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**Clinical reasoning and critical reflection in physiotherapists' examinations of patients with
low back pain in its early phase:**

A qualitative study from physiotherapists' point of view

ABSTRACT

Aims

The aim of the present study was to deepen the current understanding of physiotherapists' decision making process and more specifically, to investigate their reflections on their clinical reasoning when examining low back pain patients.

Methodology

Data were collected in interviews with six physiotherapists, where the stimulated recall method was used. Interviews were audio-recorded and transcribed and then analysed by content analysis.

Major findings

physiotherapists critically analysed and reflected their choices and decisions in clinical reasoning with patient's symptoms, onset of pain, clinical test choices and results. They stopped to consider the adequacy of tests for drawing conclusions and their own manual skills as physiotherapists and also the classification of LBP being used. At critical reflection levels, based on King and Kitchener, physiotherapists judgements were at levels four to seven.

Principal conclusions

The results showed that physiotherapists critically justified their clinical reasoning by systemically using a hypothetico-deductive reasoning model and reflected on their decisions in all phases of low back pain patient's examination, from the history to the physiotherapy diagnosis and also on the classification of nonspecific low back pain.

Key words: clinical reasoning (CR), classification of low back pain, critical reflection, direct access, content analysis

INTRODUCTION

In Finland, training for physiotherapists in “Quick Direct Access” for patients with low back pain (LBP) and related continuing education has been conducted since 2000. In order to prevent LBP and its chronic reoccurrence, quick direct access is specifically aimed to be performed in the early phase of back pain (lasting less than three months). Continuing education has focused on the clinical testing of pain in its early phase, on clinical reasoning (CR) and on the patient’s self-management. The decision-making regarding the possible causes of pain is essential for guiding patients’ self-management, and it should be properly targeted and safe for patients. The assessment of the various opportunities and decision-making during the examination requires expertise in clinical examination alongside self-reflection skills in the whole chain of CR to assess the validity or the credibility of this process and the conclusions made during it.

In this qualitative study, the most important three background theories and approaches were as follows: (a) the CR approach when examining LBP patients (1-3); (b) classification of LBP in its early phase (4-6); and (c) the critical reflection process in decision-making and in analysing the physiotherapist’s own practice (7-10). These theories and approaches were used when planning the study and when analysing the data.

Clinical reasoning

CR refers to the thinking process associated with the clinical examination and management of a client. It occurs in a unique frame of reference within a person’s professional and individual context as well as in the practice patterns of each workplace (1). According to Jones and Rivett (2), CR in physiotherapy includes the thinking process that occurs during the examination of a patient. It consists of a decision regarding the reasons for the patient’s pain/disability and the choices of different treatment methods. During the examination, a physiotherapist makes assumptions on the subjective and objective test results obtained, either strengthening or weakening the earlier hypothesis he/she made according to the medical history. The CR process is guided by a physiotherapist’s competence (knowledge and skills) in interaction with a patient (Figure 1). It exists different CR models (11-13) including mainly the same phases.

A physiotherapist’s clinical knowledge develops through work experience and with continuing learning. In this case, the action of the therapist is no longer routine, but is increasingly based on professional and independent decision-making as well as on the choices in each situation (14). physiotherapists can use different decision models making conclusions. Four of these models are

discussed in this study.

The first model, which was used in this study, is the progressive line of reasoning, starting from the initial assumptions made during the examination, is called hypothetico-deductive reasoning. The second systematic model is applied especially by novices, where decisions are not made until the end of the examination. The third model is based on the patient's stories and the contents of the dialogues (14). Fourth one is a clinical inference model, used for example when dealing with chronic pain. According to this model, the psychosocial frame of reference takes precedence. The influence of the biopsychosocial approach should be constant. On which parts of them (bio-, psycho-, or social) is the main focus depends on the primary factors behind patient's pain and dysfunction (15). In this study phases (pain history, initial hypothesis, choice of clinical tests and final conclusion) in hypothetico-deductive reasoning were used as a frame for data coding.

Classification of low back pain

Non-specific low back pain (NSLBP) is identified that there is no serious illness or trauma-like vertebral fracture, nor is there a tumour, osteoporosis, ankylosing spondylitis, or cauda equina syndrome, all of which could be identified with imaging techniques (e.g., MRI, X-rays) (16). A survey by Kent and Keating, whether a NSLBP is one condition, was conducted of 1093 primary care clinicians (17). 93 percent of them claimed that they treat NSLBP differently based on patterns of signs and symptoms. (18-21).

There are currently many classification systems for chronic NSLBP); some that are descriptive, some prognostic, and some that attempt to direct treatment. Fairbank et al (22) recommend that no one classification system be adopted for all purposes. They further recommend that future efforts in developing a classification system focus on one that helps to direct both surgical and nonsurgical treatments. (22)

In physiotherapy, there are four common treatment based classification systems fitting also in the early phase of LBP that attempt to match treatments to subgroups of patients using a clinically driven decision-making process: (1) the mechanical diagnosis and therapy classification model described by McKenzie (23), (2) the movement system impairment syndromes model described by Sahrman (24), (3) the mechanism-based classification system described by O'Sullivan (19) and (4) the treatment-based classification (TBC) system described by Delitto et al (25).

However, NSLBP in the early phase, often goes undiagnosed, partly because it is considered to improve by itself, and partly because existing, reliable methods for its classification and examination require expert understanding in order to be utilized efficiently. Also, the degree to which the psychosocial factors are considered varies greatly (26).

Clinical tests of low back pain in early phase

The type of clinical examination items for the assessment of patients with back pain include functional and mobility tests, inspection, provocation and alleviation of symptoms, muscle tightness, stability, and neurological and neurodynamic tests. The inter- and intratester reliability and specificity and sensitivity of those clinical tests vary from moderate to excellent (3-5, 27, 28). Based on those studies, the clinical tests batteries have been developed (29).

The pain mechanisms and symptoms reported in patient pain histories guide, already at this early phase, CR and choices of clinical tests (2, 30). However, little is known about the relationships between clinical findings in the low back and LBP in the normal working population (31).

According to some studies, back pain in the early phase can be localized in various tissues/structures through provocation and alleviation tests. The strain or overloading of different tissues and structures of the back (the discs, ligaments, nerves, joints and muscles) can be felt in the same area of the lower back or radiate into the lower extremities. With specific pain loading/provocation or pain relieving tests it may be possible to determine from which tissue/structure the nociceptive stimulus is primarily coming. (27, 28, 32-34). Although positive and negative findings of clinical tests do not explain why these tissues/structures are overloaded or strained, they are important when explaining the pain mechanism to patients and when pain treatment for the early phase is designed. However, in chronic LBP, possible central sensitivity and neuropathic pain mechanisms need other types of examination methods and explanations for consideration (22).

In continuing education on “Direct Access for physiotherapists”, classification was based on tissues and structures as well as on the mechanism-based classification by O’Sullivan’s (19), those being the primary methods in the first appointment in the early phase of LBP.

Critical reflection in clinical reasoning

Reflective thinking and reflective practice have been mentioned as crucial skills for professionals in many disciplines (35-38) and as a hallmark of professional behavior (39). In the physiotherapy

profession, reflective practice has been defined as an important and necessary skill for continual professional development and as the most important element in developing expert practice (40) in a more evidence-based direction (41).

Reflection as a concept has been defined in many different ways. Reflection has been seen as the skill to combine theory and practice (42). Reflective skills have been defined as part of self-regulatory knowledge, which, together with formal and practical knowledge formulates the knowledge required from an expert (43). According to Kolb, prior knowledge and skills are applied to the present situation during reflection, and past experiences are reconstructed while new meanings are given to them and extended to other situations and circumstances (44). Furthermore, Mezirow and Brookfield see reflective action as a critical assessment of one's own assumptions, and as an integral part of the decision-making process (45, 46). A person is critically reflective, when challenging their own or someone else's established practice.

In terms of improving and analysing reflective skills, an understanding of various levels of reflectivity is necessary. Van Manen developed a three-level reflectivity taxonomy that helps to bridge theoretical concerns and observations from practice. Van Manen's taxonomy divides reflectivity into practical/technical, interpretative and critical levels. At the practical level, reflection focuses on practical application whereas, at the interpretative level, the focus shifts to analysing the phenomenon. At the critical reflectivity level, interest focuses on ethical and societal considerations and the question that can be asked at that level could be "*What ought to be?*" (47).

This study applies King and Kitchener's conceptual framework for analysing reflective judgment thinking, which includes seven levels (9). The first three levels are called pre-reflective, and in these levels knowledge is understood to be absolutely correct and gained through the word of an authority. It is only from the fourth level that the presence of ambiguity in knowledge is accepted. When an individual reaches level five in one's reflectivity, knowledge is understood to be subjective and contextual in nature, and thus different possibilities are found as a basis of interpretation. Even though at levels four and five one can use evidence in analysing knowledge, the role of evidence in constructing a conclusion is not understood. Levels six and seven are the actual reflective levels. At level six, knowledge is understood to be a construction of evaluations based on evidence. Level seven's reflectivity is similar, but the process of re-evaluation is added to methods of inquiry and new perspectives in evaluation (9, 10).

During a CR process physiotherapist either consciously or subconsciously makes decisions and

choices. Conclusions based on the client's pain history guide the physiotherapist in choosing examination practices and clinical tests. Physiotherapists' skills in taking into account the factors that are relevant to patients' pain affects their conclusions and selection of the best evidence-based therapeutic practice. Recognizing the factors and reasons behind one's own thinking and choices helps to review one's own decision-making and, in that way, also guides continued professional growth (7, 8).

The aim of the present study was to deepen the current understanding of physiotherapists' decision-making process and, more specifically, to investigate their reflections on their CR.

The research questions were as follows:

1. What do physiotherapists tell about their thinking processes in their clinical reasoning and which arguments they use to justify and reflect on their decisions after examined LBP patient in early phase of the pain
2. At which reflective judgement levels physiotherapists evaluate their decisions in their clinical reasoning?

MATERIALS AND METHODS

Participants

This study was a part of a research and development project focusing on improving physiotherapists' skills to classify patients with LBP in its early phase (30). The project also focused on implementing new physiotherapy practice for the direct access of physiotherapists to health care centres. A large health care centre with 25 outpatient clinics in Southern Finland participated in this wider project. The present study included the three outpatient clinics which were the first to begin direct access for physiotherapists as a pilot. Furthermore, from those three clinics, all these six participants (four females and two males) were those being the first and only ones to start the direct access, and who also expressed being voluntary for interview. These physiotherapists' experiences varied from four to 24 years (Table 1).

The study protocol was ethically approved by the CEO of X Health Care Center 8th February 2012.

Data collection

The data was collected using the stimulated recall interviewing method, in which the interview is carried out with the help of stimulus activities that follow the course of the actual situation (48). A stimulus can be, for example, a situation that is audio -recorded or videotaped (49, 50). In this

study, the written reports of the physiotherapists' LBP patients (patient records) were used as the reinforcing stimulus. These written documents made possible to revisit the decision-making processes the physiotherapists have carried out during each of clinical examination and recall, as closely as possible, the situation as it actually happened (8,49).

The responsible author conducted the interviews between May and September of 2012, at the end of the physiotherapists' workday in the physiotherapy offices. The LBP patient records which were used as reinforcing stimulus were randomly selected by the workplace's chief physiotherapist from the reports made by the physiotherapists during the previous week. The chief physiotherapist removed the patients' identification information before giving those documents to the interviewer. Prior to the interviews, the researcher explained the schedule and the aim of the situation to the physiotherapist and asked verbal permission to the research. The interviews started with the physiotherapist reading his/her own structured data entry records from two LBP patients. The researcher then gave the following instructions to the physiotherapist: *"In front of you is a record you have made of your own patient examination. Would you tell me now how you came to the conclusions you have written down?"* During the interview, the researcher further asked about, for example, what the physiotherapist now thinks about the decisions and conclusions made during the CR process. Each interview lasted approximately 40 to 60 minutes. The interviews were audio-recorded and further transcribed containing 36 A4 pages (font = Times New Roman 12, spacing = 1.5).

Data analysis

In the analysis of the data, qualitative, deductive, theory driven content analysis was applied (50). In deductive content analysis, the existing data, in this study the interviews, was analysed by applying the themes of theory. The themes were created and build based on the prior knowledge or theory (51, 52). In this study two theories were used. To the first research question the themes following the phases, in research methodological language, (pain history, initial hypothesis, clinical tests, results and conclusions) used in hypothetic-deductive reasoning process (the one taught for the physiotherapists in the "Direct Access for physiotherapists" –training) was applied. And, for the second research question, the seven levels of reflection, described previously, developed by King and Kitchener, was used. (53). Schreier defines shortly qualitative content analysis as a method for systematically describing the meaning of qualitative material as instances of the categories of a coding frame (54). In practise, the theory driven content analysis can be seen as a process in which the data has been examined through the lenses of the coding frame.

In the first analysing phase, the responsible author read the written texts several times, initially focusing on the first research question, that is, on searching for the clinical reasoning process phases from the data. In practice, this meant underlining passages in the text and marking the pages where the physiotherapists' comments related to the different phases of the examination (pain history, initial hypothesis, clinical tests, results and conclusions) were found. This coding frame is presented in Figure 2. In the second phase, the marked text areas from each physiotherapist and from both patient records were collected together under each theme (e.g. history, tests and test results). This summary was then discussed with the co-authors in terms of testing the interpretations made. After discussion, the revisions were made.

Next, the analysis shifted to the second research question and the analysing followed the similar steps as in analysing the first question. The analysing coding frame (Figure 3) based on the King and Kitchener (9) reflection levels was applied.

The data that were difficult to categorise were discussed by all of the authors. Those extracts from the texts, which were viewed as best describing each category were selected as examples in order to give readers an opportunity to evaluate the interpretations made and to increase the credibility of the study.

RESULTS

Justifying and reflecting on the clinical reasoning process

In the analysis of what physiotherapists told about their clinical reasoning and how they justified and reflected on their CR process when examining LBP patients, the first finding was that all the physiotherapists started their reflection systematically following the course of the patient's assessing process. They did not question the sequences of the assessing process. They began their reflection from the patient's history, that is, from what situation the pain began in and what kinds of symptoms the patients themselves said they had and how those symptoms hindered their functional capability.

The history

The sudden onset of pain, its location and its intensity influenced the physiotherapists' initial hypotheses regarding which structures or tissues (disc, facet joint, SI joint, muscles, nerve tissue) they told as being the potential nociceptive source of pain and what clinical tests they chose to confirm their hypothesis. Yet the physiotherapists also started to question their decisions, adding

more information to take into consideration. They said how they started to doubt their initial hypothesis and consider the possibility of insufficient testing or weak test performance. They also gave other alternatives to improve their decisions during the CR process.

When discussing the patients' pain history, the physiotherapists mentioned the following as the factors that influenced their decision-making: *Definitely the first thought has come up at that point when the client says they have started a work placement as a cook and suggested that the physical load has aggravated the pain, which to that point had been occasional and variable, my hypotheses was that there is muscle weakness in the background that makes the controlling of movements and positions more difficult....But on the other hand I should also have considered possible psychological stress factors for pain and the experience of pain because of the new working situation.* (physiotherapist 3)

Another physiotherapist justified her initial hypothesis and clinical test choices by saying: *"I should have also been taking account of the impact from the client's previous back pain on the current period and possibly also its consequences for her condition."* (physiotherapist1)

Physiotherapists also identified alternative courses of action they could have considered, but some other physiotherapist started to defect their choices and found more justifications for her primary decisions.

Physiotherapists 6 trusted palpation skills and extensive experience as a physiotherapist when justifying the diagnosis of the patient's local back pain, commenting: *"The strongest palpation sensitivity and most significant finding was muscle pain in the lower back"*, and then continuing, *"I trust my conclusions because of my X years of experience"*

According to the results of the analysis, it seemed that all physiotherapists made the initial hypothesis and clinical test choices to confirm or reject the hypothesis based on each patient's pain history. However, at the same time, as they explained the test results, they started to justify their initial hypothesis. *Sharp low back pain related to pregnancy, which is provoked when transferring weight to the right leg when walking and turning in bed on to the side is painful, so my hypothesis was that potential tissue stress pain would be originating from the SI joint and I tested my hypothesis with the ASLR test and SI joint pain provocation test, but I should have confirmed my conclusion by also using the stabilization belt in those two tests to distinguish if pain was coming from the lumbar spine.* (physiotherapist 2)

In this case, the physiotherapist started to evaluate if the hypothesis was made too quickly or too simply.

Clinical tests

In their decision-making, the physiotherapists said they considered choosing the right tests as the most crucial aspect of confirming the initial hypothesis. However, they also told how they saw their manual skills to perform the clinical tests as important.

The pain began during a sudden lifting situation without distal-referred symptoms, so my assumption was that symptoms suggestive of a prolapsed disc were not the cause, but I should have been able to be more certain of my conclusions before excluding the discogenic problem with a sitting disc load test. (physiotherapist 4).

Physiotherapist 3 and physiotherapist 5 critically assessed their skills, with physiotherapist 3 commenting: *“I haven’t used the manual facet mobility test in the past, so I was not quite sure of the result of the assessment.”* physiotherapist 5 had a similar observation: *“The implementation of this new approach to LBP examination was a little uncertain, so I couldn’t be entirely sure of my conclusions.”*

Conclusion, the physiotherapy diagnosis

At the same time that physiotherapists started to critically justify the initial hypothesis, some physiotherapists also started to question the final conclusions. They added new points to take into consideration, such as a patient’s psychological stress or working environment. *“I should have taken into considerations patient’s possible psychological stress factors for the experience of pain because of new working situation.”* (physiotherapist 3)

The levels of critical reflection in physiotherapists’ justification

When answering the second research question regarding at which level of critical reflection physiotherapists justified their decisions, we discussed the results alongside answers to the first research question. We found that in order to justify their CR and decision-making, the physiotherapists used their clinical knowledge and skills as well as the clinical classifications and associated tests related to the classification of the early phase of LBP. They mentioned their own expertise, as well as their lack of it, when carrying out clinical tests and test choices. When the physiotherapists assessed the reliability of their final conclusions (the physiotherapy diagnosis), they also presented the significance for the decisions of any possible faults that occurred during the

examination process as well as the possibility to use some other classification of LBP.

Viewed from the perspective of King and Kitchener's (9) model of critical reflection levels, the interviewed physiotherapists reached levels four to level seven. They recognized uncertainty in their own interpretation and remained open to other alternatives. In addition, they were uncertain about the examination and the results of the tests they carried out. The physiotherapists paused mostly to consider how to proceed on the basis of test results. These results were of crucial importance in helping the physiotherapist distinguish which tissues/structures should be emphasized – a patient's symptoms and/or pain being almost similar to each other.

At level four, the uncertainty of knowing is admitted and generally linked to one's own limitations. physiotherapists assessed the uncertainty of their CR at all stages of decision-making, mostly in regards to the relevant choice of clinical tests for better differentiation. *One physiotherapist noted uncertainty to perform manual skills, and the other one identified an insufficient choice of tests.*

At level five, the physiotherapists assessed their own actions in a broader framework, such as through the earlier episodes of back pain experienced by the patient and the connection between back pain and working environment. *Physiotherapist identified the possible consequences of earlier pain periods on the current back pain.*

At level six, the physiotherapists started to consider other factors which might have influenced a patient's experience of pain and functional difficulty, such as possible psychosocial stress in a patient's life. *Physiotherapist also started to consider a patient's new working situation and possible psychological stress factors in the patient's back pain experience.*

At level seven, the physiotherapists assessed the uncertainty in their own competence and the possibility of other interpretations, but they also presented and justified other alternatives in order to increase their knowledge and the accuracy of their interpretations. They suggested additional tests to be performed in order to confirm the differential diagnosis. In addition, they clarified the progression of their CR by bringing up other alternatives alongside tissue/structure pain for the explanation of back pain. On the other hand, for their selection of tests and the conclusions they made during the examination, physiotherapists also used knowledge and evidence-based justifications grounded in *the education they had received before this new practice of physiotherapist direct access.*

DISCUSSION

The main purpose of this study was to examine how physiotherapists justify and reflect on the CR they used when examining LBP patients. The results showed that physiotherapists systematically used the hypothetico-deductive CR model and tissue-structural classification of LBP in its early phase in their justifications. Even if they reflected on all phases of the CR chain, they most often stopped to justify their decisions regarding the selection and performance of clinical tests. All CR phases, starting from a patient's pain history, are crucial, and wrong decisions lead to wrong final conclusions and inadequate treatment plans. The physiotherapists used testing to confirm or reject their initial hypotheses and decided how to continue. Even if they accepted the initial hypothesis drawn from the onset of pain and symptoms, they also noted insufficient choice of clinical tests and their performance of them. At the same time that physiotherapists explained and criticized the facts influencing their CR, they not only recognized the weak points in their decisions, but they also presented alternatives for confirming their decisions and final conclusions (the physiotherapy diagnosis). One explanation for physiotherapists' uncertainty regarding their performance could also be that, at the time the interviews were conducted, the new model of examining LBP patients in direct access was only at the beginning of its implementation at the health centre.

We found that when physiotherapists were in the process of justification, their critical reflection occurred in levels four to seven of King and Kitchener's model (9). Physiotherapists recognized uncertainty in their interpretations and decisions, and they remained open to other alternatives at some points of the CR process. Yet, at other points, they provided new solutions to the problem. In this study, physiotherapists were found to use primarily tissue-structural classification and movement control impairment subgroup classification by O'Sullivan (19). The use of these, however, could also have hindered the consideration of other classifications, such as those by Linton (20) and STarT Back (55), from the beginning of the examination when there were questions of recurrent or chronic LBP.

Three background theories were used when planning the study and when analysing the data: the hypothetico-deductive clinical reasoning model (2), classification of LBP (4, 5, 19) and King and Kitchener's critical reflection model (9, 10). Based on these theories, the coding frames for the data analysis were modified. To evaluate the validity and credibility of the coding frames, Schreier (54) has stated that a coding frame is valid to the extent that the categories adequately represent the concepts being studied. In the present study, the categories were the phases of LBP examination – from pain history to initial hypothesis – the clinical tests, -results leading to the final conclusion (physiotherapy diagnosis), and the four levels of critical reflection used to meet the study aims. The categories in the coding frames were used as guiding instruments when interpreting and coding the

data and when answers to the study questions were determined. The frames and categories, with their basis in three background theories, seemed to function sufficiently (57, 58). All of the authors participated in the analysis to add to the power and credibility of the data interpretation. The amount of interviews proved to be sufficient because the same elements of CR and reflection began to be repeated several times. Stimulating physiotherapists thinking and justifying their clinical reasoning with their patient records seemed to be a useful method. In the future, patient records could be good stimulus to use in different types of continuing education programmes as well as in peer discussions at workplaces to learn more about each other's way of thinking and reflecting on their decisions.

In the implementation of new physiotherapy practice as in this case physiotherapist's direct access, it is important that physiotherapists are able to evaluate their practice and further develop their performance to the highest possible level. Continual professional growth is part of being a good physiotherapist, and it requires the critical assessment of one's actions and an awareness of the background factors in one's choices (7, 8, 59). In our earlier study, we made a case for the translation of continuing education into practice (30), but even if the results indicated a good grade for a particular practice, we cannot be sure what the justifications of their actions were. As Langridge and Roberts (60) have noted, research on the CR of physiotherapists remains scarce. Hammond (61) and Bucknall (62) have suggested that the factors influencing correct decision-making in the clinical environment are the physiotherapist's task knowledge and decision-making skill/competence. In the present study, physiotherapists justified their CR with knowledge of the different phases of the hypothetico-deductive CR model as well as the tissue and structural classification of LBP. They also questioned the sufficiency of this classification for those patients with psychosocial stress factors or with possible chronic back pain. According to our results, physiotherapists were shown to have skills in making decisions as well as in critically justifying them. One physiotherapist strongly justified decisions by referring to extensive experience, so we can ask whether extensive experience could be a hindrance to adopting new practices. We did not compare differences in CR according to work experience or gender- or age-related differences, but these could be fruitful topics for future studies.

LIMITATIONS

The data were collected in interviews with six physiotherapists through the use of physiotherapists' written reports of their patients' examinations as a recall stimulus. In earlier studies, videotaping has been used as a recall stimulus (57-58). There are limitations to both of these approaches.

Videotaping can be seen as disturbing the action, but written patient records contain only a part of

the therapy situation. Some physiotherapists mentioned the time delay (3–5 days) between the patient's examination and the interview as a reason for the difficulties recalling all the factors that had influenced their decision-making. Another limitation of the patient examinations mentioned by the physiotherapists was the time (45–60 minutes) for examination in the first appointment. Because of the limited time, they explained, some questions and clinical tests (e.g. movement control testing) had to be left for the next appointment.

Furthermore, in this study we did not examine all the factors, which influence a physiotherapist's CR process. Regardless, the strength of one's personal identity and knowledge affects any situation in which a person's professional expertise is involved (8). This applies to the interview situation in this study as well. How reliable and secure people feel in interviews is affected by how openly and stress-free they are able to assess their performance. So in regards to the physiotherapist who referred to their extensive experience, a further explanation for mentioning this could be weak self-confidence or a feeling of unpleasantness regarding the interview or the interviewer? Secondly, in the present study the time of interview, after the working day, could also have affected the ability of the interviewees to concentrate on the task. Third, the small number of participants does not allow for generalization to all Finnish physiotherapists practicing direct access for patients with LBP. However, this group of physiotherapists can be seen as representative of a large health centre in Finland and, going forward, the results will help to develop physiotherapists' direct access. In the words of a physiotherapist, *“This was a very good way to learn more about how to improve performance in my physiotherapy practice”*.

In this study the responsible author conducted the interviews and she was the main person in coding and interpreting the data as well. All the co-authors checked the interpretations. The authors also discussed if there were difficulties to categorize the data. Thus, the research team's systematic analysis provided credibility to the results. The team was a combination of expertise in the field of musculo-skeletal physiotherapy and qualitative research method, which was a base of the credibility of interpretations.

In continuous learning, it is crucial to identify the assumptions that frame our thinking as well as our actions and to check the degree to which these assumptions are accurate and valid. According to Mezirow and Illeris (7, 8), in a transformative learning process individuals analytically and critically reflect on their beliefs and assumptions and make plans to implement their revised understanding. Therefore, critical reflection skill is an important part of a key competence for expert physiotherapist (9, 29, 30, 64).

CONCLUSION

Our results showed that physiotherapists critically justified their clinical reasoning by systemically using a hypothetico-deductive reasoning model and reflected on their decisions in all phases of LBP patient's examination, from the history to the physiotherapy diagnosis and also on the classification of nonspecific LBP.

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Figure captions

Figure 1. Clinical Reasoning (Higgs and Jones 2008, 4–5).

Figure 2. Coding frame for the phases of clinical reasoning in LBP classification (modified from Jones and Rivett 2004).

Figure 3. Coding frame for the levels of critical reflection (modified from King and Kitchener 1994).

Table 1. Characteristics

Physiotherapists	Female	Male
Sex (N)	4	2
Age (yrs), mean (SD)	34.3 (7.5)	30.0 (4.2)
Work experience (years)	15.2 (8.5)	9.0 (4.9)