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Original article

The clinical reasoning of pain by experienced musculoskeletal physiotherapists

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Abstract

There is currently no research within Physiotherapy to explain the extent to which current theories and models of pain influence clinicians' reasoning related to clinical presentations of pain. The purpose of this qualitative study was to investigate the clinical reasoning of experienced musculoskeletal physiotherapists in relation to three different presentations of pain.

A qualitative multiple-case studies method was used in this study. A purposive sample of seven experienced musculoskeletal physiotherapists viewed three videotaped patient-therapist clinical interviews describing three different pain presentations. An audio taped, semi-structured interview was carried out with each participant during which the participants were encouraged to verbalize their thoughts regarding aspects of each patient's pain presentation. All interviews were subsequently transcribed, coded and analysed.

Results showed a dynamic, multidimensional nature to the therapists' clinical reasoning, which was found to be grounded in a number of established models of pain. Five main categories of pain-based clinical reasoning were identified. These were (i) biomedical, (ii) psychosocial, (iii) pain mechanisms, (iv) chronicity and (v) irritability/severity. Reasoning within these categories influenced therapists' prognostic decision-making as well as the planning of physical assessments and treatment.

The clinical reasoning of pain by the participants in this study appeared to reflect the integration of diverse models and theories of pain into current clinical practice. Mechanisms-based clinical reasoning has not been previously observed amongst physiotherapists.

Keywords: Clinical reasoning; Pain; Physiotherapists

1. Introduction

It has been suggested that pain is the main symptom with which patients present to musculoskeletal physiotherapists (Watson, 1996; Cheing and Cheung, 2002). It has also been suggested that within physiotherapy considerable importance is placed upon the patient's report of pain, as elicited through the patient-therapist clinical interview, by physiotherapists when reasoning and decision-making with regard to its nature and treatment (Main and Watson, 1999).

Epidemiological studies and reviews suggest that between 10% and 20% of the populations of industrialized western societies have a persistent pain problem (Magni et al., 1993; Verhaak et al., 1998; Pain in Europe, 2003). The personal cost to sufferers of 'chronic pain' can be devastating. One in five chronic pain sufferers have lost a job as a result of their pain, and one in five sufferers have been diagnosed with depression as a result of their pain (Pain in Europe, 2003). Financially, the costs to societies both directly (through expenditure on healthcare) and indirectly (through lost productivity and tax revenue and disability compensation) run into the billions (US dollars) (Turk, 2002).

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1.1. Theories of pain

A review of the literature shows a variety of theories and clinically applicable models to account for the experience and presentations of pain. The Cartesian/Medical model and specificity theories of pain explain pain as a direct correlate of physical disease or injury (Melzack and Wall, 1991). The gate control theory of pain (Melzack and Wall, 1965) described the neurophysiological mechanisms of pain transmission and modulation centring on the dorsal horn of the spinal cord. The gate control theory of pain together with more contemporary approaches such as the biopsychosocial model (Waddell, 1998), and mechanisms-based approaches (Jones, 1995; Gifford and Butler, 1997) have contended the usefulness of earlier theories, such as the medical model, by attempting to explain and account for the often variable and inconsistent relationship between pathology and pain.

1.2. Clinical reasoning and pain

For physiotherapists, a hypothesis-oriented, mechanisms-based approach to the clinical reasoning and categorization of pain has been proposed (Jones, 1995; Gifford and Butler, 1997). This approach suggests that clinical presentations of pain may be categorized according to five classes of pain mechanisms: (1) nociceptive, (2) peripheral neurogenic, (3) central pain, (4) autonomic and motor mechanisms and (5) affective mechanisms.

This approach has been based upon the perceived limitations of the medical model of pain and illness and recent advances in understanding of the neurophysiological basis of pain. According to Gifford and Butler (1997) a pain mechanisms approach could aid judgements regarding the assessment, treatment and prognosis of patients' pain. The 'mature organism model' proposed by Gifford (1998) further expanded the mechanisms-based approach by integrating knowledge of the neurophysiological mechanisms of pain with the science of stress biology and the biopsychosocial model of pain and disability. The 'mature organism model' describes the numerous and interrelated biological systems and processes involved in the initiation, maintenance and perception of pain together with the physiological and behavioural reactions to it. This type of broad understanding of pain, the model suggests, is required in order that clinical presentations of pain might be better managed.

Whilst the clinical reasoning of pain has not been directly studied in physiotherapy, a limited body of literature exists with respect to the study of pain knowledge amongst physiotherapists and health professionals. Wolff et al. (1991) in their survey of 500 orthopaedic physiotherapists, conducted by postal questionnaire, found specific deficiencies in clinicians' knowledge regarding pain mechanisms. In addition, 72% of respondents perceived their graduate/entry level of pain education, with respect to pain theory and management, as very inadequate or less than adequate. Moseley (2003) also found health professionals to have poor knowledge of the neurophysiology of pain but that with appropriate training were capable of improving their understanding. Rivett and Higgs (1997), in a study of the hypothesis categories used by 19 manual therapists, found no evidence for clinical reasoning concerning neurophysiological pain mechanisms. Other authors have also highlighted the discrepancy that exists between published information on the neurobiology and psychosociology of pain and the knowledge and actions of clinicians (Woolf and Decosterd, 1999; Champion, 2000).

Theories and models of pain provide a conceptual framework with which to investigate and interpret current methods of clinical reasoning of pain. It has been argued that within manual therapy (Main and Watson, 1999) and medicine generally (Waddell and Main, 1998) clinical reasoning with respect to pain remains dominated by the medical model with its structure/pathology-oriented explanations of pain and disability. However clinical reasoning in relation to pain in physiotherapy practice has not been subject to focused investigative study. The extent to which clinicians incorporate and utilize other theories and models of pain into clinical practice, such as the biopsychosocial model (Waddell and Main, 1998) or mechanism-based methods (Jones, 1995; Gifford and Butler, 1997) has not been studied in physiotherapy.

The aims of this study were:

1. To investigate the clinical reasoning processes of experienced musculoskeletal physiotherapists in relation to three different pain presentations.
2. To determine how such reasoning may inform or influence other areas of clinical decision-making in physiotherapy.

2. Method

2.1. Study design

A qualitative multiple case studies design was used in this investigation (Yin, 1994). Yin (1994) defines a case study as 'An empirical inquiry that investigates a contemporary phenomenon within its real-life context'. According to Yin (1994) case study inquiry can be guided by the theoretical propositions that lead to the study. Current models and theories of pain as outlined in the introduction provided the conceptual framework

for this investigation and were the guiding propositions for the study.

2.2. Subjects and setting

A purposive sample of seven experienced physiotherapists took part in the study. In this multiple-case study the 'cases' were seven experienced musculoskeletal physiotherapists and the units of analysis were the therapists' clinical reasoning processes. All subjects had a minimum of 10 years experience in musculoskeletal physiotherapy and had engaged in formal postgraduate study. Profiles of study participants are displayed in Table 1.

The study took place in the physiotherapy department of a large teaching hospital in Dublin. Approval was obtained from the hospital's Ethics Committee prior to the commencement of the study. All patients and physiotherapists gave signed consent prior to their participation in the study. All physiotherapists were told the purpose of the study was to gain access to their thoughts regarding aspects of different patients' pain presentations.

2.3. Procedure

Multiple data collection methods were used in this study and included audio taped semi-structured interviews, participant personal profile data and recorded field notes. The use of multiple sources of evidence allows for triangulation of data sources (Yin, 1994). Data collection and analysis was carried out by one researcher who was a senior musculoskeletal physiotherapist. Each physiotherapist viewed, in the same sequence, three separate videotaped patient-therapist clinical interviews describing three different pain presentations. Patient 1 presented with chronic low back and leg pain, patient 2 with Complex Regional Pain Syndrome (CRPS Type I) 3 months post distal radius fracture and patient 3 with an acute ankle sprain. Patients with differing presentations of pain were chosen in order to allow for study participants to reveal potentially diverse methods of reasoning.

Table 1
Profiles of study participants $N = 7$

Mean years since qualification	16.1 (range 12–25)
Practice setting	3 hospital outpatient dept., 3 private practice, 1 private practice/university lecturer
Postgraduate	5 taught MSc, 2 taught MSc in progress
Teaching experience	1 undergraduate, 1 postgraduate, 3 under/postgraduate, 2 none
Formal research experience	4

Before viewing the three videotaped patient-therapists interviews, each study participant was given written instructions similar to those used by Barrows and Tamblyn (1980) whereby they were asked to verbalize their thoughts regarding the nature of the patients' pain presentation. As participants viewed each of the three pain presentations, an audio taped semi-structured interview was carried out with the principal researcher. At pre-determined intervals the video recordings were paused at which point the researcher asked open-ended questions in order to stimulate participants to verbalize their thoughts regarding aspects of each patient's pain presentation. Further questioning was designed to encourage participants to relate aspects of pain reasoning to clinical decision-making associated with prognosis, physical examination and treatment. An audio taped semi-structured interview format was used in order to generate verbal protocols (Patel and Arocha, 2000) and each interview was subsequently transcribed (Ericcson and Simon, 1984). The transcripts combined each patient-therapist interview with the subjects' comments. Each of the seven participants generated three transcripts. These 21 transcriptions along with the seven physiotherapist profile documents and field notes formed the final case study database (Yin, 1994). In order to maintain a chain of evidence (Yin, 1994) each transcript was given both a subject and patient presentation number. In addition each transcript was line numbered to allow for identification of all citations from the case study database.

2.4. Analysis

Data analysis was guided by the approach described by Miles and Huberman (1994). The process of data analysis allows for the development of analytic and conceptual frameworks for the purpose of generating description and theory of the phenomenon under investigation (Creswell, 1998). According to (Gwyer et al., 2004), 'a final component of the multiple case study design is the development of grounded theory or theory building'.

All case study reports were read and re-read a number of times in order to obtain an overall sense of the data (Creswell, 1998). A tentative coding framework was devised based on theories and models of pain from the literature previously outlined, and subsequently expanded as further themes and categories emerged from the expanding database of transcripts. The coding scheme was thus revised to reflect the multiple perspectives of study participants. In the first stage of analysis five primary codes were used (Table 2). In the second stage of analysis a further three secondary level codes (Table 3) were used. Inter-coder and intra-coder reliability of the coding scheme was checked on a random selection of transcripts and was calculated using

Table 2
Definition of primary level codes with examples

Code	Definition and examples
Biomedical	Reasoning of pain related to: (a) its structural source or anatomical distribution, (b) biomechanical principles, (c) its aetiology, (d) pathological processes (e.g. inflammation) and (e) diagnostic labelling. Example: "there's a very mechanical nature to his pain" (7)
Psychosocial	Reasoning of pain related to patients' (a) thoughts (cognitions), (b) feelings (emotions), (c) behaviours, (d) attitudes and coping styles, and (e) to sociological factors such as work, family, social life, financial issues, and their impact on any pain presentation. Example: "She is afraid of moving it so there is an element of fear avoidance" (1)
Pain mechanisms	Reasoning of pain related to the underlying pathophysiological mechanisms responsible for its generation and/or maintenance. More specifically this relates to reasoning surrounding the five classes of pain (nociceptive, peripheral neurogenic, central neurogenic, autonomic/motor and affective) as outlined by Jones (1995) and Gifford and Butler (1997). Example: "it's almost 100% peripheral nociceptive in origin" (3)
Chronicity	Reasoning related to the temporal aspects of pain as indicated by the use of descriptors such as 'chronic' or 'acute'. Example: "Well she's a chronic pain state" (5)
Severity/irritability	Reasoning of pain as related to it's (a) severity, i.e. to the degree of pain (Maitland, 1991) or its intensity (Maitland, 1986) and (b) its 'irritability', as conceptualised and defined by Maitland (1986), that is a disorder's susceptibility to become painful, how painful it becomes and the length of time this pain takes to subside. Example: "I would go quite a bit on the severity and irritability of somebody's condition" (2)

Table 3
Definition of secondary level codes with examples

Code	Definition and examples
Objective	Reasoning of pain as related to aspects of the physical examination of patients. Example: "I am going to choose in my physical examination to reproduce it" (4)
Prognosis	Reasoning of pain related to concurrent thinking concerning a patient's prognosis or outcome. Example: "prognostically it may take longer to settle" (7)
Treatment	Reasoning of pain related to reasoning surrounding issues of physiotherapeutic and/or other intervention Example: "Four years on, I think we would be looking at rehabilitation as oppose to getting rid of her pain" (2)

the formula suggested by Miles and Huberman (1994). Intra-coder reliability showed 88% agreement. Inter-coder reliability was checked by two separate coders, the primary researcher and one other musculoskeletal physiotherapist and showed 78% agreement. The Kappa coefficients for intra and inter-coder agreement were 0.83 and 0.76 suggesting excellent and good agreement respectively (Daly and Bourke, 2000).

The third stage of analysis involved within-case analysis where each case was analysed across all three settings or patient presentations. The fourth stage of analysis involved a cross case analysis across the seven cases and three settings. A number of data analysis methods, as described by Miles and Huberman (1994), were utilized, including, noting patterns and themes, making contrasts and comparisons, and noting relations between variables. Six verification procedures, as outlined by Creswell (1998), were used in order to ensure the integrity of the research including, prolonged engagement and persistent observation, peer review or debriefing as an external check of the research process, triangulation of data through use of multiple data sources, negative case analysis (to purposely seek any inconsistent or disconfirming evidence for conclusions), rich, thick description and clarifying researcher bias, such that the researcher's background, position and motivation is known and how these may impact upon the inquiry.

3. Results

Data are presented in the form of verbatim quotes. All citations are followed with a number from 1 to 7, corresponding to each participant physiotherapist, in order to give a sense of the spread of the data. Five main categories of pain-oriented reasoning were identified in this investigation. These were; biomedical, psychosocial, pain mechanisms, chronicity and severity/irritability. In addition, reasoning within all categories occurred interchangeably and simultaneously.

3.1. Biomedical

All seven therapists demonstrated extensive biomedical-oriented reasoning of pain in relation to each of the three patient presentations. Biomedical-oriented reasoning included reasoning of pain related to structural/anatomical source, biomechanical principles, aetiology, pathological processes and diagnostic labelling.

Table 4
Biomedical reasoning

Sub-classification	Examples
Structure/ Source	"She's mapping it out quite clearly, it's maybe indicating a level of the lumbar spine that might be of interest to me."(6)
Biomechanical	"I would think of mechanical pain as pain that is aggravated by certain activities and eased by rest"(2)
Aetiology	"Well the mechanism of injury is the sudden macro trauma…I didn't catch which way he went but it's probably an inversion type of strain." (3)
Pathology	"There may be an element of degeneration or early degeneration here" (4)
Diagnostic	"The pain seems to be a big obstacle to her moving on with doing the exercises. I'm fearful of her getting complex regional pain syndrome."(5)

Examples of biomedical based pain reasoning are displayed in Table 4.

In addition, biomedical based reasoning appeared to influence four participants' prognostic reasoning. For example, one participant stated in relation to biomechanical principles:

> "He has a pretty good prognosis because he has a simple mechanical type presentation." (5)

Biomedical based reasoning was also found to influence thinking concerning treatment and also in the planning or implementation of the physical examination. For example, one therapist suggested:

> "Already in my mind I'm thinking of the structure at fault…my physical examination would be directed at that structure." (7)

In relation to biomedical reasoning, three study participants commented on the apparent 'normality' of patient presentation 3. For example:

> "There is a very mechanical nature to this pain …what he's describing is fitting with the structures that you would think would be at fault, so again it's fitting a normal case presentation." (7)

3.2. Psychosocial

All seven therapists demonstrated extensive and diverse psychosocial oriented reasoning in relation to all three presentations of pain. This included reasoning related to patients' cognitions, emotions, behaviours, attitudes and coping styles and sociological factors as shown in Table 5.

Table 5
Psychosocial reasoning

Sub-classification	Examples
Cognitions/thoughts	"And the factors that influence the pain would be like you know the thoughts the belief system"(2)
Emotions	"It's the emotive component of her pain that is striking me most…but I'm thinking that her whole response to her fracture is very emotive rather than the commoner pain descriptors that we hear."(3)
Behaviours	"He doesn't have fear avoidance. He is a little bit nervous himself which I would perceive as within expected limits."(1)
Attitudes and coping	"Well he's coping with the pain pretty well, he's not letting it interfere too much."(5)
Sociological	"As well as financial implications she is looking at her career implications, which are again factors that will influence her pain" (2)

Reasoning associated with the psychosocial aspects of pain appeared to be significant to six study participants when considering approaches to treatment, as illustrated by one therapist:

> "So now my management strategy is going to have to consider her home life, her work life, her capacity to live her life and to manage her pain." (6)

In addition, reasoning associated with the psychosocial aspects of pain appeared to inform the prognostic decision-making of five participants, whereby the presence or absence of psychosocial factors appeared to act as negative and positive prognostic indicators respectively, as illustrated by the following comments:

> "From the psychosocial factors there, it has interfered with her everyday activities. She can't work at a job she enjoys, she's been missing out on socialising as well, so all that's going to hamper recovery. (5)
>
> If he was starting to say some of the things that some of the other patients said like "I can't do this, I'm off work, I can't get back", if things were starting to progress like that then I'd be really worried about his prognosis. Alternatively the fact that he has very little in the way of psychosocial components to this problem, that's all going well for his prognosis." (4)

3.3. Pain mechanisms

All seven study participants demonstrated clinical reasoning associated with the neurophysiological basis of pain, specifically nociceptive, peripheral neurogenic,

central and autonomic/sympathetic mechanisms of pain. Five of the seven study participants showed evidence of reasoning directly related to nociceptive mechanisms of pain. Such reasoning was expressed more often in relation to patient presentation 3. For example one therapist stated:

> "It's a soft tissue injury…He's still got quite a bit of inflammation there…so it's a nociceptive type of pain mechanism, pain presentation." (5)

There was also some evidence that reasoning surrounding nociceptive pain mechanisms was closely integrated with various subcategories of biomedical based reasoning, as demonstrated by one therapist:

> "There's a mechanical nature to his pain he's describing specific activities that would be telling me that there's a nociceptive source of pain." (7)

Five of the seven therapists demonstrated clinical reasoning related to peripheral neurogenic mechanisms of pain, almost exclusively in relation to patient presentation 1. All seven therapists showed evidence of reasoning with regard to central mechanisms of pain and were expressed in relation to patient presentations 1 and 2. For example, one therapist explained:

> "From a pain processing point of view I would say that she's probably got a primary and secondary hyperalgesia happening and…she has an ongoing pain presentation. So rather than a peripheral nociceptive source, I would definitely be thinking of some kind of central component happening, central nervous system pain." (7)

Reasoning with respect to autonomic/sympathetic mechanisms of pain was demonstrated by all seven study participants, exclusively in relation to patient presentation 2. Such reasoning was also expressed in conjunction with diagnostic based reasoning, as suggested by the following therapist:

> "Well again it's fitting into the sympathetic element of a causalgia or an RSD." (4)

There was some evidence that mechanism-based reasoning appeared to influence participants' thinking surrounding aspects of the physical examination. Three study participants described how the presence of neurogenic mechanisms would lead them into conducting a more cautious physical examination. Mechanism-based reasoning of pain also appeared to influence four participants' prognostic reasoning, where nociceptive and central mechanisms of pain were associated with more and less favourable prognoses correspondingly. In relation to treatment, the identification of predominantly neurogenic and central mechanisms of pain by four participants appeared to discourage the use of predominantly manual therapy based approaches.

3.4. Chronicity

Six of the seven study participants showed evidence of reasoning linked to the relative chronicity of pain i.e. inferences regarding the duration of patients' pain. The study participants appeared to hold clear and relatively consistent frames of reference as to the cut-off time after which pain may be labelled or defined as 'chronic'. i.e. after 3–6 months duration. There was evidence of less consistency between subjects regarding a suitable cut off time by which to distinguish or define 'acute' pain, ranging from less than 6 weeks to less than 6 months duration.

In addition, there was some evidence of the integration of chronicity based reasoning with biomedical, psychosocial and pain mechanisms oriented reasoning. For example one subject highlighted the influence of a patient's thought processes:

> "She's constantly thinking about her back, so that just feeds into chronicity." (1)

3.5. Severity/irritability

All seven study participants showed evidence of reasoning with respect to the severity and irritability of patients' pain, as conceptualized by Maitland (1986, 1991). Judgements about the severity and irritability of patients' pain appeared to be based on cues derived from the pain reports, particularly night pain and sleep disturbance, aggravating and easing factors of pain and the use of medication. In addition, such judgements were in some instances graded by participants using descriptors such as mild, moderate and severe. For example, one participant stated:

> "So the aggravating and relieving factors are giving me an indication of his irritability which I think is mild to moderate." (6)

Reasoning associated with the irritability (three participants) and severity (two participants) of patients' pain also appeared to influence thinking concerning the extent of any physical examination, as evidenced by the following comment:

> "I am not overly concerned about aggravating her during the physical examination part. I mean that would be one of the main reasons why you would want to assess irritability up front." (4)

In addition there was limited evidence from two participants that reasoning related to the irritability and severity of patients' pain had an influence on decision-making concerning the planned extensiveness of subsequent treatment.

Table 6
Summary of results

	Category				
	Biomedical	Psychosocial	Mechanisms	Chronicity	Sev/irrit
	Sub-category				
	Structure biomechanical aetiology pathology diagnosis	Cognitive emotive behavioural attitudes sociological factors	Nociceptive neurogenic central autonomic/ sympathetic	Chronic acute	Severity irritablity
No. of therapists	7	7	7	6	7
Setting[a]	1,2,3	1,2,3	1,2,3	1,3	1,2,3
Implications for Phys. Ex.	√	X	√	X	√
Treatment	√	√	√	X	√
Prognosis	√	√	√	X	X

[a]Setting = patient presentation.

3.6. Summary

The results of this study suggest a broad and multidimensional nature to the clinical reasoning of pain by the experienced musculoskeletal physiotherapists observed in this study; which appeared to be grounded within a number of different theories and models of pain. Reasoning within categories appeared to occur simultaneously and interchangeably suggesting a dynamic reasoning process associated specifically with the clinical reasoning of pain. The main categories of pain based reasoning identified are summarized in Table 6. The therapists clinical reasoning of pain appeared to influence reasoning associated with other aspects of clinical practice such as the planning of physical examinations and treatment, and prognostication.

4. Discussion

Evidence was found from all participants that the clinical reasoning of pain was grounded, in part, within what has been termed the Medical/Disease model of pain and illness (Waddell and Main, 1998; Main and Watson, 1999). The medical model refers to a tissue and pathology oriented approach towards the explanation of pain and dysfunction (Watson, 2000) and functions on the premise that all pain has a dominant tissue or structural source. These findings of this study lend some support to the assertion by Gifford (1998) that physiotherapists often attempt to validate somatic tissues and nerves as definitive sources of patients' pain. Biomedical oriented reasoning has also been identified in other studies investigating the clinical reasoning of physiotherapists, however the focus of these studies was physiotherapists' pain beliefs (Daykin and Richardson, 2004), diagnostic reasoning (King and Bithell, 1998), the identification of hypothesis categories (Rivett and Higgs, 1997) and the investigation of hypothetico-deductive reasoning (Payton, 1985) rather than the clinical reasoning of pain specifically.

In addition, the findings from this study also provide some evidence that clinicians made inferences regarding the 'normality' of some presentations of pain based on reasoning grounded within the medical model. The description of some presentations of pain as 'normal' may suggest an implicit view on the part of some clinicians that presentations of pain that do not readily fit the medical model may in turn be regarded as 'abnormal' and perhaps, therefore, somehow more difficult to understand or explain. That some presentations of pain may be regarded in this way may perhaps reflect the extent to which the 'traditional' medical/disease model (Waddell and Main, 1998) continues to influence clinical thinking, possibly as a result of physiotherapists' prior education.

Substantial evidence was found from all study participants of reasoning related to the psychosocial aspects of pain consistent with the biopsychosocial model of pain and disability (Waddell and Main, 1998). This model recognizes that the clinical expression of pain and any resultant disability is multiply determined by the interaction of physical disease with psychological and social factors. Specifically, the participants in this study were found to recognize and acknowledge the importance of the cognitive, emotive, behavioural, attitudinal and sociological aspects of patients' pain, suggesting that the multiple determinants of and influences on patients' experience of pain were appraised for each patient. This finding appears to provide evidence that the therapists in this study adopted a more holistic approach towards the interpretation of patients' pain. Evidence of psychosocial oriented

reasoning has also been found in other studies investigating clinical reasoning within physiotherapy (Payton, 1985; Embrey et al., 1996; Jensen et al., 2000; Jette et al., 2003; Edwards et al., 2004). Whilst none of these studies investigated the clinical reasoning of pain specifically they do provide some evidence that psychosocial oriented reasoning is an established part of the clinical reasoning of experienced or expert physiotherapists.

Reasoning in relation to the psychosocial determinants of and influences on pain appeared to be particularly important and directly linked to five participants' prognostic- based decision-making. The findings from this study therefore appear to reflect the growing consensus of opinion that psychosocial factors rather than physical factors may be more important as prognostic indicators for predicting outcome and determining which patients are most at risk of developing chronic pain (Dworkin, 1997; Waddell, 1998; Turner et al., 2000; Watson, 2000; Picavet et al., 2002). The findings from this study also appear to concur with those of Overmeer et al. (2004) whose survey found Swedish physiotherapists to be well aware of the psychosocial risk factors for developing chronic pain and disability.

The results from this study provide clear evidence of mechanism-based reasoning of pain in four out of the five classes of pain mechanisms described by Jones (1995) and Gifford and Butler (1997) and therefore provide some evidence to support the use of this method of mechanism-based reasoning amongst experienced physiotherapists. Minimal evidence was found of reasoning related to the fifth or affective class of pain mechanisms. Whilst attention to the emotive aspects of pain was clearly demonstrated by study participants as part of a psychosocial oriented approach to the reasoning of pain, they appeared not to consider the emotive (affective) dimension of pain from an inherently neurophysiological perspective as outlined in the literature (Price, 2002; Zusman, 2002). Reasoning within these five classes of pain mechanisms, it has been suggested, is necessary in order for clinicians to better understand clinical presentations of pain (Jones, 1995) and to inform decision making associated with the assessment, treatment and prognosis of patients' pain problems (Gifford and Butler, 1997). The results of the present study suggest that the mechanism-based reasoning of pain employed by the experienced physiotherapists in this investigation served similar ends.

Mechanism-based reasoning of pain has not previously been identified or described within the existing body of literature on clinical reasoning within (musculoskeletal) physiotherapy. A study by Rivett and Higgs (1997), which investigated the clinical reasoning of manual therapists found no evidence of reasoning related to the neurophysiological mechanisms of pain. One possible explanation for the difference in findings may be the greater dissemination and awareness of knowledge within physiotherapy concerning the mechanisms of pain since the publication of the study by Rivett and Higgs (1997).

Substantial evidence was found of clinical reasoning related to the relative chronicity of pain and for the use of traditional terms, such as 'acute' and 'chronic' to describe pain from the perspective of its duration (Waddell, 1998). The use and meaning of such terms generally coincides with definitions and perspectives from the literature (Waddell, 1998; Linton, 1999; Pain in Europe, 2003). Although based mainly on the duration of pain, reasoning and judgements associated with the relative chronicity of pain also appeared, at times, to be integrated with biomedical, psychosocial and mechanisms oriented reasoning. For the therapists in this study therefore, the determinants of acute or chronic pain appeared to be more multidimensional and not singularly dependant on judgements related to time scale as otherwise suggested in the literature (Waddell, 1998; Linton, 1999; Pain in Europe, 2003). Perhaps surprisingly, there was no evidence from the participants in this study that such reasoning in itself informed any subsequent decision-making related to treatment or prognosis. Chronicity based reasoning appeared to serve solely as a means to describe patients' pain. An alternative style of questioning may have elicited different results.

Despite consistent demonstrations of clinical reasoning related to the 'irritability' and 'severity' of patients' pain by the experienced physiotherapists observed in this study, such concepts as defined in this study (Table 2) appear to have no clear grounding in the wider literature on pain. Attention to the irritability and severity of patients' pain has been advocated as an important part of assessment and treatment planning in musculoskeletal physiotherapy (Maitland, 1991). Reasoning associated with the concepts of irritability and severity of pain appear to have their origins in physiotherapy based texts (Corrigan and Maitland, 1983; Maitland, 1991, 1986) and may represent a unique conceptual approach within physiotherapy with regards to the clinical reasoning of pain. Doody (2003) found evidence of clinical reasoning related to the irritability and severity of pain in a study of expert and novice physiotherapists in an outpatient orthopaedic setting. The findings from this study show that clinical reasoning associated with the irritability and severity of patients' pain had a clear purpose, that being to provide a conceptual framework with which to aid clinicians' decision-making regarding the planned extensiveness of any physical examination and to a lesser degree, treatment. Such planning appeared to act a precautionary influence against the unnecessary exacerbation of patients' pain as a direct consequence of physical assessment and/or

treatment procedures. The findings from this study therefore support the usefulness of irritability and severity based clinical reasoning as described by Maitland (1991).

4.1. Implications for physiotherapy

The findings from this study may have implications for both physiotherapy practitioners and educators. It is recognized that within the discipline of musculoskeletal physiotherapy, clinicians place considerable importance upon the patient's report of pain when making decisions regarding its nature, cause and treatment (Main and Watson, 1999). The findings from this study may encourage clinicians and educators to consciously reflect upon those theories and models of pain that inform, guide and underpin their practice procedures and teaching. Such reflection may lead to an appraisal of those theories and models of pain, together with the assumptions and suppositions that underlie them, against alternative or less familiar approaches to pain based reasoning and the actuality of clinical practice. A process of critical reflection and appraisal may then assist clinicians in their attempts to better understand the nature of patients' pain in the hope that it might be better managed.

The goal of establishing a clinical reasoning model for pain that can be shown to improve patient outcomes and promote the effective use of healthcare resources may be considered a priority given the prevalence of pain (Magni et al., 1993; Verhaak et al., 1998; Pain in Europe, 2003), its cost to society (Turk, 2002) and the personal suffering that can be its legacy (Pain in Europe, 2003).

4.2. Limitations of the study

Due to the specificity of the group under investigation i.e. experienced musculoskeletal physiotherapists, the results cannot be considered transferable across other clinical specialities within physiotherapy or to other groups of physiotherapists within the musculoskeletal field, such as clinicians without postgraduate education or with less years experience. In addition, the study design involved one researcher in data collection and analysis. Different results may have emerged with multiple researchers.

5. Conclusion

The results of this study show a multidimensional nature to the clinical reasoning of pain by the experienced musculoskeletal physiotherapists observed in this study, reflective of the multidimensional nature of pain itself. Five main categories of pain-based clinical reasoning were identified which were grounded in a number of models of pain. These were (1) biomedical, (2) psychosocial, (3) mechanisms, (4) chronicity and (5) irritability/severity. Reasoning within these categories appeared to be useful in helping participants understand and account for clinical presentations of pain. Such reasoning was also found to influence prognostic decision-making as well as the planning of physical assessments and treatment.

Future research might seek to describe, compare and contrast the clinical reasoning of pain by physiotherapists with varying levels of experience and educational backgrounds, such as undergraduates and novice clinicians and of physiotherapists with and without formal postgraduate education. Longitudinal studies could also be carried out to investigate if and how the clinical reasoning of pain changes from an initial assessment through to discharge, to observe if such reasoning changes through clinical encounters which include treatment and reassessment. Finally and perhaps most desirably, it may also be possible to test the effectiveness of different methods of reasoning against the outcomes of clinical intervention in order to inform and guide evidenced based practice.

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