples were given to show how to reassure and evaluate people with LBP (with increased risk of chronicity due to the presence of psychosocial factors) in a patient-centered way including metaphors, infographics, and tools usable by practitioners [53, 216–218]. The traditional intervention emphasized the importance to exclude a specific underlying cause of LBP with detailed information on the different specific pathologies and potential red flags. The importance of stratified care comprising the stepwise approach to favor physical activity was explained, but no clinical examples were given. Finally, the recommendations for the pharmacological treatment and invasive treatment in case of unsuccess of conservative management were extensively explained. The core difference between the two intervention was that the experimental intervention concretely shows how to apply important recommendations. For example, two videos of a clinician-patient communication were shown to illustrate how to reassure and promote self-management in a patient in an acute or chronic LBP situation. In the traditional intervention it was mentioned but without giving concrete clinical examples (similarly to the guidelines). These

differences in the content emphasized and how it was presented could have influenced the better results of the experimental intervention.

The third module of the two e-learning interventions ("Understanding the complexity of pain") was developed to positively impact pain knowledge of HCPs. The purpose of this module was to give clinicians either contextualized information, metaphors and stories covering the understanding of the pain experience (experimental intervention) or a more theoretical approach to understand the pain experience (traditional intervention). No significant effect was found concerning the intervention type in post-intervention assessment scores of the NPQ. Both intervention types may have been informative, but the results showed that one intervention is not superior to the other. It could be hypothesized that the NPQ is not designed to capture a change in knowledge concerning the complexity of a patient-centered reassurance about her/his pain experience (experimental module). It is also possible that this third module focused on the understanding of the pain experience could have positively impacted attitudes and beliefs (HC-PAIRS, Back-PAQ and activity/work recommendations) of physiotherapists as seen in previous studies [219, 220].

The recommendations concerning the return to work were significantly more guideline-consistent in the experimental group post-intervention. This could be explained by the content of the experimental e-learning intervention, in which the importance of return to work was explicitly stressed. Moreover, the third experimental module ("Understanding the complexity of pain") could have positively impacted work recommendations. A better understanding about the importance of context in the pain experience could have reassured HCPs and favor positive recommendations concerning return to work.

Future qualitative studies should evaluate which elements of the interventions led to a change in knowledge, attitudes and beliefs. This could allow to develop new e-learning interventions that are even more efficient to positively impact HCPs.

The current study might also help to understand why presenting a written form (i.e. paper of online document) of the guidelines might not be useful to help clinicians to adapt their management strategies. Other studies reported that the interactive aspect of an e-learning intervention is associated with significant improvement in knowledge, attitudes and beliefs of HCPs [25, 135, 207]. The experimental e-learning intervention was designed in a similar way, to be interactive (e.g., menus, voice-overs, and quiz), controllable (e.g., the ability to advance, go back or rewind in the content) and to include videos of concrete clinical situations to understand how to apply guideline recommendations (e.g., what to communicate to reassure a patient about the benign aspect of LBP). The traditional intervention could be compared to a written version of the

guidelines because only text and images on static slides were presented to participants. The didactical approach of the experimental intervention could have contributed to the better results in that group.

5.4.3 Limitations and strengths

This study had some limitations. Firstly, there was a large dropout percentage, as only 57% of the total sample fulfilled the post-intervention assessment. The online design of the study (i.e., without direct contact with the experts), the time necessary to complete the post-intervention assessment, or technical difficulties might explain this quite high dropout. An e-mail reminder to follow the e-learning and complete the study was sent one week after baseline assessment, but it is plausible that it was not enough, and that some physiotherapists forgot to complete the study. Secondly, this study compared two interventions but did not include a control group (with participants receiving only the written version of the guidelines). Thirdly, because of multiple influencing factors (design of the e-learning & different emphasis of the main content), it is not possible to be more specific in the exploration of factors that have contributed to the better results. Finally, the follow-up of this study was short and future studies should evaluate if changes in clinical behavior of physiotherapists occurred after the intervention. To enhance the efficacy of the interventions and favor behavioral changes, additional strategies could be used (in-person reminders and practical sessions).

The large sample size should certainly be considered as a strength. The results of this study are promising, given the difficulty to change beliefs of physiotherapists, especially recommendations about return to work [154]. Integrating easy-access and costless tools such as interactive e-learning in continued education could help disseminate up-to-date information from research to clinical practice, enhance knowledge, attitudes and beliefs regarding recommendations for the management of LBP and participate to better treatments in guideline-consistent care.

5.5 Conclusion

This study showed that an experimental e-learning intervention designed to be interactive and to give concrete examples on how to practically integrate content of the guidelines, such as adapted communication to reassure the patient, promote self-management and the importance of screening psycho-social factors led to significantly better improvement in attitudes, beliefs and recommendations concerning return to work in physiotherapists than a traditional online lecture.

Future studies should analyze physiotherapists' perception about the e-learning packages to led to the effect of these interventions and investigate their impact on the clinical behavior of physiotherapists.

5.6 Acknowledgements

The authors would like to thank Isaline Demeure (UAntwerpen), Sebastiaan Naessens (UAntwerpen), Félix Monnier (UMONS) for their contributions in the development of the e-learning interventions and Alexandre Bohyn (KU Leuven) for his contribution to the statistical analysis.

Chapter 6

General discussion

6.1 Summary

Low back pain (LBP) is a very common symptom present in all populations and is the first cause of years lived with disability worldwide. In some people the pain experience lasts more than 12 weeks and is considered chronic. Cognitive and emotional processes could play an important role in the progression from acute to chronic pain. Despite the tremendous evolution of the scientific knowledge regarding pain, the burden of this musculoskeletal disorder is projected to increase in the years to come. This major public health problem is a challenge and requires urgent efforts and initiatives.

Physiotherapists and general practitioners are first line actors in the evaluation and management of LBP. Sadly, there is evidence that HCPs don't follow guidelines for the management of LBP and have difficulties to evaluate patients using a bio-psycho-social framework. Moreover, attitudes and beliefs of HCPs could impact the prognosis of the patients by negatively influencing their cognition, emotions and coping strategies.

The main objective of this thesis was to develop and evaluate interventions to transpose scientific knowledge concerning a guideline-adherent approach to manage LBP in clinical practice. We developed two different e-learning interventions to enhance the knowledge, attitudes and beliefs of physiotherapists managing patients with LBP.

Firstly, we highlighted the challenges of LBP management in people suffering from low back related leg pain. Patients with LBP that radiates to the leg

are often given a variety of diagnoses (e.g. “sciatica”; “pseudo-radicular pain”; “radicular syndrome) that does not reflect the underlying predominant pain mechanism. It causes confusion and could negatively impact the patient. To discuss this challenge and help clinicians, we illustrated concrete clinical examples (objective and subjective examination) of two patients with the same pain localization but different predominant underlying pain mechanisms (i.e. nociceptive vs neuropathic pain).

Secondly, we developed and tested the feasibility of an interactive e-learning intervention on the management of LBP in HCPs. We found promising results reflected by positive experiences and significant improvement of HCPs' knowledge, attitudes and beliefs after the intervention. The e-learning intervention met the expectations of most participants, but some participants highlighted that specific topics were missing.

Thirdly, we assessed the knowledge and application of guidelines among physiotherapists and explored whether this was related to their attitudes and beliefs. We found that a high proportion of physiotherapists were unfamiliar with guidelines related to management of LBP. This lack of knowledge was reflected by attitudes that there is a strong relationship between pain and impairment, beliefs about LBP that are unhelpful and inadequate knowledge on the neurophysiology of pain.

Fourthly, based on the preliminary results we developed and tested the effectiveness of two different e-learning interventions (experimental and traditional) on the knowledge, attitudes and beliefs of physiotherapists. The results showed that an experimental e-learning designed to be interactive and to give concrete examples on how to practically integrate content of the guidelines, such as efficient communication to reassure the patient and the importance of screening psycho-social factors led to a significant improvement in attitudes, beliefs and recommendations concerning return to work in physiotherapists in comparison to a traditional online lecture.

6.2 Objectives

The main objective of this thesis was to contribute to the challenge of LBP by transposing scientific knowledge in clinical practice. Hence, we developed and tested e-learning interventions to enhance knowledge, attitudes and beliefs of physiotherapists.

6.3 Reflective analysis of chapters

Aim 1: To clarify and describe the terminology related to the underlying pain mechanism of low back related leg pain and help clinicians differentiate these mechanisms by using clinical based scenarios (Chapter II).

Clinical guidelines and scientific papers are not consistent to describe pain mechanisms underlying low back related leg pain (e.g. “sciatica”; “radicular syndrome”; “pseudo-radicular pain”). Moreover, guidelines don’t give concrete clinical examples to help clinicians to differentiate them in practice. This lack of clarity and confusion challenges clinical reasoning, favor mismanagement of patients and negatively influence patient’s prognosis.

It was important to clarify and describe terminology related to low back related leg pain and propose solutions to differentiate the potential underlying predominant pain mechanisms in patients (nociceptive or neuropathic). It was deliberate to discuss two pain mechanisms described by the International Association for the Study of Pain (IASP) to ease the differentiation between nociceptive and neuropathic pain mechanisms. We did not discuss nociplastic pain in that chapter, the third pain mechanism. On that matter, it is important to acknowledge that some similarities could exist between subjective and objective examination of patients with predominant neuropathic or nociplastic mechanisms that does not ease the differentiation in practice, such as positive signs during the neurological (such as allodynia or hyperalgesia) or neurodynamical examination. Nevertheless, the IASP defined clinical criteria to help clinicans with a grading system to classify a patient with a possible or probable nociplastic pain mechanism: (1) report pain of at least 3 months duration, (2) report a regional rather than a discrete pain distribution, (3) report pain that cannot be explained by nociceptive or neuropathic mechanisms, and (4) show clinical signs of pain hypersensitivity (allodynia) that are at least present in the region of pain [221, 222]. Because of the lack of reliable clinical tests, the purpose of this grading system is to indicate a level of certainty and not a definitive diagnosis. A future editorial on the subject, aiming to help clinicians to differentiate pain mechanisms in practice could include this third pain descriptor.

Studies highlighted that despite extensive efforts to develop a global consensus on pain definitions, disagreement still exists on the characteristics features that could aid differentiate pain mechanisms [223, 224]. As discussed in chapter II, overlap exists between pain mechanisms, they should not be considered as distinct entities. Giving this overlap, implementing treatment based on predominant pain mechanisms is challenging and complex.

It could be argued that differentiating pain mechanism in practice is not useful and will not change the physiotherapist's treatment approach. We argue it is important for clinicians to (1) be aware of the existence of the current definitions of the different pain mechanisms, (2) know the criteria to differentiate these pain mechanisms in clinical practice. The objective is to help clinician to avoid the trap to diagnose a "sciatica" (neuropathic pain) in a patient with nociceptive referred pain (e.g gluteal tendinopathy with pain radiating in the leg). Moreover, in case of predominant neuropathic pain, it is crucial for the clinician to be able to assess it, as the prognosis is worse for the patient. In that case, evidence suggests the use of specific medication, adapted passive treatments, appropriate dosage of exercises and specific communication about the symptomatology. Moreover, a patient's condition can evolve, it is why the HCP must assess the patient repeatedly in the follow-up and be aware of possible symptoms' aggravation. Further research is necessary to better define clinical pathways for patients with low back related leg pain.

Aim 2: To develop an interactive e-learning intervention concerning the management of LBP and to evaluate the feasibility of its implementation in HCPs (Chapter III).

The next step of this thesis was to develop and evaluate the feasibility of an e-learning intervention in HCPs. On purpose, the sample was diversified and includes several health professions (physicians, nurses, orthopedists, physiotherapists, occupational therapists) to gather as much data as possible on the feasibility of integrating an e-learning intervention in healthcare professions.

Firstly, the intervention was highly appreciated (structure, presentation, length, flexibility) but some suggestions were made on the content: (1) to give more information related to the psychological and emotional aspects of LBP and (2) more information concerning the type of exercises useful for LBP patients. Indeed, clinical guidelines don't integrate concrete examples of psychologically informed practice or exercises that could be used by HCPs. Thus, these suggestions were added in the final version of the e-learning (Chapter V) using recommendations of the guidelines and in association with knowledge from the scientific literature on these topics to complete them. The third module of the experimental e-learning intervention was entirely dedicated to the understanding of the pain experience from the point of view of the therapist and the patient. This module gave concrete example on how integrating psychological and emotional aspects in the treatment with various tools (e.g. metaphors; images; videos) which are lacking in clinical guidelines. Moreover, strategies to implement exercises and physical activity were developed with the same strategy.

Secondly, this pilot study gathered promising results concerning the effectiveness

of the intervention to enhance knowledge, attitudes and beliefs of participants. But because the sample of participant was small, these results should be analyzed with caution. Chapter V allowed an in-depth analysis of the efficiency of different e-learning modalities on knowledge, attitudes and beliefs of physiotherapists.

Aim 3: To examine the current knowledge, attitudes and beliefs of physiotherapists about a guideline-adherent approach to LBP and to assess the ability of physiotherapists to recognize signs of a specific LBP (Chapter IV).

To answer this aim, we analyzed the baseline data of the physiotherapists participating to the study before they followed the e-learning intervention.

Firstly, a majority of physiotherapists (63%) reported they were uncertain or did not know the content of the guidelines on the management of LBP. This number is striking because more guidelines-inconsistent attitudes and behaviours (i.e., reflected by significantly worse scores on HC-PAIRS, Back-PAQ, NPQ, recommendations based on clinical vignette) were observed in these physiotherapists. The mean years of clinical experience of our sample of physiotherapists could be considered as low (12 years). These results may indicate that the education of physiotherapists does not optimally integrate clinical guidelines for the management of low back pain in the education and training. In Belgium, the focus of physiotherapy education is related to biomedical theoretical knowledge (e.g. neurophysiology or biomechanical courses) often given by academic physicians without link and implications for physiotherapists' clinical practice. Moreover, practical courses are mainly oriented towards hands-on techniques. These techniques, such as inter-vertebral mobilizations, could be efficient to manage a patient with LBP but should not be the only part of the management. Often, the time allocated to learn these manual techniques is not equally distributed compared with other crucial soft skills (e.g. patient-centered communication) related to psycho-social factors that are known to positively influence patient management and recovery.

Fundamental skills such as critical thinking, clinical reasoning and patient-centered communication are under trained and should be part of every curriculum at early stages to allow continuous integration of clinical recommendations by future practitioners and enhance patient's management.

Secondly, half of the physiotherapists did not suspect the presence of a specific type of LBP in a clinical vignette, despite clear indicators of a neurological condition that should arise suspicion or concerns and influence clinical decision making. This could mean they don't have the knowledge to perceive, to analyze transversally and to generate a relevant hypothetico-deductive reasoning based on the information disseminated in the clinical vignette. Without the knowledge

concerning specific pathologies, appropriate clinical reasoning including pattern recognition is limited. As discussed previously, theoretical teaching lack of concrete links with clinical practice, and clinical reasoning is under trained in physiotherapy schools in Belgium. It could also participate to these results. The lack of screening abilities observed in this study could potentially cause inappropriate management or even harm patients with delayed referral that could cause irreversible health problems. These results are highly concerning and question the possibility to open direct access to physiotherapy in Belgium and France without appropriate training or level of specialization.

Efficient strategies should be developed and evaluated to integrate the recommendations of the guidelines into the theoretical but also the practical training of physiotherapy students. E-learning could be a useful intervention tool, by their flexibility and interactive format, to help the transition of science knowledge and clinical recommendations into clinical practice. Chapter V allowed an in-depth analysis of the efficiency of two different e-learning modalities on knowledge, attitudes and beliefs of physiotherapists.

Aim 4: To develop two different e-learning interventions based on (inter)national guidelines for the management of LBP and evaluate their effectiveness to improve the knowledge, attitudes and beliefs of physiotherapists (Chapter V).

The main objective of this project was to (1) develop e-learning interventions and (2) to positively impact attitudes, knowledge, and beliefs of physiotherapists managing LBP.

This study compared physiotherapist's knowledge, attitudes and beliefs of licensed physiotherapists' following completion of either an experimental e-learning (interactive with clinical examples) or a traditional e-learning (classical lecture without interaction).

We observed a large response rate during the recruitment procedure with more than 2720 entries on our online platform to participate to the study. Among them, 737 physiotherapists were eligible to be randomized either to the experimental or traditional e-learning. A large dropout percentage was observed: only 57% of the total sample completed the study. This could be explained for multiple reasons. The online design of the study did not allow direct contact with the researcher. Despite the availability of an email address, participants could have stopped the study in case of technical problems. The time to complete the study could have been too short for some physiotherapists, as two weeks were mandatory to follow the three modules of the e-learning intervention. It is also possible that some participants forgot to complete the e-learning. An e-mail reminder was sent one week after baseline assessment,

but it is plausible that it was not enough or too late for some participants.

Beliefs and attitudes improved more significantly in the experimental group compared to the traditional group. It is worth mentioning that we observed a large variability in the scores of the questionnaires at baseline and post-intervention assessment. This could be explained because different professional levels of physiotherapy do not exist in Belgium and France, such as specialized physiotherapists (advanced clinical practice) in New-Zealand or Australia. We did not integrate in the data analysis the specific field or post-graduate training that physiotherapists could have followed (e.g.specialization in musculoskeletal physiotherapy) and it could explain the large variability of results concerning knowledge, attitudes and beliefs of the participants in this study.

Enhancing knowledge, attitudes and beliefs of physiotherapists is an important first step, especially concerning recommendations about return to work that are known to be difficult to change. The results of this study are promising, but to have a positive clinical impact on patient care, the clinical behavior of physiotherapists must change consecutively. This was not analyzed in this study. However, phone interviews were made after participants completed the study. Questions related to their clinical attitudes concerning management of LBP were asked. In future studies these interviews will allow an analysis of the participants' understanding of key concepts and steps recommended from the guidelines developed in the e-learning interventions. To further analyze the impact of these interventions on their clinical behavior, future studies could include simulated patients in their workplace to gather data on their clinical decision-making concerning LBP management.

For future research, a specialist in learning theories and pedagogy should be incorporated in the development team to enhance the experimental e-learning intervention. Indeed, the interventions were developed by experienced academics, researchers, physicians and physiotherapists, but no experts in learning theories and pedagogical design were involved.

Moreover, a hybrid approach consisting of e-learning interventions completed with in-person practical sessions could be interesting and positively impact the clinical behavior of physiotherapists.

6.4 Conclusions and perspectives

The aim of the thesis was to answer to several calls made in the scientific community to "determine how best to put existing knowledge and evidence to use" and "[...] widespread and inaccurate beliefs about LBP among [...] healthcare professionals should be challenged" [16].

Concerning results related to guidelines adherence, inability to screen specific LBP, absence of recommendations about return to work and inadequate attitudes and beliefs in physiotherapists were highlighted in chapter IV. Hence, the objective of this PhD was to develop solutions to transpose advancements in science knowledge to clinical practice. Because this is a clinical challenge and it is not explicit in clinical guidelines, we wrote an editorial paper to give concrete examples to healthcare practitioners on how to differentiate pain mechanisms related to LBP in chapter II. In chapter III we found that an e-learning intervention for healthcare practitioners was feasible and positively impacted attitudes and beliefs of participants. Based on these results we developed two e-learning interventions aimed to be evaluated in a randomized controlled trial. In chapter V we found that an experimental e-learning intervention led to better improvement in attitudes, beliefs and recommendations about return to work in physiotherapists than a traditional lecture. The experimental intervention was designed to be interactive and to give concrete examples on how to practically integrate content of the guidelines such as adapted communication to reassure the patient, promote self-management and the importance of screening psychosocial factors.

A reflective analysis of the aim of each chapter was discussed in the previous part. To conclude this thesis and discuss future perspectives, different needs were identified to enhance knowledge, attitudes and beliefs of physiotherapists and favor best practice in the future. They are discussed in the paragraphs below.

6.4.1 Need of systemic changes

In Belgium, physiotherapists receive a license to practice after their graduation. They keep their license indefinitely. They are free to follow post-graduation courses but there is no incentive to do so. Advanced training and certification in neuro-musculo-skeletal physiotherapy (Manual Therapy - IFOMPT level) does not translate in any recognition or salary differences. Moreover, in contrast to several other countries, no mandatory continuing education is required to maintain their practice license despite the evolution of scientific knowledge. This might lead to lack of motivation of physiotherapists to pursue continuing

education during their career and explain the alarming results of chapter IV. The national health system has a role in the current situation. They must support the development and maintaining of best practice in Belgium. Efficient strategies, such as yearly education courses, to favor transmission of science recommendations in practice should be implemented and mandatory for healthcare practitioners.

6.4.2 Need of new tools in education

Giving the results of our studies, e-learning modalities concerning the management of LBP should be adapted, integrated and evaluated in physiotherapy curriculum. Their flexibility and interactivity could allow a better transition between theoretical teaching and practical skills. For example, by using a video that transpose theoretical neurophysiology knowledge into a clinical example of a physiotherapist discussing with a patient worried about the pain, in a patient-centered way. Moreover, skills of clinical reasoning should be an essential part of the physiotherapy education system. Clinical reasoning is a reflective process of inquiry and analysis in partnership with a patient to understand their context and clinical problems. Clinical reasoning is the first step to guide evidence-based practice. It is a fundamental thinking process that should be developed early in physiotherapy students to favor future critical thinking in practice. Sadly, clinical reasoning is under-trained. One of the potential causes is the lack of practical tools to practice clinical reasoning with students. A serious game tool was recently developed [225] to favor the development of clinical reasoning in students. It could be interesting to evaluate the added benefit of serious games with e-learning modalities on longitudinal studies. Serious game tools could be used during in-person practical sessions to complete e-learning modalities, to work with students and illustrate “how to” transpose theories into practice.

6.4.3 Need of new tools for working physiotherapists

E-learning interventions could be a useful tool to support teaching for physiotherapy students but are probably insufficient to drastically change the clinical behavior of actual physiotherapists and healthcare practitioners. However, some recent progress in the technology field could help us getting closer to our goal to enhance inadequate knowledge, attitudes and beliefs of practitioners.

Artificial intelligence (AI) is already used to assist practitioners in different medical fields such as radiology [226], dermatology [227], psychology [228]. In

the musculoskeletal field, AI can be trained to classify MRI images as well or better than medical experts, or screen for pathophysiological changes [229, 230]. To avoid the transition from acute to persistent LBP, AI could be trained to enhance tasks related to classification and prediction of patients and support therapists in their clinical reasoning. For example, clinical guidelines recommend screening the risk of chronicity of patients with LBP. AI already demonstrated promising results to classify these patients based on clinical vignettes [231]. As these technologies are evolving quickly and becoming widely available, future research could integrate and evaluate their usability and added benefits. A potential use of these technologies could be to support healthcare practitioners in their clinical decision making. AI could support therapists by gathering real time advice and summaries of best recommendations based on patient's symptoms. AI could also be useful to enhance the e-learning interventions presented in this thesis. In the near future, AI could be powerful enough to be integrated in education, to naturally answer questions, generate clinical situations, and give feedbacks during learning process, and create dynamic interactions when the teacher is not present.

In this thesis we proposed solutions to the challenge of LBP by developing, evaluating, and discussing strategies to transpose scientific knowledge in clinical practice. Enhancing knowledge, attitudes and beliefs, as well as clinical behavior, of physiotherapists is still an enormous challenge. It is crucial to continue to evaluate multiple strategies to target this problematic. The ultimate goal is to have first-line practitioners worldwide who can think critically, manage patients on the basis of evolving scientific knowledge, to meet the challenge of low back pain and offer patients the best available treatments.

Appendices

Appendix A

Guidelines summary

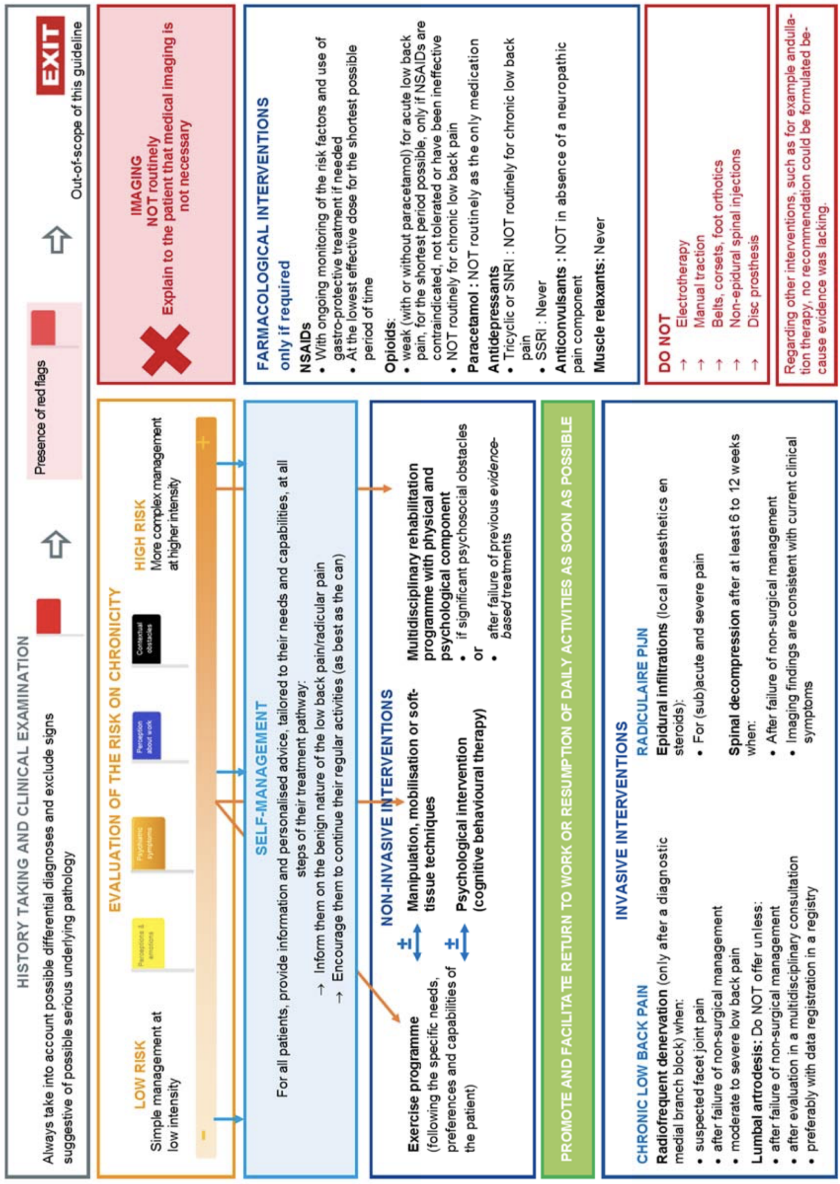


Figure A.1: Summary of the KCE guidelines - KCE REPORT 287Cs

Appendix B

Questionnaires

B.1 HC-PAIRS

Veuillez lire attentivement chaque proposition et sélectionner ce qui correspond le mieux à votre ressenti. Les réponses à chaque question sont exprimées au moyen de l'échelle de Likert suivante. *Gelieve elke stelling grondig te lezen en het nummer te kiezen die het beste past bij uw overtuiging. Per stelling dient u een Likert schaal in te vullen:*

(1) Pas du tout d'accord. *Helemaal niet akkoord.*

(2) En désaccord. *Niet akkoord.*

(3) Plutôt en désaccord. *Enigszins niet akkoord.*

(4) Ni d'accord, ni en désaccord. *Neutraal.*

(5) Plutôt d'accord. *Enigszins akkoord.*

(6) D'accord. *Akkoord.*

(7) Tout à fait d'accord. *Helemaal akkoord.*

Questions	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Les patients lombalgiques sont encore censés remplir leurs responsabilités familiales et professionnelles malgré la douleur. *Van chronische rugpijn patiënten mag verwacht worden dat zij in hun gezin en op het werk hun verantwoordelijkheden vervullen ondanks de pijn.*	☐	☐	☐	☐	☐	☐	☐
2. Une accentuation de la douleur indique que le patient lombalgique devrait arrêter ce qu'il est en train de faire jusqu'à ce que la douleur diminue. *Een toename van de pijn is een indicatie dat een chronische rugpijn patiënt moet ophouden met waar hij/zij mee bezig is tot de pijn vermindert.*	☐	☐	☐	☐	☐	☐	☐
3. Les patients lombalgiques ne peuvent pas accomplir les activités normales de la vie quotidienne lorsqu'ils ont mal. *Chronische rugpijn patiënten kunnen hun normale activiteiten niet uitvoeren wanneer ze pijn hebben.*	☐	☐	☐	☐	☐	☐	☐
4. Si leurs douleurs disparaissaient, les patients lombalgiques seraient tout aussi actifs qu'avant. *Zonder de pijn zouden chronische rugpijn patiënten net zo actief zijn als ze voorheen waren.*	☐	☐	☐	☐	☐	☐	☐

Continued on next page

Questions	(1)	(2)	(3)	(4)	(5)	(6)	(7)
5. Les patients lombalgiques devraient bénéficier des mêmes avantages que les patients handicapés en raison de leurs douleurs. *Chronische rugpijn patiënten zouden vanwege hun chronisch pijnprobleem dezelfde voordelen moeten krijgen als gehandicapten.*	☐	☐	☐	☐	☐	☐	☐
6. Les patients lombalgiques se doivent vis-à-vis d'eux-mêmes et de leur entourage d'accomplir leurs activités habituelles même lorsque leurs douleurs sont importantes. *Chronische pijnpatiënten zijn aan zichzelf en hun omgeving verplicht om hun dagelijkse activiteiten uit te voeren, ook al hebben ze erge pijn.*	☐	☐	☐	☐	☐	☐	☐
7. Compte tenu de leurs douleurs, la plupart des gens attendent trop des patients lombalgiques. *De meeste mensen verwachten teveel van chronische rugpijn patiënten, gezien hun pijn.*	☐	☐	☐	☐	☐	☐	☐
8. Les patients lombalgiques devraient veiller à éviter de faire des choses qui pourraient accentuer leurs douleurs. *Chronische rugpijn patiënten moeten opletten om niets te doen wat hun pijn zou kunnen verergeren.*	☐	☐	☐	☐	☐	☐	☐
9. Tant qu'ils ont mal, les patients lombalgiques ne seront jamais capables de vivre comme avant. *Zolang ze pijn hebben, zullen chronische rugpijn patiënten nooit in staat zijn hun leven te leiden zoals voorheen.*	☐	☐	☐	☐	☐	☐	☐

Continued on next page

Questions	(1)	(2)	(3)	(4)	(5)	(6)	(7)
10. Les patients lombalgiques doivent accepter qu'ils présentent une incapacité (handicap) en raison de leurs douleurs. *Chronische rugpijnpatiënten zullen moeten accepteren dat ze, vanwege hun chronische pijn, belemmerd zijn (ze vertonen een handicap).*	☐	☐	☐	☐	☐	☐	☐
11. Il n'est pas possible que des patients lombalgiques puissent refaire ce qu'ils faisaient avant tant qu'ils n'ont pas trouvé un traitement pour soigner leurs douleurs. *Het is voor chronische rugpijn patiënten onmogelijk om de dingen te doen die ze voorheen deden, tenzij ze eerst een behandeling voor hun pijn hebben gevonden.*	☐	☐	☐	☐	☐	☐	☐
12. Bien que leurs douleurs soient tout le temps présentes, souvent, les patients lombalgiques ne les remarquent plus du tout lorsqu'ils sont occupés. *Ook al is de pijn altijd aanwezig, toch merken chronische rugpijn patiënten het vaak nauwelijks als ze bezig blijven.*	☐	☐	☐	☐	☐	☐	☐
13. Tous les problèmes des patients lombalgiques seraient résolus si leurs douleurs disparaissaient. *Alle problemen van chronische rugpijn patiënten zouden opgelost zijn als de pijn weg zou zijn.*	☐	☐	☐	☐	☐	☐	☐

B.2 Back-PAQ

Les réponses à chaque question sont exprimées au moyen de l'échelle de Likert suivante. *Per stelling dient u een Likert schaal in te vullen.*

(1) C'est faux. *Fout.*

(2) C'est peut-être faux. *Mogelijk fout.*

(3) Je ne suis pas certain. *Onzeker.*

(4) C'est peut-être vrai. *Mogelijk correct*

(5) C'est vrai. *Correct.*

Table B.2: Ces questions concernent votre propre dos. *Deze vragen gaan over uw eigen rug.*

	(1)	(2)	(3)	(4)	(5)
1. Vous pouvez facilement vous blesser le dos. *Het is gemakkelijk om uw rug te beschadigen.*	☐	☐	☐	☐	☐
2. Vous pourriez vous blesser le dos si vous n'êtes pas prudent. *U zou uw rug kunnen beschadigen als u niet voorzichtig bent.*	☐	☐	☐	☐	☐

Table B.3: Ces questions concernent le mal de dos en général. *Deze vragen gaan over rugpijn in het algemeen.*

	(1)	(2)	(3)	(4)	(5)
3. Avoir mal au dos signifie que vous vous êtes blessé le dos. *Rugpijn betekent dat u uw rug hebt beschadigd.*	☐	☐	☐	☐	☐
4. Un tiraillement dans votre dos peut être le premier signe d'une blessure grave. *Een pijnscheut in uw rug kan een eerste teken zijn van een ernstig letsel.*	☐	☐	☐	☐	☐

Table B.4: Ces questions concernent ce que vous devriez faire si vous avez mal au dos. *Deze vragen gaan over wat u zou moeten doen als u rugpijn heeft.*

	(1)	(2)	(3)	(4)	(5)
5. Si vous avez mal au dos, vous devriez éviter les activités physiques. *Indien u rugpijn heeft, zou u oefeningen moeten vermijden.*	☐	☐	☐	☐	☐
6. Si vous avez mal au dos, vous devriez essayer de rester acti.f.ve. *Indien u rugpijn heeft, zou u moeten proberen om actief te blijven.*	☐	☐	☐	☐	☐

Table B.5: Ces questions concernent la guérison d'un mal au dos. *Deze vragen gaan over het herstellen van rugpijn.*

	(1)	(2)	(3)	(4)	(5)
7. Vous concentrer sur autre chose que votre dos vous aide à guérir d'un mal de dos. *Focussen op andere dingen dan uw rug, helpt u om te herstellen van rugpijn.*	☐	☐	☐	☐	☐
8. Vous attendre à une diminution de votre mal de dos vous aide à guérir de votre mal de dos. *Verwachten dat uw rugpijn gaat beteren, helpt u om te herstellen van rugpijn.*	☐	☐	☐	☐	☐
9. Une fois que vous avez eu mal au dos, vous aurez toujours une faiblesse. *Wanneer u eenmaal rugpijn hebt gehad, blijft dit een zwak punt.*	☐	☐	☐	☐	☐
10. Il est très probable qu'un épisode de douleurs de dos ne se résolve pas. *Er is een hoge kans, dat een episode van rugpijn niet opgelost geraakt.*	☐	☐	☐	☐	☐

B.3 NPQ

Questions	Vrai *Juist*	Faux *Fout*	Je ne sais pas *Onzeker*
1. Les récepteurs qui se trouvent sur les nerfs fonctionnent en ouvrant des canaux à ions de la paroi des nerfs. *Receptoren op zenuwen werken door ionenkanalen in de wand van de zenuw te openen.*	☐	☐	☐
2. Quand une partie de votre corps est blessée, des récepteurs spécifiques à la douleur transmettent le message de la douleur à votre cerveau. *Wanneer een deel van uw lichaam gekwetst raakt, voeren speciale pijnreceptoren de pijnboodschap door naar uw hersenen.*	☐	☐	☐
3. La douleur survient seulement quand vous êtes blessé ou risquez d'être blessé. *Pijn treedt alleen op wanneer je gekwetst bent of het risico loopt om gekwetst te raken.*	☐	☐	☐
4. Des fibres nerveuses spécialisées situées dans votre moelle épinière transmettent des messages « danger » à votre cerveau. *Specifieke zenuwen in uw ruggenmerg voeren "gevaar" boodschappen door naar uw hersenen.*	☐	☐	☐
5. Il est impossible d'avoir mal quand aucun message nerveux ne provient de la partie du corps douloureuse. *Het is niet mogelijk pijn te voelen indien er geen zenuwboodschappen van het pijnlijke lichaamsdeel komen.*	☐	☐	☐

Continued on next page

Questions	Vrai *Juist*	Faux *Fout*	Je ne sais pas *Onzeker*
6. La douleur apparaît à chaque fois que vous êtes blessé. *Pijn treedt op iedere keer je gekwetst raakt.*	☐	☐	☐
7. Le cerveau envoie des messages descendant par la moelle épinière, qui peuvent modifier le message montant par celle-ci. *De hersenen sturen dalende boodschappen via het ruggenmerg die de stijgende boodschap via het ruggenmerg kunnen veranderen.*	☐	☐	☐
8. Le cerveau décide quand une douleur doit être ressentie. *De hersenen beslissen wanneer je pijn zal ervaren.*	☐	☐	☐
9. Les nerfs peuvent s'adapter en augmentant leur seuil d'excitabilité au repos. *Zenuwen kunnen zich aanpassen door hun rustniveau van exciteerbaarheid te verhogen.*	☐	☐	☐
10. Une douleur est chronique quand une blessure n'est pas guérie correctement. *Chronische pijn betekent dat een letsel niet goed genezen is.*	☐	☐	☐
11. Quand il a mal, le corps le dit au cerveau. *Het lichaam zegt de hersenen wanneer het pijn heeft.*	☐	☐	☐
12. Les nerfs peuvent s'adapter en produisant d'avantage de récepteurs. *Zenuwen kunnen zich aanpassen door meer receptoren aan te maken.*	☐	☐	☐

Continued on next page

Questions	Vrai *Juist*	Faux *Fout*	Je ne sais pas *Onzeker*
13. Plus les blessures sont graves, plus les douleurs sont importantes. *Ernstigere letsels leiden altijd tot intensere pijn.*	☐	☐	☐
14. Les nerfs peuvent s'adapter en gardant les canaux à ions ouverts plus longtemps. *Zenuwen kunnen zich aanpassen door ionenkanalen langer open te laten staan.*	☐	☐	☐
15. Les neurones descendants sont toujours inhibiteurs. *Dalende neuronen zijn altijd inhibitorisch (remmend).*	☐	☐	☐
16. Quand vous vous blessez, le contexte dans lequel vous vous trouvez n'influence pas l'intensité de la douleur que vous ressentez, tant que la blessure est exactement la même. *Als je jezelf kwetst, heeft de omgeving waarin je je bevindt geen invloed op de pijnintensiteit die je ervaart, zolang het letsel maar precies hetzelfde is.*	☐	☐	☐
17. Il est possible d'avoir mal et de ne pas s'en rendre compte. *Het is mogelijk pijn te hebben zonder dit te beseffen.*	☐	☐	☐
18. Quand on se blesse, des récepteurs spécifiques transmettent le message de danger à la moelle épinière. *Wanneer je gekwetst raakt, voeren speciale receptoren de gevaarboodschap door naar uw ruggenmerg.*	☐	☐	☐

Continued on next page

Questions	Vrai *Juist*	Faux *Fout*	Je ne sais pas *Onzeker*
19. Dans un même contexte, une même blessure au petit doigt d'un violoniste fera probablement plus mal au petit doigt gauche qu'au petit doigt droit alors que ce n'est pas le cas chez un pianiste. *In eenzelfde context, zal een identiek letsel ter hoogte van de pink van een violist waarschijnlijk meer pijn doen aan de linker pink dan aan de rechter pink, maar dit is niet het geval bij een pianist.*	☐	☐	☐

B.4 Rainville vignette

Un homme âgé de 37 ans, contremaître dans une usine, se plaint de douleurs lombaires à droite irradiant dans le mollet droit suite à un accident de voiture survenu il y a 9 mois au cours duquel le véhicule a été heurté par l'arrière. Il décrit des douleurs modérées à sévères dans le bas du dos et dans la jambe qui ne se sont pas améliorées au cours des 6 derniers mois. L'examen neurologique est normal. Une IRM récente de la colonne lombosacrée a montré une protrusion discale centrale au niveau L4-L5. Le patient a repris le travail plusieurs mois après l'accident, mais l'a de nouveau interrompu moins de deux semaines plus tard en raison de l'aggravation de ses douleurs lombaires et dans la jambe due à la station debout et à la marche dans le cadre de son activité professionnelle.

Een 37-jarige mannelijke ploegbaas klaagt over lage rugpijn aan de rechterzijde, die uitstraalt naar de rechterkuit, na 9 maanden geleden betrokken te zijn geweest in een kop-staart botsing. Hij beschrijft zijn pijn in rug en been als matig tot hevig, zonder verbetering over de laatste zes maanden. Het neurologisch onderzoek is normaal. Een recente MRI van de lumbo-sacrale wervelkolom toont een uitstulpende centrale discus ter hoogte van L4-5. De patiënt heeft enkele maanden na het ongeval zijn werk hervat, maar heeft binnen twee weken het werk stopgezet omdat staan en lopen op het werk zijn pijn in rug en been deed toenemen.

1. Les symptômes de ce patient sont. *De invloed van deze patiënt op diens dagelijks leven is.*

   ☐ Très légers. *Zeer licht.* (1)

   ☐ Légers. *Licht.* (2)

   ☐ Modérés. *Matig.* (3)

   ☐ Sévères. *Groot.* (4)

   ☐ Extrêmement sévères. *Zeer groot.* (5)

2. Il est très probable que les symptômes de ce patient résultent d'une pathologie vertébrale qui est. *Het is het meest waarschijnlijk dat de symptomen van deze patiënt afkomstig zijn van spinale pathologie met als ernst.*

   ☐ Symptômes non issus d'une pathologie vertébrale. *Geen spinale pathologie* (1)

   ☐ Légère. *Lichte ernst.* (2)

   ☐ Modérée. *Matige ernst.* (3)

- ☐ Sévère. *Grote ernst.* (4)
- ☐ Extrêmement sévère. Z*eer grote ernst.* (5)

3. Je recommanderais à ce patient. *Ik zou deze patiënt adviseren*:

   - ☐ Ne limiter aucune de ses activités. *Geen enkele activiteit te beperken.* (1)
   - ☐ Éviter seulement les activités douloureuses. *Alleen pijnlijke activiteit te beperken.* (2)
   - ☐ Limiter ses activités à des efforts modérés. *Alle activiteit te beperken tot matige inspanning.* (3)
   - ☐ Limiter ses activités à des efforts légers. *Alle activiteit te beperken tot lichte inspanning.* (4)
   - ☐ Limiter toutes les activités physiques. *Alle fysieke activiteit te beperken.* (5)

4. Je recommanderais à ce patient. Ik zou deze patiënt adviseren:

   - ☐ Un travail à temps plein, sans restrictions. *Full time zijn volledige werk te hervatten.* (1)
   - ☐ Un travail modéré à temps plein. *Full time zijn werk tot matige belasting te hervatten.* (2)
   - ☐ Un travail léger à temps plein. *Full time zijn werk tot lichte belasting te hervatten.* (3)
   - ☐ Un travail à temps partiel. *Part time zijn werk tot lichte belasting te hervatten.* (4)
   - ☐ De ne pas reprendre le travail. *Werk blijven verzuimen.* (5)

B.5 Specific LBP vignette

Une dame de 74 ans consulte son médecin généraliste car elle éprouve des difficultés progressives à marcher. Le généraliste la connaît comme une femme courageuse et "résistante", mais qui a toujours une "petite douleur" quelque part. Il la suit depuis des années pour un problème persistant de douleurs lombaires. Jusqu'à présent, plusieurs mesures ont été prises : la dame a fait des exercices sous la supervision d'un kinésithérapeute, a pris de l'ibuprofène (mais qui lui a donné un ulcère) et a reçu des infiltrations qui ont rendu le mal de dos supportable pendant des mois. Mais maintenant, c'est différent. Auparavant, elle parvenait à influencer positivement son mal de dos en marchant, mais aujourd'hui, la marche est très difficile. Chaque fois qu'elle va se promener, elle ressent une fatigue très gênante dans les deux jambes (arrière de la cuisse, mollet irradiant vers la cheville) après 500 mètres et cela va de mal en pis. L'année dernière, elle pouvait marcher deux kilomètres avant de devoir s'asseoir, depuis une semaine elle n'arrive même plus à faire 500 mètres. Elle est donc obligée d'utiliser un vélo pour ses déplacements. Elle peut faire du vélo sans aucun problème. A côté de cela, elle ressent une somnolence au niveau du gros orteil droit, mais c'est resté stable au cours des derniers mois. Elle n'a pas de douleurs nocturnes et ne ressent pas de paralysie dans les membres inférieurs, mais elle n'est plus sûre de sa façon de marcher. Par conséquent, elle n'ose plus sortir aussi souvent. Son histoire personnelle et familiale est sans antécédents. Elle ne prend pas d'autres médicaments que celui mentionné ci-dessus.

Een 74-jarige dame komt bij haar huisarts omdat ze progressief moeilijkheden ervaart met het stappen. De huisarts kent mevrouw als een moedige en "harde" dame, die echter wel altijd ergens een "pijntje" heeft. Hij volgt haar al jaren voor een hardnekkig probleem van lage rugpijn. Er werden tot nog toe al verschillende maatregelen genomen: de dame deed oefeningen onder supervisie van een kinesitherapeut, nam ibuprofen (maar waaraan ze een maagzweer overhield) en kreeg ook infiltraties die de rugpijn voor maanden telkens draaglijk maakte. Maar nu is het verschillend. Waar ze voorheen haar rugpijn zelf gunstig kon beïnvloeden door te stappen, gaat stappen nu heel moeilijk. Telkens ze nu gaat wandelen, krijgt ze na 500 meter een zeer vervelende vermoeidheid in de beide benen (achterzijde dij en kuit uitstralend tot aan de enkel) en het wordt steeds erger. Vorig jaar kon ze nog twee kilometer stappen vooraleer ze moest gaan zitten, sinds deze week geraakt ze zelfs niet meer aan 500 meter. Ze is dus verplicht om voor dergelijke verplaatsingen gebruik te maken van de fiets. Fietsen lukt immers zonder problemen. Verder geeft ze aan een slaperige grote teen rechts te voelen, maar dat bleef over de laatste maanden stabiel. Ze heeft geen nachtelijke pijn en heeft geen verlammingsgevoel in de onderste ledematen, maar ze is niet langer zeker van haar stappatroon. Daardoor durft ze niet zo vaak

meer buiten te gaan. Haar persoonlijke en familiale voorgeschiedenis zijn blanco. Ze gebruikt, boven de aangehaalde medicatie, geen andere medicatie.

- Quelles sont, selon vous, les causes et/ou les facteurs contribuant de la douleur de ce patient? *Wat zijn volgens u de oorzaken en/of bijdragende factoren van de pijn van deze patiënt?*

- En tant que prestataire de soin, quelle serait votre première approche pour ce patient? *Wat zou voor u, als zorgverlener, de eerste aanpak zijn?*

- Quels conseils donneriez-vous à ce patient en ce qui concerne l'activité physique? *Welk advies zou u deze patiënt geven met betrekking tot fysieke activiteit?*

Appendix C

E-learning

C.1 Experimental e-learning

C.1.1 Module 1 - Triage and evaluation of LBP

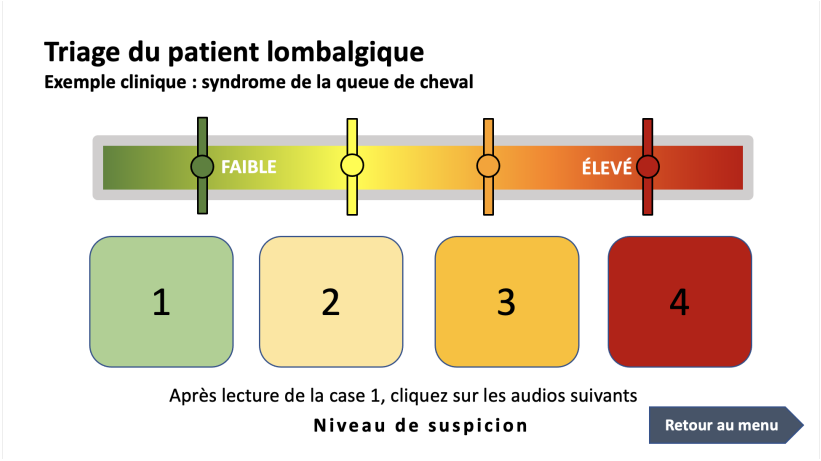


Figure C.1

Figure C.2

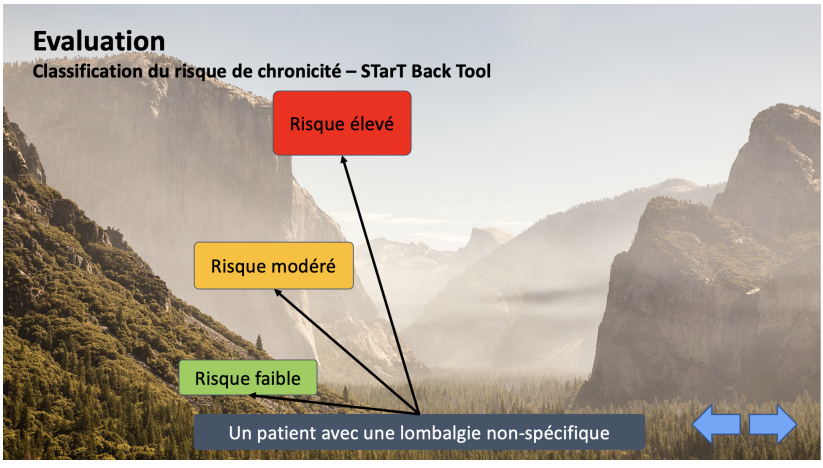


Figure C.3

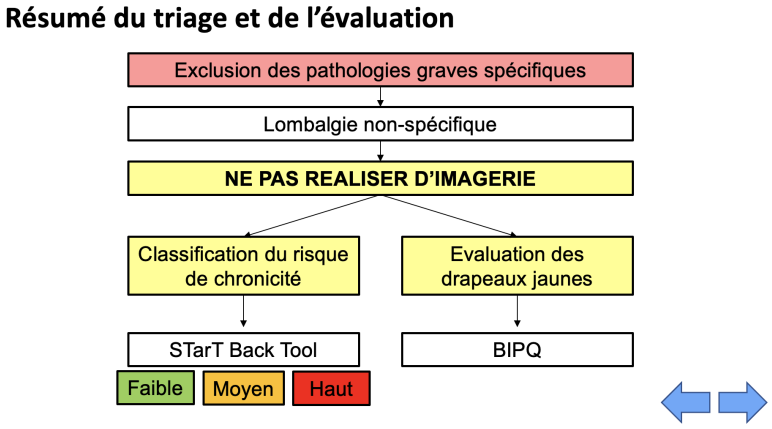

Résumé du triage et de l'évaluation
Exclusion des pathologies graves spécifiques
Lombalgie non-spécifique
NE PAS REALISER D'IMAGERIE
Classification du risque de chronicité
Evaluation des drapeaux jaunes
STarT Back Tool
BIPQ
Faible
Moyen
Haut

Figure C.4

C.1.2 Module 2 - Management of LBP

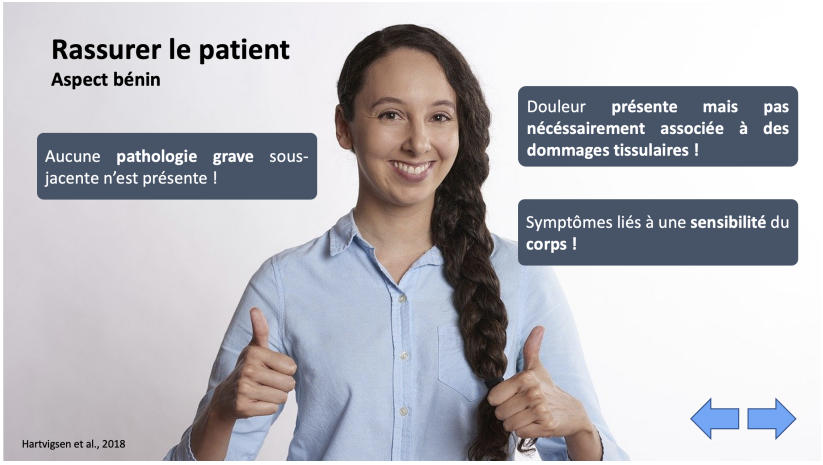


Figure C.5

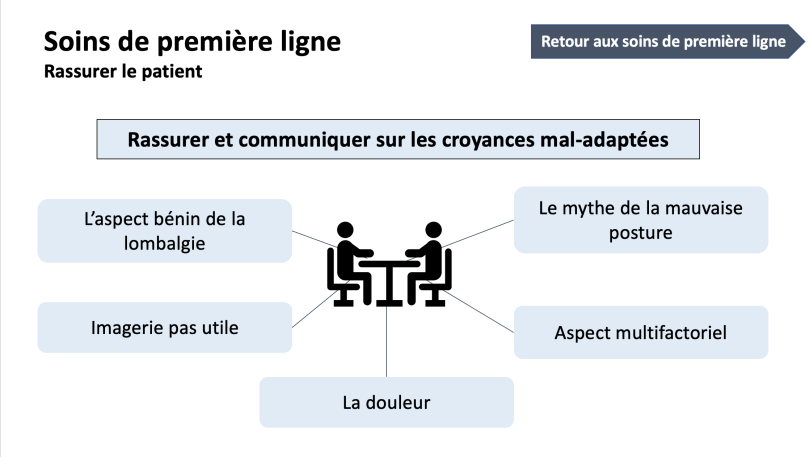


Figure C.6

Figure C.7

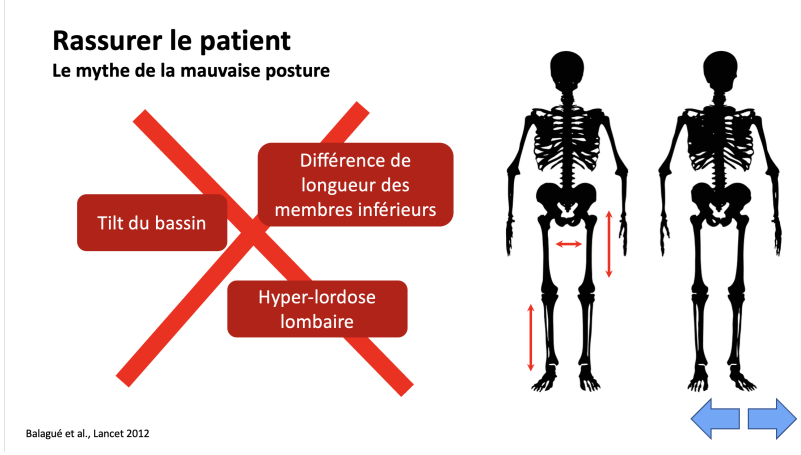


Figure C.8

C.1.3 Module 3 - Understanding the complexity of pain

Figure C.9

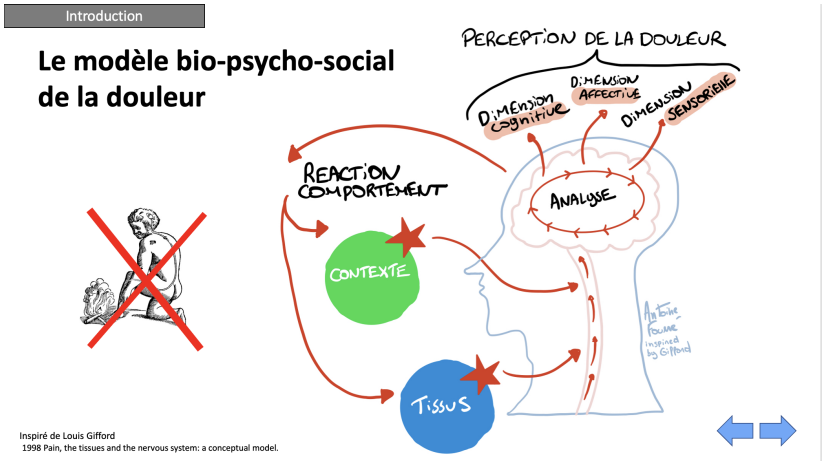


Figure C.10

Figure C.11

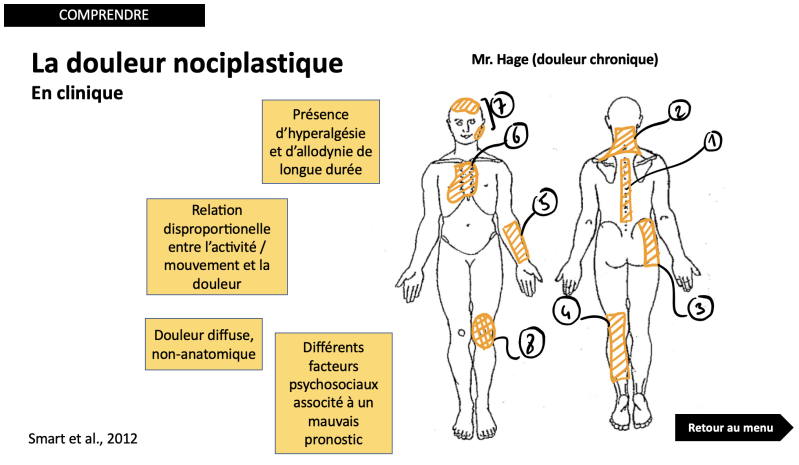


Figure C.12

C.2 Traditional e-learning

C.2.1 Module 1 - Triage and evaluation of LBP

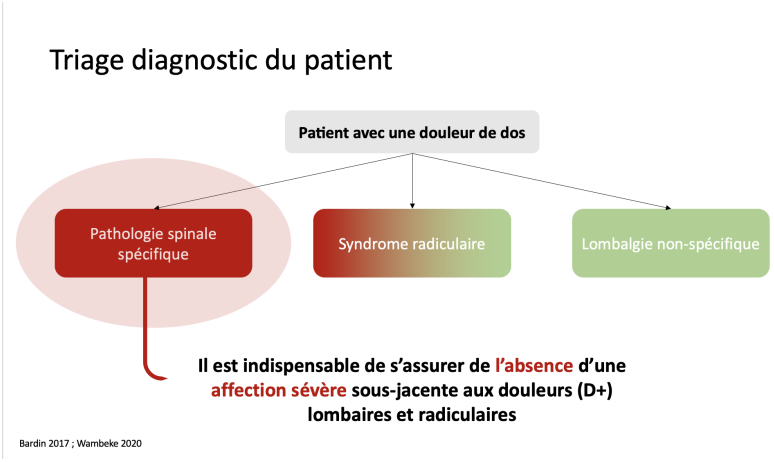


Figure C.13

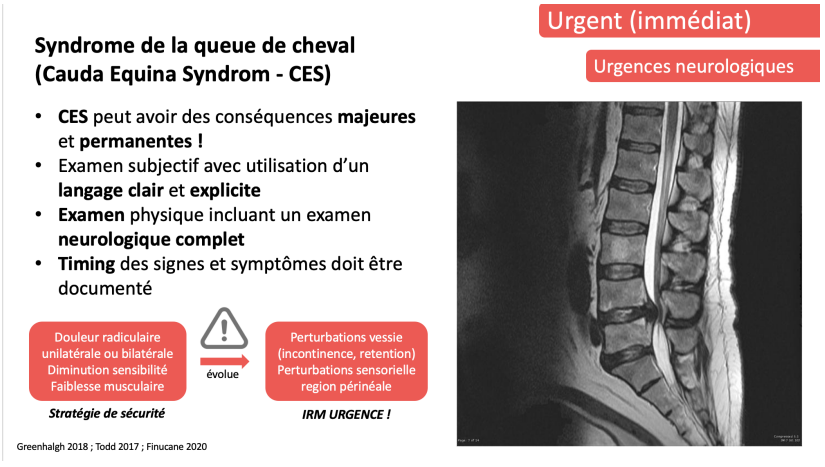


Figure C.14

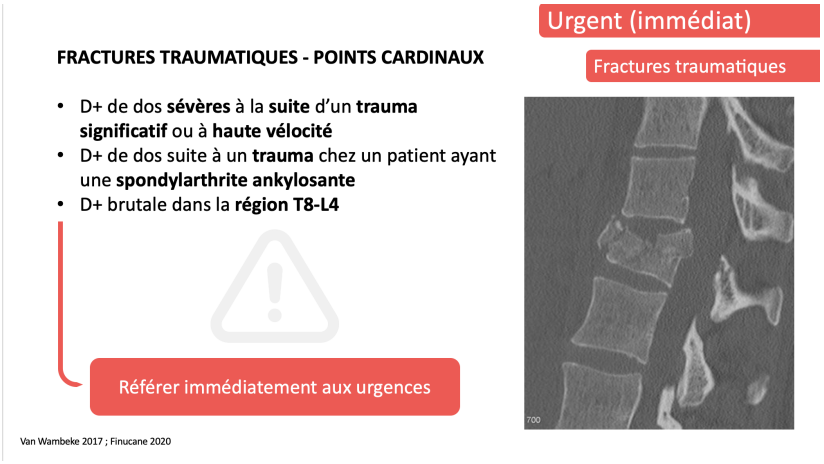


Figure C.15

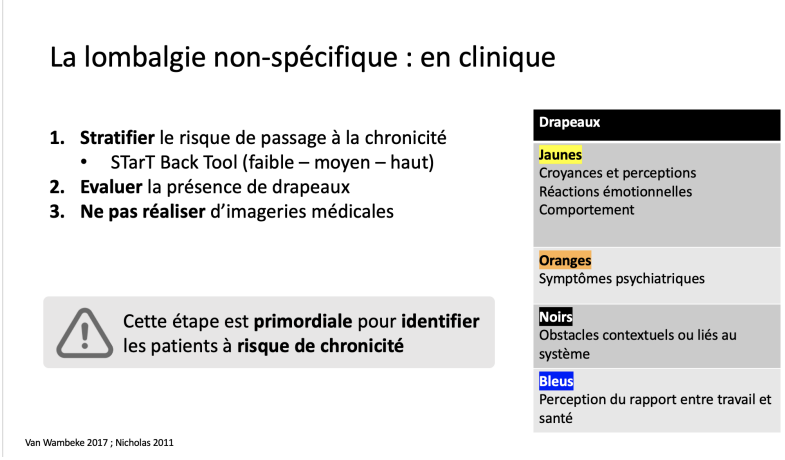


Figure C.16

C.2.2 Module 2 - Management of LBP

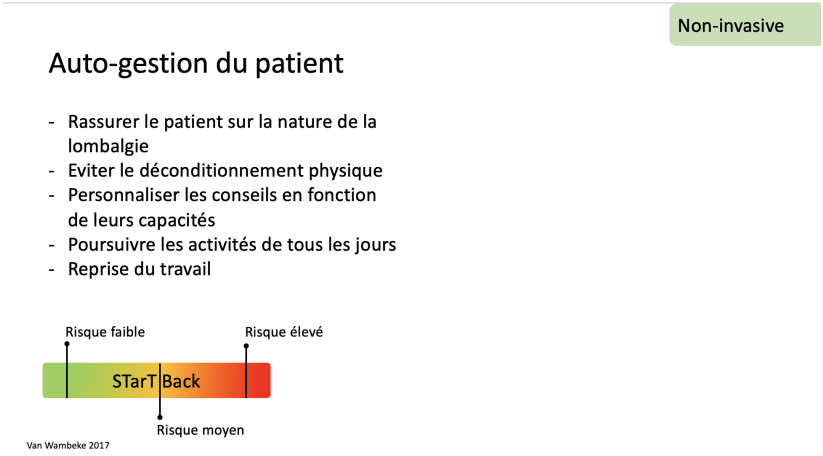


Figure C.17

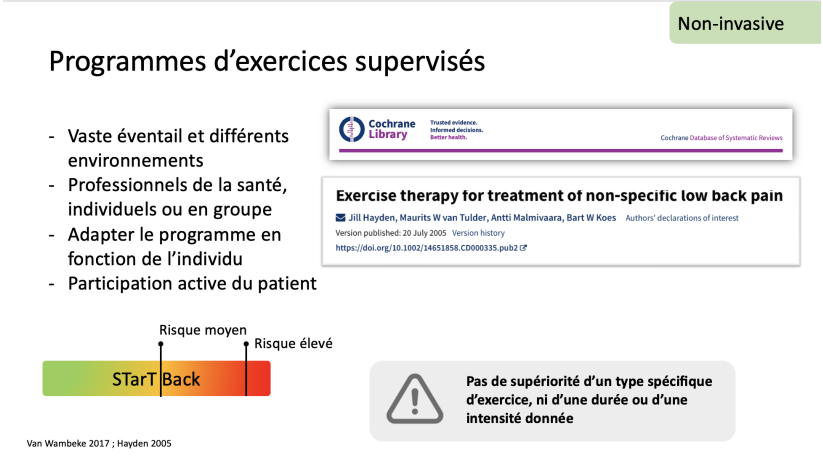


Figure C.18

Pharmacologique

AINS, morphiniques ou paracetamol

- Pas toujours nécessaires
- AINS en premier choix (attention toxicité)
- Effets morphiniques ⚠
- Paracetamol ≠ lombalgie aigue

⚠ Myorelaxants ne sont pas recommandés dans la prise en charge des lombalgies


Articles

Efficacy of paracetamol for acute low-back pain: a double-blind, randomised controlled trial

Christopher M Williams, Christopher G Maher, Jane Latimer, Andrew J McLachlan, Mark J Hancock, Richard O Day, Chung-Wei Christine Lin

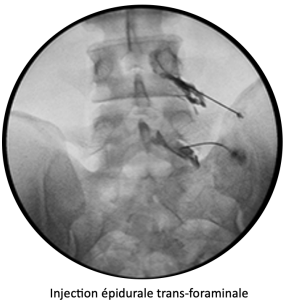
Van Wambeke 2017 ; Williams 2014

Figure C.19

Invasive

Infiltrations épidurales

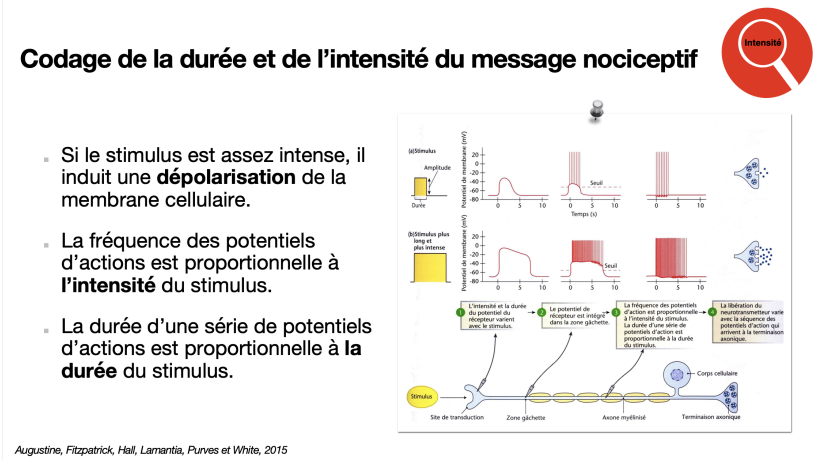
- Patient avec douleur radiculaire
- Après 2-3 semaines de douleurs
- D+ sévères (> 5/10)
- Consentement éclairé du patient ⚠
- Voie trans-foraminale


Injection épidurale trans-foraminale

Van Wambeke 2017 ; Brunner 2012

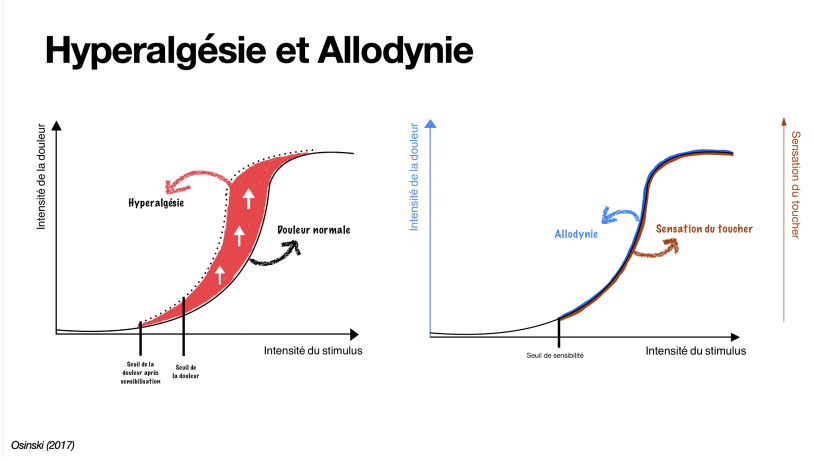
Figure C.20

C.2.3 Module 3 - Understanding the complexity of pain



Augustine, Fitzpatrick, Hall, Lamantia, Purves et White, 2015

Figure C.21



Osinski (2017)

Figure C.22

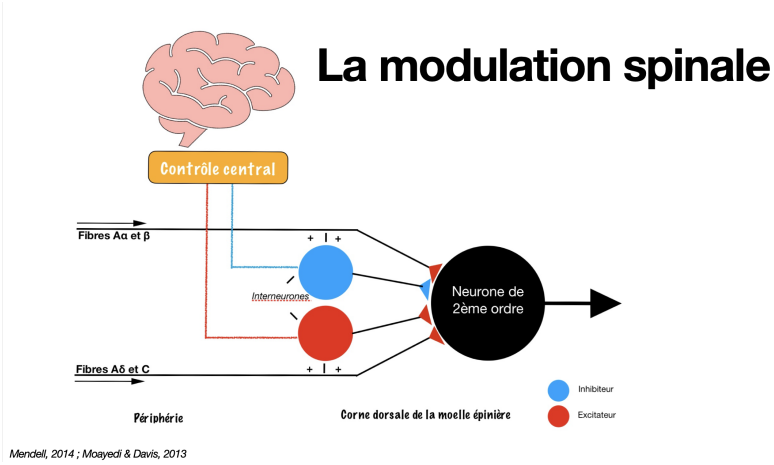


Figure C.23

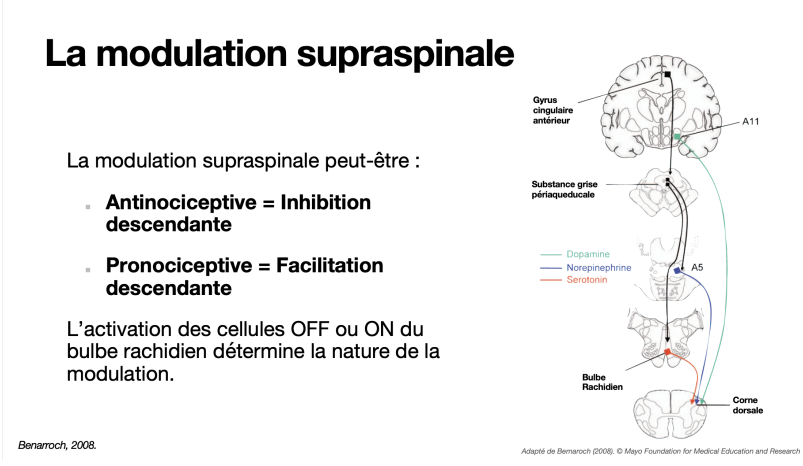


Figure C.24

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