UNIVERSITY OF SOUTHAMPTON

FACULTY OF HEALTH SCIENCES

The Clinical Reasoning Processes of Extended Scope Physiotherapists Assessing Low Back Pain.

By

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ABSTRACT

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Doctorate in Clinical Practice

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The role of the extended scope physiotherapist has developed relatively recently within health-care. The extended role has utilised the skills of allied health professionals including physiotherapists, and given them autonomy to use knowledge and clinical acumen to request investigations such as Magnetic Resonance Imaging (MRI) as part of the diagnostic process. These requests and processes are delivered outside their traditional scope of practice. Further knowledge on how these practitioners clinically reason is therefore needed as there is little within the literature regarding reasoning in this specific group of clinicians. This research aids in the development of future roles, the governance of services, whilst supporting the training of clinical reasoning for new recruits to this work. This qualitative study has explored the processes by which extended scope physiotherapists clinically reason decisions regarding patients reporting low back pain. The study has used a multiple case study design informed by grounded theory methodology with focus groups and semi-structured interviews as a method to investigate these processes. The themes identified included prior thinking, patient interaction, formal testing, time, safety and accountability, external/internal and gut-feeling. Subtle differences in clinical reasoning were seen in the focus group study between ESP and non-ESP clinicians. The processes of clinical reasoning are presented that suggests how these clinicians reason whilst highlighting how they differ to non-extended scope physiotherapists.

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Declaration of Authorship

I NEIL LANGRIDGE declare that the thesis entitled The clinical reasoning processes of extended scope physiotherapists assessing low back pain and the work presented in the thesis are both my own, and have been generated by me as the result of my own original research. I confirm that:

- This work was done wholly or mainly in candidature for a research degree at this university;
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this university has been clearly stated;
- Where I have consulted the published work of others, this is always clearly attributed;
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
- I have acknowledged all main sources of help;
- Where the thesis is based on work done by myself jointly with others, I have made exactly what was done by others and what I have contributed myself;
- None of this work has been published before submission.

Signed: ……..

Date:……

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Presentations resulting from this work

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Post graduate conference. Poster presentation. University of Southampton. “The clinical reasoning processes of extended scope physiotherapists: methods and methodology.” June 2009

Papers in preparation

Clinical reasoning concepts in musculoskeletal physiotherapy: Is gut-feeling justifiable?

The clinical reasoning processes of extended scope physiotherapists assessing low back pain.

Chapter 1: Introduction

1.1 Reasons for this study

This study has its origins in clinical practice. I have been a musculoskeletal physiotherapist for 18 years and an extended scope physiotherapist (ESP, see operational definitions 1.2) for over ten of those years. As a clinician I am continuously challenged in providing a clinical diagnosis and management plan for the patients that I serve. To enable this, I have to utilise as many strategies as possible to gain information and an understanding of the patient before I can begin to formulate any hypotheses about their clinical presentation. Every patient is different, but may present in similar ways to patients I have encountered previously, and so experience plays a part in building a clinical picture that I possibly use when determining how to help the patient. Throughout my recent clinical career I have observed the differences in how I and other ESPs make decisions and rationalise when compared to traditional musculoskeletal physiotherapy. I have been trained and train others to provide ESP services and this experience prompted my wish to research how this group of physiotherapists think and reason. As a spinal specialist I am especially interested in and have directed this question towards decision-making in assessing low back pain. I am also aware of the socio-economic impact that low back pain has on health services and the community as a whole which makes this research relevant, this is discussed in section 1.6. My thesis research is thus directed to the question of how extended scope physiotherapists clinically reason patients presenting with low back pain.

1.2 Operational definitions

Extended scope physiotherapist (ESP). "Working beyond the recognised scope of practice, for example: requesting investigations e.g. blood tests, scans, nerve conduction studies; using the results of investigations to assist clinical diagnosis and appropriate management of patients" (CSP 2006).

Clinical reasoning. Defined as the thinking and decision-making processes associated with clinical practice (Ladyschewsky 2000).

Professional background. The people, places of work and experiences that have influenced a professional during their career.

Low Back Pain & associated disorders. Non-specific low back pain is tension, soreness and/or stiffness in the lower back region for which it is not possible to identify a specific cause of the pain. Several structures in the back, including the joints, discs and connective tissues, may contribute to symptoms.

The lower back is commonly defined as the area between the bottom of the rib cage and the buttock creases. Some people with non-specific low back pain may also feel pain in their upper legs, but the low back pain usually predominates. More specific disorders are described as sciatica, inflammatory disorders, infection and malignancy. (NICE 2009)

1.3 Thesis overview

The thesis reports two separate phases of data collection. The methods for each are separately described; however the overall discussion links the two phases to support the conclusions. The same methodology underpins both studies and its justification is presented. The origins, background and relevance of the methodology to clinical practice are discussed. The literature review makes reference to the most relevant models of reasoning pertinent to musculoskeletal practice and thinking whilst, also giving context from a neuro-biological perspective. Both phases used qualitative methods. Phase one presents focus groups with ESPs and non-ESPs to look at the models of reasoning, to highlight differences and to provide an initial working model to explore in the second phase. The second phase concentrates on ESPs, and uses semi-structured interviews to develop the ideas from the first phase. The thesis reports a number of themes identified in the analysis and one of these themes is presented in detail to show how the coding process was developed.

Throughout the thesis, there are references to clinical practice from a personal perspective. This clinical doctorate has its roots in practice, and so providing this continual clinical reference was seen as a vital component of the thesis. The aim of this thesis is to provide a theoretical model that can be used for further work and to aid in the training and development

of ESPs, whilst also informing the practice of clinical reasoning. The theoretical model will be useful in providing clinicians with structure to their clinical reasoning which may be used to enhance reflective practice, and to aid in the teaching of reasoning in these specific and clinically-related roles.

1.4 Clinical reasoning perspective and context

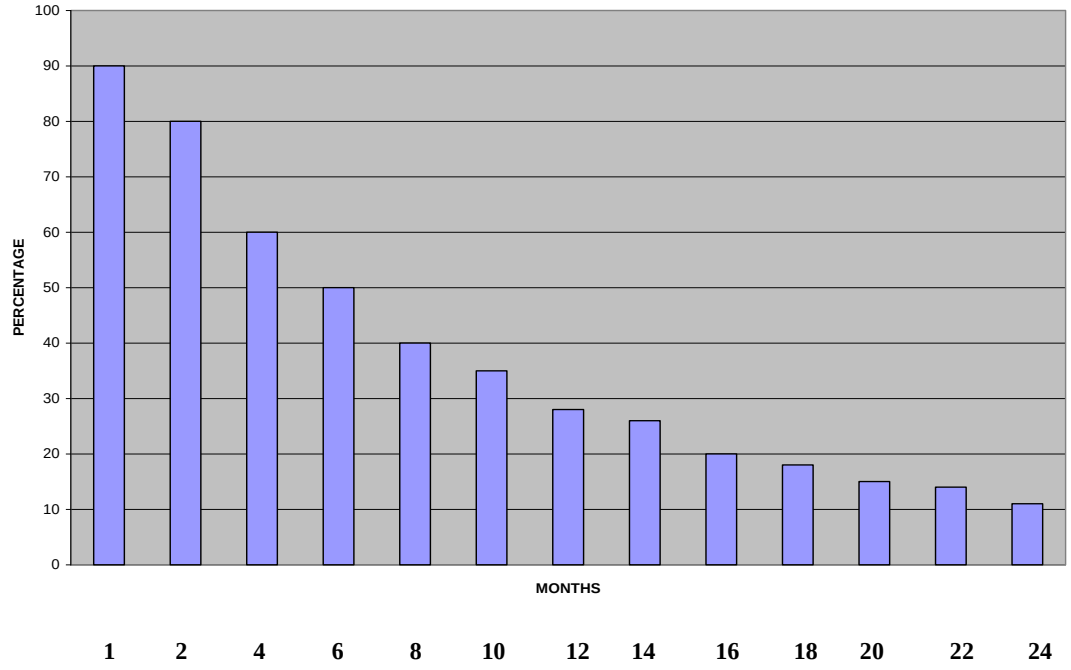
Clinical reasoning refers to the thinking and decision-making processes that are used in clinical practice (Edwards et al 2004), and is regarded an integral, vital component to being a clinician (Norman 2005). From the outset of training to the point of expertise, the learning and refining of clinical decisions continues (Curran et al 2006). The clinician-patient relationship relies on trust, understanding and the ability of one to communicate well with the other (Jeffrey and Foster 2012). Enhancing clinical reasoning can therefore be argued to improve communication, and ultimately the patient experience, as a greater understanding of the patient should enable a bespoke management plan. Patient experience and a feeling of being understood are therapeutic, and are argued to enhance patient care and the outcome of treatment (Payton et al 1998). It is likely that clinicians who understand how to engage with patients and create methods of enquiry that enhance this experience will better serve their patients.

1.5 The problem of low back pain

Low back pain (LBP) has a significant socio-economic impact and is only second to the common cold in terms of frequency of conditions presenting to a primary care doctor (Katz 2006). As well as the personal costs to the patient and family there are wider economic and social problems associated with LBP. The national health interview survey conducted in the United States (U.S.) involving over 30,000 U.S. residents found 24.6% residents reported LBP lasting at least one day in the previous three months (Deyo 2002). The costs in the U.S. in terms of lost productivity have been estimated as $16,000 per patient, and these costs have been positively correlated with disease severity, and duration (Ekman et al 2005), whilst in the U.K. estimated work productivity loss due to LBP in a year has been suggested to be at £9.1 billion, based primarily on work absenteeism (Maniadakis and Gray 2000). The rate of return to work of patients who have reported LBP is such that the longer the patient is away

from work; the less likely they are to return (Waddell et al 1992, see figure 1). The impact of physiotherapy on this data has yet to be fully explored, but a greater understanding of the influence physiotherapists and ESPs could have on LBP would seem relevant. The graph below demonstrates the percentage of people who return to work after reporting LBP from one month to 24 months.

figure 1 - to show the percentage of people who return to work after reporting LBP in months. The percentage chances of recovery after months up to 24 are shown.



Adapted Waddell et al (1992)

Low back pain research specifically aimed at diagnosis and management through the application of guidelines or protocols has been conducted in many different countries, and regularly involves physiotherapy (Bekkering et al 2003; Fritz et al 2008; Koes 2007). Therefore, designing studies that look at these in terms of how guidelines or protocols may affect decision-making would also seem appropriate. There still remains a rising problem of managing this problem though, and even with the advent of new ways to approach, think and manage low back pain, it remains a significant clinical challenge (Dagenais et al 2008).

1.6 What is an extended scope physiotherapist/advanced practitioner?

The study centres on the clinical reasoning of a specific group of physiotherapists with reference to their non-extended scope counterparts. Therefore, defining this group and discussing how their practice is similar or different from other clinicians is felt to be appropriate as part of the justification for the research. Extended scope physiotherapists /advanced practitioners are a group of health care professionals who have extended their role outside of the agreed scope of practice, defined by their professions regulatory body (CSP 2006). The role of the physiotherapist in health-care has diversified in areas such as musculoskeletal, rheumatology, neurology and respiratory care such that the models of practice between medicine, nursing and allied health professional have become inter-related (Gardiner and Turner 2002). Enhancing patient-care and smoothing the pathways to appropriate musculoskeletal management has been a prior government directive (DOH 2006). In response to this, services continue to look at innovative ways to utilise the skills and training of staff to provide these extended role services, which has led to the growth of ESP/advanced practice. Keane (1989) describes the characteristics of an advanced practitioner as;

- A desire for more freedom in decision-making.
- Goal orientation.
- Self motivation.
- Self-confidence.
- Optimism about their ability to effect change.
- Courage.

Underpinning these characteristics are components such as scientific understanding, moral perspective, and personal awareness (Carper 1978). These are described as methods of sourcing evidence for which decision-making can be made. Advanced practitioners are argued to utilise these methods through the process of clinical reasoning and reflection (Dewar 2010). Dewar defines advanced practitioners as accountable for direct care, having to exercise judgement, and being aware of their organisations strategic plans. This suggests that practitioners working at this level have specific clinical roles that also have a wider impact on patient-care than clinical counterparts.

This has meant that the individual clinicians or services that provide care via physiotherapists may not be doing so with traditional physiotherapy, but are providing clinical roles outside scope that suitably trained professionals can deliver.

These historical shifts have therefore meant a change in how physiotherapists may be perceived, interact with medical colleagues, and ultimately defined by their clinical practice. This is discussed below.

1.7 Political context

This study addresses a gap in the literature surrounding extended role physiotherapists and clinical reasoning. LBP is a common and costly healthcare problem, and thus research to aid advancement of its management is also deemed relevant and timely. ESPs are a relatively new response to a changing workforce, and so the evidence base in this area remains limited (McPherson et al 2006). These clinicians have embarked in many new and different roles and are now working closely with medical colleagues in environments that are quite different from standard physiotherapy practice. This has potentially shifted the paradigm further and possibly is one of the biggest changes in physiotherapy since autonomous practice occurred in 1977 (CSP 2012).

LBP leads to disability (Wyatt et al 2004) and this leads to significant direct and indirect costs. Government policies regarding the delivery of health-care are directed by the cost of the intervention, versus the expected outcome in terms of health gain and savings made (Sheldon 1998). This clinical effectiveness versus cost ratio needs to be understood in relation to the wider concerns about disability, work absenteeism and recovery, all significant factors associated with LBP (Linton and Buer 1995; Linton 2000; MacFarlane et al 2009). Further additional costs are not only associated with intervention and support, but also in injury claim compensation (Katz 2006; Watson et al 1998). Therefore, research programmes analysing LBP continue to be on the agenda due to the escalating costs of social welfare, loss of work productivity, health care costs and legal settlements that all occur with this health problem (Linton 2000).

LBP research can be conducted in the laboratory and clinical setting. For example, laboratory work has centred on the biomechanical, movement, force and load features of LBP (Foster et al 2009; Waddell et al 1992). Correlating this biomechanical work to understand pain and disability and then enabling actual health gain is difficult, and means this context is limited. Translating research into the clinical arena is important because it enables direct measurements to be made with patients alongside opportunities to seek opinions. Quantifiable measures such as cost per episode, work absenteeism and use of local services may be more useful in developing guidelines as compared to biomechanical studies (Marras 2001). Unfortunately there still lacks real consensus on best practice due to significant problems of standardising the base-line characteristics of patients experiencing LBP, and the external influences upon recovery (Foster et al 2009; 2010). Pragmatic studies that explore how clinicians work may measure performance within a more natural context, but can be criticised due to the lack of generalisability of the findings, due to individual clinical autonomy of practice. This problem coupled with the lack of diagnostic accuracy related to LBP assessment (Billis et al 1997;LeBoeuf-yde et al 1997) means that conducting research in the clinical field requires large complex studies with multiple methods, and strong logistical management to produce outcomes that need to be implemented to alter practice.

A further context that LBP research is conducted in relates to the individual experience of the problem. Qualitative methods of data collection and analysis have enabled researchers to develop theories on how LBP could be assessed and managed (Schers et al 2001). Exploring LBP from the lived experience of the patient will potentially reveal the socio-economic burden of why some patients fail to recover. Some of the highest costs of LBP disability emanate from the five percent that fail to improve (Asche et al 2007; Katz 2006).

Therefore, this study is relevant for populations managing people with LBP and especially for clinicians working in extended scope roles, and for all with an interest in clinical reasoning. The context for how this new area of research was developed is described below.

1.8 Research context

The development of the research question has required much thought and discussion regarding the appropriate paradigm in which to explore the research question. In selecting an appropriate methodology, understanding the nature of scientific inquiry had to be explored.

A dominant view of science has been perceived that it is a process of verifying prior hypotheses leading to a quantitative result, which was believed to represent high quality, results, and conclusions (Guba and Lincoln 1994). The positivist paradigm reflects this, and presents an ontological perspective that is one of realism, while epistemologically the investigator and the "object" under investigation are independent. Researchers in this paradigm accept that a lack of independence will influence the validity of the results. This scientific approach reflects the testing of a hypothesis in a controlled environment, and the emphasis rests upon the measurement and analysis of causal relationships between variables (Denzin and Lincoln 1998). Generally, quantitative research can be described as;

"…*supported by the positivist or scientific paradigm, leads us to regard the world as made up of observable, measurable facts*" (Glesne and Peshkin, 1992, p. 6).

In the positivist paradigm, researchers aim to produce generalisable explanations, which then allows for generalisation and the discovery of universal laws (Della Porta and Keating 2008). The process begins with a theory, hypotheses generation, followed by rigorous testing, which has been described as the hypothetico-deductive model (Corbetta 2003 pg 13). Therefore, by performing a 'measurement' on the physical world, the observer, who is distinct from the object, is able to generate results that enable explanation (Crocker and Algina1986).

In contrast, the interpretive paradigm is guided by a set of beliefs that focus on the processes by which meaning is created within the context of human action (Denzin and Lincoln 1998 p225). It was developed in an effort to develop a "natural science of the social" and contests that here is no unique "real" world which is independent of interaction (p236) Within this paradigm the method of qualitative research uses a naturalistic approach that seeks to understand phenomena in context-specific "real world" settings, in which the "researcher does not attempt to manipulate the phenomenon of interest" (Patton, 2002, p. 39). Qualitative research, broadly defined, means;

"*Any kind of research that produces findings not arrived at by means of statistical procedures, or other means of quantification*" (Strauss and Corbin, 1990, p. 17).

Unlike quantitative researchers who seek causal determination, prediction, and generalization of findings, qualitative researchers instead seek illumination, understanding, and extrapolation to similar situations (Hoepfl 1997). This means that methods such as interviews and observations are dominant in the interpretive paradigm and supplementary in the positive paradigm, where the use of these methods aid in the determination of the hypothesis to test (Winter 2000). Although it has been claimed that quantitative researchers attempt to dissociate themselves as much as possible from the research process, many qualitative researchers have come to accept their involvement and role within the research itself. Patton (2002) supports the notion of researcher's involvement and immersion into the research by considering that the real world is subject to change, and therefore a qualitative researcher should be present during the changes to record an event before, and after the change occurs. However, both qualitative and quantitative researchers need to test and demonstrate that their studies are credible. While the credibility in quantitative research depends on instrument construction, in qualitative research, "the researcher is the instrument" (Patton, 2002, p. 14). Therefore, it seems that when quantitative researchers highlight validity and reliability of their research, they are usually referring to its credibility. In contrast, the credibility of a qualitative research depends on the researcher's ability to remain reflexive, taking into account their influence on the data (Della Porta and Keating 2008 p. 31).

The discussion above relates to the epistemological stance surrounding the methodology required to gain knowledge about the world. How we explain and understand events, practices, and behaviours will range from discovering laws to explaining culture, human nature, and interaction (Della Porta and Keating 2008 p26). Whilst appreciating this stance, it therefore is also relevant to relate this to the research question, and resultant tools for data collection; i.e. the methods. The positivist approach will begin with the hypothesis, and an expected outcome is then proposed, while the inductive approach taken by an interpretivist will build up the research question from the data, and perhaps modify the design as the process develops (Della Porta and Keating 2008 pg 29; Denzin and Lincoln 2005 pg 25). This more inductive approach requires flexible methods that allow for changes to the types and format of the data dependent on the information that is found. A qualitative approach may

encompass this flexibility while a quantitative, controlled approach does not. There is also a difference in the number of cases needed for analysis. Positivist researchers will potentially choose high numbers to ensure generalisability in the statistical analysis. In contrast, interpretivist researchers may select smaller numbers of cases of interest (King et al 1994), and ensure a range of cases are considered to test the concept under review. The researcher's ontological, epistemological and methodological stances are linked to their approach or paradigm, and this then informs how the research will be constructed (Denzin and Lincoln 2005 pg 22).

The present study is not testing or verifying a hypothesis. The epistemological position is one that is interpretive, as the environment under study is naturalistic, and from an epistemological perspective the object of the investigation and investigator are interactively linked, and are not two separate entities. (Denzin and Lincoln 2008 pg5).

1.9 Clinical context

The drive for evidence-based practice within health-care has created a need for interventions that have been tested and found to be of use, rather than relying on a clinical assessment and subsequent management plans that experientially are believed to be of value (Jette et al 2003). Much of the research that supports musculoskeletal physiotherapy has been derived via quantitative methods such as randomised controlled trials (Stanton et al 2010). In practice, physiotherapists also inform their clinical decisions using patient interview data and interpreting results from physical testing. If clinical tests and measures do not lead to a diagnosis or subsequent management plan, then the clinician may have to search the clinical presentation with different thought processes. This potentially stems from the understanding and appreciation of more distant anatomical and biomechanical, biochemical and psychological processes that indirectly apply to the patient presentation (McGill 1997; Radebold et al 2000). Practitioners can therefore make clinical connections and linkages based upon the knowledge of these processes when the initial diagnosis is found lacking in substance and validity (Jones 1995). The creation of further potential influences upon the patient presentation may require being more abstract in a deductive manner, which is then tested in a systematic manner (Doody and McAteer 2002). A more interpretive approach

would be more inductive allowing the conclusions to emerge and appreciating the influences upon them (Klauer 1990).

The belief that an external environment exists which can be viewed by many in the same way is one that drives much of the delivery of decisions in medicine, and also in musculoskeletal physiotherapy (Loftus and Smith 2008). The counter-interpretive argument is one that challenges this view. It may be too narrow to assume that musculoskeletal physiotherapists provide physical testing that when completed, is void of external and internal influences. Physical testing procedures within a clinical environment may not be able to replicate the research setting upon which the validity and reliability outcomes were produced. In these environments, perhaps the patient perception, physiotherapist beliefs and interpretation of events will influence outcome. It could be argued that a physical testing procedure cannot be separate from internal and external influences which are not anatomically, biomechanically and physiologically associated with the test/treatment (Jack et al 2010).

The research findings in a positivist paradigm are interpreted by the researcher for relevancy in terms of suggesting how it may influence practice. This process may be influenced by their professional clinical practice, previous professional supervision, under and post graduate teaching as well as the previous patients that have been treated will all create the decision as to whether the research can be implemented. This process could be described as using research to inform clinical practice (Rosenberg and Donald 1995).

Orthopaedic/musculoskeletal testing also sits within a second process, which is the interpretation of the patient presentation. Relevancy of clinical testing does not always take into account all the previous data and its interpretation, which would have been explored in the history-taking interview and in the other physical examination. For example a clinical test may sit very differently in terms of its relevance for some patients as compared to others, even with a similar descriptive pain or dysfunction. This will be due to the previous clinical finding s and how they influence the interpretation of the data from the test. Therefore, interpreting the patient perspective requires the clinician to judge not just the result of the test, but the choice and the relevancy of the test. It is far too simplistic to assume that the local application of physical tests enables a diagnostic certainty. Firstly, many tests in musculoskeletal physiotherapy/orthopaedics are based either upon movement or a pain response (Simmonds et al 1998;Van de Wurff 2000).

This approach fails to appreciate the complexity of a pain response and how pain science research has revealed that a pain response is multi-factorial, and therefore is a patient's interpretation of a chemical event (Sullivan and Adams 2010). This can be affected in a multitude of ways, the history, family and social influences, previous experience, and patient/therapist relationship are just a few of the variables that will affect the result of a orthopaedic/musculoskeletal test (Wood et al 2011). This more interpretive approach has been adopted in the study of clinical reasoning within other areas of health care other than medicine. Fleming (1991) highlights that the reasoning strategies of occupational therapists differ to medical colleagues when they are dealing with disability, but is similar when confronted with medical problems. The ethnographic method that highlighted these differences led to a descriptive piece of work that identified that the nature of practice will influence the reasoning strategy using other methods to the hypothetico-deductive model. This was also supported by Edwards et al (2004) who looked at physical therapists via interpretive methods, and found subsequent models of reasoning such as interactive and collaborative, which are put forward as methods of reasoning that require interpretation rather provide diagnostic conclusions. Therefore, an interpretive paradigm within musculoskeletal physiotherapy is likely to play a part in the patient/clinician interaction.

In conclusion, musculoskeletal/orthopaedic physiotherapy decisions maybe influenced by three components, the literature, the patient presentation and clinician beliefs. The paradigm of choice will relate to which process is used and the clinicians experience. Being experienced means having a strong base for interpretation while less experience requires a more deductive approach to allow structure that accounts for that lack of experience (Doody and McAteer 2002). An appreciation of all the possible influences that may affect a test and treatment plan may need to be employed with all the complexities that patients may present with. An appreciation of positivist and interpretive paradigms and how they may potentially inter-link within a patient interaction is one that possibly should be considered with any analysis of clinical assessments. Therefore, research that is aiming to explore clinical reasoning is centred within the interpretive paradigm, and so gives the researcher information regarding the narrative, contextual and interpersonal dimensions of clinical practice (Higgs et al 2008).

Chapter 2: Literature review

The understanding of how clinicians' formulate decisions is now an important component of how health-care is delivered, as independent and responsible decision-making is now regarded as one of the characteristics of an autonomous profession (Higgs 1999). Reflective practice is now well established as an integral part of learning and developing the necessary skills for good clinical practice (Paget 2001). Early studies and models related to physiotherapists' clinical reasoning suggested similar modes of thinking to physicians hypothesising that the primary model was a "diagnosis" grounded in a hypothetico-deductive process (Jones 1997; Payton 1985). This method of decision-making is embedded within empirico-analysis, having its roots in the positivist paradigm.

Researchers looking at expertise within physiotherapy, occupational therapy and nursing began to consider alternative methods for studying clinical reasoning. Much of the early research had been laboratory based; this then saw a change with researchers working within clinical practice providing a contrasting paradigm. This has led to other forms of reasoning models being developed, such as narrative reasoning which seeks to understand the unique lived experience of patients (Mattingly 1991a). This review intends to look at the most common theories and models of reasoning, and their influence upon health professionals. It begins by exploring the very basics of a decision, the neurobiology of the construction, it then will lead to the development of musculoskeletal clinical reasoning and the common models that are used in clinical practice.

2.1 Search strategy

Databases	Search Items
CINAHL	Extended scope physiotherapists
EMBASE	Extended scope physiotherapists + low back pain
MEDLINE	Clinical reasoning + (medicine, nursing, physiotherapy)
PSYCH INFO	Clinical decision-making
	Models of clinical reasoning
	Intuition + clinical reasoning
	Gut feeling + clinical reasoning
	Pattern recognition
	Hyothetico-deductive
	Expert and novice practice + (physiotherapy, medicine, nursing)
	Clinical reasoning + Occupational therapy
	Pattern recognition + gut feeling + intuition
	Biology of making a decision
	Neuro-biology of decision making
	Neurobiology of clinical reasoning
	The brain + decision making
	Intuitive practice
	Dual-processing theory
	Cognitive continuum theory
	Jones + physiotherapy reasoning
	Deductive reasoning
	Expertise and clinical reasoning

2.2 The neurobiology of a decision

The process of a decision is perhaps simply described by the actions/events and cognitive responses that contribute to it. These components could be compartmentalised as stimuli, interpretation, reaction, and evaluated outcome (Ellamil et al 2012; Sailer et al 2007; Ullsperger and Von Cramon 2004). Decision-making is also described as rational cognitive processes assisted by emotion-related signals, which are known as somatic markers. These are in contrast to economic theory which suggests decisions are devoid of emotion, whilst the

somatic marker theory suggests emotions can guide or bias our decisions and have a critical role in decision-making (Damasio et al 1996). These "markers" are theorised to be stored in the ventero-medial prefrontal cortex (VMPFC) (see figure 2) which is suggested to create a physiological state such as confidence (Northhoff et al 2006).

If decision-making is considered as a stimulus response occurring in the environment then perhaps it firstly requires the decision process to decide how to react, if at all. Many decisions in an awakened state will occur with a sub-conscious reaction (Lindsen et al 2010), for example; choosing to step around a puddle. The system has a received a stimulus (the puddle) and a risk and reward decision (Bechara et al 1998) is therefore made that will support an expected outcome; stay on course and be wet, move and be dry. There is no obvious deliberation, no reflection, it just happens at a fast sub-conscious pace. Some health-related decisions that appear stressful also can happen very quickly, and possibly sub-consciously. For example, in an emergency situation, the deliberate rule-based approach may not be appropriate as a quick decision is needed, whilst perhaps considering whether to spend a large amount of money may take longer. Therefore, rule-based decision-making will need conscious weighing of the options available, whilst taking a slower, reasoned approach towards alternatives (Bunge 2004). Decision-making whether fast or slow interprets the information, and in this state, an evaluation of possible reactions occurs to what might happen and these maybe emotional, physical or perhaps both (Krawczyk 2002). This response may stay in a memory "loop" that helps define our reaction in the future in a similar situation, therefore becoming a stored "associative memory" (Bechara et al 2000). This "associative memory" (Bar 2007) stores reactions for use again if needed, helping to reaffirm for future reference. This is also why recalling an earlier decision, either perceived as good or bad, can sometimes induce a physical reaction as a link is made back to that marker and its outcome (Ohira 2010).

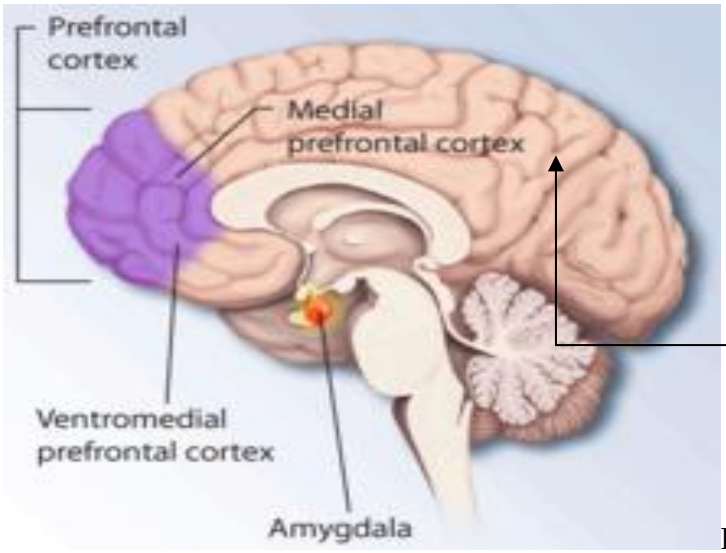
It has been suggested that the way in which the brain deals with a change in the senses, or coping with a new environment is by linking the input from the environment with an analogous representation in memory (Bar 2009). Bar further suggests that the brain uses immediate access to associated representations, and relies on memory and the ability to match the memory data against incoming information. This can blur the border between cognition and perception (Grossberg 2009). Humans try to understand new phenomenon and changes to the environment using links to familiar information, therefore aiming to make it "fit" with

a close resemblance within our memory systems (Bar 2009). Bar et al (2007) suggest this analogical phase is followed by "association", which is the basis of prediction. This can be a complex process with multiple analogies and predictions all occurring at similar moments (Bar 2009). The recollection of contextual memory and this process of linking to previous events have been shown via neuro-imaging to occur in the pre-frontal cortex (Simons and Spier 2003). Critchley (2009) suggests that autonomic arousal (such as heart rate/blood pressure) occurs via the anticipation/expectation of what might happen. A study that evaluated the neuro-physiological reaction to expectation highlighted that when patients receiving what they perceive to be acupuncture (and therefore a treatment reward) were shown, via functional (f)MRI, scanning to activate the dorsal- lateral pre-frontal cortex, anterior cingulate to cortex and midbrain (Pariente et al 2005). The study concluded that expectation will stimulate the dopamine opiod system, suggesting expectation creates physiological responses in relation to mood such as confidence (Spanagel et al 1991). The physical responses potentially reinforce the feedback from a potential decision; this then supports the decision-maker in selecting what alternative to choose (Barrett and Armony 2006). This reinforced loop could therefore be part of what drives the selection of memories involved in future decision-making processes.

Authors such as Hassabis and Maguire (2009) use the term "episodic memories" to describe the retrieval of semantic information and feelings of familiarity which in essence is the conscious retrieval of the memory of meaning, and therefore the ability to give meaning to new information (Saumier and Chertkow 2002). The memory/retrieval related areas of the brain suggested by these authors include the medial prefrontal cortex (MPFC) but also the lateral PFC, para-hyppocampal gyrus and posterior cingulate cortex. The anterior cingulated cortex has been suggested to play a role in reactive motor functions and emotions, while the posterior component deals with visuo-spatial and memory function (Devinsky et al 1995). This network has been studied but individual contributions are difficult to extrapolate due to lesions being uncommon in this area, as the only way to fully explore these regions is when lesions occur in individuals, and deficits can be assessed (Hassabis and Maguire 2009). This whole network is suggested to be characterised by the reactivation, retrieval and integration of semantic, contextual and sensory components and is described as "associative construction" (Hassabis and Maguire 2007), which uses the meaning of memory, physical responses to memory and cognitive understanding to produce an appropriate reaction to a decision. Therefore, the process of recognising an analogy, filtering episodic memories, then

creating a prediction seems to be a combination of many areas surrounding the pre-frontal cortex and leads to a construction of the environment within oneself. This will be potentially different on every occasion it is experienced, and interpreted in various ways by individuals at different times. With experience, the process in a similar context will get quicker and easier if done repeatedly.

figure 2 - to show the regions of the brain associated with decision-making

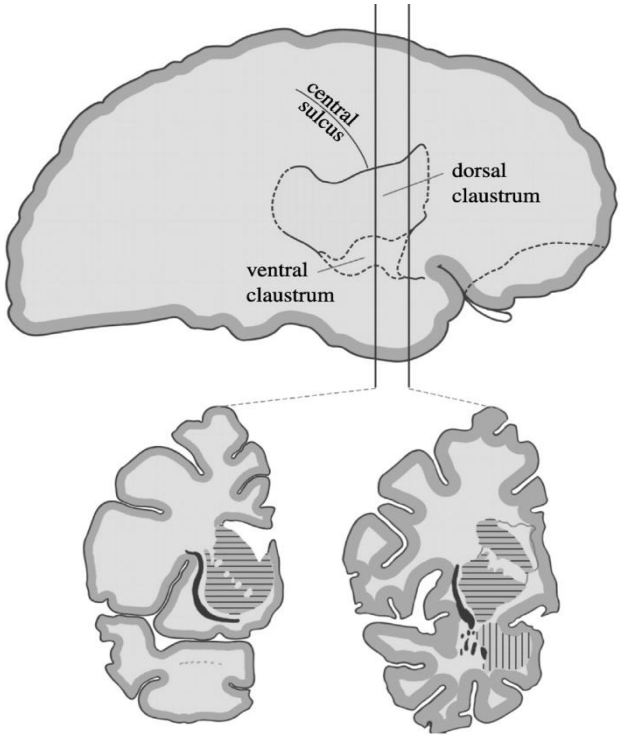


(free from Wikipedia 2013)

Authors such as Bechera et al (1999) and Damasio et al (1996) proposed the hypothesis that neural activation occurs when associations are learned between stimuli and outcomes. This highlights the direct neural connections between stimulus and outcome. The VMPFC recognises and stores stimulus built information whilst also creating somatic effective states that stimulate such regions as the hypothalamus. This hypothalamic stimulus activates the autonomic system creating changes such as increased sweating or breathing rate (Beck 2008). This in turn then creates the physiological reaction to risk and reward (stress or safe) (Krawczk 2002). This reaction is associated with the emotional side of decision-making, and is also felt to be linked to the orbito-frontal cortex which plays a role in the release of dopamine, thereby creating the link to the emotional state (Elliot et al 2000). This can lead to a stress reaction or a feeling of being correct or right.

Schnyer et al (2004) investigated the feeling of knowing, described as “feeling right”, via a memory task that involved the recognition of a word in a sentence via a scale of 0-5. Functional MRI suggested that it is the medial pre-frontal cortex that is engaged in this task of predictive accuracy of judgement. The speed of providing a “value judgement” (Volz et al 2010) was enhanced by quickly combining memories to create further context, and the area of the brain that seemed to be involved with this was the claustrum. The claustrum connects with the cortex and many studies have mapped this with anatomical assessments in cats and monkeys (Katz 1987). Various theories have arisen regarding this area, leading to a consensus that suggests that the claustrum coordinates the perceptual, cognitive and motor modalities when dealing with incoming stimuli to provide a context for new information (Crick and Koch 2005).This basically suggests that our emotional, visceral and motor responses to a decision are modified dependent on the incoming information and the context that the decision is made in.

figure 3- to show the region of the claustrum



Crick F C & Koch (2005) (with permission)

The dorsal lateral pre-frontal cortex is believed to be involved in conscious deliberation, and slower consideration of options, whilst the anterior cingulate and fronto-polar cortex support conflict processing and rule based decisions (Krawczyk 2002). Previous studies utilising the iowa gambling task (IGT) which is a method that simulates decision-making from a psychological perspective for the purposes of research have shown that advantageous decisions are made before the advantageous strategy is known (Bechera et al 1997). It has been demonstrated that skin conductance responses (SCR) are delivered prior to selection of an advantageous decision suggesting that there is a sub-conscious sympathetic nervous system response to a decision which is perhaps linked to an emotional (somatic) marker.

Linking these physical, emotional and cognitive elements Gutbrod et al (2006) demonstrated that with amnesic patients SCR did not occur and there was no learning mechanism to supplement the response as compared to healthy controls that showed anticipatory autonomic responses to punishment, which were greater than responses to less advantageous choices. These reactions occurred before obvious learning had happened and suggests a sub-conscious reaction. The findings from this study suggest that associated memory is linked to the autonomic nervous system creating visceral and physical responses either safe or stressful. This therefore suggests that decision-making is a combination of psychological and physical responses.

Responses to a feared or stressful stimulus involves the recruitment of cognitive, motor and endocrine systems (Schulkin et al 2005). The autonomic nervous system drives this “fight or flight” mechanism due to the sympathetic nervous stimulating the release of adrenalin which will stimulate heart rate, sweat glands, and motor function (Beck 2008). A study that looked to evaluate the effect of anxiety on decision-making and therefore evaluate this fight/flight mechanism was developed by asking participants to make a decision concurrently with an intermittent uncomfortable noise (Barrett and Armony 2006). The researchers measured decision accuracy, therefore offering a measure of cognitive output and a physical response of skin conductance. With increased anxiety the skin conductance was raised yet the decision speed and accuracy improved, suggesting that the adrenalin response heightened the cognitive ability of making a decision. Autonomic arousal according to Critchley (2005) is based around the role of anticipation feedback. This feedback is then re-enforced with a physiological reaction such as heart-rate or sweating. This will possibly enhance learning as the memory of that decision will have a physiological and emotional marker combining

emotion with a physiological response. This suggests that when accessed the cognitive, autonomic and physical responses will create a consciousness of thought.

Critchley et al (2001) also used the IGT to evaluate the area of the brain that became active as skin conductance rose when faced with a reward or punishment decision. The electro-thermal measure of sympathetic arousal correlated with activity enhancement in the cortical regions, including the bilateral ventro-medial prefrontal cortices and right anterior insula. The dorsal anterior cingulated cortex has been shown to be involved with demanding tasks, and a feature of cognitive effort is autonomic arousal (Critchley et al 2003), further linking the association of cognition and physical responses when decision-making is stressful.

A study that combined the clinical reasoning processes with further physiological performance was conducted on a group of "expert" physicians via a think-aloud process when under fMRI imaging (Durning et al 2012). This takes the responses to a deeper cognitive level and offered some interesting conclusions. The study suggested that the pre-frontal cortex is involved with "guessing", when answers were incorrect or lacked clarity, the area had greater activation with incorrect answers, offering the proposal of greater mental effort. The precuneus (see figure 2) seemed more involved in the faster, confident processes. Overall, the study (unfortunately) did not compare experts and novices and so would have given greater differentials, yet the authors suggested that perhaps analytical and non-analytical reasoning is more complicated than just two systems, and involves many other cognitive processes. This would suggest that simplified models of clinical reasoning may not be relevant in the clinical scenario, especially when the stresses of practice are high.

These physiological changes to sub-conscious pressure and cognitive effort have been described as "gut feelings" (Stolper et al 2010). These feelings are linked emotionally to stress, dependent on whether the associative memory can confirm the decision is advantageous (Critchley et al 2001). It will heighten awareness if it is believed to be less safe, although there is a suggestion above that this heightens accuracy, which perhaps is a safety valve for the conscious decision.

In summary the main features of physiology in the construction of a decision are in the cognitive, emotional, and associative memory areas. The interpretation of the information that supports the outcome of a decision may be due to the physiological reaction within the

motor, endocrine, visceral and autonomic functional areas. The human system uses memory and links against previous markers, these markers are supported by sub-conscious outputs that help confirm the outcome of the decision made.

2.3 What is clinical reasoning?

Clinical reasoning has also been described as;

"A context dependent way of thinking and decision making in professional practice to guide practice actions. It utilises core dimensions of practice knowledge, reasoning, and metacognition and draws on these capacities in others." (Higgs & Jones 2008).

Health-care professions such physiotherapy, occupational therapy and podiatry have evaluated clinical reasoning and certain differences in processes and theories have been highlighted, (discussed below), but much of the supporting evidence is similar across professions. Evaluative work surrounding expertise and novice practice show common linkages across professions, especially involving common decision errors (Curran et al 2006;Hoben et al 2007; Jensen et al 2000;Mattingly 1991b).

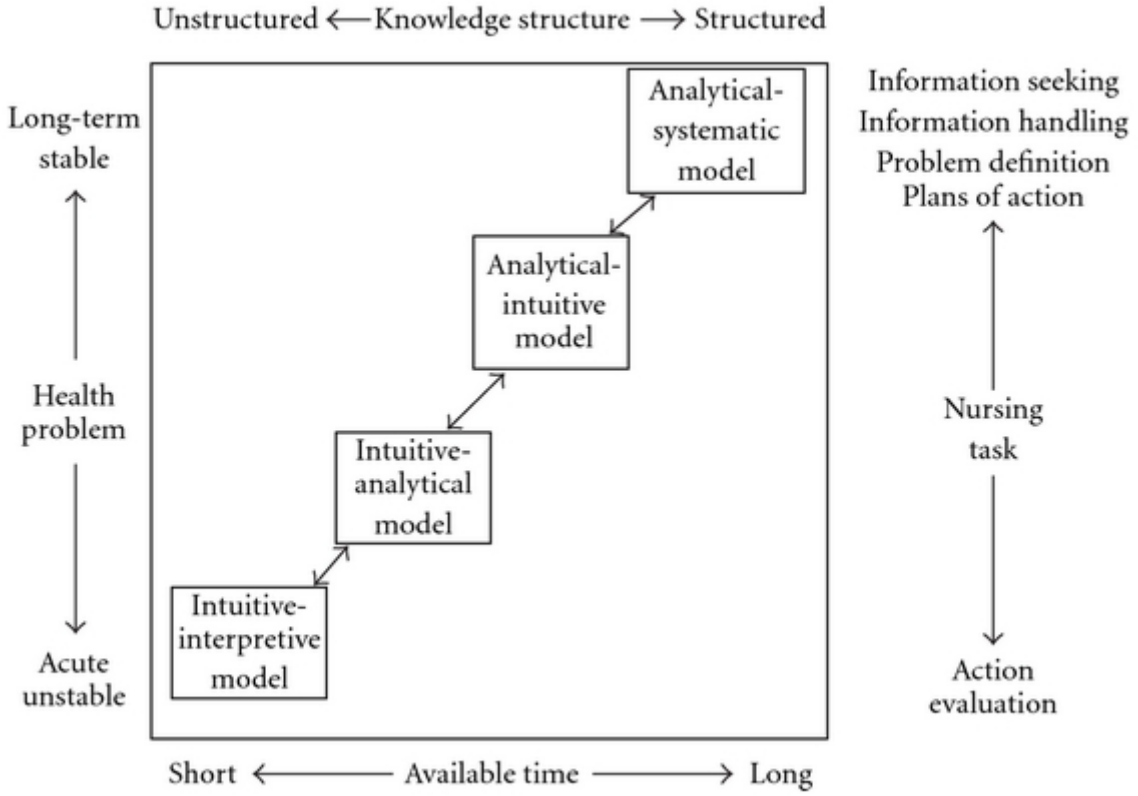
2.4 Cognitive continuum/dual processing theories

Clinical decision-making or clinical reasoning is underpinned by many differing processes that Forde (1998) describes as within a continuum: At one side of the continuum is the strongly embedded scientific, analytical approach; while at the opposite end of the spectrum lies the humanistic, intuitive element that is not grounded in medical reasoning principles, such as hypothesis testing or systematic sorting of clinical data (Jefford et al 2010). When considering these paradigms of clinical thought, there is a selection of variables that support the thinking process and delineate certain professional characteristics for specific clinical practitioners. The continuum (see figure 4) suggests a range of thinking processes, yet more simplified theories suggest only two. Croskerry (2009) describes this within the "dual processing theory". This theory presents two systems of thought that apply to how a decision is made. System 1 (intuition) is a cue acquisition and matching process and if this fails then system 2 (hypothetico-deductive) is then chosen as a more analytical approach.

The *cognitive continuum theory* (CCT) (Harbison 2001) is a descriptive theory that illustrates how judgement, situations, or tasks relate to cognition, and describes those judgements within a decision making continua rather than a simple two process approach. Hamms adapted CCT is shown below.

figure 4- Cognitive continuum theory

The model presents a range of cognition modes with the associated time differences required.



Bjork and Hamilton 2011 (unrestricted access)

From the diagram above it is possible to see that there are a number of thinking modes, and methods of choice influences, which clinicians can utilise. Scientific experiment i.e. RCTs may be seen as the gold standard of research data to assess the effectiveness of intervention, but they are argued to only make predictions to average effects (Downing and Hunter 2003) and may not address how clinical reasoning varies from circumstance to circumstance, and from patient to patient (Edwards and Richardson 2008). Therefore, although this continuum

looks to support the more scientific element (as the continua depicts RCTs at the top) to a decision, it may not reflect clinical practice, and as Bonis (2009) acknowledges, the use of empirically driven knowledge may have its roots within intuitive beliefs and thoughts. The CCT acknowledges the differences between analysis and intuition and is responsive to understanding the mode of cognition that the clinician uses when approaching a decision, but perhaps fails to appreciate the inter-linkages of thought processing that occur with clinical reasoning. Groups of health-care professionals have attempted to analyse specific areas of practice to explore this with more depth, suggesting that the CCT for example would not cover all areas of clinical practice. Therefore, perhaps more diverse models of reasoning and processes of thought underpin clinical practice and the production of a decision (Edwards et al 2004; Fleming 1991; Hoben et al 2007). This therefore implies that clinicians making reasoned decisions need theoretical models to underpin specific clinical practice, which will aid further evaluation of clinical decision-making (to enhance patient-care).

To understand how clinicians contextualise a problem it therefore could be argued that an appreciation of these different processes is a valuable tool when exploring new areas of clinical practice. The phenomenon of the multi-faceted process of clinical reasoning has to be approached in a way that accommodates the complexities surrounding a decision (Higgs and Jones 2008). Perhaps it should also be acknowledged that individual clinicians are influenced not just in the way that they construct a decision, but previously to that in the desire to make the decision. The factors that influence the clinician to want/have to make a clinical decision were assessed via a questionnaire involving a group of nurses. Hoffman et al (2004) examined a sample of nurses and the factors affecting the desire to participate in clinical decision making via a one group prospective correlation survey. Using a previously-constructed questionnaire to measure role values and decision-making (Rhodes 1985), the team used the 26 item orientation scale to evaluate professional, paramedical and bureaucratic ideology. This was measured via 5–point Likert scale. The main factors noted in affecting participation in clinical decision-making were professional occupation orientation, level of appointment, clinical speciality and age. The response rate was 58% (n=96), with an average length of clinical experience of 11 years. There was no significant relationship between education and perceived decision-making, or with experience and decision-making. Experience in this research was measured by years in post, but this is not necessarily an indicative marker of expert practice (Darbyshire 1994), and therefore would need greater clarification. Looking closely at the relationship between education and decision-making

highlights a discrepancy between the participation, educational levels, and a desire to be involved in a decision. Higher educational levels had a weak correlation with desire to participate, which may be regarded as surprising given that potentially education and knowledge would, in many professions, lead to individuals being involved in decisions in many different environments. It is therefore important when analysing clinical reasoning, to consider how clinicians perceive their role in making a decision, and consider the factors that affect whether involvement in the decision is perceived as their responsibility. Therefore, a range of theories underpin practice to produce a selection of theoretical models. Within the context of a musculoskeletal examination the most commonly cited models are now outlined below.

2.5 Common musculoskeletal models

Butler (2000) simply defines clinical reasoning under the heading of a "wise action" and this process encompasses three major components together to construct the "action".

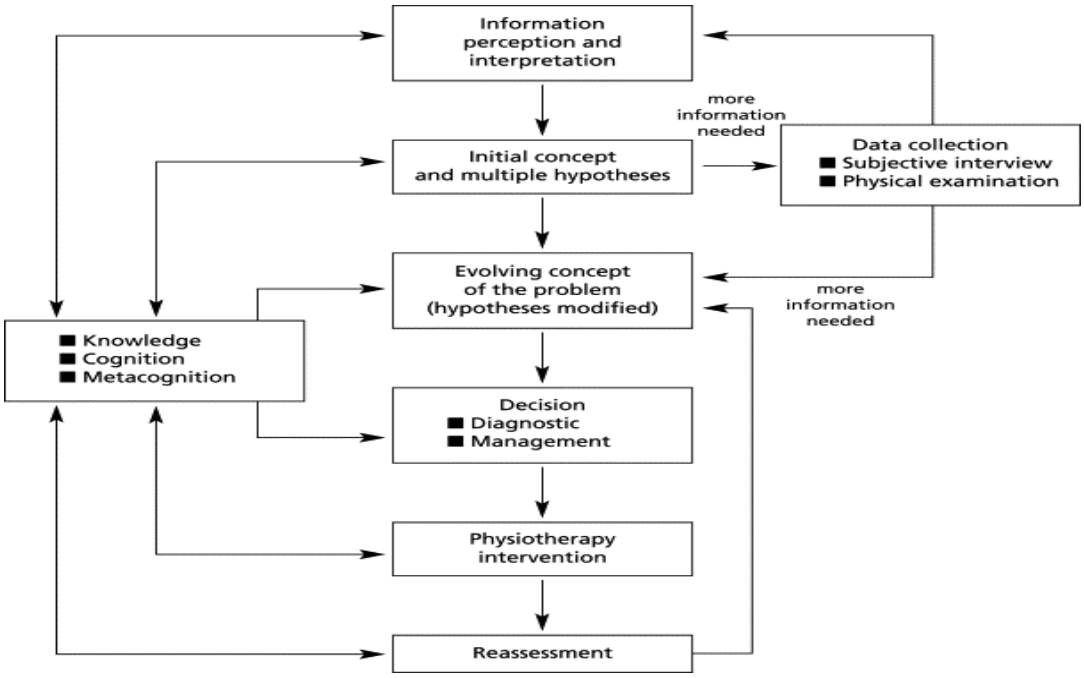
figure 5 – Butlers' Constructed elements of clinical reasoning.

(Adapted) Butler (2000)

Butler further describes the clinician's beliefs and personal foundations, namely "experience" yet really does not describe them in detail with regard to referencing how this may affect the reasoning process, only that it does.

Jones (1995) has suggested that reasoning involves the categorisation of elements pertaining to the patient and although inter-linked, these are placed in a certain order and this then enables a semblance of understanding about the patient (see figure 20 below). Jones (1995) further presented a model of pain assessment in physiotherapy. It begins with initial cues which represent initial cognition, followed interpretation, induction and deduction about available data suggesting a mixture of reasoning processes such as intuitive, hypothetic-deductive and pattern recognition rather than one in place of another. The authors describe this combination of patterns and hypothesis driven data examination as the links to the clinical schema stored in the memory system (Bar 2009).

figure 6 - the process of clinical reasoning in physiotherapy.



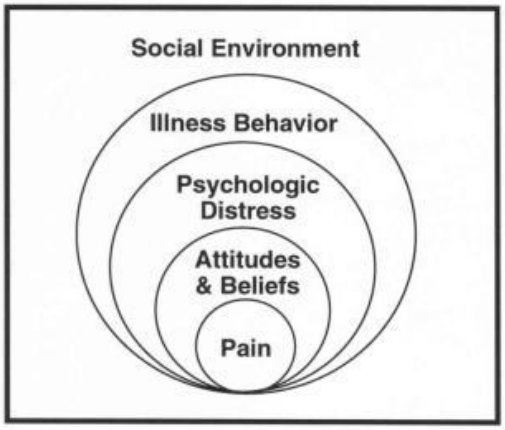
Jones (1995) (with permission)

Jones similarly describes external and internal factors in the influences upon reasoning but this is not entirely clear The final categories suggested by Jones relate to the cognition and meta-cognition regarding the patient information and how they interact. Cognition is described by Jones as the ability to think about the current situation, and meta-cognition being able to reflect upon it. Lastly, Jones recognises knowledge and 6 categorical areas for development of a patient diagnosis

- Source
- Mechanism
- Contributing factors
- Precautions and contraindications
- Management and treatment
- Prognosis.

The source and mechanism above are similar to the current research categories of prior thinking and formal testing. Considering the data and then testing against a hypothesis, links to the hypothetico-deductive process, but selecting the tests from prior thinking is pattern related as test selection is a choice based approach upon a perceived pattern, learnt, read or experienced. Jones and Rivett (2004) presented this mechanism of hypothesis testing and added capability and participation /restriction as a "new component". A well recognised and accepted model that pertain to an understanding of the patient is the bio-psychosocial model (Waddell 1984). This (see model below) explores the nature of the psychological and social impact upon the patient and gives the clinician an understanding of the experience of the presenting condition.

figure 7 - the bio- psychosocial influences upon a patient presenting with LBP



Adapted Waddell (1984)

2.6 Hypothetico-deductive

The use of the hypothetico-deductive model of reasoning in health-care was identified in 1978 by Elstein et al, who suggested that diagnostic problems are solved by generating a number of hypotheses or problem formulations, which then guide clinical data collection. The model focuses upon the processes of cue acquisition, hypothesis generation, cue interpretation, and hypothesis evaluation (Loftus and Smith 2008). This technique of collecting data and then generating hypotheses is a method that structures a problem into possible solutions. A systematic approach is then applied via tests or questions that either support or refute the possible solutions. The hypothetico-deductive model remains the most enduring clinical reasoning approach in medicine, and early studies involving physiotherapy reasoning also provided explanations that involved a "diagnosis" followed by testing of the hypothesis (Payton 1985).

A study comparing novice and expert musculoskeletal practitioners highlights the model in practice (Doody and McAteer 2002). Ten patient participants were purposively sampled to either the expert or novice musculoskeletal physiotherapy assessment group. The chosen methods of enquiry were on-site non-participant observation, audio-taping each treatment, followed by semi-structured interviews with field notes. Using a coded framework of analysis, the authors found that the experts generated the majority of their hypotheses during the subjective interview. Close links were then developed between the hypothesis and

subsequent musculoskeletal treatment. The team noted a high level of pattern recognition in the expert assessment, although experts used hypothetico-deductive reasoning when confronted with an unknown presentation. In contrast, the novices were unable, due to lack of experience, to develop pattern recognition reasoning, and subsequently relied heavily on hypothetico-deductive processes. This study highlights that at expert level combinations of reasoning models are used dependent on the situation, and this is also dependent on whether the clinician has had previous experience of the presentation (Doody and McAteer 2002).

A study that evaluated experienced and inexperienced reasoning processes in speech and language therapists demonstrated different thinking between the two groups (Hoben et al 2007). Assessing pre-selected cases the inaccurate students had difficulty with accessing theoretical knowledge, using clinical data effectively such as linking to previously gained information, and carrying out tests in the correct sequence. These process errors would affect the faster non-analytical process of pattern-recognition, but perhaps would be better dealt with via hypothesis generation and deductive thinking.

A study that looked to compare the reasoning processes of experts in physiotherapy but across disciplines was conducted via a case study design featuring manual, neurological, and domiciliary physical therapies. A grounded theory methodology was chosen although this was not described in detail; the analysis was supported by triangulation, member checks and negative case analysis (Edwards et al 2004). The study provided a more interpretative framework of reasoning and concluded that the patient/clinician interaction and hypothetico-deductive methods occur throughout the decision-making process, and that expert practitioners are able to move between the two. The study was constructed in three "waves", starting with observation combined with semi and unstructured interviews whilst audio-taping treatment sessions. The second wave analysed written material from the clinicians that identified potential sources of knowledge, such as previous training. The third wave aimed to explore the initial themes from wave one and this was in the form of further interviews. This fairly robust method required three coders plus cross study analysis, and provided a fairly seminal piece of physiotherapy clinical reasoning research. It demonstrated qualitative research in physiotherapy and used grounded theory to provide theoretical proposals that supported clinical practice (Petty et al 2012). Much of the differences in expert and novicereasoning surround the poor interaction of hypothetic-deductive (systematic) and pattern recognition (intuitive), and so pattern recognition are now considered.

2.6.1 Pattern recognition

Pattern recognition requires the clinical examiner to make assumptions that are fast and effective, and is related to the structure of a person's memory (Patel et al 1997). This has been developed from cognitive psychology and involves the clinicians utilising "illness scripts" which are presentations of conditions that are supported from the clinicians' previous experience (Arocha et al 1993). This has also been described as forward reasoning and is in contrast to backward reasoning which is similar in process to the hypothetico-deductive model of initially selecting a hypothesis followed by systematically testing it.

It is suggested that expert clinicians will use a hypothetico-deductive model in difficult cases and experts may move between pattern recognition and hypothetico-deductive reasoning suggesting interpretation of the relevance of testing and results is vital, but accuracy and thoroughness may be separate (Jensen et al 2008). If an expert can formulate a decision quickly, then systematic and thorough testing is unlikely to have occurred, while the choice of clinical tests/questions rather than the number of tests could be argued to play a greater role. It is suggested that experts formulate decisions based on prototypes of experiences that have been experienced many times before (Jones and Rivett 2004), using patterns to quickly move towards a diagnosis with the support of knowledge of disease features, biomedical/mechanical properties and aetiological likelihood of presentation (Woods 2007). This categorisation is only possible via the supportive knowledge underpinning it, although this will not always be clear to the clinician (Wisniewski 1995).

Schmidt and Rikers (2007) suggest that pattern recognition is the matching of memory to a seen presentation. An example of this was described via work carried out involving experienced and inexperienced doctors assessing clinical decisions with or without "enabling information"; such as age, gender, and lifestyle. With the enabling data the experienced doctors were significantly "better" at a quick diagnosis than the inexperienced, yet without the enabling data, there was little difference (Hobus 1999 cited by Schmidt and Rikers 2007). This highlights the importance of applying a context to the stored memory from which a pattern can be matched, suggesting a complex cognitive process rather than simple matching of signs. There needs to be some analysis to contextualise correctly. This was also explored

in a study looking at this in more detail using electrocardiographs, which in their simplest form, are line drawings. The clinicians looked at prior cases followed by attempting to match test cases against what they had already experienced. When relevancy of data was matched, the accuracy significantly improved irrespective of the amount of data available (Hatala et al 1999). The relevancy, not the amount of data, highlights that clinicians need to contextualise appropriately and this is once again demonstrated by work in dermatology that shows that accuracy of diagnosis in experts when they see an un-interpreted photo of a skin condition versus an interpreted verbal one (Kulatanga-Moruzi et al 2001). In this study 16 medical students assessed colour sides of dermatological conditions and rated them on a seven-point scale for typicality. Training was given that offered feedback and experience of cases, this similarity approach enhanced their diagnosis rather than adopting an analytical based rule-based approach. This highlights that it is not just experience over time that allows pattern-recognition but perhaps the experience itself, however short and in a feed-back driven environment. The authors suggest that the similarity (pattern) reasoning is a hall-mark of greater skill, but perhaps the literature demonstrates that clinicians do use different processes at different times. A study in the field of podiatry was conducted that demonstrates this further. It analysed expert versus novice clinical reasoning (Curran et al 2006). The study involved five experts, and nine novices in the first phase, and six experts only in the second phase of the study and demonstrated a combination of reasoning. Opportunistic sampling was used for both phases. In phase one the novice selected a condition after assessing the patient, then via a think-aloud method, explored the diagnosis. The expert was able to hear this process and then repeat the assessment in the same way. In the second phase the experts selected and made the assessment again via the think-aloud process. Results indicated the use of tacit knowledge, which has been described as acting without having to think and without lengthy cognitive processes (Welsh and Lyons 2001). The study indicated that both novice and experts use these processes, which are similar in method to pattern recognition. The second phase of the study did highlight some further clinical themes linked to expert practice; they were able to readily use “illness scripts” which are suggested as accumulation of causal knowledge about disease and its consequences combined with experience of real cases. (Custers et al 1998). They were able to move quickly between inductive and hypothetico-deductive reasoning, and use clinical intuition.

It could be argued that the process of think-aloud may have slowed the cognitive process, but in the case of the novices, it may have helped them as it gave time for reflection,

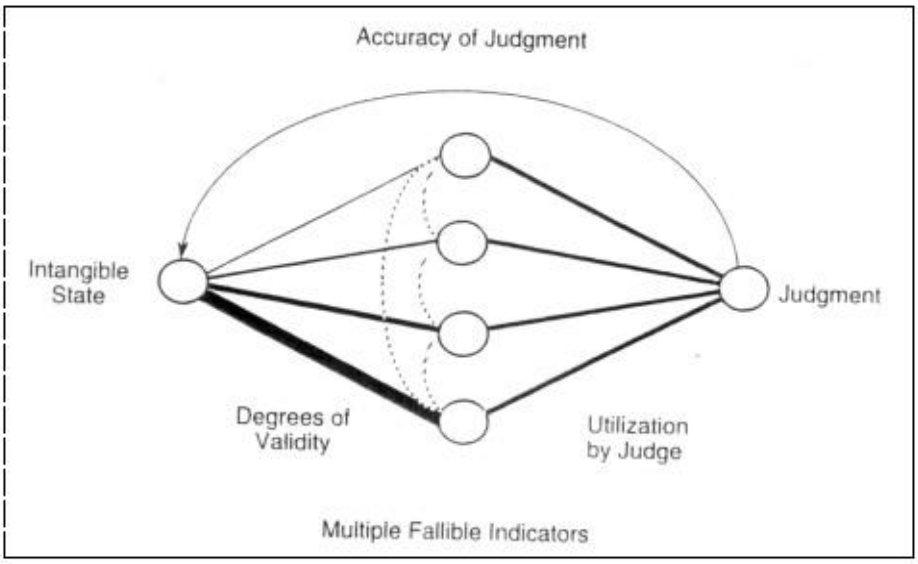
consideration and evaluation. This could have been the reason why much of the assessment data was similar in the first phase. It also may have been preferable to not have had the experts listening to the novice assessment as this could have affected the novice and or the experts thought processes. In conclusion, the process of recognising patterns is fast, less analytical and requires the matching of memory and the contextualisation of clinical signs. This process is perhaps supported by the understanding of the patient via a narrative method, which is now described in more detail.

2.6.2 Intuitive practice – gut feeling

Intuitive practice may occur when the clinician empathises, seeks to understand and communicates with the patient, and so social context research is needed to highlight this (Orme and Maggs 1993). The physical scientific side of research may provide clinical guidelines and protocols which may lack individual application but can be condition specific (NICE 2009), but this may not cater for all patient needs. These patterns when placed in a framework have been described as clinical decision/prediction tools (Wasson et al 1985). Therefore, intuitive thought, and gut-feeling are possibly separate elements from pattern-recognition. Pattern recognition could be described as patterns of clinical pictures potentially driven by protocols and guidelines, and therefore fits further along the continuum to the physical analytical perspective. All three can be considered part of the process of making a decision with less emphasis on analytical evidence.

Intuitive thought and gut-feeling both seem to sit well with the definition of sub-conscious decisions that are difficult to explain (Hammond 1996). It remains largely invisible as it is not articulated (Standing 2008). The Lens model (Cooksey 1996) offers a structure that may explain how intuition and gut-feeling differ from pattern recognition.

figure 8 - Single-System' Lens Model- this demonstrates the factors involved in making a judgement, such as cues, relevance of validity and how these link.

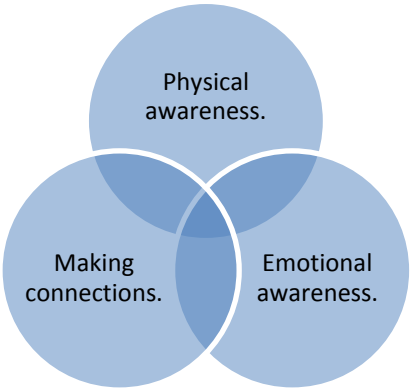


Single-System' Lens Model (Hammond [2], 1996, p. 168) (with permission)

The model takes an uncertain situation (intangible state) and uses the cues from that situation to build into patterns of prioritised information. If enough of these pieces of information can be grouped they may form a heuristic (rule of thumb), this will generate a behaviour or outcome. The model shows that the accuracy of a decision is affected by many indicators, and how those indicators are integrated and judged. This is common practice in the decision-making of paramedics (Shaban et al 2004). These cues may mean very little without context, yet as a group or pattern they mean a course of action is needed. It is therefore not just the recognition of the patterns but the prioritisation of these that differentiates the three modes of thinking. The "Lens model" takes the intangible state (such as intuition) and validates it to a judgement via knowledge and understanding of the relevance of indicators that support that judgement. Gut-feeling can be thought of as intuitive thought that has created concern; the patterns are such that it creates a neuro-physiological response in the clinician as it raised alarm in some way (Bechera and Damasio 2005). This differentiates gut-feeling from intuition, i.e. thought without awareness, and has not raised that awareness in a physiological way, as the cues have not grouped to arouse the tacit skills of the clinician to a physical response (Stolper et al 2010). The gut-feeling response has potentially produced a neuro-physiological prioritised response.

The clinician recognises the physical response of a gut feeling, and realises in themselves that the information that they have acquired houses elements of concern;
All three descriptions of thought have been put forward as a conceptualisation of intuition, presented in diagrammatical form below.

figure 9 – Conceptualisation of intuition. Highlighting the inter-linkages.



Adapted from Smith et al (2004)

These descriptions are suggested as "intuitive knowing" but could be argued separate in their usage as they suggest different human reaction such as emotion, physical awareness and connecting interactively.

A qualitative study that explored the opinions and beliefs of nurses' intuition suggested that it is an interaction of attributes including, expertise, knowledge, personality and environment, and its acceptance was validated (McCutcheon and Pincombe 2001). The over-arching theory referred to what was described as a "synergy" which linked the described factors involving the patient/clinician relationship. These elements are described in the current model, whereby gut-feeling and patient interaction help form the diagnosis. The development of this theoretical model is argued to help with the evidence of articulating gut-feeling as a method of gaining an understanding regarding patient care and the safety elements surrounding it.

When faced with complex decisions, it is suggested that humans are more accurate with their initial intuitive decision as compared to slow analytical ones; this is described as "using the entire human system" (Strick and Dijksterhuis 2011). This suggests that intuition uses our senses, feelings and thoughts to provide a greater depth than a singularly cognitive one. A study that looked to explore this further asked participants to analyse information regarding

the choice of an apartment under different circumstances. Some were given time to think without distraction, others with distraction and some with no time to think at all. One apartment was "loaded" to be the more attractive choice. The decision accuracy found that the group with time were 36% correct, the group without time were at 47%, yet time and distracted was 59% (Dijksterhuis 2004). This result was suggested to be due to a weighting principle that gives less conscious thought the ability to link the importance of various attributes quickly, and the emotion behind it, suggesting the use of other cognitive systems (such as emotion and feelings). The use of emotion has classically been a differential between the analytical and less rational systems and links to the description of gut-feelings. It is suggested that it is these "feelings" that are the product of various options being weighed up quickly and a result is being driven without rational explanation (Mikels et al 2011). The data suggest that clinician have a "sense" of the diagnosis, a physical reaction stemming from unknown/sub-conscious sources.

This feeling of right and wrong has been investigated within the brain via fMRI (functional Magnetic Resonance Imaging) and within the visceral, autonomic responses of the human system. A study that connected gamblers to a polygraph showed that there were visceral changes (sweating, heart rate) that occurred before the participant turned over cards that were specifically "loaded" to be linked to a penalty. These visceral responses occurred before the participants could verbally/consciously explain the nature of the game (Bechara et al 1997), it was described as a "hunch" but seemed to be unconscious understanding of the game leading to visceral responses that could be learnt and acted upon. The linkages and descriptions to the gut within the term gut-feelings has been described as the "belly brain" (Nyatanga and de Vocht 2008), and may play a part in the reactive physical processing of heightened awareness but at a sub-conscious level. The brain appears to detect conflict when intuitive and reflective/analytical processes may create different judgements. The anterior cingulate cortex and right prefrontal cortex via fMRI have shown to be active in these situations (Neys et al 2008; Tsujii and Watanabee 2009). The right pre-frontal cortex has been shown to be involved in the control of weighting of risk and benefit responses (Knoch et al 2006), whilst the anterior cingulated reacts in error detection (Carter et al 1998).

These studies underline that the theme of gut-feeling has a physiological component that is a reaction to sub-conscious balancing of analysis and emotion. The rational side of judgement has been suggested to not be affected by emotion, but when emotion occurs in the intuitive

process, it is suggested that cognition errors such as, "over riding with personal opinions or poor hypothesis testing" can all affect the outcome (Goel 2001). It seems that worry and concern lead to heightened awareness in ESPs and this seemingly creates anxiety which is an emotional experience (Lang 1985).

Emotion leads to specific activity in the central nervous system (Collet et al 1997) and has been suggested to "fine tune" the cognitive system" (Russell 2003). Therefore, it could be argued that the emotion of the decision is linked with clarity when reacted to correctly, but error levels may rise if reacted to poorly. The role of emotion in decision-making potentially needs greater acceptance and the internal influence theme in the current research demonstrates a cognitive realisation in this via the participants' accounts, but perhaps gut-feeling goes much deeper in the senses, linking with the safety component to be there to support and drive important decisions.

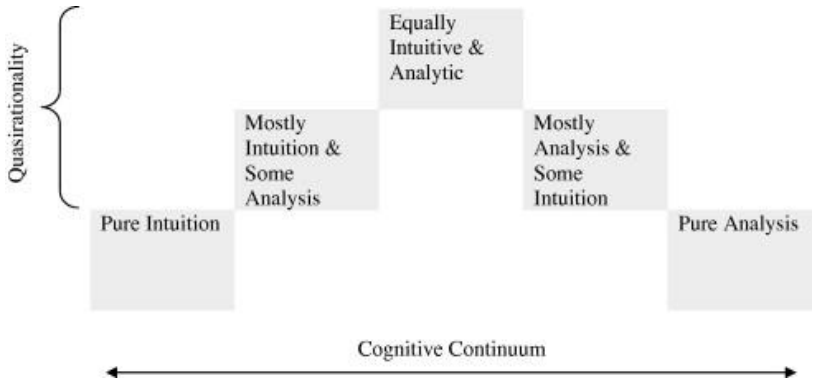
Therefore, it is possible that fast decisions are linked to memory recall and the perception of that memory (Evans 2007). What possibly should also be considered also are the emotional responses in the visceral and emotive systems that heightens the feelings of right and wrong, which is tested cognitively in the rational brain to judge relevance and make it a more conscious retrieval of information informing explicit decision-making. The associative memories are linked to an emotive response of memory recall (Bechera et al 1997); therefore without this recall and association of the feelings at the time, the clinician may well find judging relevance and the severity of the presentation difficult. A gut-feeling is beneficial if it produces an appropriate action, and it perhaps is the emotional link to memory recall that creates this action. Coombes et al (2009) noted that motor efficiency is adversely affected by anxiety, yet as described above; anxiety can be efficient in decision-making. This is unlikely to be the case involving intuition as there is little evidence to suggest it produces a physical reaction. Therefore, when looking at how gut-feeling and intuition differ it is probably best described in terms of cognitive and visceral physical responses. Intuition is perhaps how we <u>think</u> about something at a less conscious level and gut-feeling is how we physically <u>feel</u> about it as it emerges into our pre-conscious state.

In greater contrast to intuition and gut-feeling, pattern recognition could be described as patterns of clinical pictures potentially driven by protocols and guidelines, and therefore fitting further down the cognitive continuum (figure 24) to the physical analytical side. If

enough of these patterns form a heuristic (rule of thumb) then this will generate a behaviour or outcome (Gore and Sadler-Smith 2011). Singularly these cues may mean very little, yet as a group or pattern, they mean a course of action is needed. This has attempted to be re-created in the work surrounding clinical prediction rules and physiotherapy (Childs et al 2003; 2004; Flynn et al 2002). It is therefore not just the recognition of the patterns and emotions associated with them, but the prioritisation of these that differentiates the three modes of thinking.

Pattern recognition, and therefore heuristics, could be argued to be more conscious than intuition and gut-feeling and therefore outside the emotional/intuitive side of cognition. They could be argued to sit more comfortably with the analytical approach as they are governed more with rules and less with emotion. This distinction between analytical and emotive is an area that requires further thought with specific regard to ESPs, this is now considered. Reviewing two major theoretical constructs surrounding decision-making presents a number of challenges. An up-dated and newly formulated cognitive continuum theory below suggests separate processes that are distinct from one extreme to another.

figure 10 - up-dated Cognitive continuum theory.



Dhami and Thomson 2012 (with permission)

It could be argued that the interactive nature of decision-making is not reflected in this model. The monitoring of the analytical side and the drive of the emotional side in fast or slow reflective situation are not adequately demonstrated. This challenge also affects the dual-processing theory stemming from cognitive psychology that standardises thought in two

ways (analytical and intuitive) (Pelaccia et al 2001). It could be argued that both occur at the same or different times depending on the scenario, and in reality we are perhaps using multiple manifestations of the same thing, the continuum is possibly better described as a movement and interaction of consciousness that may move forwards and backwards and is monitored cognitively and reactionary to the physical symptoms it derives. This may better reflect the process of ESP reasoning and the linkages of emotion and analysis, which are now discussed.

2.6.3 Narrative reasoning

Narrative reasoning has been described as;

"*The communication involved in expert history taking, seeing patients in their functional and psychological context, and collaborative reasoning with the patient regarding management.*" May et al (2008)

Narrative reasoning aims to establish insight into the presentation from the patients' perspective rather than establish a "cause effect" basis of a decision (Edwards et al 2004). The literature further subdivides this type of approach into categories. Procedural reasoning is a method of assessing occupational performance, whilst interactive reasoning assesses the patients' and therapists' interaction/therapeutic relationship, and its influence upon management (Fleming 1991; Mattingly and Fleming 1994). The clinical reasoning literature has many differing models that support practice, and whilst the evidence suggests hypothetico-deductive coupled with forward reasoning are common forms, it is relevant to highlight that not all aspects of the patient examination are directly related to a diagnosis. This may require a more interpretive approach to the patients' presentation, fully exploring the whole illness experience, and this may play a part in the specialist assessment of low back pain. An example of narrative reasoning in clinical practice is recounted in work by O'Reilly et al (1990), in work that involved a group of patients who had experienced a head injury. The group had been given therapeutic exercises, but were not enthusiastic about their use. The reasoning process then centred on what the patients needed and how to engage them within their treatment plan. The therapist noted that all the patients were from the city of New York, and felt that this could engage the group as the class was conducted outside New York State. By knowing their background stories, the therapist was able to give a context to the

group and this engaged them in the therapy by making a "contact" with familiar circumstances. The room that the exercises took place in was converted to resemble a New York sub-way station. The group then completed their exercises in a way that gave them a "context" and so engaged their cognitive interest that was deemed important in their physical rehabilitation. Without knowing more about the patients lives this would have not been possible.

An exploration into factors affecting clinical decision-making in occupational therapy gives further information regarding how the patient as a person can influence the clinical decision made (Kuipers et al 2009). Defined "experts" (n=11) were invited to attend two focus groups which aimed to look at the factors affecting assessment of upper limb function after brain injury. The aim of the study included exploring what is important when making a clinical decision, such as what is it about the person that leads to a decision i.e. cues. The analysis was completed via qualitative software which allowed coding and thematic analysis. Second author reading and member checks were used for the trustworthiness of the scripts and analysis. Themes highlighted were extrinsic factors (external to the patient), including the therapists' knowledge and the environment in which the assessment was carried out in. From a patient's perspective the decisions were intrinsically influenced by their condition, the duration of the condition and where the status of the condition sat on a rehabilitation time line. Patients' cognitive state and sensory awareness were also factors that were suggested as important when making a clinical decision in this environment. Using a head-mounted camera to explore current conceptualisation in occupational therapy, a team assessed 13 occupational therapists (O.T.s) and their clients (Unsworth 2005). The O.T.s were defined as "experts" by managers, and the patient participants all had experienced a stroke. The head-mounted camera gave direct video recall to the therapists when providing reasoning on the intervention. The team coded the examinations initially as pragmatic reasoning (Schell and Cervero 1993), described as used by therapists when thinking about their practice and personal context and felt to be therapeutically driven, and also Mattingly and Fleming's (1994) codes: procedural (selecting interventions); interactive (understanding the client as a person); and conditional reasoning. A second sub-set theme was described as generalisation reasoning (drawing on past experiences). The outcomes highlighted that the therapists analysed and utilised all these aspects and were client-focussed, offering an insightful approach, which supports the narrative nature of therapeutic assessment. Using identified codes may have limited the analysis and researchers looking for these codes may have made

assumptions about what they were seeing, and missed any new developing potential theories. The authors did however describe a new sub-set of generalisation reasoning and provided an insightful video capture method, which could be taken forward in future reasoning research into other areas of health-care.

2.7 Choosing the context of reasoning

Understanding the influences upon reasoning and a clinical decision would need to also be contextualised in analysing what type of reasoning would be appropriate in different clinical scenarios. For example, using a narrative approach for the examination of an ankle sprain would not be as relevant as hypothetico-deductive as it would not give a patho-anatomical/tissue source of the pain, which would be needed initially to ensure the correct treatment is applied. Narrative reasoning should not be discarded in this example though, as it may complete the picture when providing a rounded evaluation of the patient. This wider evaluation potentially can only really be achieved if practitioners are able to understand a number of influences upon it. When faced with a clinical scenario involving deciding between possibilities, the process in some ways becomes more defined. This process sits under the umbrella of clinical reasoning but the examination of each clinical decision through to delivering a reasoned outcome, requires a stream of clinical choices to be made. The decision needs to be placed within the context of the clinical data and available knowledge. Clinicians need to be able to link the two. Being able to evaluate clinical data against likelihood of a condition has been placed into a conceptual model. A well documented process that achieves this is the Bayesian model. Bayesian theory enables the decision maker to assess the probability of events occurring based on the logical interpretation of the available evidence. Within health-care this can be conceptualised into a simple equation described below.

The clinical evidence – likely conclusion

The prevalence of that conclusion within a population that appropriately represents the patient.

Therefore, clinical choices based upon clinical evidence are then influenced by the research underpinning a test or procedure and its applicability across a population. Whilst also taking this into account the epidemiology of the possible condition also aids in the assessment of likelihood of prevalence. Therefore, clinicians, when making a reasoned choice, may have to appreciate, the patient in front of them, their own beliefs, the research base, their understanding of the research, their own biases and likelihood ratios when assessing a patient. The behavioural context towards reasoning can also be driven by how practitioners' react and behave within their own professions (Chapparo and Ranka 2008). This has been described as an attitude towards therapy and entails the expectation of an interaction based upon a set of personal, theoretical, and contextual beliefs (Azjen and Madden 1986). It could be argued that this aspect of the reasoning process should be considered when evaluating how a decision is constructed, and therefore should be considered in the evaluation of the process. Taking into account the clinical data, linking to previous knowledge and expected outcome yet understanding one's own biases and beliefs may lead to predictive strength but can yet still lead to diagnostic error (May et al 2008). Without an understanding of error the clinician may find reflection and skill acquisition to be limited. This is now considered.

2.8 Diagnostic reasoning and error

Common biases in clinical reasoning have been identified by Hicks and Kluemper (2011). Fast processing has been linked to biases within the field of clinical reasoning. Heuristics are fast cognitive processes that support clinical decisions and are strongly linked to clinical decision-making by allowing short-cuts to resolve a clinical question (Elstein 2000). These are discussed by Eva and Norman (2005) and are outlined below.

The *representative heuristic* links the patient to a stereotypical category but fails to acknowledge the relative likelihood of that individual falling into that category. The *availability heuristic* is a judgement influenced by how easy similar examples can be retrieved from memory. This could be influenced if a clinician has recently attended a course and is looking for pre-set markers that relate to what they have just studied. *Overconfidence* is a lack of insight into their gaps in knowledge, whilst *confirmatory bias* highlights individuals seeking out data to confirm rather than disprove their judgements. Eva and Norman argue that these biases can be useful in time-saving and in certain situations such as

accident and emergency, where reliance on similarities can be vital. It can be argued that matching patterns and allowing heuristics is appropriate but there needs to be awareness of biases to allow further interpretation when the outcome is just not right, and therefore intuitive thought needs to be acknowledged.

When looking at speed, pattern recognition, and the relationships to error, expert practitioners are good examples to possibly highlight: Noll et al (1999) analysed via qualitative analysis, the clinical reasoning dimensions of an "expert" practitioner. The team attempted reliability and validity via a triangulation of data collection using videotaping, retrospective interviewing and analysis by two researchers blind to the study. One practitioner was analysed assessing six patients reporting low back pain. Two core dimensions were identified from the clinical assessment, clinical experience and the McKenzie method. The clinician utilised the McKenzie approach (a symptom driven movement approach to LBP assessment) to develop a diagnosis and this was identified as protocol-driven in nature. Using only one therapist fails to give a generalisable analysis, this coupled with the therapist, strongly trained in one concept of movement pattern analysis, potentially leads to a uni-dimensional approach in the assessment of LBP. From a reasoning perspective, the clinician made many decisions based upon previous experience and was able to move forward very quickly in the diagnostic process. The team suggest forward reasoning as the hallmark of the expert practitioner.

The Noll et al study gives an example of how a decision-making process could be biased by a particular protocol-driven method, potentially leading to error. It could be argued that biasing may be counter-productive as it may miss some information as "short cuts" occur, while the other side of the argument suggests that these biases are robust and allow a comfortable framework which may have less errors as it is a procedure that is strongly protocol-driven. Eva et al (2007) explored this argument and compared pattern recognition to analytical methods, with 60 undergraduate psychology students reporting no experience of Electro-cardiogram (ECG) evaluation who were recruited into two groups. Both groups were trained in the diagnosis of ECG and key features of ECG were explicitly taught to help in recognising pathology. Ten example ECGs were presented; Group one were given instructions that were analytically reasoned in nature, while group two were not. Each group was also divided again, one group had clinical features given to them that were false and so they had to balance the ECG to the features while the other group had features that matched the ECG.

The group with the explicit instruction to consider analytical patterns were stronger in the diagnoses made. The participants basing the diagnosis on purely the key features of pattern recognition and failing to self-analyse the ECG, did not achieve as strong an outcome. This was more pronounced when the key features did not match the ECG. This research supports the use of an analytical approach when presented with a new concept or framework, although some caution should be exercised as the differences in instruction and training were minimal and this study would need to be repeated to serve further strength to the conclusions. New ESP clinicians for example working outside the scope of physiotherapy perhaps would need to ensure that the analytical process to diagnosis is maintained as experience in this area would be lacking. Whether experience over time is enough to ensure correct diagnosis in the ESP environment is an area for further research.

Further causes of diagnostic error were examined by a team who analysed three groups in their analysis of a clinical scenario (Groves et al 2003). 21 general Practitioners, 35 second Year Medical students, and 43 final year Medical students were recruited and their assessment of a clinical reasoning scenario was assessed. The responses were scored, analysed and then conclusions formed around the following causes of error;

- Provision of an incorrect diagnosis, or failure to provide a diagnosis at all constituted -*Hypothesis error.*
- Failure to identify all the critical features of a process qualified as-*Identification error.*
- Poor interpretation of the signs of the features- *Interpretation error.*

The team found, via regression analysis that, as expertise increases, hypothesis error decreases, whereas errors in identification and interpretation increases. The year two students made less identification and interpretation errors but failed to come up with as an efficient diagnosis as the GP. This highlighted the lack of synthesis in hypothesis generation. The GPs did not need to use feature identification and could recognise patterns without such deep interpretation of the data. The authors suggest that a further reason for this could be the manifestation of the intermediate effect which is a process whereby knowledge acquisition outstrips the rate at which it can be organised into memory (Patel and Arocha 1995). The

reasons for error were not analysed, and it is possible to suggest that bias, experience, and training were the prime causes, but this requires further analysis. The reduction of error has been approached via the advent of clinical prediction rules. These try to reduce error judgments by producing a combination of analysis and patterns to produce a predictive outcome. These are now discussed.

2.9 Clinical prediction

Clinical prediction is an example of how the decision-making process (choice between alternatives) is utilised to give a management plan for that patient. The purpose is to improve the practitioners' ability to accurately predict the outcome of an intervention (Reilly and Evans 2006). This means the reasoning process that underpins practice has been directed in some way by an external influence that has no knowledge of the current patient presentation and is unable to wholly appreciate that patients' condition. Research is emerging that details a need for clinical prediction in the sub-classification of LBP (McCarthy et al 2004), and therefore, robust methods in musculoskeletal research are entirely appropriate and needed. The counter-argument to these algorithms is that reliance on this method within the clinical environment may run a risk of a directed diagnosis that does not fully understand all the available forms of clinical evidence. These forms of bio-psychosocial evidence, coupled with past experience and knowledge, are possibly needed for every patient in the clinical environment. If these cues, themes and processes are not acknowledged, then clinicians may not be able to offer an entirely appropriate examination. This has led to an evidence base investigating clinical prediction in the study of low back pain.

A prospective study of a cohort of patients reporting low back pain was conducted aiming to develop a clinical prediction rule for patients who were likely to benefit from spinal manipulation (Flynn et al 2002). Patients underwent a standardised examination, which centred on identifying reduced mobility in the sacro-iliac joint. The patients were treated with manipulation. The team then measured the outcome and correlated this against symptom duration, a fear avoidance beliefs questionnaire (Waddell et al 1993) and a number of movement/symptom tests. Analysis then revealed which tests were significantly positively correlated to the participants improving in the spinal manipulation group, and therefore would be indicators of patients likely to respond to this method of treatment. Five variables

were identified to form the clinical prediction rule. The treatment dose was the same for each patient and was not directed by a reasoned treatment plan, which does not reflect practice. Further limitations noted involved the cohort being sampled only from a naval base which limited its generalisability. The "rule" also suggested that manipulation would be beneficial for patients with pain for less than 16 days, no radiating symptoms, no fear avoidance and a stiff back. If this is compared to NICE (2009) guidance then it could be argued that patients with LBP receiving usual care for pain less than 16 days could be argued to be likely to recover without input. Therefore, with no control group it is difficult to extrapolate clinical meaning.

Many of the clinical prediction studies are single-arm in nature; however one that assessed the effectiveness of a prediction rule in terms of validation was carried out using 14 physical therapists and 131 patient participants (Childs et al 2004). Using previous work in identifying a prediction rule for spinal manipulation (Flynn et al 2002), the group compared the use of the rule in patients receiving exercise and manipulation. The results showed that the use of the rule improved outcomes in terms of pain and disability up to six months. Unfortunately as with previous studies in this area the team did not re-assess the initial predicators (loss of internal rotation of the hip, symptom duration, fear avoidance beliefs questionnaire results and relative hypomobility). Symptom duration could not be re-measured but the other values could have been, and to therefore further validate the tool it would seem relevant to have expected these factors to have changed in the group that improved and were positive for the rule. Previous studies that this study was based upon were conducted using a very specific group, and also the spinal manipulation they received was the same for all, and targeted at the same spinal level. This possibly reduces the clinically reasoned approach to a protocol and is directed rather than allowing a wider patient centred approach. A similar study analysing an exercise-driven approach was completed on 54 patients who subsequently were treated with lumbar stabilisation exercises. The method and analysis were similar to the manipulation studies and produced guidelines in the same way. All patients received the same exercise plan. The predictors to success were a normal straight leg raise, low fear avoidance and the main problem of increased local lumbar articular movement (Hicks et al 2005). These predictors could be argued to represent a normal non-painful group, as these factors near mimic the elements of not having a back related disorder. Within the field of back care management a recent review of clinical predictions rules was completed (Haskins et al 2012). They concluded that the evidence does not support their clinical application and importantly

none have been shown to have a positive effect on clinical outcomes or resources. Many of the trials have not been validated but of the controlled study designed trials (Cleland et al 2009; Hancock et al 2008) the patients tended to all have a positive effect to intervention, meaning the treatment effects on those who do not have a positive response to the tool remain untested.

Overall, the use of clinical prediction rules have gained prevalence in the assessment and treatment guidelines for low back pain, but taken within the context of clinical reasoning, perhaps the process remains limited and restricts individual thoughts of the clinician, and needs of the patient. This has been attempted with studies that look to validate a diagnosis. These are now considered.

A pathological diagnostic validation study was carried out with 151 patients reporting low back pain (Laslett et al 2006). This study used radiological blocks of the zygapophyseal joints to ascertain the common features pertaining to patients who responded well to this procedure. The results were based on an examination procedure and analysis of the injection procedures. This looks at one aspect of low back pain, and is limited, as it over-simplifies the multi-factorial nature of chronic low back pain, which could include the social and emotional aspects of this condition (Burton et al 1995). Although it could be argued to be useful in providing clinical support for an invasive procedure, it should be interpreted with a clinical caution. The caveat that is not associated with this type work should be that low back pain has many sources and drivers of pain and the clinical reasoning around the presentation of low back pain should reflect its multi-factorial nature (Jones 1995). Developing a diagnostic tool that reflects possible differential diagnoses was developed by a study team analysing the ability of clinicians to diagnose lumbar spinal stenosis, and therefore subsequently developing a clinical diagnosis support tool (Konno et al 2007). This is similar in its benefit to the Laslett study but was not supported by any radiological set standard. This means that the common features identified were based on clinical consensus of the orthopaedic consultants evaluating 468 patients. The work was supported by excluding other pathologies from the presentation, whilst some primary features such as exacerbating symptoms while walking were included. This type of clinical diagnostic tool is perhaps easier to formulate due to it not being under the 85% of patient reporting non-specific low back pain (NICE 2009), leaving greater chance of providing a diagnoses.

Clinical prediction rules and diagnostic criteria based protocols can be argued to have a part to play in improving clinical decision-making, yet there are features of this approach that are positive and negative. The tools may be seen to provide a more structured safety model, but only looks at one presentation or pathology, therefore some reasoning needs to be applied prior to this process. If these tools are just extracted and then delivered to a patient they may miss other issues, may not integrate all safety components, and the learning of subtle patterns that are the hall-mark of expertise may be lost. To deliver predictive rules that change practice the research needs to demonstrate when decisions are made based on the prediction rule, that improved outcomes occur and costs can be reduced (Toll et al 2008).

2.10 Extended scope roles

Since 1986 the role of physiotherapists have been extended into other domains of practice, as the need for reducing costs and improving the waiting times for patients was addressed (Daker-White et al 1999). There have been comparative studies that sought to evaluate the diagnostic accuracy and benefits of seeing either a physiotherapists or doctor for orthopaedic conditions. In a study that compared nearly 400 patients there were no differences in clinical outcomes for assessment of musculoskeletal conditions in an orthopaedic department, whilst perceived treatment quality was greater in the physiotherapy arm of the trial. Furthermore, the physiotherapists were significantly less likely to order investigations, whilst the doctors were significantly more likely to order plain radiographs (Daker-White et al 1999). Examining diagnostic accuracy further highlights the clinical elements of the ESP. Fifty patients attending a knee clinic were recruited and assessed by a consultant and two physiotherapists. In the non-surgical cases 13/17 cases the diagnoses was agreed upon. In the arthroscopic cases the consultant was accurate in 92% of cases while the physiotherapists were 80% and 84% of cases respectively (Dickens et al 2003). Clinical recommendations in a triage environment were assessed via patient examinations for hip and knee complaints and found that surgical pathway management plans were the same in 56/61 cases and in the cases that were not agreed upon there was still surgical management in the proposed plans from the physiotherapist Mackay et al (2009).

A retrospective audit was carried out to determine whether an ESP in an orthopaedic clinic was making “appropriate” decisions. 128 sets of notes were assessed of which the ESP had

seen 18% (n=23). All patients listed for a surgical procedure by the physiotherapist gained therapeutic benefit as compared to 79% listed by the doctor. In comparison to the arthroscopic findings, the physiotherapist was 52% accurate and the doctor was 37% accurate (Gardiner and Turner 2002). Evaluating one physiotherapist reduces the validity of the conclusions and further research is needed to evaluate across primary and secondary care, and across different specialities. Application of results must also be taken into the context of what is defined as scope of practice. Although the studies are defining the inclusion of participants as extended scope practitioners it was not always defined how far the scope of each individual practice extended, which makes interpretation more challenging when judging for relevance. A systematic review of extended roles suggested that there is a lack of patient related health outcomes in the comparative work of medics and ESPs (McPherson et al 2006). The work also has currently centred primarily on diagnostic accuracy rather than long term benefits, therefore extrapolating the long term implications for ESPs and their future in health-care are difficult to achieve.

2.11 Clinical relevance

The discussion above supports a suggestion that expert practice is related to pattern recognition, memory retrieval and processing, leading to a predictive strengthened conclusion. This is then supported by feedback from the decision which further supports whether the memory association, subsequent prediction and outputs were correct or not. This creates the supposition that perhaps clinical reasoning in most cases is not a first time process; it is not a blank sheet where new data are constructed to give rise to new outcome. It is possibly related to what is assumed and what has been experienced before. The differential between novice and expert practice is suggested to be experience but also semantic memory retrieval. It could be argued that the clinician who has been working many years would have experienced many presentations, but the question remains whether they retained that experience within the appropriate context, and completed the process with retrieved feedback? If the learning process did not complete and lead to a stored, contextual memory, then it could be argued that years of experience will not necessarily mean expert. On the counter side to this is the novice who is able to take every opportunity to experience new presentations, learn from case studies, and explore clinical discussions to enable a wide a deep contextual memory may develop pattern-recognition far earlier than expected. What

may be lacking is the feedback from decisions that will reduce response bias, and enable greater clarity without internal/external bias.

What is also important to consider in light of the memory system humans employ, is how we teach clinical reasoning to clinicians, such as ESPs. The discussion above suggests that to gain experience, the context to the memory must be available, as should the consequence of a decision. It should also be recognised that physical, emotional and visceral responses will be apparent. It should also be highlighted that decisions may be stressful and this may be useful or counter-productive. Therefore, in learning clinical skills such as reasoning and in clinical practice, the application of case study environments, appropriate feedback and allowing the clinician to experience success and error would seem important. In conclusion, the literature suggests that there are many forms of clinical reasoning that it is multi-factorial and it is lacking in the certain areas of practice, such as extended scope roles.

In summary the literature review highlights that the neurobiology of a decision is complex and likely relates to memory and the product of experience. It also suggests that there are a number of methods ranging from analytical to intuitive processes that enable clinical reasoning to develop. Importantly, the review has presented the common models of reasoning in musculoskeletal physiotherapy and has critically evaluated these in line with the other models of reasoning in health-care. By exploring other professional clinical reasoning such as podiatry, occupational therapy and nursing, this review has given a breadth to the topic whilst challenging the current musculoskeletal models. It has provided evidence that the literature surrounding ESP practice is lacking and so given strength to the presented research process. This therefore has led to the development of the research question below;

What are the clinical reasoning processes of extended scope physiotherapists assessing low back pain?

Chapter 3: Methodology

3.1 Introduction

Choosing the appropriate methodology is an important component in the research process (Barbour 2008). The current project was approached with a qualitative methodology due to the exploratory nature of the research question. The discussion below presents four qualitative methodologies that were considered to address the research question, and justifies the chosen approach. The chapter also explains how questions of rigor and trustworthiness were addressed and how these issues are addressed.

Phenomenology, ethnography, grounded theory, and case study are empirical methodologies that aim to describe the participants' perceptions, experiences of the world and its phenomena (Baxter and Jack 2008; Neergaard et al 2009). They have sometimes subtle differences. Phenomenology focuses on the meaning of an experience, grounded theory aims for theory development; ethnography provides a deep description and explanation, whilst case study facilitates exploration of phenomena within their context (Neergaard et al 2009; Yin 2004). The section below explores this further, and discusses the philosophy, sampling, analysis and relevance to the current study.

3.2 Phenomenology

Phenomenological research has been described as wanting to know the world in which we live (Van Manen 1990). Phenomenology has a strong philosophical heritage and has been utilised in the development of qualitative research (Holloway and Wheeler 2009). This approach grew in the 19th century in Germany, where researchers, interested in the study of human behaviour, were increasingly critical of the constraints of a positivist paradigm and wanted to observe human behaviour and to interpret meaning (Shepard et al 1993).

By intuition and reflection, the researcher aims to open-up and explore the meaning of the experience (Starks and Brown Trinidad 2007). Sokolowski (2000) further suggests

phenomenology "states the obvious, perhaps what we already know", but feels even information that is not new can be illuminating (p.57). Van der Zalm and Bergun (2000) suggest that phenomenology is best suited to disciplines where the practice is engaged with the experience of health and illness, such as nursing. Phenomenology is often seen as overly descriptive elements, but it can provide explanation (Van de Zalm and Bergun 2000). Phenomenological research uses the accounts of those living the experience to produce a voice to human experience (Jardine 1990). Van Manen (1997) argues that phenomenological interpretation occurs through the deliberate act of describing the experience, such that all phenomenological descriptions have an interpretive element. Sokolowski (2000) suggests that phenomenology states the obvious, perhaps what we already know, but feels that this in itself can be illuminating (p.57).

Within phenomenology, the researcher formulates a research question that is recognised as having a phenomenological basis (Finlay 2005). After gaining the data through methods such as observation and interviewing, the researcher extracts significant statements that support any codes that may be emerging. These are then clustered into discreet categories and themes. Sampling is not about quantity; it is about the quality and the understanding of the phenomena at a deep level that provides the level of understanding (Holloway and Wheeler 2009). The themes emerging from the data then build into the description of the phenomena observed. The further analysis continues to the connecting of themes (thematic analysis), which then provides an "exhaustive description" of the event (Smith and Osborn 2003).

3.3 Ethnography

The roots of ethnography lie within cultural anthropology, with a focus on small scale societies. Its key feature is fieldwork studying people in their natural settings (Goulding 2005). This involves the ethnographer participating in peoples' lives for an extended period, learning from them rather than studying them (Hammersley 1995). The researcher has to uncover experiences and meaning through observing peoples' social activities, interactions and behaviours (Thomson 2010). The close contact with the field means the internal belief and philosophies of the researcher may significantly influence how the data are interpreted so reflexivity is essential. As in phenomenology the researcher identifies categories via coding which are then brought together via content analysis (Morse 1994). Recently, ethnographers

have sought to understand, rather than just describe how a culture is constructed (Sharkey and Larsen 2006). This has led to what has been described as critical ethnography, and explores critical refection between the researcher and participants on various aspects of practice, such as procedures and organisational practices (Mannias and Street 2008). Increasingly relevant in an ethnographic study is an in-depth discussion/reflection regarding how the researcher is perceived with the group involved in the study. How the researcher is perceived and the awareness the participants have regarding what the researcher is doing, coupled with the amount of researcher participation within the study, must all be addressed within the analysis (Goulding 2005). This is not unique to ethnography, as phenomenology and grounded theory have a considerable level of researcher involvement, but the potential difference is the depth of participation, and the observation being driven at an internal rather than external perspective. It is felt that while phenomenological research looks for essential structures of meaning, ethnographic research is concerned with predictable patterns and behaviour (Osborne 1994).

3.4 Grounded theory

Grounded theory is a popular approach in qualitative health research. Glaser (1998) describes grounded theory as the discovery of theory from data systematically obtained from social research. This inductive approach contrasts to research that tests and verifies a prior-assumed theory. Charmaz (2008 p204) describes the process of grounded theorising as a set of flexible analytical guidelines that build inductive middle range theories. A middle-range theory uses empirical data to develop generalisations, in contrast to "grand theories" that which are more abstract and distanced from systematically-analysed data (Charmaz 2008). Sociologists Barney G. Glaser and Anselm L. Strauss (1967) initially developed grounded theory whilst working collaboratively as part of a research programme involving seriously ill and dying patients. This study delivered detailed observation coupled with analyses of these situations, and this allowed Glaser and Strauss to construct a systematic way of analysing data. The book that materialised from this work, *The Discovery of Grounded Theory*, proposed this approach in developing theory which is grounded in its construction from within the data, rather than deducing a testable hypothesis. Grounded theory is therefore based upon the assumption that the formulation of a theory is constructed upon a discoverable process (Miller and Fredericks 1999).

The methods of grounded theory consist of simultaneous data collection and analysis that focus further data collection. Charmaz describes the process as one that applies an interpretation of the participant's world processes, and this interpretation could become quite abstract and distinct from the initial behaviour as the concepts emerge.

This qualitative approach was a breakthrough in that it endeavoured to integrate the strengths of qualitative interpretative traditions, with quantitative approaches of logic and rigor (Charmaz 2008). It challenged the then dominant logico-deductive way of theorising, which acknowledged the development of a theory followed by a subsequent testing. Charmaz (1995) outlines four key points that emphasises how the revolutionary work developed by Glaser and Strauss challenged the research communities beliefs, which were;

(1) Qualitative research is a precursor to more "rigorous" quantitative methods.
(2) The requirements of rigor made qualitative research unusable.
(3) Qualitative research methods are unsystematic.
(4) Qualitative research only produces descriptive case studies.

In 1978, Glaser further developed his approach to grounded theory via his book *Theoretical Sensitivity*, which was regarded as less accessible to many readers (Charmaz 2003). At this time there was a split between the authors as Strauss developed the text, *Qualitative Analysis for Social Scientists* (1987). The split in terms of ideology rested on a number of re-interpretations of the approach, and Strauss' further methodological developments, but the main difference centred on Glaser advocating the gathering of data and then developing an emergent theory without forcing either preconceived questions or beliefs upon it (Charmaz 2003). This contrasted with Strauss' view (developed with a co-author, Juliet Corbin in 1990 in, *Basics of Qualitative Research*) that data are understood through analytical questions, preconceived ideas and hypotheses-producing what Glaser described as a "full conceptual description", rather than a grounded theory (Glaser 1992).

3.5 Developments in grounded theory

More recently, grounded theory has been further adapted and described by Charmaz (2008). She recognises that the viewer creates the data, and the analysis through their interaction with it, such culture, situation, and past experience are argued to define the analysis (Charmaz 2003). Any interpretation of how the participants have constructed their realities may result in a potential theory. The question is whether an interpretation of the participants' world gives a generalisable "truth" and so giving a predictive strength to the theory, or whether it accommodates and allows for further research to confirm the theory (Miller and Fredericks 1999). An objectivist approach presented by Glaser suggests that separate researchers observing the same phenomena will see and interpret the same thing. Charmaz suggests that the researcher may be influenced and biased, before and during the process and therefore different interpretations can be made. Recognising this, and acknowledging this as an interpretative influence creates the difference between Charmaz (constructivist) approach and the more Glaserian (objectivist) position.

The key characteristics of grounded theory therefore are as follows;

(1) *Theoretical Sensitivity* - this relates to the researcher's level of insight into the research area, entering the field without preconceived ideas following Glaser, or questioning of the data, using the data to compare against a hypothesis which is more associated with Strauss and Corbin.

(2) *The integration of the literature* - Glaser proposes that reviewing the literature should not occur before analysis, for fear of inhibiting the analysis (Glaser 1992). In contrast, Strauss and Corbin encourage a pro-active engagement in the literature from the beginning. This more pragmatic approach for example would enable the researcher to write a grant application and gain ethical approval as these practices are required to include a summary of relevant literature and so in the current context of clinical research, a purely Glaserian approach is problematic. In support of engaging with the literature, involvement has been described as providing another "voice" to the reconstruction, whilst providing stimulation of thought and so increasing theoretical sensitivity (Strauss and Corbin 1994). In essence it would be perhaps difficult to remain in the field without some support of the literature as potential theories are generated. Whilst analysis is concurrent, it would also mean that

utilising the data to formulate potential theory would also generate questions that might be supported by the literature as well as the data itself.

(3) *Coding* - Different descriptions and emphasis split the founders of grounded theory surrounding coding. Commonly it is approached line by line, followed by building codes by grouping into incidents such as certain behaviours or actions and undertaking with constant comparison (described below). These incidents can then be grouped as categories which then would need to be compared with each other in as many abstract ways with acknowledgement of one's self and prior perspective, including the literature to provide a theoretical stance on what the data produced. Therefore a modified approach may take aspects from Glaser, Strauss and Corbin, and Charmaz, yet in reality take a step-by-step approach to the process of coding in grounded theory.

(4) *Memo writing* - This process allows further questions about the data as part of the constant comparison method. The practice of memo writing roots the researcher in the analyses and allows for an increasing level of abstraction of analytical ideas (Charmaz 2008; Montgomery and Bailey 2007). Also, memos provide evidence of an audit trail (as presented in the results section).

(5) *Constant comparison* - Glaser (1969) suggests the 'constant comparative method' as a procedure for interpreting empirical material. It comprises four stages: '(a) comparing incidents applicable to each category, (b) integrating categories and their properties, (c) delimiting the theory which is a method of focussing to the core themes, and (d) writing the theory'.

(6) *Saturation*. This is the point at which further sampling will not yield any new data (Charmaz 2008). It is important though to recognise that being able to verify this is difficult as it is impossible to confirm that a further data set would not have produced something new or different and so full acceptance of saturation is debatable.

As has been shown, the grounded theory approach is contested and cannot really be understood as a single approach. Nonetheless it appears to offer ways of systematically collecting and analysing data, and the six features described above have informed both

grounded theory studies and research approaches which could be described as modified or adapted forms of this approach.

3.6 Case study

Case study is an approach that can provide tools for researchers to explore and study phenomena within a specified context (Baxter and Jack 2008). Merriam (1988) describes qualitative case study as an intensive and holistic description of a single entity, phenomenon or social unit.

Case studies have also been described as a method of studying one or perhaps a range of cases to develop a full understanding of phenomena. A case can be thought of as a single entity, or a phenomenon which has boundaries that allows it to be explored as a unit of analysis (Miles and Huberman 1994). It can be thought of as a form of qualitative descriptive research that is used to look at individuals, small groups of participants, or groups as a whole (Silverman 2006). Researchers collect data about participants that may include participant and direct observations, interviews, protocols, tests, examinations of records, and collections of writing samples. A range of approaches can be taken including; intrinsic, instrumental and collective. Intrinsic approaches do not attempt to generalise or build theories; instrumental approaches provide insight whereby a collective case study uses a number of cases to describe a phenomenon (Silverman 2006).

According to Yin (2003) case study should be used when the focus is to understand "how" and "why" questions. Case study design has been purported to be based upon a constructivist paradigm, and allows for a collaboration of the researcher and participant to be developed during the acquisition of data (Yin 2003). The purposes of case study has also been described as descriptive, interpretative and explanatory (Mariano 1993), and it has a number of processes associated with it that allow researchers to enter the field, gain information and analyse data. Yin (1994) considers these processes to be the research question, transcribed notes and interviews, mapping of concepts and a full description of the phenomena of interest.

Zucker (2009) describes case study as an iterative process whereby the researcher can move in and out of the literature before, during and after the study has begun, and suggests it has a three stage process of: (1) describing the experience; (2) describing the meaning; and (3) focussing the analysis. Multiple case study is often described as comparative case study and has been suggested to be useful for a) predicting similar results (literal replication) or b) predicting contrasting results but for predictable reasons (theoretical replication) (Yin 2003). Stake (1995) also uses the term collective case study to describe multiple cases, which has been suggested that this (as compared to single case studies) increases transferability. Transferability refers to the degree to which the results of qualitative research can be generalized or transferred to other contexts or settings. Analysing across a number of case units, with depth of analysis can be achieved in a case study design. Therefore, a case may involve a number of similar units that then support the research question, yet this must be "bounded" in the context of the phenomena under scrutiny (Miles and Huberman 1994). Binding the case requires defining what the case is to be and what it is not, therefore this process of definition allows the researcher to frame their inclusion and exclusion criteria (as per a quantitative study). Sampling or selection of cases in a case study design can be purposive and different strategies can be used to identify cases before and during data collection.

As in phenomenology, ethnography and grounded theory the analysis of case study data includes: coding; pattern matching and grouping of codes; linking data to propositions; explanation or model building, building; logic models; and cross-case comparison/synthesis (Baxter and Jack 2008). Finally, establishing credibility can be based upon peer review, member checking, independent coding and consensus processes (Russell et al 2005). Therefore, in conclusion, the case study design requires the case to be defined via its breadth and depth, the sampling and whether it is singular or multiple in nature (Baxter and Jack 2008). Linking the methodologies of grounded theory and case study could be argued to be appropriate due to the cross-over in many of the processes as well as the challenge of delivering a pure grounded theory. Furthermore, producing a 'pure' grounded theory can take several years (Glaser and Holton 2004) as once the initial theory is constructed, it then needs to be tested in order further support it and produce transferability. Therefore, given the constraints of a professional/clinical doctorate, it could be argued that it is not feasible to undertake a substantive grounded theory in full. The identification of the phenomena, use of the literature, sampling, coding processes and subsequent theoretical construction suggests

particular similarities in approach between the four methodologies and case study in particular seems to offer scope to use particular elements of grounded theory. This is now discussed.

3.7 Justification for a case study design informed by grounded theory

The methodology for the study is thus referred to as a multiple case study design informed by grounded theory. The data collection and analysis techniques, including theoretical sampling and memos, used within grounded theory were employed to support a case study design (Yin 2003). This kind of adaptation of grounded theory has been used in previous published research which used interviews but in an industrial setting (Bowyer and Davis 2004). It also has been used as a grounded theory informing multiple case studies in the assessment of expert practice in physiotherapy (Resnik and Jensen 2003).

This following section explains how the methodological links between grounded theory and case study approaches were combined to support the current research aim which was to generate a preliminary model grounded in case study data. The sampling strategy is the first element to be addressed. Purposive sampling can be used in a case study design informed by grounded theory to direct, as part of the early work in the field (e.g. where to begin), and as the data are collected and analysed, some theoretical sampling (as in grounded theory) may occur as a growing understanding of the phenomena may lead to further data sets chosen throughout the iterative process. This may be the location of the field or a particular attribute of a potential participant, such as experience. In the current research the decision to explore primary and secondary care settings and to compare ESP and non-ESP respondents was informed by theoretical understanding that these differences were important when examining decision making. It was theorised that to answer the question regarding ESP reasoning that comparative work with non-ESPs would need to be completed in across the two main settings in the NHS. Therefore a mix, of both purposive and theoretical sampling occurred at different times in the research process.

The coding of the data in grounded theory enables the researcher to define what has happened and build the substance to the theory. Different variants of grounded theory have different terms for forms of coding: Glaser describes substantive and theoretical codes, Strauss and

Corbin suggest open, axial and selective, and Charmaz has developed line by line, axial and selective coding.

The analysis in grounded theory rests on the constant comparative method, which relies on constantly comparing and contrasting data and codes. This is very similar to the type of comparison required when analysing multiple case studies. The current study cited grounded theory techniques. Therefore, a case study coding process informed by grounded theory, uses the systematic line by line coding approach, linking codes to create categories with accompanying memos, and the constant comparison method from grounded theory were used within the case study approach. The researcher creates categories by comparing incident to incident and then compares new incidents to those categories as an iterative process. Throughout the process, memos provide theoretical sensitivity, which can also be applied in a case study design informed by grounded theory enabled systematic, rigorous analysis. Glaser advocates neutral questioning, without bias and only allows emergent themes through constant comparison, whereas Strauss and Corbin enhance the use of more analytical questions to aid in the recognition of the perspective of the researcher, and that influence on the data. In the design of this research, it would be appropriate to use analytical questioning of the data due to the researchers' background in the area of interest, acknowledging the literature, yet ensuring memos are used throughout, to provide an audit trail as well as stimulate reflexic thought. Therefore, this multiple case study design informed by grounded theory can be concluded to be systematic, rigorous and incorporating several of the techniques of grounded theory in a constructivist approach.

3.8 Strategies for ensuring rigor and trustworthiness

If the trustworthiness of the research can be demonstrated, then this has been suggested to lead to generalisability which some authors, such as Stenbacka (2001), put forward as a hallmark of high quality qualitative research. To address this for the current research, the concepts of rigor suggested by Guba (1981), who constructed criteria that correspond to the positivist approach, have been taken and addressed;

- Credibility (in preference to internal validity in positivist approaches)
- Transferability (external validity/generalisability)
- Dependability (reliability)
- Confirmability (objectivity)

Credibility is based upon the findings and their relationship to reality. In the case of the current research, this credibility will firstly be enhanced due to the adoption of a well established methodology, (grounded theory) whose techniques have been applied to a case study design. It will also be supported by the researchers' own role as a practitioner and ability to reflect on the interpretations. The use of two methods, such as focus groups and semi-structured interviews coupled with a wide range of participants (see chapter 4) allows some 'triangulation' (Charmaz 2008). Constant comparison and memo writing allowed the researcher to continually check the credibility of the emerging findings. Lastly, peer review, cited by Shenton (2004), is an important check of credibility, which allows the researcher to be challenged throughout the process and this was achieved discussing emerging interpretations with the supervisors (one of whom is also a Physiotherapist) and clinical colleagues throughout this doctoral research.

Transferability is the extent to which the research can be applied to other situations (Patton 1990). The inclusion of different groups of participants from different practice settings addressed this but a key test of this will be in further work beyond this study to see if the findings can be transferred to other settings and will depend on the depth of description and clarity of analysis, to enable readers to apply to their context.

Dependability in a qualitative research study is more difficult to achieve than, as compared to reliability in a positivist paradigm (Shenton 2004). Interviews and focus groups by their nature occur in a particular time and place with particular respondents and cannot be exactly replicated. Nevertheless, the processes of the data collection and analysis established should be detailed in such a way as to reassure the reader of the rigour of the interpretation (see chapter 4) (Golafshani 2003).

Confirmability is described as making sure that the findings reflect the experiences of the participants, rather than the researchers' own experience or bias. This is dealt with in the current study by using peer review, reflective practice, involving an independent observer in data collection and providing an appropriate audit trail of how the data were obtained and analysed (see chapter 4).

3.9 Insider research and the researcher-participant relationship

The term "insider research" is used when the researcher conducts studies with groups, populations or communities that they belong to (Asselin 2003). An example of this maybe a nurse conducting research within a ward or caring environment in which they work. This is appropriate to discuss for the current study. There are advantages and disadvantages to this research role. Benefits may be that the researcher understands the processes, rapport being easily made with participants, and access is possibly easier to attain. Ashworth (1995) states that insider research can provide researchers with a depth of analytical richness that otherwise would not be accessible. On the negative side, the concept of bias is a challenge, and so providing trustworthiness is paramount. Assumptions about the phenomena (such as expecting certain behaviour) can be made which have been suggested as "limiting" the researchers' ability to aim for depth of meaning (Field 1989). Therefore, to address this, the researcher must aim to look at the data with "eyes open" and not be limited by prior assumptions, past experiences and expectations (Kanuha 2000). Self-reflection is vital in the process of analysis. Asselin (2003) suggests completing the research at different multiple sites but in similar settings to help address this issue. Recording the relationship of the researcher with the participants is also vital to within insider research and in the current research was addressed by the independent observer. Rapport and trust may be gained, but trust is built on past experiences and relationships and being comfortable with this on the part of the participant. It could be argued that an insider would gain trust and foster those realistic responses, as the participants may feel that the insider researcher "understands" their beliefs and opinions. Yet, the counter-side to this is that participant may also have concerns about possible reprisal or negative outcome if they give a controversial response. The insider researcher therefore needs to invest in developing the participant relationship, to foster trust by setting appropriate grounds rules and using reflection to ensure their own perceptions and experiences are understood to limit their effect on the research participants. In conclusion, insider research has advantages and disadvantages. The disadvantages can be partially

mitigated by being reflective, researching areas on different sites but with similar settings, using an independent observer to aid with bias, using peer review whilst understanding and stating one's own personal influences and beliefs.

3.10 Conclusion – summary of the proposed methodology

The methodology used for the current research is a multiple case study design informed by the processes of grounded theory. It takes some of the core elements from the approach described by Glaser, Strauss and Corbin as well as Charmaz. These elements are used in a comparative single set of principles. Therefore as this is the case, then the grounded theory approach is described as "modified" from the original concept yet underpinned by a constructivist approach due to the researchers' position within the research itself. This has been further adapted to inform a case study design that involves two cases surrounding clinical reasoning, namely cases ESPs and non-ESPs: The nature of the cases is further discussed in chapter 4. The methods used in the study that supported this methodology are now considered.

Chapter 4: Methods

4.1 Introduction

This chapter outlines the methods chosen to answer the research question in this thesis. It describes the sampling strategy, recruitment, consent, and data collection processes, and presents two separate phases of data collection, and the justification for the selected approaches. The two methods of data collection were different in terms of process, but analysed in a similar way, as both are appropriate for developing a case study design informed by grounded theory. The chapter includes examples of the coding process, presenting the initial line by line coding followed by the construction of themes, linkages and grouping, model construction and theoretical development.

4.2 Research question

What are the clinical reasoning processes of extended scope physiotherapists assessing low back pain?

4.3 Study aims

This study aims to: -

- Identify and describe the clinical reasoning processes undertaken by ESPs, and non-ESPs and how these may differ in their clinical reasoning regarding patients reporting LBP.

- Explore clinicians' beliefs regarding clinical reasoning and how ESPs and non-ESP may differ.

4.4 Background justification - focus groups (phase one data collection)

The data collection was achieved through two separate phases. Two methods of qualitative data capture were considered for the first phase of data collection: focus groups; and semi-structured interviews. Unlike structured questionnaires that produce quantitative data, focus groups and semi-structured interviews allow respondents to express their own views with their own perceptions and definitions rather than within a predetermined framework (Sim & Snell 1996). This was considered vital in understanding a clinical reasoning process. Focus groups have been cited as an appropriate method of studying practitioners' decision-making processes (DePoy and Gitlin 1994), and when exploring a range of ideas and / or feelings about a topic (Krueger and Casey 2001). Semi-structured interviews are different to focus groups in that they offer the dynamic between the researcher and respondent. An agenda is set in both, but the interview is under greater control of the respondent as compared to the facilitator/researcher within the focus group. It has been suggested that focus groups offer insights that are less accessible in individual interviews (Ulin et al 2005). Focus groups therefore work well when participants feel comfortable, respected, and free to give an opinion that is not judged, creating an environment of disclosure (Kruegger and Casey 2001).

Focus groups have some advantages over interviews, in that they facilitate dynamic interactions that are more likely to trigger memories and facilitate disclosure, whilst also allowing the researcher to observe debate (Wilkinson 2004). The negative aspects of focus groups revolve around participants possibly feeling inhibited in larger groups and therefore not offering a "real" insight into their opinions, beliefs, and personal stories (Barbour 2008). The status of certain individuals, dominant personalities, and the resultant inhibition may also affect respondents, generating a greater awareness of those around them, and so leading to them affecting their responses. Sensitive issues may be expressed in homogenous groups but less so, in heterogeneous ones, as similar experiences may offer respondents an opportunity to discuss personal matters (Kitzinger 1995).

Therefore, although semi-structured interviews offer security to the respondent against dominant individuals and inhibition, the focus group could offer the security of shared experiences. To ensure the group dynamics are catered for it is imperative that the researcher facilitates the focus group environment in a non-directive, open, and non-threatening manner.

Focus groups have been used in research that explored the consent to treatment practices of physiotherapists managing patients reporting low back pain (Fenety et al 2009). In their study, physiotherapists were involved in focus group discussions of consent to treat. This was then analysed via qualitative software, and an inductive process that involved coding, clustering, and comparing themes. The singular group of participants were private practitioners, and this possibly limits it applicability as others sectors (such as NHS) were not included in the sample. The authors concluded that the data, with appropriate analysis, can produce a model that is explanatory in nature. They suggested that in this case, the focus groups were not an initial exploration, but a method that was able to contribute to theoretical development.

An example of focus groups used at the end of a study process (rather than as an early exploratory technique) was conducted examining patient satisfaction with outpatient physiotherapy (Hills and Kitchen 2007). Pilot developmental interviews created the structure for the focus groups, therefore the topic guide, and the sampling were influenced by the initial interviews. Content analysis was undertaken that involved coding and categorising excerpts of the data, which was then followed up with concepts being attached to the categories. The team produced five principle themes which, due to the two purposefully sampled groups, enable contrasts to be made between satisfied and unsatisfied patients, which then led to suggestions of clinical change. This example highlights that focus groups can be used at different times within qualitative studies dependent on the question to answer, and interactive methodologies.

A further example of focus groups and the qualitative data they produce enhancing clinical care was conducted with patients who had either recovered, or had failed to recover from low back pain (Hush et al 2009). Eight focus groups were conducted and the data were audio-recorded, and then analysed. A specific methodology was not stated: the author described an interpretative analysis looking for associated patterns. From the analysis, specific domains of patient perceptions towards recovery were noted, and therefore the focus groups were able to highlight the patients' beliefs which as well as quantitative measures, should be taken into account when assessing/treating patients. This example also highlights how qualitative methods can directly aid in the clinical care of patients.

Having explored their purpose and application, focus groups were chosen for the first phase of data collection in the present study. A wide range of opinion and potential themes was required to give breadth to the topic of clinical reasoning. This was especially important in the current study, as the researcher was known to some of the participants, and had a professional understanding of the research area and therefore was not as unbiased as Glaser advocates in grounded theory designs. Focus groups have been advocated as an exploratory method whereby the researcher interacts with participants, as well as the participants interacting with each other, to aid in initial exploration of poorly-understood areas (Sim and Snell 1996). Therefore, this study used focus groups to gain an initial understanding of the topic, gain initial data, explore differences between ESP and non-ESPs, and deliver components towards a case study informed by grounded theory.

4.4.1 Study design - focus groups/phase one data collection

When planning the focus groups, a number of processes and procedures had to be considered: the choice of participants and the potential dynamics; choice of location; introductions; schedule; observer notes; and the influence and dynamics involving the researcher, and topic guide. Therefore, the first focus group was developed to collect data, allow for the logistics, trial and evaluate the topic guide. This would be followed-up with two further focus groups, conducted in primary and secondary care, thereby giving a further breadth to the data. Local services were approached for this part of the data collection and the sampling strategy is described below.

4.4.2 Participants - phase one

The participants in each focus group chosen were recruited from two separate clinical groups. One group were extended scope physiotherapists (ESPs) who had completed their competency training and primarily were involved in assessing patients with low back pain in orthopaedic or rheumatology clinics. The other participants were musculoskeletal physiotherapists (non-ESPs) who also assessed and treated patients with low back pain but did not have an extended role. Extended scope physiotherapists have been described as working outside their scope of practice, enabling them to use diagnostic procedures such as Magnetic Resonance Imaging (MRI), ultrasound imaging and injections (CSP 2006). It was felt that by using focus groups with two different sets of clinicians, initial contrasts may be seen that would highlight processes, especially within the extended role participants,

therefore addressing the research question. Some basic demographic data pertaining to gender and length of time qualified plus time in extended role was also considered necessary to give some background to the participants (see Figure 22), which may have influenced the group dynamics in each focus group session .

4.4.3 Sample size - phase one

The appropriate size of a non-commercial focus group has been cited as between five and eight (Kruegger and Casey 2001), or up to 10 in some cases (Barbour 2009). Based on this literature, ten would be the maximum and six, the minimum number for the current study. It was envisaged that an even number of extended scope physiotherapists and musculoskeletal physiotherapists would be recruited as an ideal dynamic, but with drop-out and recruitment, this was acknowledged as potentially difficult to achieve.

4.4.4 Sample groups - phase one

- The three focus groups covered three discrete services but these were local to the researchers' base of work. The sampling strategy was purposeful in nature as specific types of clinicians were selected to yield the richest data. The geographical sample was one of convenience in the first phase of data collection.
- Focus group one - 6 participants 3 ESPs, 3 non ESPs- primary care (researchers' NHS Trust)
- Focus group two - 6 participants 3 ESPs, 3 non-ESPs- primary care.
- Focus three group - 6 participants 3 ESPs, 3 non-ESPs -secondary care.

Two focus groups were undertaken in primary care because this reflected practice in the locality of this research, as most ESPs were employed was employed there. The pilot study was conducted within the researchers' own NHS Trust as participants were considered particularly likely to be open when evaluating the data collection process. Two further two groups were chosen as they were local, but discrete services in nearby NHS Trusts. The pilot study allowed the group dynamics to be observed, a trial of facilitation skills and a test of the topic guide. The group being conducted in the researchers' place of work had obvious implications for the dynamics, interactions, status assessment, and responses. This was

recognised and observer notes in this environment were used and feedback acted upon (see section 5.9).

4.4.5 Recruitment and consent - phase one

Ethical approval was granted by the Southampton and South West Hampshire Research Ethics Committee (10/H0504/3) (see appendices) and governance approval attained for each site. (see appendices).

Appropriate environments for the study were identified through local knowledge of ESP services. The clinical lead/manager for the musculoskeletal service that included the ESP clinicians was approached and invited to collaborate in the research. These local collaborators agreed to facilitate the consent process by offering participants the opportunity to take part. Each potential participant were handed the information sheets by their local collaborator. This meant that the researcher did not directly approach the participants regarding participation. The participants, after reading the information sheets and having the opportunity to discuss the research with the researcher, then agreed to attend a focus group set up between the researcher and local collaborator. The participants signed the consent form immediately prior to the group commencing, once they had the opportunity to ask questions.

4.4.6 Data collection - phase one

The focus groups were set up with chairs in a circle to encourage participation. The sessions were audio-taped; the recorder was placed on a table at the side of the group, which meant it was less conspicuous to the participants. In all three focus groups, an independent observer took notes regarding the interactions. The topic guide was developed via the literature review, the gaps noted in the literature, and the research question. The topic guide was open and flexible with the main areas of interest outlined below;

- What is clinical reasoning?
- What influences clinical reasoning?
- Do ESPs and non-ESPs differ in their clinical reasoning processes?

- How is clinical reasoning learnt?
- Are there specific questions that you ask with patients with LBP?
- How do they help with your diagnosis and management plan?
- What are the key components to a diagnosis?

After reflection and observer notes from the focus groups (which occurred after each one), the researcher's influences on the interaction and potential biases were assessed and acted upon. Some basic demographic data were sought from the participants via a one- page questionnaire (Figure 24). The length of time qualified and number of extended scope clinics was noted, and this enabled an overview of the representation of clinical experience.

The groups were planned to last approximately one hour in duration. All participants were issued with a focus group topic guide, as an overall picture. The specific questions were kept by the researcher, only as it was felt that this may need to be altered as the discussions flowed, and it may have distracted the participants. An initial introduction to the group aims was made, ground rules were discussed and agreed, and the first question was then asked. The groups were closed by thanking the participants and turning the audio-recorder off. The data were then gathered using a grounded theory methodology and the coding process is presented in section 4.6. The data from the first phase were constructed and used to inform a second phase of data collection. This data collection involved semi-structured interviews with ESPs in NHS clinics further afield than the focus groups. The first phase of data collection produced a number of potential themes, and these were then developed further with greater depth via the interview data collection, described as phase two. This is now presented.

4.5 Background justification - Semi-structured interviews (phase two data collection)

Semi-structured interviews (SSI) are a research method that uses open-ended questions related to the topic of interest (Britten 1995; 1996). It has been used in many qualitative studies across health disciplines and this also includes the study of LBP. A review of the literature reveals a number of studies that have involved practitioners and patients in gaining a greater understanding of LBP via SSIs. In a study involving 64 patient participants and 22 health-care professionals, SSIs were conducted to gain a greater understanding surrounding

strategies in the management of LBP (Crowe et al 2010). Topic guides were used for the two groups of participants. The topic guide was developed via an assessment of the literature and discussions with relevant professionals. Five open-ended questions were developed. The study used a content analysis to understand "what the participants were doing, rather than explain latent meaning". The content analysis produced some depth of understanding but comparative linkages were not sought, and this reflected the aim of describing what was happening rather than explanation. A study that did use a constant comparative method was conducted with 25 patient participants via SSI (Coole et al 2010). The team looked at the concerns of workers who were reporting LBP. Themes were developed by coding and comparing, but the methodology, such as grounded theory, was not specified which makes this challenging for researchers to replicate in further studies. The SSI method was therefore chosen for this study to enable greater understanding and depth for further data collection.

The study aims in phase two of the presented data collection was to understand clinical reasoning processes and the beliefs of clinicians regarding this process. To enable further depth, an appreciation of what and how each clinician/participant is thinking had to be employed. Therefore, a think-aloud method was chosen for the SSI. The think-aloud process is a qualitative method that has been described as a tool to analyse problem-solving (MacNeela et al 2010). It is a method that has been used in other studies involving the study of decision making and clinical reasoning.

In a study analysing the judgments of 12 general practitioners regarding patients reporting LBP, a think-aloud process was used retrospectively when considering a particularly challenging patient (Fullen et al 2008). A content analysis was used to produce codes and subsequent themes. The think-aloud process was based upon in-vitro patients, and therefore potentially lacked some depth and clinical relevance, this coupled with the retrospective element possibly reduced accuracy. By using the same case-study for all the interviews, the research analysis may have produced some direct comparative work, although assumed saturation may have been reached quicker with this approach without the variability of different presentations although the applicability of the findings to other patients with low back pain is likely to be more limited. In a study exploring the decision-making of paediatric physiotherapists, researchers video-taped a clinical assessment, and then later asked the participants to verbalise their thoughts whilst watching the video-tape. They also verbalised their thoughts regarding other therapists' decisions with their patients (Embrey et al 1996).

The semi-structured interview that followed the observation of the clinical assessment was led by written instructions to the participant, and was relatively open-ended, allowing the participant to be expressive and not restricted. Developing the interview in this way aimed to reduce interview bias upon the data and this was acknowledged throughout. The coding of the data was completed in a "non-specific inductive manner" (Hood 2010 pg 152), without a background explanation about a specific methodological process. The analysis produced "illness and movement scripts" to describe the reasoning processes. The methods described here emphasise the relevance of the "open" aspect of the questioning and its relationship with reducing bias. This would be relevant in research involving a researcher who is professionally connected to the participants, data, or processes under analysis.

4.5.1 Study design - Semi-structured interviews/phase 2

This phase of the study involved an audio-taped interview with extended scope physiotherapists using a think-aloud process within a semi-structured interview format. The extended scope physiotherapist (ESP) would firstly complete an assessment of a patient reporting low back pain and associated disorders (NICE 2009). The ESP then had time to complete any notes, which was then immediately followed by a semi-structured interview. This was facilitated by the researcher, who did not observe the clinical assessment. The researcher had a short interview schedule and therefore used the semi-structured interview model to gain data from the ESP. The ESP was encouraged to use a concurrent "think-aloud" process (Embrey et al 1996), to verbalise their thoughts regarding the decisions that they have made. This was facilitated by the researcher but was aimed to be led by the participant to reduce the potential bias of the researcher.

The study design was such that it aimed to link "realistic" clinical data and the important features of this are outlined below;

- The participants discussed their own patient, whom they have clinically assessed. This was felt to give a more realistic insight as the situation was real rather than based on a case study that they had not interacted with.

- The participants discussed their patients immediately after the assessment to allow as close as a representation of what happened, and to give as credible insight into the participants' thinking as possible. It also aimed to minimise bias due to memory recall and contamination from previous patient presentations.

4.5.2 Participants - phase 2

All participants were ESPs and working in clinics that involve assessment of patients reporting LBP. They had completed all relevant locally- agreed competencies that have been agreed internally by each individual service. There was a mix of clinicians working in secondary or primary care NHS settings.

ESPs currently involved in training, and therefore working under supervision, were excluded from this phase of the research. It was anticipated that these participants would not be making autonomous decisions within these clinics and so were not independent in their individual reasoning processes.

4.5.3 Sample - phase 2

The sampling strategy was purposeful as specific clinicians (ESPs) assessing LBP were required. The selected geography of the clinical settings was purposeful in that it needed to be some considerable distance from the researcher's place of work and deliver ESP services for patients reporting LBP. Due to the researcher being an ESP, and involved in LBP clinics, it was considered necessary to sample further afield than local (within three surrounding counties) services. This reduced the chance that the participants would be known to the researcher and vice versa, which was felt to be an important element in attempting to reduce bias towards the data. It was reflected after the focus groups that there may have been a bias as some of the participants professionally knew the researcher as discussed in 5.9.1, and so this was acted upon with this sampling strategy.

4.5.4 Recruitment and consent - phase 2

Ethical approval was granted by the Southampton and South West Hampshire Research Ethics Committee (11/SC/008)) (see appendices) and governance approval was attained at each site. (see appendices 19-21).The services approached were identified as NHS services that employ extended scope physiotherapists assessing patients reporting low back pain in orthopaedic and rheumatology clinics. An internet search identified potential NHS services where ESPs were working with patients reporting LBP. At the time of recruitment, no private sector services were available. A selection of services were approached that the researcher could logistically travel to, but were outside the surrounding counties that produced the first phase of data collection. After these services had been identified, a letter inviting participation was sent to the service manager. If the service manager expressed an initial interest in the service participating, then this was confirmed to the researcher via a return slip received in a provided stamped addressed envelope. The service managers were invited to discuss the study with the researcher if they had any questions, but they did not have to respond if they did not wish to. The expression of interest from the service managers necessitated them to hand out information packs to the ESPs that worked in their service. The service manager was then contacted to enquire whether there were any ESPs expressing an interest in participation. Potential participants were then invited to make contact with the researcher to book an appropriate interview time. Immediately prior to the interview the researcher was available for questions, and obtained the participant's consent.

The study aimed to recruit up to 10 participants. The sample size can be justified in a number of ways. Earlier studies of clinical reasoning, and LBP with a think-aloud method have used a similar number (n=12) (Fullen et al 2008). Initial data to support the aims of this study has already been retrieved via three focus groups, enabling some breadth to the study. The data collection for phase two covered three further NHS Trusts; therefore the study had an overall data collection (phase one and phase two) across six separate Trusts, with 28 participants, demonstrating similar recruitment numbers to other studies (Coole et al 2010) (n=25). Therefore, taking these points into account and with the aim of the interviews being a depth of understanding, the sample number of 10 SSIs was considered appropriate in further addressing the research question.

4.5.5 Data collection - phase two

After each participant completed a clinical assessment, the clinician completed notes and then the researcher was able to begin data collection. This occurred in the clinic room without the patient present and was audio-recorded. The clinician had access to their clinical notes from the patient assessment. The participating clinicians were not offered a topic guide*;* this was to ensure the think-aloud process was not affected by these prompts allowing as close a representation of the clinicians' thinking as possible. The interviews lasted approximately 45 minutes and were closed by the audio-recorder being switched off. An example of the topic guide is now presented. The specific themes and subsequent topic guide for the SSI centred on;

- What methods, approaches and procedures were used in reasoning a diagnosis with the current patient?

- Eliciting what aspects of the history taking, physical testing, and responses directed the reasoning process.

- Exploring whether there are elements external to the patient assessment that influenced the clinical decisions and subsequent plan for the current patient.

- Exploring differences in ESP thinking compared to non-ESPs.

- Understanding the important features of reasoning in relation to the assessment of LBP.

4.5.6 Transcription process

The transcription process for both phases was conducted by a commissioned company. They provided a word for word professional transcription process which enabled the line by line

coding and onward analysis. Each transcription was reviewed with the audio-taped account. This was to check for accuracy and also to begin the line by line coding. The line by line coding was completed with the audio-tape and transcriptions to ensure the context of the discussions were also adhered to. Memos were written about the researchers' interpretations, questions and thoughts at this junction and throughout each of the coding processes.

4.6 Coding process - phase one and phase two

The coding process is demonstrated using some selected examples. Presenting every code and theme in its entirety is beyond the scope of this thesis, therefore this section allows the reader to understand the process that supports the analysis. Both the focus-group and semi-structured interview phases were approached with the same method. The process of analysis is referenced against section 3.6 in the methodology chapter. As per Lincoln and Guba (1985), the audit trail for this work begins with an example of the raw data accompanied by the researchers' memos. The memos were written by hand on to the transcripts, these have been copied as comments on to the data in this thesis. It is possible to see that the memos in this cases include asking questions of the researchers' perceptions and also of the data. This was vital in remaining relexic and also for gaining a depth of understanding rather than description. The questions in the memos were used to help with grouping the codes in the next phase of the process. For example, the fourth memo down (see Figure 11) asks about fear and this was part of the building of the code and eventual theme of safety/accountability.

figure 11 – Demonstrates an example of the raw data and accompanying memos.

you are forming a thought of what it should be then you are using your clinical reasoning to negate that it's not other things so that you are trying to …..

What is forming ?

That's the important point yeah.

So it's a yes that's a massive part is then the important to prove what it is and what its not as to what it is too

Proving – can it be that clear?

Yeah

To coin a phrase again evidence of absence, absence of evidence so you want to you know have evidence of something that's not there but you don't want to leave out stuff that allows you to make, I was gonna say guess then, but I suppose in a way a diagnosis is a bit of a guess isn't it but ….

A guess ?what does that mean

I suppose with the more junior members of staff that's more in terms of its definitely not against them being safe because they know it's not this ……

I think, don't you think when it's more junior that you're, you're looking, you cover everything

Fear perhaps?

Sure

You know like when you see signs of patellofemoral you are still

checking that its not meniscal or ligamentous
That ….
Laughter
And then you eventually come back to the patellofemoral joint
Absolutely.
All talking at once …. Sorry
Masters people that have that experience are much quicker at getting to that hypothesis testing and discarding the unnecessary
Yeah
Cause they learn in different ways, certainly than I learnt
Yeah but the thing is I take your point but the thing is from that is that given a situation that I, anybody at any level came to me and said that's patellofemoral because and they had nothing in any way shape or form to suggest to me that it wasn't say a back then that isn't good enough that's not a reasoned approach if they at least need to say to me, Okay they may not be physically able to test the lumbar spine but they would say to me its not lumbar spine because ding ding ding so say 2 or 3 things that they have got from the history
Yeah
But then this persons ……..
My point was really that I think as a whole active passive everything…..
Laughter
Very boxed and …..
Yeah

What is experience mastery Or time?

The data were coded line by line and then summarised. As per a grounded theory methodology, a three stage process of coding was undertaken. The data were firstly coded line by line (see Figures 12 and 13), directly from the raw data such as Figure 11, with each line of data being represented with a descriptive code. These were colour coded, in italics and bold, to represent similarity. Each piece of data collection in the focus groups and SSIs were completed in this way. The data from the ESPs and non-ESPs were expressed differently to allow comparative analysis. This is demonstrated in the figures below, Figure12 presents a line by line coding process that summarises the codes, and has highlighted all codes relating to non-ESP data from one of the focus groups. Figure 13 demonstrates an equivalent example of the ESP line by line coding summary of the data from one of the focus groups. These summaries are codes from each line of data. Therefore, initial line by line coding was completed for the three focus groups and ten semi-structured interviews with the codes for ESP and non-ESPs highlighted to allow for comparison.

figure 12 – Demonstrates the non-ESP line by line codes retrieved from focus group2

line	Line by line coding- focus group 2-non-ESP data
32	Thinking to support practice.
33	**Logical/sequential**
34	**Process of a puzzle**
66-67	Conclude to give direction
68	Linking the question and tests Matching data
69	Physiology
78	Social influence
82	Justifying the conclusion
85	*Able to break it down*
88	Assumptions without evidence
107	***Specific questions.***
109	**Patterns**
141	Pictures
142	**Prior info=diagnostic aid**
143	Prior observation.
144	Stay on toes – vigilance
149	Prior information
162	Prior assumption
166	Patient information
167	**Tell the story**
168	**Listening to the story**
168	**Patient tell the story**
187	***More directive***
194	Relaxation of questions
196	**Tell the story**
197	Social
198	Social issues
199	***Narrowing***
267	*Wider consideration of factors*
268	**Narrowing**
273	Limitation of singular tests-
278	Clouding the picture
279	**Patterns**
282	**Patterns**
301	Tests to negate
303	**Flexible –non rigid approach**
306	Guided by the patient not a protocol
308	Testing based on the patient
310	Developing-creativity
349	Searching
350	Anatomical
379	**Compartmentalising**
380	Prior patient information
382	Patient clinician relationship
383	Patient cognition
385	External personal issues
395	Power of information
398	Clinician confidence
400	Confidence in physiotherapy
402	Safety to reassure
414	Patient information

416	Timelines
422	Patho-anatomical timelines
434	Social influences
440-441	Time frames
443	Knowledge of time frames =experience
445	Physiological processes
447	Time lines
448	Patient lifestyle
452	Patient processes upon physiology
453	Timelines
495	Meeting expectations
513	**Gut-feeling v reflection**
521	**Gut feeling=experience**
523	**Active gut feeling**
535	**Gut feeling**
549	**Sub-conscious patterns**
561	Proving
	Question the gut feeling

figure 13 - Demonstrates the ESP line by line codes retrieved from focus group 2

line	Line by line codes- focus group 2 ESP data
9-11	Knowledge of conditions.
	Relevance of history.
15-18	Analysing information-matching to knowledge
	Leading to next decision based on prior decision.
21-22	Academic knowledge mixed with prior experience.
27	Thinking and judging.
29	Science linking with the presentation.
81	Immediate first impressions
95	Developing a first clinical impression.
97	Remaining open.
101-104	**Proof**
	Pre-judgement
	Test a developing theory.
124+128	Concern.
125-127	Pre-judge-re-judge.
137-140	Gathering to develop possibilities.
	Remaining open.
150-153	Filtering process.
154	Patient perspective.
158	Use of a system.
161	Patient volunteering information v what is asked/balance.
167	Open process moving to closed process.
171	Linking patient and clinician perspective.
178-180	Creating the balance –patient offers versus what is needed.
185-187	**Assumption – patient making and clinician making.**
195-200	Rapport.
	Clinician perspective
	***Clinical agenda*.**

	Clinically led questioning.
230-232	**Gut feeling-negative connotation.**
	Previous learning = gut feeling?
246-250	**Gut feeling-positive versus negative**
	Gut feeling=product of experience.
257-259	Balancing-symptoms to pathology**.**
262	Pathological diagnosis.
268-270	Pathology driving prognosis.
271-274	Importance of linking descriptions to possible pathology
289-292	Pathological description.
292	Switching mode.
296	Work impact.
298	Patient perspective.
301	Acknowledgement.
302	Balancing a judgment.
303	Patient perception.

The line by line coding for each section of data collection was followed up by developing the emerging codes from each of the data sources that presented in a similar fashion (FGs and SSIs). This is described as linking the codes or axial coding (Charmaz 2008) and was the second component of the coding process in this research. An example of this process is depicted below (Figures 14 and 15); it also demonstrates the data differences from the ESP and non-ESP sources from the first phase of the data collection. The size of each bubble does not depict relevance, but the number in each bubble highlights the number of times that a linked code was identified. This helped with ascertaining the importance of each theme. A name was given for each theme. Each data source (FGs/SSIs) were compared and contrasted with each other (i.e. all ESP data compared within a focus group and across focus groups, as well as across the semi-structured interview

figure 14 – Demonstrates the non- ESP linked codes retrieved from focus group 3.
The initial codes are represented in separate circles and the number in brackets depicts the number of quotes.

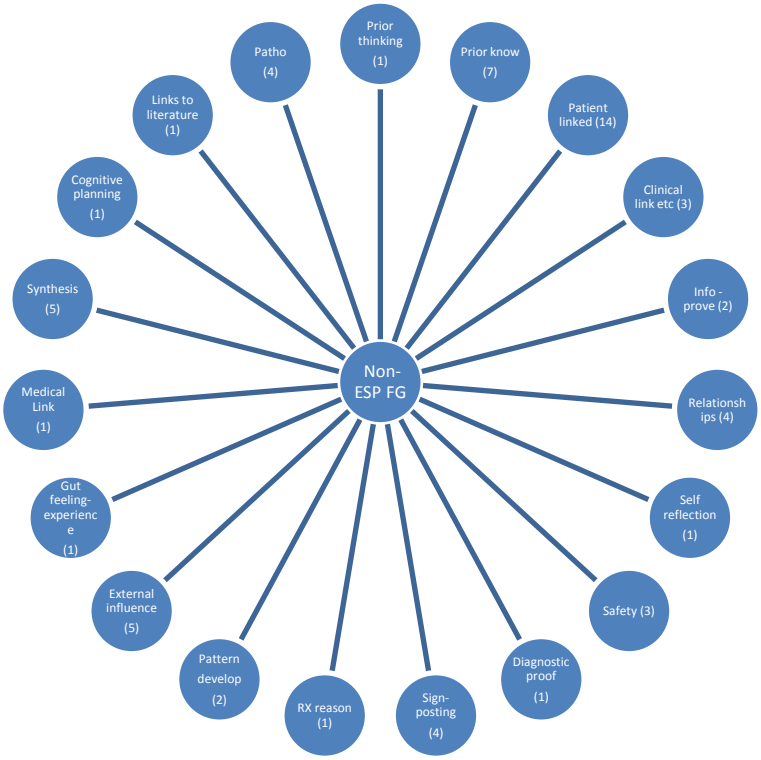
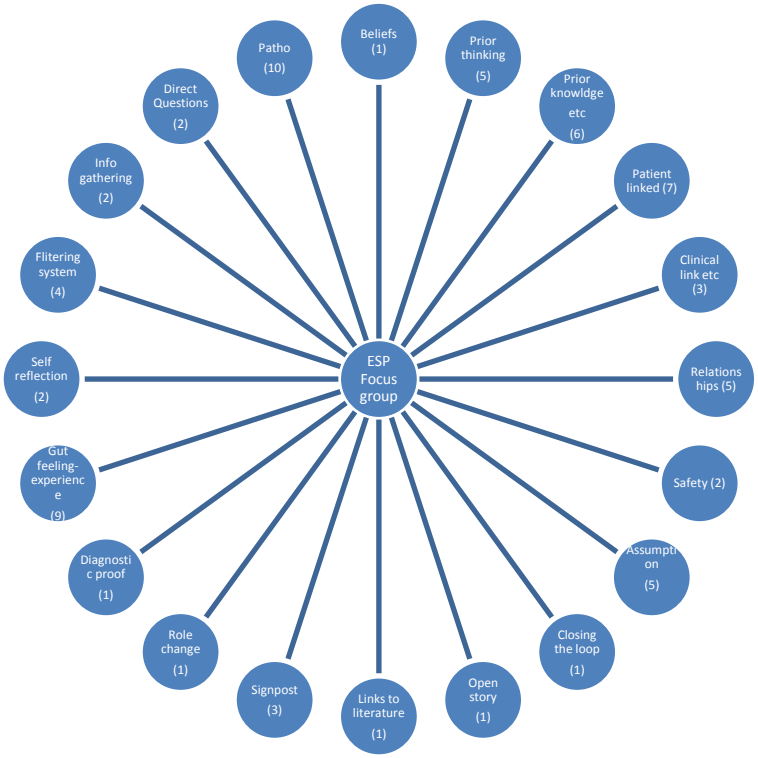


figure 15 – Demonstrates the ESP linked codes retrieved from focus group 3



The linked codes seen above were the codes developed from the individual data sets (either a focus group ESP or non - ESP or SSI). These linked codes required grouping together, comparing and contrasting across each data set. Using the memos, peer review and regularly referring to the raw data, the linked codes were then grouped. This grouping was a process of connecting the linked codes above from all the data sets to allow for further analysis and to gain a deeper understanding of meaning. An example of a grouped model from the linked model is now presented as Figure 16.

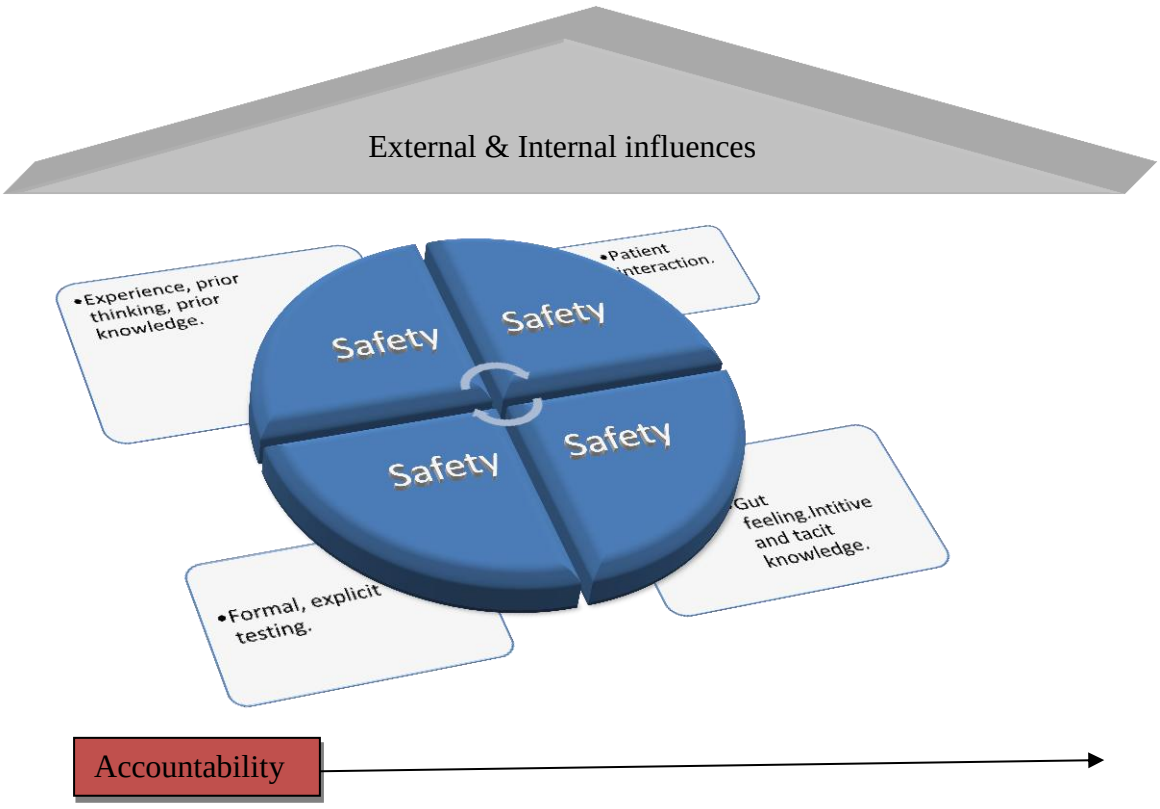
figure 16 – Demonstrates an example of how the linked codes were grouped

The diagram above demonstrates the researchers' thinking process. It has a central point developed from the memos which is seen here as "clinical linking". This is built by all the codes from the FGs and SSIs being grouped together, looking for familiar patterns within the data.

Following this, an iterative process of building potential models from these grouped codes then occurred. This involved comparing the cases (ESP and non-ESP) and the incidents within the data sets, such as participant discussions and points of view. Each data set aided in the development of these models, which were reviewed and critically approached, in relation to ensuring bias was accounted for on the part of the researcher, and that conclusions were grounded in the data.

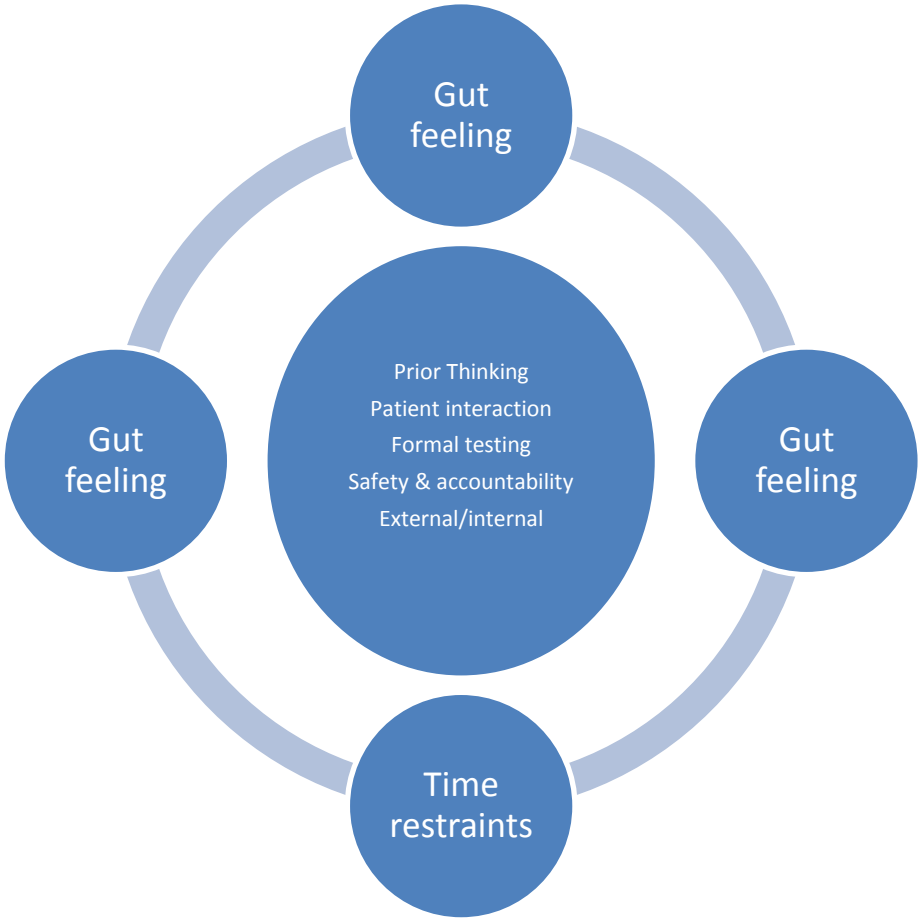
Each model was supported by the major themes that emerged from the grouped codes. These were then described under one singular description. From the example above, it is possible to see that these grouped codes have a number of words associated with them. Therefore, as the themes developed, this description began to tighten up towards an explanatory model. ESP and non-ESP data continued to be compared and contrasted, using the data from all the sources. This is presented now as the third phase of the coding, described as selective (Charmaz 2008). Some examples of these themes and early explanatory models are now presented.

figure 17 – Demonstrates an example of how the grouped codes began to move into themes



The model example above shows the grouped codes brought together as themes and how they may inter-link. This was an important process that examined the potential themes and highlighted how they may have worked together.

figure 18 – Demonstrates a model describing the themes of ESP reasoning and linkages



This example demonstrates further thinking and a review of how the developed themes may link together in an example of ESP clinical reasoning. The theme of gut-feeling is seen as having a supportive role throughout at this point and so pictorially this was demonstrated. Further examples of how the themes were addressed and assessed are also presented.

figure 19 – Demonstrates an early model describing the themes of ESP reasoning as a process

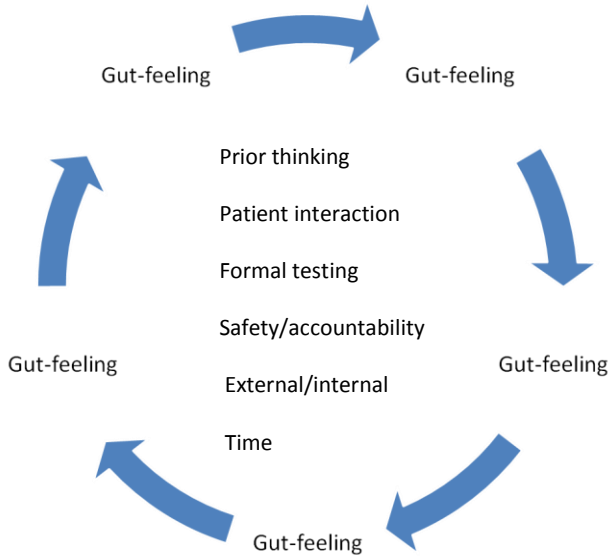
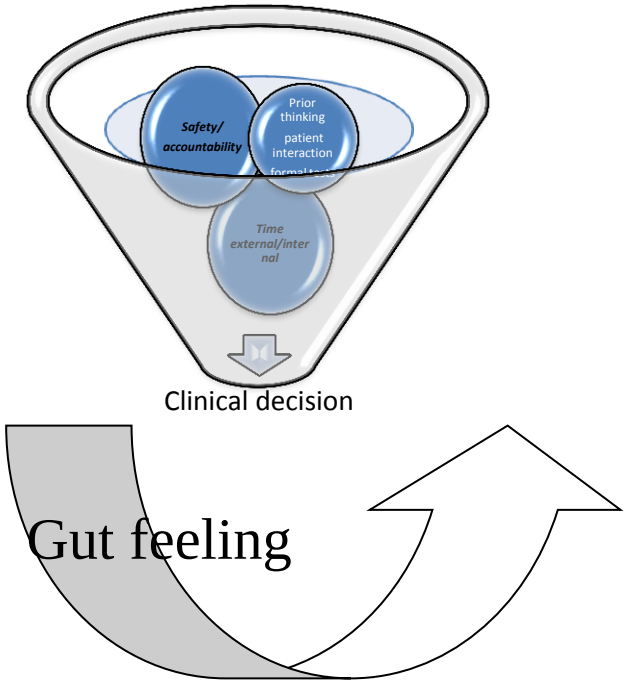


figure 20 – Demonstrates a more developed model describing the themes of ESP reasoning as a process



As the models were developed, they were individually reviewed against the raw data supporting the themes. This was important as part of maintaining a grounded theory informed methodology. An example of combining data from phase one and two which directly underpinned a selected theme is now presented for the theme of gut-feeling. This allows the reader to see how the grounded data were built into a theme. The data are divided into ESP and non-ESP, allowing similarities and differences in ESP and non-ESP reasoning to be recognised. As the themes developed, the quotes supporting that theme were selected and placed in a table format (as per Figure 21).

figure 21 – Demonstrates raw data from the line by line coding that then built a theme The data are shown that led to a development of a theme.

Gut Feeling	**Data to support codes – with lines and source. Red = ESP Blue = non-ESP**
	"I think, again through experience and through learning what you've previously learnt, previous scenarios, similar things, gut feeling plays a huge part. *Pilot FG 230-233* "Gut feeling is perhaps just another term for experience isn't it? I can't remember many gut feelings when I first started working." *FG 2 513-514* "My gut feelings have gone up as I've worked for a bit longer" *FG 2 516* "A number of times you prove yourself wrong with your gut feeling and reflect back" *FG 2 495* "I would imagine cause that's the one thing that influenced my learning is getting the hunches confirmed" *FG 1 266-267* "it wasn't going in the direction I thought it was going in, so it's a good learning tool" *FG 2 496-497*
	"we shouldn't rely on gut feeling, you know, i think you know, they should be confirmed" *FG 2 545-546* *FG 2 513-514 a/a* "I think officially gut feeling doesn't necessarily play a part but I think officially we all use gut feeling all the time, well I do anyway" *Pilot FG 230-231*
	"I think sometimes you have to make probably a conscious effort to try and

	make sure you don't, um you know, I can think of a patient yesterday that I saw her initial papers when I walked in and my initial judgement was completely wrong, but its being allowed to be open to do that and it is quite hard to not allow yourself to be pre-judging" *NMS Pilot FG 112-115* "gut feeling is how, how that person in front of you, feeds into your experiences and knowledge, … I mean gut feeling is a loose term which actually refers to a lot of different things" *NMS Pilot FG 237-240*
	"I think I would do minimal testing to give me some weight to my argument" *FG 1 782-783* "You could be biased with gut feeling, you're gut feeling directed somewhere and actually missed things that are not reasoned" *FG 2 535-536* "I suppose in a way a diagnosis is a bit of a guess" *FG 1 47* "In the physios you have the luxury where you can test your gut feeling as they are coming back aren't they. Where in the ESP you can't because you only perhaps see them once*" FG 2 554-556* "Even i think sometimes you do set out to prove your gut feeling if you are not careful you get yourself thinking about gut feeling that you manage to prove it" *FG 2 549-551*

Further cross-case analysis occurred, whereby the data again were reviewed and a number of different descriptions continued to be formulated, grounded in differences in ESP and non-ESP data, and informed by the literature that had been accessed. This phase produced a final explanatory model which is presented in the findings chapter

Chapter 5: Findings

This chapter presents the data supporting the development of a model of clinical reasoning that extended scope physiotherapists apply when assessing people with low back pain. The model highlights a complex, dynamic process, used to inform a decision. This chapter presents the model construction, while sub-sections of the chapter identify each theme and present its role in the theoretical development.
As the chapter develops the theory, the interactions of the themes that play a continual role in the construction of the theory and ultimately how ESP utilise reasoning processes are also highlighted. The final model delivers themes as the processes that occur as an extended scope physiotherapist (ESP) and non-ESP construct a decision regarding the management of people with low back pain. One theme (gut feeling) emerged that has a continual role in all of the thinking processes. This is presented as an initial thought and inter-twining process, as well as a separate theme (pre-decision gut feeling).

The chapter concludes with two models of clinical reasoning and highlights similarities and differences to the non-ESP reasoning processes throughout. Both ESP and non-ESPs have different highlighted themes that represent the perceived importance variance between the groups. Section 5.1 introduces the basic demographic information that enables the reader to see the breadth of participants and their skill mix.

5.1 Demographic data

figure 22- to show the demographics of the focus groups (phase on data collection) participants

	Male NMS Physiotherapist	Female NMS Physiotherapists	Male ESP	Female ESP
Number in study	5	4	5	4
Average years in role (range)	6.5 (5 – 8)	9.5(6 – 13)	4.8 (3-10)	6.25 (5-7)
Average years qualified (range)	5.8 (5-8)	10.75 (6-13)	14.2 (10-16)	21.2 (14-28)
Number of clinics per week (range)	10 fulltime	10 fulltime	3 (1-5)	2.8 (2-4)

In phase two of the data collection the ratio of male to female was 4 versus 6 as was the primary and secondary care roles. The years qualified (11-25) average (17) suggested experience whilst time as an ESP ranged (2-9) years, average (5.6), this again reflects that many ESP posts are relatively new.

figure 23 - to show the demographics of the interviews (phase two data collection)

Clinician	Gender	Primary / Secondary care?	Number of years qualified as physiotherapist.	Number of years as ESP.
1	m	S	15	8
2	f	S	13	6
3	f	P	11	2
4	f	P	23	5
5	m	P	22	9
6	m	P	12	3
7	m	P	11	5
8	f	P	25	5
9	f	S	18	7
10	f	S	21	6

Section 5.2 looks to identify data that represents the ESPs and non-ESPs initial description of clinical reasoning. This is then followed by the model construction.

The quotes were chosen via the coding process and subsequent thematic building of themes. The themes were developed from the data and therefore all quotes that pertained to the line by line coding process were grouped together.

5.2 What is clinical reasoning?

The data analysis described the clinicians' construction of clinical reasoning. An ESP clinician below describes the process.

> *"You gather information with detailed questioning; relate it back to clinical scenarios in relation to pattern recognition, for me that works really well in the reasoning process." FG 1ESP 18-21*

This clinician sees clinical reasoning as an information gathering exercise, a way of attaining data and matching against past experiences. This gathering and matching of data is a way of describing pattern recognition, and this is a method that is well documented in the literature, especially in the field of expert practice. (Loftus and Smith 2008). Clinical reasoning is also described as a process, which is on-going:

> *"In clinic the clinical reasoning process is on going from the receiving of the letter all the way through because you all the time stay on your toes, the questioning interview that's your clinical reasoning going on in your head all the time, it never stops." FG 2 ESP 153-155*

The initial clinical data collection process suggests clinical reasoning begins as soon as the clinicians think about the patient. The data below suggest that initial hypothetico-deductive is also acknowledged (Loftus and Smith 2008), and the themes presented highlight how the data gathering although described differently, is apparent throughout the clinical assessment. Even the processes such as hypothetico-deductive and pattern recognition etc are perhaps not necessarily distinct, but interlink:

> *"I think a lot of the hypothesis testing but also the information gathering before that you may do, you may not have a hypothesis depending on how much information you have got particularly in the therapy field as compared to the ESP, which starts with connections of an information gathering exercise." Pilot FG ESP 72-75*

"I think before you see the patient you pick up the referral and it might be a gross mistake sometimes, but you pick up the referral, you see what's written and you look at the age and you start thinking is there something that fits potentially with the patient." FG 2 Non-ESP 141-144

These quotes above show little differences in the ESP and non-ESP perceptions of clinical reasoning. Initial thinking, information gathering, hypothesis testing all are described. When asked directly in the focus group environments the clinicians had some level of agreement that clinical reasoning is complex, and consists of different processes. This may have been due to the clinicians wishing to conform, and therefore feeling professionally vulnerable. This is a limitation of focus groups which is discussed in the methods section.

Section 5.2 analyses each of the themes, with examples that were highlighted through the coding processes. The themes were supported by the data whilst comparisons are made via the focus group (FG) and semi-structured interview (SSI) data between the ESP and non-ESP clinicians. This was deemed useful in developing the model pertaining to the specific practice of the ESPs, whilst identifying similarities and differences between the two groups.

5.3 Prior thinking

The definition of prior thinking in this research is the use of knowledge gained about the patient or the patient's presenting condition prior to a consultation. It has two supporting elements.

1. *Natural knowledge.* This is an understanding and appreciation of natural aetiology and biological processes.
2. *Clinical patterns*. This is the concept of pattern recognition and is based on the clinical signs and symptoms that have been encountered before in similar cases.

This theme is likely to supplement other cognitive processes such as pattern recognition, intuitive thought, gut-feeling and hypothetico-deductive processing. All conscious and sub-conscious applications of reasoning need a trigger (Banning 2008). That trigger may be generated from the patient scenario, although even at this point it could be argued that the memory facilitation means that the embedded thought cognitively, at a "conscious level" has been recognised at a less conscious level improving the matching against the salient clinical findings. A pre-requisite of prior thinking is prior knowledge and experience to generate the thought, this is highlighted below.

> *"You can't clinical reason without knowledge, you have to have a good base knowledge because you know to ask questions, you can't grab this from the air" FG 2 ESP 72-73*

> *"I think the knowledge and the experience are so closely interlinked so I think you know obviously you can have a new graduate who has all the book knowledge but book knowledge and clinical practice can be poles apart." SSI 2 86-89*

The linking of acquired knowledge and experience appear to be the key here. Linking those together means that both can support a working diagnosis:

> *"You gather information with detailed questioning, relate back to clinical scenarios in relation to pattern recognition, for me that works really well in the reasoning process FG 1 ESP 18-21*

This ESP above is relating pattern recognition to clinical scenarios, and therefore is suggesting experience influences their decision-making. In the quotes below, one clinician supports reasoning with theories and evidence based practice, whilst the other feels experience delivers the supporting elements to recognising patterns.

> *"I think there are elements to the clinical reasoning processes that sort of use literature and the sort of theories behind obviously pattern recognition." FG 1 ESP 27-28*

"But yeah, I'm not the best at quoting lots of references and research and that, so I probably do work more on that I think. Patient mileage I think." SSI 5 153-155

"Patient mileage" or experience is again used here by the ESP. In this data set, many participants grounded their reasoning in patient mileage, where the initial thoughts and perceptions reportedly originate from experience. The non-ESP below has proposed a method of assessment looking for assumed patterns. They are proposing that the pattern is embedded from previous initial thoughts, and they are looking to confirm this through tests, leading to an onward management plan.

"I might try and do some of my combined movements looking for an opening pattern, moving pattern and you know yes referring some tests if you think its neurological issue, if you think there's an element of restriction within the neural system, so there are things that I would throw in hoping to justify and agree with what subjectively I thought had come through." FG 2 Non-ESP 278-284

The ESPs in the quotes below are describing a pathology and pain-driven diagnosis. The initial thoughts drive a description of a pathological diagnosis coupled with the pain generating source. In the last quote below there is reference to non-ESPs using movement directions rather than pathology to drive reasoning, which is a difference between the two groups.

"I think working in an ESP clinic could be my hypotheses, my clinical impression of that patient I would start with potential pathology, you know, get a feeling for what I feel is the dominant pain mechanism." Pilot FG ESP 642-644

"If you are looking for stenotic type thing you might ask questions about whether there are any you know shopping trolley signs and those sorts of things, relieved by sitting" FG 1 ESP 518-522

"But looking at it as a physio in a mechanical patterns what makes the directional patterns things....or this is disc/radicular when you start at the ESP thinking way" FG 2 ESP 368-370

This underlines the initial thoughts of ESPs, either driven by potential pathology, pain, or supported by experience. The non-ESPs are familiar with treatment patterns which are not necessarily driven by pathology.

Prior thinking may be seen as a way of linking the expected to the reality, by helping inform the direction and aims of the assessment (i.e. finding pathology or finding a movement problem). The clinician needs to explore their perceived knowledge such as what they think they know about a condition, and what they expect to find, against what they actually find out about the patient. This is potentially gained by working with the patient; this patient interaction is now discussed.

5.4 Patient interaction

This theme is defined as the formation of a clinical relationship, understanding the patient and the creation of patient confidence in the clinician. Confidence in the clinician from the patient then allows for the delivery of information in a safe environment and can positively improve outcome (Harkapaa et al 1991).

"It could be they've waited 3 months for the appointment so if they want to tell you how bad it was and the second time you see them its actually a lot better and they've unloaded all that." FG 1ESP 456-458

The quote above gives relevance for letting the patient speak, to help them move forward, and to get them to be able to give the ESP the information that they may need.

"And if you don't listen to them they are hardly likely to listen to you." FG 2ESP 201

The quote above suggests a symbiotic communicative relationship requiring understanding, respect and an appreciation of common ground. This component of patient interaction is described as clinical rapport (Leach 2005), and had some comparative differences between the two sets of clinicians.

> *"Are we talking about an accumulated rapport or are we talking about a rapport that is established after one assessment..... Because you can't compare if you've seen somebody seven times." FG 1 ESP 464-467*

The identification of accumulated rapport occurring after a number of contacts with a clinician was discussed in the focus groups. It was suggested that this does not occur with the ESP because the number of sessions are less (***time).***

> *"I was just gonna say exactly the same, I think in a therapy role it's, it's really vital that you have that rapport with the patient and relationship with the patient and the extended role where you might only see a patient once maybe twice as a follow up. I think the rapport is possibly less important because you are driving a diagnosis." Pilot FG ESP 376-381*

This accumulated rapport versus diagnostic rapport is driven by the need to gain the information that will help to confirm the clinicians' thoughts. Both groups utilise the interaction differently because of the ***time*** restrictions and this is a significant differential between the groups.

> *"You see the patients repeatedly when you come into the physio department so it's much easier to build a rapport, and also you get more time for your assessment in the physio department which makes a big impact." SSI 4 206-209*

It was suggested that the ESP creates less of a rapport in the clinical setting. This is highlighted below.

> *"In extended physio I wouldn't have thought they would expect a rapport." FG 1 ESP 470*

When a patient is interviewed the discussion may centre on some personal issues, the literature strongly identifies the elements of understanding the potential yellow flags, i.e. risk factors of chronicity as well as getting to understand the patient and their beliefs, concerns and aims (Kendall 1999; Main and George 2011). Attending a specialist clinic would suggest to the patient an element of specialist assessment. The patient is likely to be attending the clinic via a referral from a GP, possibly after some failed treatment for their condition. It is unknown whether the GP may have given the patient some information, and told them that they would be receiving a specialist assessment, as opposed to the non-ESP physiotherapy referral which is requesting treatment. Therefore the dynamic is pre-set, possibly making it easier for the ESP to keep the interview and subsequent physical assessment at a diagnostic level, rather than treatment based, and supporting the ESPs belief that a "proper" rapport will not be generated.

> *"You probably should be able to get a proper rapport in physio." FG 1 ESP 449-450*

This suggests that there is a perceptual difference between the two groups. The ESPs in nearly all cases work also in a non-ESP role, and in doing so change "hats" to suit the situation. The non-ESPs are grounded in developing a therapeutic relationship as this is familiar in many cases where treatment is over a prolonged period of ***time***. This natural way of changing persona may support the belief that the ESP role is diagnostic, and that rapport is less important in the generation of a diagnosis, as compared to the non-ESP role.

A number of the ESPs interviewed felt that rapport in the ESP clinics was vital, and although **time** was restricted (therefore the use of time to build a rapport was limited), they felt that their skill as a practitioner was heavily supported by rapport and interaction.

> *"I feel there should be a rapport, because you want that confidence to build between the patient and yourself with the decision making really." SSI 5 207-209*

"I think I can get that rapport, I'm not blowing my own trumpet but I know if I can get that patient on board I can give them their diagnosis, I can get them to tell me it back, so okay." SSI 7 279-281

The perceived benefits of gaining a rapport features strongly in many of the data sets acquired. The focus groups and interviews link gaining of a rapport as a means to attaining information, the quote below presents this as a "two-way process".

"I just see it as real two-way process that you need to get the questions to that patient, if the patients are not giving you the information that you need from them, you have to think how can I get that information out of them." *SSI 8 135-138*

This two-way process emphasises the link between ***prior gained knowledge*** followed by the need to get information. To gather information clinicians need to have appropriate interaction.

In the example below two separate ESPs are discussing how questioning skills and narrative reasoning versus structured questioning may differ. These approaches are well known within the clinical reasoning literature and it seems potentially ESPs may use both at different times.

"I think that the first 2-3 minutes the patient if you let them talk they actually tell what's the problem." FG 2 ESP 174-175

"But if you are just letting them talk then you don't actually have the time, so then you are more direct and say sort of, can I actually stop you there?" Pilot FG ESP 214-216

Therefore, creating a rapport enables the receipt of information; it may be generated in different ways or not at all according to some ESPs. These differences in perception may be influenced by their own internal perception of their role.

These differences in approach to rapport are also highlighted by data gained from the non-ESPs in the focus groups who see the ESP role and the relationship with their patients in a way that suggests internal professional differences, this relates to patient expectation.

> *"Clearly your decision making's harder I think in physiotherapy cos you have to try and meet their expectation, which is treatment, the specialist has said that treatment will be from you." FG 1 non-ESP 640-642*

> *"The patient already thinks well I'm going to be seen in a clinic by a specialists….. we almost in a way have to work harder to get that rapport in the first place" FG 1 non-ESP 416-420*

There is a suggestion that patient expectation will drive the rapport. The patient expects certain elements from a therapeutic encounter versus the "specialist" assessment. This is further highlighted below.

> *"The more faith they've got in you as the ESP I would imagine the more happy they're gonna be." Pilot FG non-ESP 392-393*

The ESP here recognises that the thoughts and beliefs of the patient in the clinician are probably important. The patient may perceive "specialist" care as better and so the expectation is different when attending an ESP versus a non-ESP assessment. Whilst the patient expectation is described above, the clinicians' perception of the patient seems also relevant, as the non-ESP below emphasises.

> *"You have also got to take the patient into account you know their, what their feelings about things as I think we are very easy to pre-judge with our experience." Pilot FG non-ESP 52-55*

In this example the link between prior information (described above as pre-judgement) is felt to be important to acknowledge when gaining insight into the patients' feelings (***patient interaction***) and there is a warning about how the clinicians may use experience to make assumptions. The quote below highlights how the ESP

uses ***prior thinking*** and the interaction to gain what they need within the constraints of ***time***. Furthermore, issues of accountability and ***external/internal influences*** have an effect on their decisions.

> *"ESP assessment allows us to do a mixture of all of that because, you know, we want to find out what's been going on. I do think I've got time to build up a rapport but I don't think that's just me I think it's the skill of, generally it's physios we're good at that sort of any of our ESP's tend to be good at that." SSI 8 346-350*

The ***patient interaction*** theme supports the thinking process, aids in developing the diagnosis, and ultimately the management plan for the patient. This patient interaction could be described as a primary non-physical component of the examination, as much of this centres around questions, answers and interpretation of responses and the overall non-specific treatment effects of perceived empathy and communication skills. The interlinked reasoning model driven via prior thinking and patient interaction sets the scene for the examination and the choice of tests, either physical or diagnostic. This is now considered.

5.5 Formal testing

This theme is defined as the use of physical or non-physical tests that aid in the diagnosis and management of a patient. It looks to take the evaluation of physical tests and diagnostic examinations such as X-ray to blend with the ***patient interaction*** and ***prior thinking***. The previous themes suggest that prior thinking and patient evaluation has led to the selection of test that could be employed. The selection of physical tests such as a straight leg raise, or a diagnostic examination, such as Magnetic Resonance Imaging (MRI) may be linked to previous two themes:

> *"You don't put all your weight of evidence on your subjective or your objective, you need to combine them." SSI 4 63-64*

One of the key differences in practice between ESP and non-ESPs is the ability to order non-physical investigations, followed by the responsibility to action the results. This created discussion regarding what this responsibility brings to practice, whether this is a benefit and whether it has changed them as a clinician. The clinicians below feels the use of non-physical diagnostic tests creates greater objectivity.

> "*I suppose you can be slightly more objective in the clinic because you've got the aid of diagnostic tests, so if we made an hypothesis and then had some arranged diagnostic tests, when it comes back its confirming a diagnosis*." *Pilot FG ESP 486-488*

The clinician in the data above recognises the benefit of diagnostic tests and suggests that this "confirms" a diagnosis. This was very much a repetitive element of this theme for the ESPs.

> *"If their subjective shows they've got an L5/S1 nerve root compression the objective confirms that, and then you do a scan and it shows that, that's an absolute confirmation." Pilot FG ESP 504-505*

> *She was very restricted in her walking I felt it was probably ideal to go ahead straightaway and do a MRI scan to actually confirm if it was the case of spinal stenosis. SSI 5 20-25*

These quotes above demonstrate the strong connections that the ESPs made with a pathological condition and the use of diagnostic tests, such as MRI. This is in contrast with the non-ESPs who related their clinical practice to different components of the analytical aspect of the patient examination.

> *"I might try and do some of my combined movements looking for an opening pattern, a moving pattern." FG 1 non-ESP2 278-284*

Describing patterns rather than pathology identifies a difference in the two approaches. As the non-ESPs are unable to use these non-physical diagnostic tests they rely on the physical tests and interpretive questions to produce what they need.

The ESPs felt throughout both phases of data collection that the need to investigate related to ***safety*** and patient expectation, but also supporting and ***internally*** justifying their clinical examination. This is perhaps the internal professional confidence that clinicians may need in an autonomous, extended role. Both quotes below support this and also highlight how the ESP creates a primary aspect of their role, which is to diagnose the patient problem with diagnostic physical and non-physical testing. The ESP below feels the MRI gives the patient greater satisfaction as it delivers what they may perceive as a thorough examination procedure.

> *"The other thing as well, we also have if the patients not happy, we have the facility to investigate further in the form of MRIs' etc." FG 2 ESP 404-405*

Diagnosis via formal testing in this format is different from the non-ESP but what is of note here is the perception of the ESP that they are more likely to provide a diagnosis. Throughout the data there are examples of the ESP seeing themselves as a diagnostician, and this being perceptually separate from the non-ESP.

> *Interviewer: "In physio, is the diagnosis less important?"*
> *Response: "Yeah. I think it's a factor, but you are treating more signs and symptoms, maybe, and looking at more movement dysfunctions, and trying to improve that." SSI 5 107-110*

The clinician above feels that the non-ESP diagnosis to be less important. Potentially either clinician could see the same patient dependent on the source of the referral. The result of the formal testing is different; the data suggests that the type of diagnosis is separate; movement or pathology.

Therefore, the formal testing components of clinical reasoning play a different role in each group, and highlight that in an ESP role this part of the examination seems to lack the clinical reasoning relevancy as highlighted below:

> *"The physical examination was a confirmation of those findings really and not quite a token gesture to the patient but a gesture that actually we have examined him. So yes he is going to have an MRI scan of the whole spine." SSI 6 58-61*

The non-ESP below looked to use formal testing to generate a diagnosis that would lead to treatment, such as "core muscle work".

> *"I noted significant muscle imbalances and really work on core etc, this is going to be completely different in the ESP clinic." FG 2 ESP 355-356*

Musculoskeletal dysfunction incorporates the ability of joints, soft tissues and nerves to work together to produce movement which is controlled (van Vliet and Heneghan 2006) and is different in its use and interpretation by the ESP. Perhaps the ESP feels that this measure of practice as a differential has is a pivotal component of their work, as this is a key difference to their practice versus non-ESPs. They use non-physical diagnostic testing which costs money, requires extra training, and places the ESP outside previously defined scopes of practice. The pressure of presenting themselves in this environment whilst distancing themselves from their roots of practice may play a part in how they reason, and this is discussed further below **(*external/internal influences*).** For example, the clinician below is describing an element to their practice that would not have played any part of their examination when in a non-ESP role perhaps even with the same patient.

> *"He has had no blood test done from his GP so he is also going to get a range of blood tests, so looking at his inflammatory markers, protein electrophoresis, PSA and a bone profile, we will do a function test, just as a blood screen." SSI 6 44-47*

Therefore, the non-physical formal test is referred to before any physical tests are completed; this would not be relevant with the same patient in a non-ESP clinic. The ESP below describes the different "thinking" methods; movement as opposed to pathology.

> *"But looking at it as a physio it is mechanical patterns and the directional pattern matching...or this is disc/radicular when you start at the ESP thinking way." FG 2 ESP 368-370*

All of the clinicians in both phase one and phase two of the research had dual roles in the NHS jobs. Some of them recognised the difficulties that this caused in relation to the constructed beliefs of what each clinical role is designed for.

> *"I've still got my ESP hat on because it's difficult to completely take that off, so you've got that knowledge and you've got that thinking more broadly about other potential diagnoses, and you've got that clinical reasoning behind you to be able to say whether you think something is serious or not." SSI 4 164-174*

The changing of roles is described as "changing hats" in this example. This description suggests that changing hats is a difficult task. This potentially is due to the ESP reasoning requirement of finding "something serious". The clinicians feel this is difficult and this may be due to the fact that their abilities to order investigations go when they have to work as a non-ESP, although this is not in all cases it was in some, and this led to stress. The formal testing elements although possibly helpful meant that some of the ESPs perceived greater stress and levels of ***accountability*** due to the tests that they felt they would need to use and action. This is shown to be different as a non-ESP.

The ESP feels that they must fully assess the patient via non-physical formal tests due to the pressures that they experience, and the utilisation of these tests such has potentially shifted their approach to decisions.

> *"So I think I can more effectively help people by having access. I would hate not to have access and in fact I can't envisage working in a place where I don't have access". SSI 2 172-174*

These clinicians' decisions are based upon access to scans which, in their minds, if not available possibly limit their clinical reasoning; this demonstrates a shift in practice. The reliance on scans and the influence this has on the reasoning process highlights the practitioners thinking system is highly influenced by this formal non-physical reasoning**.** The formal non-physical testing theme therefore in the ESP group is supported strongly by the application and interpretation of non-physical tests results. As the non-ESPs do not have this access, comparisons are difficult, but where

further direct comparisons can be made and also giving further properties to the ESP reasoning theory is the theme of ***safety and accountability.***

5.6 Safety and accountability

This is the first of the clinical influence themes**.** They have an under-pinning role in the clinical reasoning process. Safety and accountability is defined as elements within the assessment that link the clinician to aspects of safe practice, vigilance, medico-legality, and litigation. There are three main elements seen within this code.

1. *Clinician professional safety*. This aspect of the theme is composed of the clinicians' awareness of their own professional liability. It encompasses the components of the reasoning process that is influenced by the clinicians' awareness of how a decision could be affected by potential litigation.
2. *Patient safety*. This component of the theme emphasises the reasoning processes relationship to what the clinician perceives as the clinical safety of the patient. This differs to professional safety as some clinical questions may extend to what is safe for the patient such as identification of risk of serious pathology.
3. *Accountability*. This part of the theme relates to how safety elements lead to levels of accountability. It relates to the perceived clinician accountability and its development is in contrast to the non-ESP clinicians.

The ESPs provided initial codes that were in contrast to the non-ESP group and possibly shows some preliminary differences that support this type of reasoning. Safety played a greater role in ESP work than in non-ESP practice, and exemplified how these clinicians perceived their role. In all three focus groups and within the interviews, there was emphasis on this aspect, with examples alluding to specific incidents.

The quotes below highlight two examples of safety: One relates to the patient, the other relates to themselves as a clinician. Cauda equina syndrome is a medical

emergency and could be life changing for the patient if not correctly managed (Markham 2004). The clinician is aware of this and therefore it suggests an important role in their thought process. The second quote demonstrates that safety also relates to protecting themselves as clinicians, and their professional status.

> *"In the ESP role it is always cauda equina questions rather, I always cover them, completely all of them."Focus group 2 ESP 222*

> *"…if we get something wrong or miss something then we've got no one else to sort of hide behind." Focus group 1 ESP 698-699*

The ESPs also realise that as ESP practitioners there is a role to play in taking responsibility in a medical environment where in the past, the medical profession has taken the responsibility for the diagnosis of serious pathology. However, physiotherapy has been an autonomous profession since 1977 (CSP 2006), but perhaps the extra perceived responsibility of ESPs is more overt and emphasises physiotherapeutic autonomous practice to a degree that has not been accepted fully since 1977. Therefore, this theme has the two elements of safety and also links closely with levels of accountability. The data below gives examples of each of these processes with more depth. The ESP clinicians speak of the link that accountability has with stress and pressure. The ESPs perceive that they work in a pressured environment and used non-physical ***formal testing*** to reduce anxiety.

> *"I mean personally I think I feel less anxious having access to this. I think I would be more anxious if I didn't have access. So I think I can more effectively help people by having access." SSI 2 172-175*

The clinician above is discussing access to MRI scans. The practice of these clinicians has changed, within the comparative focus groups there was no mention of using scans by the non-ESPs as they do not have access. Therefore, these clinicians base clinical judgements on patients without these investigations, and still deal potentially with patients that have serious pathology. However, as soon as they have changed roles the anxiety changes;

"I mean I think if your first job as an ESP was in a community clinic, you know I think you would just melt. You know you would be so stressed so I think adequate support, adequate infrastructure/ technology so you want to see the images, you want to see the results." SSI 2 298-302

The clinician in this example highlights the potential/perceived stress level differences between the ESP and non-ESP, and how using non-physical ***formal testing*** can reduce this stress. One clinician did relate to this but used their medical colleague to deal with a clinical investigative scenario to help reduce anxiety.

"Anxiety in that I think the pressure is to get it right and things like interpreting bloods I think is a really complex thing that gives me anxiety; well I would be hugely anxious if I didn't have Dr C down the corridor on a Wednesday morning". SSI 3229-232

This is in contrast again to how a non-ESP will deal with the pressure of a diagnosis, they may not have access to medical colleagues, or have the support of a scan, and therefore the reasoning process is different in this scenario. The elements of caution play a greater part in the ESP assessment.

"I am more cautious than I would be in a normal physiotherapy." FG 1 ESP 501

The non-ESP has more time, perhaps a greater chance to explore their hypotheses and has the time to explore patient feedback. They are trying to develop a treatment protocol as against the ESP who in the quote below is doing two things; Firstly checking their safety elements;

"In the first instance you're thinking, "Is this anything serious?" SSI 4 11

Secondly, moving the patient through a clinical pathway;

"In terms of clinical diagnosis and if they have got, you know radiculopathy with imaging then an Orthopaedic option maybe appropriate for them." Pilot FG ESP 260-263

This decision-making links to clinical/patient safety, pathway management and also medical/professional safety. Ensuring not only do they do right by the patient, that they also protect themselves. This was very evident in the ESP data and dominated some of the focus groups discussions.

"So that legally it does and our responsibility to the patient and not to just dump it on the physio department" FG 1 676-677

The word legal is used here, suggesting that pressure is not just linked to diagnostic differentials, and actioning scan reports, but also the professional accountability and perception of the role. An earlier quote spoke of **"**melting**"** when moving into the first ESP role. This is an example of the pressure that they feel, and the possible change in role that they experience. Considering the levels of concern, responsibility, ***time*** restrictions and the perceived change in role, these clinical posts may need high levels of support and governance to ensure these components do not dominate the reasoning processes of the clinicians. If the clinicians are driven by these thoughts, worries and concerns, then it could be argued that this could affect the reasoning process by adversely being the prevalent factor rather than the retrieved clinical data, potentially biasing the impression in an un-helpful manner.

"*So there is a time pressure and I suppose there is a pressure of getting it right as well, so I think it is more of a pressured situation than physiotherapy." SSI 6 113-115*

The quote above suggests ESPs work in a more pressured situation, whilst accountability and worry have also led these posts to be perceived differently from non-ESPs. The profession has been drawn into these roles for a number of reasons. Government plans (DOH 2000) have wished to see greater options for patients, and different ways to deliver services supported by shorter waiting times, therefore delivering cost-effective care. The research base supports physiotherapists in these

roles in terms of their diagnostic capabilities (Hourigan and Weatherley 1994; Weatherly and Hourigan 1998), yet there is a gap regarding what a supported ESP practitioner requires, and what pressure the practitioner deals with. Competency ESP manuals and definitions of ESPs are available (Symes 2009), yet evaluating these highlights that the clinical decisions and the work that they do is not heavily driven by these perceived and identified pressures. The direct effect of these safety pressures on the behaviour of the clinician which could impact on the patient and the local health economy (i.e. requesting scans due to worry rather than clinical need) has yet to be evaluated, and would be a useful adjunct to the support structure that these clinicians potentially require.

Therefore, returning to the data highlights some of the personal elements that influence clinical reasoning; it demonstrates that the ESPs ***internally*** feel that they need to be able to demonstrate certain characteristics well, to allow them to perform the role.

> *"Have to have someone who fairly confident in themselves, they have to approach consultants, they have to be able to negotiate with radiologists about a MRI scan, it takes confident people." SSI 9 112-115*

> *"What I say is, "Worry about the things you can change and that you need to worry about, but the stuff you don't need to worry about, just try and forget it," and I'm very good at it I can do that." SSI 8 197-200*

> *"I think it is letting go and not worrying. I think we've all been there." SSI 7 322*

These pieces of data suggest two supportive components of how the clinicians deal with the decisions they are met with. They have to be confident; they have to use that confidence not to support themselves, so lessening worry. These comments outline a supportive structure of the clinical reasoning model. The model is developed with a further theme which was identified as ***external/internal***.

5.7 External/Internal

Two further significant linked influences on the reasoning processes of ESPs are ones identified as the ***external*** influences upon the clinicians as well as an ***internal*** pressure of justifying themselves to themselves and other professionals. External influences are defined as indirect elements of the reasoning processes such as policy or economics. Internal pressure relates to clinician perceptions of themselves, how they feel the medical world perceives them, and how these elements affect the reasoned decisions. The clinicians in both phase one and phase two recognised that within the extended role there were external pressures put upon them as well as an internal drive to justify their position in a medical world.

> *"Our local policy is driven by our leaders". FG 1 ESP 211-212*

This clinician notes the influence of their managers/leaders in making clinical decisions. The policies surrounding healthcare are perhaps not part of the direct one to one process of making a decision regarding patient-care. In the focus group non-ESPs did not make reference to any component of policy such as financial or governmental directives. This differs within the ESP perception. There was an appreciation of the reality of health-care pressures upon the processes surrounding patient-care.

> *"They have recently started to put the prices of blood tests on our screen." SSI 1 249*

Financial pressures influencing what clinicians do and think about patient-care is well-known to clinicians as local health economics change and drive the care given (Williams 1993). The key factor within this theme is whether these accepted influences really do make a difference within a patient assessment. Questioning whether clinicians allow these pressures to affect them highlighted some interesting thoughts and beliefs.

> *"I did work in an environment once where they were actually trying to restrict the number of X-rays that was not easy to deal with." SSI 5 293-295*

Restriction here is creating pressure. The participant is describing "they", suggesting a them and us relationship, seemingly not overtly collaborative.

> *"No, I think it's just being open and thinking outside the box, but also understanding of limitations in ESP. I don't confess ever to be a medic." SSI 5 308-309*

This emphasises the perceived gap between the ESP and medical community and suggests a relationship between the limitations of ESP work against the autonomy of the medical counterpart. This area of the ESP practice was deemed important by a number of the clinicians.

> *"And knowing that when you fill in a request form for an MRI scan they might get discussed in the Orthopaedic meeting two weeks down the line and it is your request and your name that is there. That for me makes me concerned about the referral." SSI 1 298 -301*

This clinician recognises the potential reaction of their medical counterparts and feels that they are to be possibly judged on the decisions they make. Therefore, the judgements ESPs make will rest on their reflective practice, the patient perception and the medical team they work with.

> *"He and I work very closely together and I don't know whether he gets frustrated, I think he laughs to be honest with you. He gets letters privately from physios who probably operate from the gut feeling perspective and their perspective, instead of saying 'This is a meniscal problem' or 'This patient I think has an ACL deficient knee." SSI 2 264-268*

The quote above links two themes***. Gut-feeling*** and ***external influences*** are mentioned in this data. The ESP is discussing how an Orthopaedic surgeon reacts to non-ESP referrals. The data is disparaging, referencing gut-feeling in a negative way, and also delineating the ESP from the non-ESP. The clinical relationships with medical colleagues have potentially been a perceived hall-mark of how the ESP has

moved away from the non-ESP mode of practice. The quote below highlights this as differential between the ESP and non-ESP clinician.

> *"You know our links with vascular department and neurologists and those kind of things, I think it makes you feel more part of the hospital community almost for the medical community as opposed to feeling like you're stuck in the physio department and everything goes in and out via the GP." SSI 3 362-365*

Having the credibility within a new environment is something that was discussed, and this was a combined element with the acknowledged new healthcare relationships identified above.

> *"Or if you're going to write to somebody's surgeon, you need to be saying what you think it is or you know a bit more about it really. And I think it gives us more credence really as ESPs". SSI 5 297-299*

> *"You've got to trust the people you work with so it is no good in you know the radiologists reporting your scans being less confident." SSI 2 302-304*

The credibility of an ESP is felt to be created via communication and trust. The clinicians feel that they need acceptance in the form of trust. Clinical trust perhaps in this context suggests clinical respect, and as the term extended scope indicates working outside professional boundaries, then these clinicians possibly need to have some form of professional acceptance. The medical community comprising of surgeons and radiologists etc have had their boundaries blurred by the emergence of ESPs and this in turn may have created tensions that ESPs have recognised or perceived. This recognition and acceptance of ESPs needs to therefore be evidenced in the professional relationships that are created.

> *"I think physio has tried to incorporate both medical and the what shall we call it, I wouldn't say non medical, I mean I think it has just moved so far forward to what it ever was." SS 2I 281-282*

The second thematic component noted was the ***internal*** pressures that influence the clinician. The clinicians provided data that suggested an internal stress, potentially created by the pressure of policy, new areas of working, new professional relationships, new patterns of managing patients, and differing needs of presenting patients.

> *"So I think yes. And then time frames of assessing I find quite stressful. I quite often get a headache by the end of the morning". SSI 1 408-409*

A physiological response to the pressures of ***time*** is seen here. The ESPs have less time to make decisions regarding patients. They generally see their patients once or twice. This is in comparison to the non-ESPs who will build up a therapeutic relationship and be able to work with the patient and the diagnosis over a number of sessions.

A further internal influence on the ESP was the concern about losing their skills as a physio.

> *"I mean sometimes I feel like I am de-skilling as a physio. I think there can be a lack of appropriate support" SSI 2 349*

This clinician sees the difference in roles and feels that the ESP practice has altered and is affecting their skill as a non-ESP. They also recognise the need for support and this coupled with a feeling of such a change in practice may very well be stressful and pressured.

> *"So I think I am probably in quite a protected environment in the clinics that I do but I know in the community it is very different and I know they have pressure to refer onto osteopaths equally as physios and use the podiatrists and do this kind of thing." SSI 1 262-265 (community in this context refers to ESP working in a community setting.)*

Working in a protected environment suggests receiving clinical support, and also less pressure. Overall, the ESPs acknowledge pressure. They understand ***accountability*** and its relationship to ***safety.*** They acknowledge the differences in practice and the pressures this brings as well as the time limitation that these clinics create.

This influence of ***time*** has been discussed throughout and underpins many of the processes that affected the ESP and non-ESP reasoning. The model presents the differences between ESPs and non-ESPs in two ways. The processes move from a small thought at the ***prior thinking*** stage, and increases as information is gathered and synthesised. The theme gut feeling is shown to intertwine the processes and also as a pre-decisions theme. This is now considered.

5.8 Gut-feeling

The previous discussion has highlighted the processes and influences that ESP and non-ESP practitioners describe as the framework in which they conduct clinical reasoning. The additional theme of gut-feeling has a number of associative elements that differentiate it from the other themes; these are worth considering and are presented below.

> *"I suppose in a way a diagnosis is a bit of a guess" FG 1 ESP 47*

The above quote is an example of thinking that is in contrast to models of reasoning such as hypothetico-deductive, and the previously identified themes, whereby clinicians may evaluate clinical data and put forward a reasoned, clinically evidenced diagnosis (Crook 2001). The clinician above is accepting of a process that is described as a "guess" but in reality this potentially needs to be based on something, but perhaps it is not obvious where the decision has come from. Therefore this section analyses gut-feeling but also links to other manifestations of the clinical "guess" such as pattern recognition and intuition.

Gut-feeling is defined in this research as a method that is sub-conscious, and causes a reaction to elements of fear and concern. The theme gut-feeling is selected as part of the theoretical model for a number of reasons. It is postulated in this model to have a role in the decision-making of ESPs and non-ESPs as it is presented as a separate mode of decision-making from pattern recognition or intuition. It is also highlighted as a way that ESPs differ from their non-ESP counterparts, and lastly this theme is presented as having an effect on all decision-making processes in the presented

model, from the initial thought, followed by their impression of the patients, to the interpretation of tests and finally to the decision itself.

The term gut-feeling was interpreted differently by the clinicians;

> *"Gut feeling is perhaps just another term for experience isn't it…I can't remember having too many gut feelings when I started working."* *FG 2 non-ESP 513-514*

> *"A good learning tool…." Focus group 2 non-ESP 497*

Gut-feeling possibly could be regarded as an active process and encourages the decisions in all the processes of reasoning. For example in ***prior thinking*** the clinician is making a clinical judgement based on expectation. This is generated through a clinical guess based on a very small amount of clinical data. A referral singularly is not enough to provide a working diagnosis; it is the interpretation of that data against a belief system that primes the clinician;

> *"I think before you see the patient you pick up the referral and it might be a gross mistake sometimes, but you pick up the referral, you see what's written and you look at the age and you start thinking is there something that fits potentially with the patient"* *NMS FG 2 141-144*

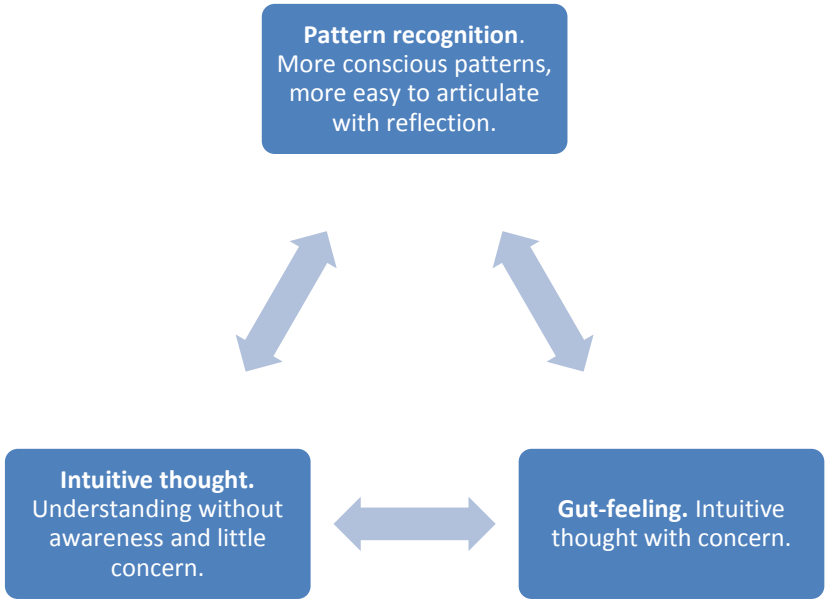
It is difficult to say whether this is pattern recognition, gut feeling or intuition. Therefore, before exploring the theme further, these descriptions of clinical interpretation and their relationship to gut-feeling are discussed in more detail.
The terms pattern recognition, gut feeling and intuition all suggest elements of subtle knowing within a decision-making framework (Stolper et al 2010). To fully explore this requires a discussion that contextualises these methods in line with the clinicians need to provide clinical "evidence" for the decisions that they make.
Although decision-making has been defined simply as" choosing between alternatives" (Deber and Baumann 1992), this does not reflect the possibility of decisions happening at a more sub-conscious level. The process of choice without the clinician consciously considering the alternatives and all factors such as the patient as

a person is an area that has less structured evidence and support for it as a method. Therefore, any definition that describes the course of conscious action of choosing as the only significant cognitive process, does not fully explain all of clinical practice (Dewar et al 2009).

> *"I would interpret gut feeling more along the lines of I am suspicious there is something sinister going on almost but in answer to your question, I don't tend to act on gut feeling or I don't perceive that I act on gut feeling. I think I would view it more that I act or react in a precautionary way so I would say well clinically this doesn't add up, therefore I am going to follow X, Y and Z to work out what is going on with the patient." SSI 2 252-256*

Pattern recognition could be argued to be more conscious than the other two as they are formed by patterns that the clinician when asked, could easily articulate and therefore also be able to justify in line with protocols or guidelines. The diagram below represents the three groups and the differentiations.

figure 24 – differences in non-analytical reasoning between three different descriptions



As suggested, prior thinking incorporates the use of a gut feeling, the clinician is clinically suspicious and the task of clinical assessment will be linked to that suspicion;

> *"In clinic the clinical reasoning process is on going from the receiving of the letter all the way through because you all the time stay on your toes, the questioning in the interview that's your clinical reasoning going on in your head all the time, it never stops" FG 2 ESP 153-155*

The clinician describes "staying on toes"; this suggests being alert and possibly suspicious indicating a similar context to gut feeling. It also suggests that process never stops; being alert is a process that is possibly ongoing.

How clinicians interact with the patient is cited as a component of the theme that both groups utilised. The clinicians use experience, first impressions, and questioning their pre-judgements;

> *"I think its got to be variable because sometimes you have also got to take the patient into account you know their, what they think their feelings about things as I think sometimes we are very easy to prejudge with our experience" NMS Pilot FG non-ESP 52-55*

> *"We make first impressions of people when they come in, this persons in pain, this persons fed up, from their expression, they are gonna make the same decision about you, this patient wants to be here, doesn't want to see me, they're are fed up, that's gonna affect how open they are with you, and how much they trust you" NMS Pilot FG non-ESP 358-361*

The clinicians are describing ways in which ***formal assessment*** procedures are not used whilst the method of cognition is suggested as a more automatic/intuitive rather than deliberate, rule-based and analytical process (Bleakley et al 2003). The clinicians take what they experience with the patient yet use fast initial, automatic feelings to help verify the processes. This underpinning continued into the formal testing theme.

At the point of formal testing the theme of gut feeling potentially influences the choice and application of the test itself. Although there are differences in tests available to ESP and non-ESPs the utilisation of gut-feeling is still apparent in both groups;

> *"To kind of either prove or disprove those things or you may actually end up deciding something completely different but again your previous experience and knowledge base that you have are gonna have to feed into that to then decide" NMS Pilot FG ESP 44-47*

> *"There is that possibility but yet when we do the interview and assessment we kind of either prove or disprove the original pre-judgement" Pilot FG ESP 101-103*

The previous experience and knowledge balances against the choice of the test, the pre-judgment (possibly a gut-feeling) is then used as a provable or disprovable trigger for the tests chosen.

> *"When I am in an ESP clinic I'm just thinking very simply is there red flags here, anything sinister and if there is that's for investigating" FG 2 ESP 342-344*

The clinician is describing finding something sinister which creates a sense of reaction to investigate. This contrasts with how a non-ESP reacts to the concept of gut-feeling where the reaction is related to instinctive thought rather than worry or fear of something sinister. The clinician below has used the words instinct and recognise. The clinician (when asked what gut-feeling was) described/used "experience" and "prediction/recognise", two words suggesting the elements of pattern recognition and intuition rather than gut-feeling, but also linking to ***prior thinking***. Therefore, this could be the difference in terms of the description of sub-conscious thoughts.

> *"Experience, I think the more patients you see you can predict a clinical picture and then you get this, there's also instinct you can tell the patient which I think*

is going to do really well and you can give a quicker prognosis versus the ones you think I'm going to have my work cut out here, it's going to take longer, psychosocial factors, its difficult to pin point ……. you …… kind of recognise." non-ESP FG 2 438-442

Evaluating when gut-feeling occurs is difficult to calculate or explain. It seems there is a natural drift towards this type of process that the clinicians were not aware how, when or in what capacity this happened. It seems possible it occurs throughout the decision-making process. It also seems sub-conscious, related to concern and safety.

"I can't learn gut feeling, so I don't know, I think maybe gut feeling is the things that we identify but don't, aren't conscious that we've identified them maybe." SSI 3 148-151

"There must be a kind of physical or there must be signs in the presentation that are giving us that gut feeling but maybe we just haven't consciously identified what they are." SSI 3 153-155

This suggests that the clinician here recognises something happens in the identification of something relevant, but it is at a sub-conscious level. Something in the presentation could mean in the clinical interview or the physical examination. This level of thinking may induce an action or reaction, and the stimulus links potentially with an autonomic, but un-explainable sense of "something wrong";

"And I can't explain it, it's the way they look, it's the way they are answering the question and there's still something about them that you're concerned about." SSI 127-129

If something in the way the patient presents triggers a response, then this is likely related to two elements of clinical thought, associative memory and elements heightening concern and worry. It triggers past experience, **prior thinking** and heightened anxiety. Clinicians in the ESP environment frequently discussed the worry and **safety** aspects of their practice. This featured strongly, and is discussed below, and although the reasons for this are likely driven by the need for justification and

working in a defined out of scope role, the possible cognitive drive to this is the physiological response to a fear. This links to a fear of missing something, a fear of reprisal, possibly a fear of serious consequence. The **safety** theme below looks closely at this, but the gut-feeling theme links well with this also. The quote below states gut-feeling as an "important intuitive feeling", and this linked with the physiological responses and possible associative memory is potentially the entity that best describes it.

> *"Oh massive, I make decisions completely on my gut feeling I think it an important intuitive feeling, it makes me think about what could be going on." SSI 9 28-32*

> *"I'm a great believer in gut feeling and I've had quite a few nasties that have come into my ESP clinic and looking back, the patient's looked unwell, there's been something that's not right and you can't try and fit it into a box or something, it aint going to fit." SSI 190-193*

The clinician who discussed the "nasties" represented gut-feeling as an important safety feature. The clinical component that they need to explore relates to **safety**, which is a support for the overall diagnosis. Both lead to an action, but the gut-feeling element leads to precautions and reactions to what might happen if they do not act or be seen to act appropriately.

Clinicians in both study groups discuss the elements of gut-feeling or intuitive thoughts in terms of its scientific legitimacy, and medical justification for practice. Benner and Tanner (1987) was one of the first nurse theorists to highlight the relevance of intuition. The perceived lack of scientific rationale behind it may leave some clinicians uncomfortable in suggesting it has been used when making a clinical decision. An example of this from the data is seen below.

> *"I think officially gut feeling doesn't necessarily play a part but I think unofficially we use gut feeling all the time." Pilot focus group ESP clinician 230-231*

This highlights the concern of clinicians when they feel they should not be seen to be basing a decision on gut-feeling. It also recognises that clinicians use it all the time,

suggesting it plays a part in all aspects of the reasoning process. This is acknowledged in the literature as it has been shown that experienced nurses develop comfort in their use of intuition which is based on personal knowledge and experience (Jacavone and Dostal 1992). There seems to be a reticence in some of the ESPs to accept gut-feeling as they view it as possibly a less scientific process.

> *"Yes, I don't really like it because I worry that I haven't got that gut feeling, I'd rather pin it down to some kind of thing that I can you know." SSI 3 145-151*

> *"You can't just hang your hat on one bit. I'd be stupid to hang my hat all on my gut feeling, I need to be taking some things that we're learning and what I've learnt and what you read isn't it, so it's a combination of all of those things really." SSI 5 168-172*

These clinicians present gut-feeling with a negative response, elements of discomfort are obvious. Pattern recognition seems more comfortable than gut-feeling, and demonstrates that these methods of thinking are perceived differently.

> ***"****So I think I use pattern recognition quite a lot but I think I do that because I have been a physio for a long time and there is lots of different things I have seen but I still try and keep an open mind." SSI 1 134-136*

> *"Patterns are information that you either see or hear from the patient to help you fit things together in a way that you would expect to gear you towards certain pathologies." SSI 138-141*

There is a mixture of opinions between the ESPs and non-ESPs regarding the relevance and use of gut-feeling with some suggesting it was not "official" but all agreed it was apparent. The clinicians had discussed patterns, intuition and gut-feeling after reflection and, this part of practice seemed to have a role in how they use these modes of practice.

"But then you are consciously competent, you are then unconsciously competent and you just really jump forward, ESP clinics don't do much assessment, we don't need to" FG 2 ESP 100-103

The ESP is suggesting that due to experience and perhaps knowledge that decisions are made without the assessment skills. A high degree of confidence is shown. This is in some contrast to the non-ESP below who provides a number of assessment procedures that they may wish to use;

"You wouldn't do a neural test on everybody, well I wouldn't unless …. There were reasons to do so but then if you are getting the result, not the results you want but if you are getting answers to what you are looking for with just the standard test you might stop there where as if they are a bit difficult to find the symptoms then you might go into the combined movements overpressure, all these sort of things just trying to push the patient harder or put them into some other positions that they've said to you that they don't like" NMS FG 2 non-ESP 303-307

There is a sense that although the ESPs are comfortable with gut-feeling, they are not happy to be completely reliant upon it. The quote below highlights this and there is recognition from the ESP that it exists, tension that it shouldn't be relied on and a need to still analytically confirm it. The non-ESPs did not refer to gut-feeling as much and this maybe due to less stress and pressure they perceived themselves to be under, but the ESPs were definite that is existed but were not really sure in the context in which it should be viewed.

"We shouldn't really rely on gut feeling, they should be confirmed" Focus group 2 ESP 544-546

As an entity, gut-feeling is apparent as an integral part of the reasoning process and is separate from other modes of sub-conscious decision-making. It separates the ESP and non-ESP and with the transition of non-ESP to ESP a common pathway it would seem appropriate to recognise this for future clinicians and current professional review purposes. The diagrams presented at the end of this chapter are simple

pictorial descriptions of the models and components. The differences applicable to ESPs and non-ESPs are described in the findings and analysis as is the relevance of gut-feeling, but it was felt helpful to see this visually for greater understanding. It presents the themes with the component of gut-feeling as suggested by the data.

5.9 Time

This theme has been embedded in many of the other themes presented in this section. Much of the data suggests that time is an issue in clinical reasoning. The building of non-ESP rapport was noted to require time over a period of patient treatments, versus the ESP who only sees the patient once (see 5.3 patient interaction). It was also discussed as part of the external/internal pressures (5.6) that ESPs find themselves under, the role has high consequence and with the time being limited the data expressed that ESPs find this difficult to deal with;

> *" And then time frames of assessing I find stressful" SSI 1 409*

The ESPs are differentiated from the non-ESPs by time, the consequential pressure and also the requirements of the role, which in many cases is a diagnostic triage approach that is asking for different elements of the patient presentation. These different elements play a part in the ongoing understanding and appreciation of the patient which the ESP may not feel they are able to ascertain;

> "*At the end of my physio session and when I reassessed her I noted significant muscle imbalance and really work on core etc etc. is going to be completely different to what I diagnosis in the ESP clinic which was she was hypermobile with mechanical back pain which was very clear cut but didn't tell me anything as a physio to what was really going on and how I was going to treat her*." FG 2 ESP 354-358

This quote highlights one of the differences that time can bring, the ability to treat and reassess. The ESP in this quote is discussing their time in non-ESP practice and explaining the differences in thought. The reassessment of a patient is a primary

feature in a hypothetic-deductive approach, whereby hypotheses can be tested; this is where the ability of treatment outcome to support the hypotheses is potentially so valuable and where ESPs may miss out. From the data in 5.4 it became apparent that some ESPs put huge faith "absolute confirmation" into the results of scan, which may in a small number of cases direct treatment, but in 85% is unlikely to (NICE 2009). Therefore, the value of time is not available in the case of non-specific mechanical LBP which is identified by the negative findings in the formal radiological testing procedures. This leaves the ESPs giving a diagnosis of non-specific mechanical back pain without the opportunity to explore this further with treatment and ascertain whether this was the case. The strength of supporting the diagnosis with data retrieved over time is demonstrated in this quote;

> *"You always get the surprises don't you, you get the patient that comes back and is 100% better and you look at the kind of history, how's that happened, in theory he shouldn't have done that vice versa the ones you expect to get better a lot quicker don't so it's very difficult to really predict"* FG 1 non-ESP 450-453

Without the ability to see change over time it makes prediction difficult which is why experience is perceived to be so important, and why the ESPs rely more on gut-feeling to help with the diagnostic prediction. Overall there are a number of themes that have been identified for both ESP and non-ESP practice. The relevancy of the themes is different in the two groups; this has been discussed and is highlighted in the figures below. The diagrams below are simple pictorial descriptions of the models and their components. The differences applicable to ESPs and non-ESPs are described in the findings and analysis as is the relevance of gut-feeling, but it was felt helpful to see this visually for greater understanding. It presents the themes with the component of gut-feeling as suggested by the data. By demonstrating both models it allows the reader to see the differences and highlight the research question.

figure 25 – final pictorial version of ESP clinical reasoning in the assessment of LBP.

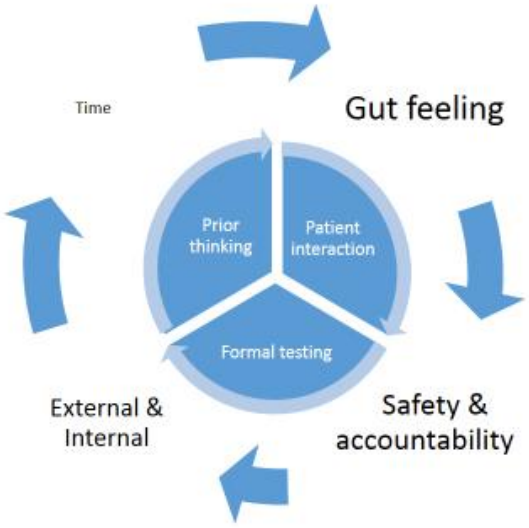
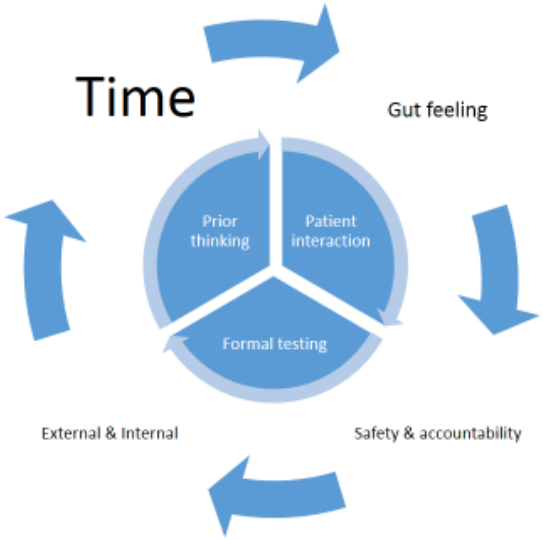


figure 26 – final pictorial version of non-ESP clinical reasoning in the assessment of LBP.



The two models above show the processes of clinical reasoning in the ESP and non-ESP data. The differences seen help answering the research question. The depiction of the central process is very similar, but the ESP has greater safety/accountability,

gut feeling and external/internal pressures. There is also the lack of time associated with these clinic assessments. The process is presented as two cycles. The three components (Prior thinking, patient interaction and formal testing are then influenced by the other four themes that also show how ESPs differ from non-ESPs and so enable the reader to see the model with clarity.

5.9.1 Reflection – personal biases

Taking into account my own background as an ESP and physiotherapist, whilst considering the focus groups included participants that knew me professionally, it was felt appropriate to address this and explore the potential effects and biases this may have on the analysis. As a clinician that has an interest in clinical reasoning, I have already inherently been influenced by my professional background, previous mentors, my own self-directed learning and patient contact. This in essence led me to want to explore the process in which reasoning is completed. I had to be mindful of my own beliefs and the effects that may have on the group dynamics and individual responses. The observer data from the two main study focus groups were reviewed. The observer made comments on the interactions as well as my own perceived influence on the dynamics.

The first group completed at a secondary care setting was affected by my behaviour, for example non-verbal nodding when I seemed to agree with what was being said. Evaluating the observers notes it is possible to see a number of trends within the interactions that stood out which requires discussion.

The observer noted that on five occasions, the participants were really directing their answers to me rather than to the group. This then reduced the benefit of the focus group dynamic and lent itself more to a semi-structured interview. The other participants were then less likely to offer an opinion, as the conversation was in one direction and as a facilitator, I needed to reduce this, and aim the questions at the group. The second trend that was noted related to my own body language. It was suggested that on a number of occasions I nodded throughout an answer. This then gives the group a non-verbal cue regarding my own beliefs and perceptions, which I

wished not to do. The reason I felt this was necessary was to encourage an answer and also to look interested in the participant, whilst also demonstrating to the group how important I felt their response was. I should have done this with far less obvious posturing, and reflected that whether I agree or disagree I need to hide that opinion whilst still providing an encouraging environment for the answer. In combination with the nodding it was also on four noted occasions that I said "yep" when responding to an answer. This verbal response in combination with the non-verbal nodding is committal, and is an obvious position in my thinking leading to further influences on the group. They may not wish to disagree, or may agree when perhaps they do not.

The third trend noted was my use of summarising what participants had said. This may lead the conversation and may influence participants further thoughts, it may not be accurate and unless the participant confirms that the summary is correct then this will influence to proceeding conversation. The final trend highlighted was a further non-verbal facial expression. It may have intimated agreement, disagreement or mis-understanding. On reflection I feel that these were probably a reflection of my own internal thoughts on the running of the session, how to structure the next question, rather than a response to the participant, although smiling I felt was important to encourage the right tone for the group.

These trends were considered and it was a secondary aim for the next session to reduce these effects on the group dynamics. In evaluating the second main study group it became more apparent that there was more group interaction rather than directing the answers directly to me. This may have been the individuals themselves, perhaps being more comfortable to discuss points of interest rather than answer my questions, but I had aimed to lessen the direct questioning and keep it more open. I also worked hard not to nod or offer obvious verbal encouragement, I left longer pauses and was more comfortable with gaps in the discussion allowing participants to answer with les prejudice.

Being acutely aware of my professional relationships with the participants would have influenced how the questions and answers were delivered, yet perhaps this is not a wholly negative aspect. There certainly seemed to be a comfortable environment in the pilot and two main study groups. Feedback afterwards consisted of comments

relating to how much it helped their reasoning skills, that the groups are something that they would like to use for further teaching, and also the benefits of hearing other points of views that they were not aware of. From my own perspective, I enjoyed the interaction, and this was something that perhaps came over too strongly in the first main study group, I gained an insight into my own influence on others, and also could see the usefulness of the groups as a teaching aid for clinicians in the future. I also recognised the level of concentration required for this type of group. It was a challenge to listen without influencing the interaction, whilst also interpreting what was being said and then linking to my next question. This required me to think ahead at the same time as listening in real-time, which under these new circumstances was something that I enjoyed but also found to be a skill that needs further work.

The second phase of the data collection did not have an external observer, but over the ten interviews I felt my technique of interviewing improved, although this was familiar environment to me as a clinician. The differences centred on once again not influencing the responses, guiding the participant whilst also allowing the conversation to move across topics. This was enjoyable and the gaining of the data in this environment was also useful for me as a professional. I was able to take these experiences into my clinical and managerial roles.

Chapter 6: Discussion

6.1 Introduction

This research addressed the research question: What are the clinical reasoning processes of extended scope physiotherapists assessing low back pain? This discussion reviews the conclusions from the finding, and compares it to current models of musculoskeletal physiotherapy practice. It highlights the advancement of knowledge surrounding this area that this research has delivered, and places it in context to clinical practice and future research.

6.2 What this research has identified

This research has identified a number of components surrounding clinical reasoning in the assessment of low back pain. It was designed to analyse the clinical reasoning of ESPs in the assessment of LBP, and make comparative reference to LBP reasoning in non-ESP practice. The research has provided a theoretical model that firstly identifies the clinical reasoning of ESPs assessing and managing LBP, whilst also comparing and contrasting this to non-ESPs. By doing so, this has given a new perspective to clinical reasoning in the ESP musculoskeletal physiotherapy management of LBP.

This research has provided some original components to reasoning that challenge current thinking, and provides new insight into the complexities of clinical thought and judgement.

The research therefore provides a novel model for practitioners, students, lecturers, mentors and health managers that challenges current thinking; it also enables the health professions to examine ESPs in a new and developed manner by creating a greater understanding of how they differ from physiotherapists working within their scope of practice. The research presents the processes of reasoning that can be

explored, reviewed, challenged and yet applied to clinicians working across musculoskeletal physiotherapy, and especially in the management of LBP.

The findings challenge recently held beliefs that physiotherapists approach patient care in a certain way, perhaps a certain protocol (CSP 2006), yet possibly this belief is incorrect, and this research will enable further research to extend the examination of how clinicians structure and construct a clinical assessment.

In summary this research has;

- Produced a theoretical model of clinical reasoning for physiotherapists assessing low back pain.
- Challenged current models in musculoskeletal physiotherapy.
- Given support for the structure surrounding competency, governance and training for ESPs.
- Produced research findings that will generate further work.

These factors will be discussed in greater depth below;

The hypothetic-deductive model tests against an hypothesis, but selecting the tests from prior thinking is pattern related as test selection is a choice based approach upon a perceived pattern, learnt, read or experienced. Jones and Rivett (2004) presented this mechanism of hypothesis testing and added capability and participation /restriction as a "new component".

This deductive screening model presented by Jones (1995), although similar in the assimilation of information via previous new data, differs in a number of ways from the current research model. It should be acknowledged that this model does not relate to clinicians in ESP roles but is similar in that both involve musculoskeletal physiotherapists potentially both assessing LBP. Therefore, a full comparison is not possible as the presented research is new, and a previously-constructed model is not available.

Safety and accountability in the current model plays an important part in how the clinician thinks about the patient but also considers the importance of their role and levels of accountability, affecting the clinician leading to higher levels of anxiety. This element of self stress and pressure is not acknowledged by Jones (1995; 1997), Butler (2000) or Jones and Rivett (2004) and it should be highlighted that these three models are presented as reacting to the patient data only, not the clinician's concerns or self-pressures. There are some acknowledgements regarding the influence of external and internal elements that primarily relate to the clinician's own internal beliefs system, and the external environment, but there is little consideration to how these themes may adversely affect the clinical reasoned outcome. The expectation of the clinician in the ESP environment in the current model links closely with how the patient perceives the clinician as well as the pressures of working outside their traditional scope of practice. These elements are not addressed in the literature and possibly they apply primarily in an ESP setting as the current data highlighted the evidence via the ESP group rather than non-ESP group, and this would explain a lack of reference to this as a theme in other previously presented models.

The levels of accountability in ESP practice in the current presented research were possibly attributed to the greater costs associated with these clinics i.e. having access to resources such as MRI scanning. These costs will create a different dynamic, as expectation from the clinician to use what is newly available to them may create a differing thought process as seen by the external influence theme in the current research, whilst the patient may also be expecting these tests to confirm the diagnosis.

The patient will potentially have an expectation that is different from when they see a non-ESP physiotherapist due to the term specialist/advanced practitioner or extended role, but this would need further exploration. ESPs work with medical colleagues and within pathway protocols (CSP 2006), which may lend consideration and thoughts about the patient to have a greater emphasis on how current policy, economics, protocols and other interested "parties" , such as radiology, may affect the reasoned decision regarding management. Stresses created by these factors lead to the internal influences that may not be the original belief systems of the clinician about best care, but possibly adopted approaches that have adapted to the external pressures such as

economics, and so are distinct from the previous models of internal thoughts from a clinical perspective.

Therefore, the current presented model offers greater insight to the external and internal elements that may be playing a part on clinical reasoning during these clinics. When reflecting on why a decision has been made, it perhaps needs to be acknowledged that the working conditions, clinical support, clinical (medical) mentorship, economics, and service/ user expectations could all play a role in how the decision is made.

6.3 Comparing the presented model to hypothetico-deductive, pattern recognition and narrative reasoning.

Taking these elements into account and suggesting that this is a current model for ESP practice in the assessment of LBP requires this model to be compared to previous musculoskeletal models of thinking (as compared to the process comparative description above) in physiotherapy. The **hypothetico-deductive** model requires the clinician to produce a hypothesis that is then tested to produce a working diagnosis (Patel et al 1997). In doing so, the clinician develops an understanding of the patient and in a deductive way works backwards from a series of possible hypotheses before settling on one of best clinical evidence. The current model provides much of this model, the prior thinking mode is one that develops thoughts generated from prior knowledge, experience and patient data before the patient is interacted with. In making use of illness scripts or **pattern recognition**, the clinician recognises certain features of a case almost instantly, and this recognition leads to the use of other relevant information, including “if-then” rules of prediction via the clinician's stored knowledge network or memory (Banning 2008; Doody and McAteer 2002). This form of reasoning moves from a set of specific observations toward a generalization and is known as “forward reasoning (Higgs and Titchen 2000 23-32). Forward reasoning contrasts with hypothetico-deductive reasoning where a person moves from a generalization (multiple hypotheses) toward a specific conclusion (Arocha et al 1993).This could be argued to begin a deductive process but it has the use of prior

knowledge and therefore it should be acknowledged that prior patterns are also used in a way that supports hypothetico-deductive thinking (Noll 2002). This combination of thought is expected as the ESP clinicians are experts/advanced practitioners and the literature strongly advocates pattern recognition as a marker of this practice (Curran 2006). Therefore, these two well accepted modes of reasoning are fairly embedded in the current models themes of prior thinking and formal testing. A further acknowledged method of reasoning discussed within the literature review is narrative reasoning.

Narrative reasoning is defined in the literature as seeking to understand the unique lived experience of patients that could be termed "the construction of meaning." (Edwards et al 2004). This has been identified in a number of studies that looked at understanding the patient within their presentation from either a physical or functional perspective (Mattingly 1991; 1998). This form of reasoning is comparable to the current models' theme of patient interaction, and allows for the patient needs, attitudes, behaviours, fears and requirements to be assessed (Waddell et al 1984). This form of reasoning that seeks to understand the "person" therefore links to the psycho-social component of the bio-psychosocial model and is relevant when gaining an understanding of the patients presenting condition. This well accepted model above whilst linking with narrative reasoning is also explored by the ESPs and plays a key role in the development of rapport and patient interaction which was deemed vital when making judgements under the pressure of time. Therefore, ESPs may need to access this model quickly as they have reduced time with the patient but need to find strategies that will enable them to understand the patient and the links to their pain. This speed of understanding also was felt to help with ensuring that nothing was missed, and linked therefore with safety and accountability.

Safety and accountability played a role in the ESP model of reasoning. It played a part in the reasoning of these clinicians due to the extension of their role outside scope and this created anxiety and pressure due to the safety components to the job. This is comparable to the Jones et al (1995) model which encompassed the elements of precautions. Where the current model differs is that Jones et al only make reference to the precautions for the patient and not how this may affect the accountability of the clinician. This is a vital differential when taking this new model in comparative terms

against current thinking. There is little mention in the physiotherapy musculoskeletal literature that references how accountability and the requirements of safety could bias a clinician. It could inhibit thinking, whilst stress and anxiety may, as it is argued in the literature surrounding fast-intuitive thinking, enhance a cognitive process (Critchley et al 2009), but conversely there may be elements of personal stress that prevents clear rational thought. Even reviewing a complex clinical reasoning model developed by Jones et al (1992) does not make reference to accountability and safety of the clinician, and furthermore gut-feeling.

Therefore, when trying to reach a diagnosis, it should be acknowledged that the pressure and the accountability status of the clinician may play a part in the outcome of the decision made. Gut-feeling was well recognised in the current model; however the current literature in physiotherapy does not seem to accept this as a legitimate process. Although widely discussed in the medical field (Stolper et al 2009) gut-feeling or intuitive thinking is perhaps only driven under the banner of pattern recognition, which possibly is inter-linked with hypothetico-deductive thinking. For example, driving a diagnosis deductively has to have some understanding of how clinical data fits, and so this type of illness script is the deduction, it is just a number of linked deductions that make a pattern, which has been learnt, taught or experienced. Pattern recognition must have a process of selecting which pattern fits and so this is deductive, perhaps they are not so distinct. The important differential from this current study is the appreciation and acceptance of gut-feeling as a method that should be considered in the teaching and reflection surrounding clinical reasoning. The main methods of reasoning in physiotherapy fail to recognise this as distinct, sub-conscious, visceral response of heightened awareness to a clinical stimulus.

This links with accountability and safety and perhaps as physiotherapists move into greater extension of their roles into medical environments, then the reasoning processes will look similar, therefore reflecting why gut-feeling in medicine and intuition in nursing have greater credibility. The final component of internal/external influences is noted by Jones et al (2008) as primarily the external influence but the elements of clinicians' beliefs and personal values within the political and economic clinical pressures must also be accepted, certainly as a factor in possible clinical error

needs to be acknowledged. The reduction of diagnostic error is relevant to all clinicians and in musculoskeletal physiotherapy: researchers have attempted to reduce this by the application of clinical prediction rules. These are discussed in more detail below and are compared to the current model.

6.4 Comparing the current model to clinical prediction

Clinical prediction rules are fast becoming accepted methods of making judgements regarding patient care (Laupacis et al 1997). These rules sit in musculoskeletal physiotherapy and in LBP, an example is seen below.

figure 27 – Clinical prediction rule for lumbar spinal manipulation

Criterion	**Definition of positive**
Duration of current episode of low back pain	Less than16 days
Extent of distal symptoms	Not having symptoms distal to the knee
Fear avoidance beliefs questionnaire	Less19 points
Segmental mobility testing	1 hypomobile segment in the lumbar spine
Hip internal rotation range of motion	>1 hip with greater than 35 degrees on internal rotation range of motion

Childs et al (2004)

This type of reasoning seeks to select the common variables in a patient presentation to therefore predict who will benefit from a treatment. It could be argued that without an algorithm of thought, questioning and reassessment that this type of thinking is reductionist pattern recognition. It may even be considered as a given protocol without thought perhaps, such as a "recipe". This reasoning lacks the depth of Jones (1995), Edwards et al (2004), Smart and Doody (2007) and fails to reflect the clinical practice of thought. It delivers uni-dimensional diagnoses without due care and attention to the multi-factorial nature of the patient, the clinicians' cognition and emotion, and the interaction between the two parties. Therefore, the current model is not comparable to this type of reasoning and delivers a different approach, i.e. not directing treatment but giving a rounded view to allow for tailored care. One of the major features in how the current model challenges all the above described models is

the identified theme of gut-feeling. It is felt to differ from other fast sub-conscious reasoning into a separate mode of thinking and this argument is now considered.

6.5 How gut feeling differs from intuition and pattern recognition

In the current study, the theme identified as gut-feeling is one important component that separates this model from others previously identified. The evidence presented suggests it has an important role linked closely with fear, safety and accountability. This cognitive/visceral process potentially differs from the recognition of patterns and intuition due to the sub-conscious drive that potentially creates a physical reaction in the clinician. This visceral sense is relevant to the current model as the data links with a feeling, a physical reaction to a clinical decision. This is presented to differ from intuition, which was not really described by the ESPs and so therefore is not presented in the current model. Intuitive judgement has been described as forming ideas or opinions without an awareness of the process that leads to them (Hammond 1996) such as knowing when someone is likely to do well with treatment without clinical data to support that assumption.

Gut-feeling is therefore now presented as a component of reasoning that may be due to the physicality of reaction it creates, based upon the findings from the current studies. This has also been recently suggested in work analysing doctors assessing patient cases. The theme of gut-feeling was highlighted as a mechanism for describing unease and a signal to be more deliberate in decision-making (Wooley and Kostopoulu 2013). The heightened awareness of internal stresses and reactions therefore link with the themes of safety/accountability and internal influences. These also potentially interlink and give greater context to the prior thinking, formal testing and patient interaction. These processes are very conscious and remain so throughout the examination. The context of the clinical data received by the ESP initially manifests itself as a formal clinical diagnosis which is then driven by being safe, ensuring accountability, and concern for patients plus their own clinical practice. This balance of data is then contextualised within the framework of gut-feeling giving the clinician a sub-conscious marker of right and wrong. It is also important to consider when gut-feeling could occur in a patient examination. Perhaps on receipt of a

referral, the clinician is informed of a past medical history that suggests heightened awareness is needed. Through the patient interaction and subsequent testing the patterns, clinical presentation and test outcomes may trigger a response at any time. This might be because it makes sense and has triggered an "episodic memory" pattern that has been experienced before, and this raises the levels of stress and anxiety. On the counter-side to this, it may be due to the clinician not being able to work out what is wrong and this raised worry and emotion could be unhelpful when trying to access a more rational, structured deductive approach as they may have encountered such a presentation previously.

It is possible that what is seen when less experienced clinicians are unable to provide potential diagnoses and have encountered a cognitive "block" which has meant that the fast intuitive/gut feeling system has over-ridden any structure to the examination. The clinician has become far more consciously aware of the visceral responses of stress that has become dominant. The nature of the ESP clinics could lead to this state due to the levels of accountability; which is now considered.

6.6 The relevance of gut-feeling in a modern healthcare setting

Gut-feeling was identified as a theme of interest and discussion as it challenges current physiotherapy models of reasoning. Jones (1995) suggests the clinical evidence should allow the clinician to sub-group the clinical presentation into specific categories of clinical reasoning. It is suggested that populating these categories with clinical evidence underpins the justification for a clinical decision. The medical community has provided literature that acknowledges gut-feeling (Stolper et al 1996), yet physiotherapy has a residual preference for pattern-recognition as the fast, sub-conscious process of reasoning. The argument surrounding how they differ is provided above, yet it remains a potential challenge to acknowledge this within the clinical practice of physiotherapy. The current data suggested that clinicians were somewhat reticent to recognise the process publicly but realise personally it was "massively important". This runs counter to the current evidence base that suggests that musculoskeletal physiotherapy has forms of reasoning that are legitimate as they have identifiable clinical evidence to support them. Pattern recognition, although

suggested as non-analytical, still links clinical patterns to memory in a way that with reflection can be simply verbalised. Gut-feeling has a deeper physical and cognitive response and is less easy to legitimise or verbalise. Therefore, the argument for relevance is available when we perhaps use visceral, physical responses to guide a decision, whilst safely drawing clinical conclusions. When deciding how to integrate this into practice the remainder of the proposed model is far less challenging and the components can used to access thought processes and to utilise effective reflective practice. Gut-feeling is less accessible but in an ESP environment it seems that it is vital, and so this means that clinicians, mentors and educators should look for ways to bring this sub-conscious decision-making tool into a conscious reflective environment. Indeed, it deserves its own category when populating a clinical reasoning model, and possibly needs to have this prompt not only at the end but as the data suggest, throughout the reasoning process. As a profession it would seem necessary to recognise its value and have it explicitly highlighted when evaluating a clinician's reason for a decision.

6.7 The stress of the ESP environment: possible effects on clinical reasoning

Stress in a clinical environment was recognised in the current study as relating to not missing a pathology, being held accountable and being "where the buck stops". The clinicians felt that they had to be vigilant and mindful; they discussed processes and finding serious pathology as part of clinical reasoning. Previously, the discussion has looked at visceral responses to feelings of right and wrong, yet this tended to be swayed towards finding something serious. The data suggests strongly that this plays a part in how an ESP judges themselves (internal influences) and how they perceive their role to deliver. This potentially has a number of effects and is born due to a number of reasons.

The historical perspective of ESPs stems back over 20 years and especially since the department of health published "Meeting the Challenge: a strategy for the allied health professions " (2000) ,nurses and allied health professions have adopted new roles, utilised new skills and worked in new environments as part of the expansion of

their practice. The initial drivers to this expansion in musculoskeletal physiotherapy were the long orthopaedic waits, and the need to reduce to the work load on doctors (Byles and Ling 1989). Physiotherapists and other allied health professional therefore began to work in a medical environment taking a similar level of responsibility as their medical colleagues.

This change of approach from the therapeutic roots of physiotherapy has possibly seen an increase in pressure, as identified in the current data. Why this is so would need further data collection and analysis yet some theoretical reasons can be surmised. Working in a new environment is classically stressful and perhaps puts more strain on clinicians but it would seem likely that this would settle over time. Trying to ensure that clinicians never make a mistake is possibly a more likely reason and this maybe for four answers to this. Firstly, expansion of practice possibly brings less support (less people in the role to support), less evidence of clinical effectiveness (little research), and greater scrutiny from therapy and medical colleagues alike (expansion of practice).

The second reason is time. Time was a noted factor in how the ESPs differed from the non-ESPs. The non-ESPs provided an assessment and following treatment to re-evaluate and re-appraise for interventional change or signs that perhaps clinical responses were not as they seemed. The ESPs did not have this facility, they had to make a decision and select a management plan within one session, creating a tension in generating a diagnosis, and also putting the pressure on not missing something relevant. This leads to the third reason which was the management plan itself. The costs of these plans such as referral for MRI, injection, consultant opinion is far greater than a physiotherapy review. Therefore, over-seeing a patient in a non-ESP clinic is not that costly, whilst an un-required MRI is (approx cost NHS £200). With the noted external pressures as a theme, it would seem the clinicians were aware of this, and not only were they felt to be held clinically accountable; they noted that they were perhaps economically accountable also.

Lastly, the non-ESPs felt that if they did not know what to do or offer regarding a patient then they had the facility to refer on to their ESP colleagues. As described above, the ESPs felt the “buck” was felt to stop with them. They perceived a higher

level of responsibility and so in many cases such as in primary care where medical consultant colleagues are not readily available, these ESPs felt the pressure to take responsibility for the management of the patient not just from a physiotherapy perspective, but medically.

This has an effect on the type of decision and the themes found, internal/external, time, safety/accountability and gut feeling all link with the differences in how these clinicians work and therefore think. It highlights the differences between the two groups and therefore places the context of training, competence and governance on the agenda separately from non-ESPs. This is now discussed.

6.8 The relevance of the current model on training, competence and the practice of ESPs

The current research identifies a new model in healthcare that relates to ESPs in spinal care. This has relevance for clinicians, mentors, educators and musculoskeletal specialist as it provides a number of advantages in the field of musculoskeletal medicine.

The field of ESP practice is varied but not extensive, it also has local application dependent on the needs of individual services. The Chartered Society of Physiotherapy has produced guidelines that appear generic and not applicable to wholly enhancing ESP practice in the field of clinical reasoning (Symes 2009). This model allows the users to access and explore areas of their practice that might require reflective deliberation. Mentorship sessions may be enhanced by subsequent matching of current practice against the model, whilst more qualified ESPs may also be challenged in their practice allowing the element of ongoing CPD to be demonstrated (Symes 2009). It is suggested that the current model has the individual themes that extend to all areas of musculoskeletal practice, but primarily ESP work.

Prior thinking perhaps will challenge the clinician on assumptions but also using data available either via the literature, experiential, or of the patient information. Formal

testing will ask questions of the tests the clinician performs. Patient interaction will enquire about how the information has been gained, the relationship between clinician and patient, and the development of rapport. Internal influences will be driven by the biases of the clinician, the stresses, anxiety and beliefs (professional and personal), this will link closely with safety and accountability which highlights how the ESP is accountable and therefore highlighting how the safety of the patient and clinician are paramount. External influences suggest to the clinician how they may consider the economics, national guidelines or protocols of supporting/limiting a decision, which may be different to their previous experience in non-ESP practice. Time is also considered as the ESP clinics are limited by this, whilst finally gut-feeling needs to be explored, considered, and not only accepted as part of their normal practice, but also as a safe, constructive method of basing a decision on. It would be encouraging to see this element being encompassed as a component of reasoning that should be "listened" to. How these elements differ from the non-ESPs will highlight this with greater clarity, and is now considered.

6.9 The relationship of the model to expert practice.

Jensen et al (2000) in their work exploring expert practice in physiotherapy highlighted that the patient is the key source of knowledge throughout a consultation. This was replicated in the current study whereby prior information and patient interaction played a role in the understanding of the patient. The key factor in providing a patient-centred approach is an agreed understanding of the problem (Potter et al 2003) as in a narrative reasoning model. Resnik and Jensen (2003) describe expert practice as the ability to provide a patient-centred approach delivered by collaboration and empowerment of the patient demonstrating this in physiotherapy. This again is demonstrated in both models in the current study but is not a differential as such, only the interpretation on the benefit of rapport seemed to be for some less important, whilst others viewed it as vital. The other component of the current research that links with previous work involving expert practice is gut-feeling. As previously described this is a component that supports ESPs in their work and links closely with safety and accountability. Benner (1984) proposes a model of skill acquisition that inherently is ascending proficiency and has its roots in the original

work by Dreyfus and Dreyfus (1980). Benner has taken this original model and generalised it to nursing. Benner goes onto to describe the process of expert practice linking to the component clinical skills as the process of intuition as a marker of expert nursing practice and also addressees the fear associated with nurses having the confidence to accept this as a legitimate method of clinical decision-making. The authors legitimise it by the theory of memory scripts based on experience; these scripts provide the bedrock from which presentation can be matched against (English 1993). Rolfe (1997) also suggests that experts do not know why they made a decision as opposed to novices who use rules and systems to support their decisions. In the current study this was discussed but the difference in this study centred on these scripts being linked to worry and concern, potentially heightened awareness. Therefore, being patient-centred yet using memory scripts quickly and efficiently describe expert clinical practice and this seems to be replicated in a similar fashion in the current study for the practice of ESPs but primarily with their use of gut-feeling.

6.10 The differences in reasoning models between ESPs and non-ESPs

The identified differences in practice between ESPs and non-ESPs seen in the data surrounded four components: time; external/internal influences; safety/accountability; and gut-feeling. These differences are grounded in the data. The non-ESPs had more time, had less perceived accountability and felt safer in their practice. Gut feeling played a greater role in the ESP practice but there was reticence to confidently acknowledge it. It is possible that although recognising gut-feeling, the realisation of this in an extended, medical environment posed a real challenge to the ESPs. Relating this to previous models of physiotherapy practice would see the non-ESPs sit closer to the models already described, and it should be acknowledged that it is unsurprising that the models would differ as the practice of ESP clinicians is different, hence the need for the research.

The areas of similarities in practice between ESPs and non-ESPs surround prior thinking, patient interaction and formal testing. The non-ESPs used prior thinking to generate possible hypotheses, and formal testing to deductively test for them, whilst patient interaction aided the rapport and understanding of the patient. One area that

stood out as acknowledged fairly equally by both sets of clinicians but in different contexts was patient interaction. Patient interaction in the non-ESPs was seen to be very relevant and enabled the facilitation of reasoning whilst the ESPs were split in their views. Some felt it was not possible to construct a rapport in such a short space of time, others felt patients would not expect it, and some surprisingly felt it was not needed.

Conversely, other ESPs felt it imperative, and judged their own practice on their ability to create a rapport and positive interaction very quickly. Therefore, although limited by time they felt their individual skills of ESP practice delivered the patient interaction quickly, and in a way that enabled the gaining of information. This then meant these clinicians felt they enhanced the safety theme, as the gaining of information quickly in a relaxed atmosphere and allowing the patient to speak freely led to the appropriate gathering of information.

In conclusion, this research has identified how ESPs and non-ESPs clinically reason a patient reporting LBP. It makes suggestions how these two groups differ, and therefore informs how this can be of value in areas of practice. These areas would include training, reflective thought, and improving the clinical support for ESP reasoning. It has added to the evidence-base, where the there is an identified gap, and also potentially supports and aids in the development of further research into ESPs, and clinical reasoning in musculoskeletal health-care.

Chapter 7: Critical Analysis

7.1 Appraisal of methods and methodologies

The methods chosen for this research were focus groups and semi-structured interviews. The focus groups had a number of features that require critical reflection. Firstly, the role of the researcher was not distinct from the data, as it should be highlighted that as a clinician in the field, it was possible that there were internal biases affecting the way in which the data were captured, and the subsequent analysis. The groups were conducted with a number of practitioners who were aware of the researcher professionally; this may have led to the interaction being affected in the respondent's views, or the subsequent interaction. This was recognised via to the process asking the researcher to be reflexive, independent observer notes in the first phase, whilst also exploring these by examining the direct professional meaning that the accounts had on the researcher. This was carried out via regular peer review. The focus groups featured an external observer who reviewed the interaction, and possible influence the researcher had on the accounts. This was completed by a non-physiotherapist with psychological experience and training. These comments were reflected upon and changes were made to the construction of the subsequent data collection such as the focus group questions, and management of the participants together in the groups. Having two groups of clinicians with similar backgrounds but different, current elements of clinical practice was useful to aid in the initial focus towards the research question, yet this dynamic may have inhibited the non-ESPs due to their lower NHS grading and potential perceived difference in experience and status.

The semi-structured interviews were deliberately sampled in areas of practice where the researcher was not known and this was recognised as important in gaining a different perspective whilst reducing researcher influence. The interviews were carried out directly after a patient consultation which was deemed appropriate in gaining as close account as possible. Potentially allowing a greater amount of reflective time between assessment and interview could have seen the participants give a deeper account of their thinking as this would have allowed the processes of

reasoning to be developed with the benefit of time. On the counter-side to this the accounts would then have been open to greater potential external influence and therefore be argued to lose the reality that was accessed via the immediate think-aloud method. There would also potentially have been issues with memory recall due to the clinicians' workload and the number of patients examined, this would have affected the rigor generated by member checks and so these were not used whilst any time for reflection would have potentially led to some problems constructing an accurate account.

Therefore, respondent validity of the transcripts was not used in this study as it would have affected the focus group interaction as one perspective would not have validated it and the context in which the discussions were made would not be clear. The multi-nature of the discussions make member-checking difficult to achieve as the transcripts were also anonymous and so it would not be obvious which particular participant said what. Member checking would have been via transcripts which also do not give tone and inflection, and so are not fully reflective of the conversation.

The methodology of a case design informed by grounded theory approach was appropriate in producing a theoretical model due to its ability to draw a theory that is grounded in the data. Other qualitative approaches had been considered, and rejected as they did not produce a theory based on the accounts of the participants. A description or personal understanding was not required as this would not explain how these clinicians think. Other further more ethnographic approaches did not fit the clinical reasoning approach and aimed to understand culture rather than a process, so therefore were also rejected. The constructivist approach to the case study informed by grounded theory was chosen due to the researchers' position as a clinician in the same field as the area of interest, its allowance to engage in the literature and the overall appreciation of the phenomena being constructed with the researcher as part of that process, which was felt to be the reality of the focus groups and semi-structured interviews . Therefore, acknowledging the potential influence of the researcher upon the data was an important component of the discussion and has been addressed in the research. As in a grounded theory informed design by questioning, both the content and the process, (the way a question is asked, the order, the time of asking) may all influence the response and interpretation. Although certain approaches to grounded

theory informed design suggests pre-conception limits the research analysis, clinical researchers evaluating their own practice are in some ways bound by it, and cannot escape it. In each research method (i.e. semi structured interview, focus groups) the clinicians are part of that process and bring their own perspectives to the forum. They will have to show reflexivity to tease out the influence this has on the data analysis but again this is an identified aspect in clinical practice. Being a reflective clinician and accepting your influence on the situation is a key to appreciating the clinical data. This then lends itself within the perspective of symbolic interactionism that has been quoted as a significant influence on the development of grounded theory. This is the construction of reality based upon interaction. It assumes the construction of reality is made through interaction and therefore accepts the dynamic relationship between meaning and action (Charmaz 2008). It accepts that reality is not just a set of actions that have only one interpretation and therefore can be influenced by different persons, at different times. Therefore, perhaps this suggests that the reality in what is seen is based on many interactions and interpretations of those actions that there is no one true reality to view. If this is true it makes the analysis of behaviour via a pure objectivist approach difficult to support.

7.2 What could have been done differently?

There are a number of factors that could have been altered if this process had been completed again. Firstly, the whole research project could have been completed on sites and with participants that were totally unknown to the researcher, therefore reducing researcher bias. Although there are supportive reasons for insider research such as the participants feeling comfortable to express themselves, the nature of the semi-structured interviews directly after a patient scenario in which the participant discussed their own reasoning may have been challenging as they may have felt professionally judged. It may have been advantageous to have observed an actual patient/clinician interaction which would have given non-verbal data to analyse, so giving a further component to the data. It also may have been useful to video the interaction, which for the non-verbal assessment would have been helpful, but also for the process of "think-aloud" allowing greater reflection data for the participant to use. A further return to the field to look at initial, first impressions of the patient and

correlate them to the final analysis would be an appropriate way to gain a greater depth of understanding concerning gut-feeling.

7.3 Transferability

This research has the potential to be transferable across a number of health disciplines. It therefore is applicable within the fields of physiotherapy, all extended roles in allied health, nursing and medicine; this research has relevance for all clinicians involved in making clinical decisions. It has a role to play in governing professional practice and mentoring staff as it provides a model that can be referred to when elucidating clinicians thinking and basis underpinning their clinical reasoning. This would be of benefit when mentoring new staff to help them understand the components to consider when deciding upon a diagnosis. It may be of help with more experienced clinicians who are reflecting upon their practice after a particularly difficult case.

Transferability of the study findings were enhanced by five main criteria drawn from a range of literature (Lincoln and Guba 1985; Silverman 2006; Strauss and Corbin 1990).

The five criteria are:
• Providing rich and dense data.
• Focusing the study on the typical.
• Multi-site investigation.
• Studying the leading edge of change.
• Use of a systematic approach.

In the study rich, descriptive data were described with the research settings and participants clearly described. The study was not sampled via convenience, rather purposive and theoretical therefore enhancing the transferability as the data sets needed were deliberately targeted to aid with assurance of the appropriateness of the data. Multi-site participants across primary and secondary care meant greater transferability as compared to single site and one aspects of care provision. The use of

2 cases (ESP and non-ESP) also increased this transferability by widening the data received and allowing for comparisons to make conclusions. Studying the leading edge of change challenges the transferability in that prolonged data extraction and analysis may render the outcomes out of date (Schofield 1993). This is addressed in the research in that this work is new and continues to address a gap in the literature. The literature in this area was continually looked into whilst supporting the analysis, so further confirming it being maintained as cutting edge research. Lastly, the use of a systematic process was used throughout via the constant comparative method and the coding process. The coding process was delivered in exactly the same manner for each piece of data and as it was described and referenced, it allows future research to entertain the same coding model.

7.4 Clinical implications

As previously discussed ESPs are relatively new and the requirement for an evidence-base surrounding this practice is needed. Courses in post-graduate education are being developed that now cater for this group of clinicians from an extended scope perspective i.e. teaching about scans or blood tests. What is not available is how to develop the clinical reasoning skills that use these tests in a model that is specific to ESPs, rather than medical colleagues. Many physiotherapists in musculoskeletal practice aspire to become an ESP, yet what it actually entails and the consequences of the level of decision-making is perhaps not nationally clear, and so this research adds to this for practitioners wanting to take on these roles. With an ever-changing health service, and the developing needs of service-users, under-graduate training may need to look ahead at the career pathways that go beyond initial qualification. It may require tailored training for longer term career plans, which again this research may add to.

7.5 Recommendations and future research

This research could be used directly in practice. Clinicians could access it to aid in their reflective practice, and there are features of this research that could be taken further in the future. There is a real need to explore the relevancy of gut-feeling, and the accuracy of it in this environment. This would need to be developed in a research model that looks to evaluate initial or gut-feelings and the accuracy of these versus a final diagnosis. This would enable researchers to make a greater contribution to the argument of whether this mode of reasoning has a legitimate place in standard musculoskeletal or ESP physiotherapy practice. There is also some further research to be explored in other fields of therapies to see whether there is commonality in either other forms of advanced practice and therapies. This would also be appropriate for the other themes highlighted in the research.

It has also suggested that understanding the role of emotion and the clinicians' beliefs upon the reasoning of patients is an area worthy of further research, and this might even go as far as imaging the brain in certain clinical scenarios to gain a sense of the linkages in thought. By looking at the brain when making decisions it might be possible to see the possible influence that emotion has on clinical decision-making. By understanding the role of emotion clinicians may be able to recognise it when particular scenarios occur. To enable this to be useful it would be relevant to know whether when the brain reacts in an emotive way whether this affects the clinical decision positively or negatively. By knowing this clinicians can either allow emotion to be a part of the interaction or control it depending on whether it is felt to be useful or destructive.

In a future NHS/healthcare environment it is also pertinent to examine how health policy, economics and managerial requirements could be affecting the clinical choices clinicians make, which was not developed with enough depth in the current research.

7.6 Personal perspective

The journey through the doctoral process has been one with many challenges. The qualitative nature of enquiry presented an initial challenge as it was new, and presented many unfamiliar terms and scientific approaches. This meant a basic depth of understanding had to be achieved before the study could begin to develop. Time management and dealing with commitments continually led to issues with prioritisation as this doctorate was completed part-time while working full-time and with the responsibility of a family. I feel it has improved my clinical practice in a number of ways. It has improved my knowledge of how clinicians think, learn and understand patients. This enhanced knowledge will enable me to be more reflective whilst giving greater support to my staff. It has given me a range of research methods and new methodologies that will take my studies further in the future. It has enabled me to explore the psychological literature in more detail and challenged my preconceived ideas regarding clinical thinking. The specific skills of planning and leading focus groups as well as the interviewing skills are all transferable into my role as a consultant physiotherapist, and day to day practice with patients. The time management component of completing a study such as this has given me further skills in project management that will be invaluable as a leader of clinical services. Lastly, this process has given me confidence in my writing, critical analysis and embarking into the academic field.

7.7 Conclusion

This research has identified a model of clinical reasoning that describes extended scope physiotherapists and their decision-making regarding LBP. It has highlighted differences between ESPs and non-ESPs, and therefore given supportive evidence in musculoskeletal physiotherapy decision-making as a whole, especially in the assessment of LBP. The thematic elements of internal/external, time, safety, accountability and gut-feeling are shown to be the differentials that highlight the specific nuances of ESP practice. It has identified that this group of clinicians experience stress due to the levels of accountability, and the requirements of safety and internal drivers for competence. It shows that external influences such as policy and economics also play a part in how a reasoned decision may be cultivated. It

demonstrates that reasoning in the ESP environment is different due to time restraints, which link directly with the accountability components.

This is very timely; with ESP practice becoming such an integral component to modern health-care delivery the governance, training and delivery of these clinics needs further evaluation. Without research involving clinicians in new and extended roles, the modernisation of physiotherapy practice will remain static and threatened. The way health-care is about to be commissioned suggests a competitive market that is clinically led (DOH 2012). The future of therapies and associated allied health professionals may depend upon their ability to justify their role, and benefit to patients, therefore research that contributes to this is welcome. This research also contributes to the literature regarding accepted models of musculoskeletal clinical reasoning by challenging concepts and published models. These previously identified models do not apply to ESPs and perhaps an ever-changing non-ESP care delivery.

These findings also contribute to LBP research which is very relevant and needed. It also provides a method that can be replicated for future research in the field of clinical reasoning. This method can be taken forward to inform further work into this field in other areas such as neurology, pulmonary-care or community settings. This will hopefully therefore stimulate further research into these settings.

It has also identified a theme described as gut-feeling that also challenges commonly held beliefs that this non-analytical decision-making process is not in keeping with evidence-based medicine. This approach of thinking perhaps has a stronger element to it than previously suggested, and so clinicians may find this notion challenging. This requires further enquiry, yet it opens up the debate in physiotherapy that to date has been apparent in medicine for some time. This debate questioning the relevance of intuition or gut-feeling is now needed, and it is hoped that further research specifically targeting this will be developed. Therefore, with the advent of financial pressures requiring faster, economical ways of working, physiotherapists not comfortable with gut-feeling as a reasoning method may need to acknowledge this with greater acceptance.

Appendices

DClinP – Interim Assessment

Neil Langridge

The clinical reasoning processes of extended scope physiotherapists assessing low back pain

Overview

An interesting study that should provide very useful data and insights into the clinical reasoning processes of ESPs when assessing patients with lower back pain.

The background to the transfer document focuses on the differences between quantitative and qualitative approaches to research and reflects your developing understanding of these approaches. Care needs to be taken that a thorough and systematic approach has been taken to the literature review and that there is an appropriate critique of methods chosen.

The clinical location of this work is very important and your thesis should clearly begin with the clinical relevance of the work to ESPs and other professionals. In the transfer document as a whole it is light on the clinical location and utility of the work – what we already know about the subject should help us determine the appropriate approach to the study.

You may wish to consider a more in depth review of the literature around clinical decision-making; you use the term clinical reasoning process. How is this different to clinical decision-making (CDM)? It might be helpful to explore a theoretical framework of CDM – you may wish to look at Hammond's Cognitive Continuum. You make reference to hypothetico deductive reasoning (Elstein et al 1978) but you do not identify the weaknesses with this strategy.

Methods – it would be useful to look again at section three when you are preparing your thesis being clear to link the theoretical approach to the methods you have chosen. The critique of focus groups is limited; as is the critique of think aloud these will need to be strengthened considerably in your thesis.

A more narrative approach to the results section to reduce the burden of interpretation by the reader.

It was clear through our discussions that you have learnt a great deal through the first phase of the work; a reflexive account would be very helpful in the final thesis.

UNIVERSITY OF Southampton

Report on Interim Assessment of research for candidates registered for Doctorate in Clinical Practice (DClinP)

Name of Student:	Neil Langridge
Name of Supervisor(s):	Dr Lisa Roberts and Prof. Catherine Pope
Title of Thesis:	The clinical reasoning processes of extended scope physiotherapists assessing low back pain
Name of Assessor:	Dr [redacted]

(NB - the process of interim assessment of research must include the input of a member of academic staff who is independent of the supervisory relationship with the student)

Date of Viva: 29/04/11

Please attach a report on the student's performance in the interim assessment report and viva. Please supply the student with a copy of your report, and ensure it is detailed enough to assist the student should you have any criticisms or doubts as to the eventual award of a DClinP degree.

Please list any problems which came to light during the viva, and if so, describe what action will be undertaken to overcome them:

What action (if any) should be taken by the candidate with respect to the eventual submission?

Has a copy of this report been given to the student?

Do you feel that this student will ultimately achieve a DClinP? If not, why not?

Yes

Please add any further comment you wish to make:

Please see notes attached

Please tick one of the following recommendations:

- [x] Pass interim assessment with effect from 29/04/11... (please insert date)
- [ ] Pass interim assessment subject to revision of interim assessment report by ..... (please insert date) *
- [ ] Candidate to undertake a second interim assessment by ..... (please insert date) *
- [ ] Continuation for submission of alternative exit award ..... (please name)
- [ ] Termination of candidature

Signed (Assessor) [redacted] Date 29/04/11

Signed (Supervisor) Date 29.4.11

It is the responsibility of the supervisor to ensure any revision is undertaken. Written certification will be required from the assessor that revisions have been completed satisfactorily, before a recommendation will be made.

Please return to: Nicky Thomas, PG Research Officer, Health Sciences
University of Southampton, Building 67, Highfield Campus, Southampton SO17 1BJ United Kingdom

UNIVERSITY OF Southampton
School of Health Sciences

Research and Enterprise Services Office
Form PR1/April 2009/V1.3

Peer Review Form

IMPORTANT

- Timeframe for this process: *minimum 3* weeks *(AND allow extra time in case amendments are recommended by the peer reviewer)*
- Please make sure that you use the most up to date version of this information by checking with the Research and Enterprise Services Office (RESO) before you start.
- If you have any queries please contact the Head of Research & Enterprise Services (Susan Rogers, ssr@soton.ac.uk or 023 8059 7942).

Part 1: To be completed by the applicant

Guidance Notes:
Please complete the Investigator Details and Enclosures sections overleaf and submit the whole form and the relevant enclosures **via email** to Sonia Bryant (sb13@soton.ac.uk) / Zena Galbraith (zg@soton.ac.uk). The subject of your e-mail should be "Peer Review" and documents should be labelled appropriately, e.g. protocol **"J Bloggs, Protocol, v1.0, 17Jul08".**

The RESO will contact a peer reviewer and notify you when the reviewer has completed their task. Please ensure you leave sufficient time to incorporate any changes the peer reviewer recommends or requires.

The peer reviewers is asked to complete the review within three weeks from receiving your documentation, however, you should allow extra time in case amendments are recommended by the peer reviewer.

Please make sure you arrange for a final check of the proposal and supporting documents with your project supervisor(s)/project lead before submission.

If the outcome of the initial peer review requires you to submit amendments for further review you should submit your amended protocol together with an amendment sheet, for the latter please follow the exemplary format below (copy relevant row/section from reviewer's form and indicate page number/s on revised protocol):

2.	Research Question/Hypothesis: Is there a clear hypothesis/ question/purpose which leads on from the background and literature?	No	Literature review emphasises spousal care givers, but this is not specified in study inclusion criteria. **Amendments (i.e. your changes/reply to reviewer): For the purposes of the study 'care-givers' are defined as the person who provides the main source of support for the person with MS. The term 'spousal' has been omitted to avoid confusion. pp. 2, 5, 6**

Investigator Details		Enclosures	
Name:	Neil John Langridge		Please tick
Address:	2 Bracken Way Walkford Christchurch Dorset BH23 5LW	Full Proposal Other documentation (e.g.): • Information sheet(s) • Invitation letter(s) • Consent forms	☐x ☐x ☐x ☐x
Tel No:	[redacted]		
Email:	nil1w07@soton.ac.uk		
Student (Y/N)	Y		
Level (e.g. PhD):	DclinP		
Other investigators / collaborators:			
Supervisors:	Dr Lisa Roberts Dr Paula Kersten Dr Cathy Pope		
Title of proposal	**The clinical reasoning processes of extended scope physiotherapists assessing patients with low back pain**		

Part 2: to be completed by the Reviewer

Please would you provide a Peer Review of the enclosed research proposal on behalf of the School. This is required before the project can be submitted to Ethics.

Please complete your assessment **electronically** on the enclosed form and qualify your views where necessary. You are not asked to assess the ethical issues in this review. However, if you feel specific issues are likely to be queried by an internal or external ethics committee please note them in the general comments section with possible solutions.

Please return your assessment by : *RESO to insert date here*
Please provide your views on the project proposal, commenting **specifically on the areas identified in the left hand column.**

Research Quality			
Questions:		**Yes / No**	**Specific Comments**
1.	**Background & Literature:** Is the current state of knowledge outlined, well structured, coherent and well referenced?	Yes ? ?	Introduction provides a robust overview of background literature. How might you link the background more tightly to the objectives of your study? I.e. you mention exploring the beliefs of practitioners as an objective without reference to clinical reasoning in relation to beliefs in the introduction. A sentence or two on p2 might improve logical consistency of your argument.
2.	**Research Question/Hypothesis:** Is there a clear hypothesis/ question/purpose which leads on from the background and literature?	Yes	
3.	**Objectives:** Are the objectives: a) stated clearly?	Yes	Objectives are well formulated
	b) appropriate?	Yes	The focus, problem statement, aim, objectives & grounded theory approach link effectively to form a set of steppingstones throughout your text.
	c) achievable?	Yes	

Questions:		Yes / No	Specific Comments
4.	**Sample:** a) Is the sample population described?	Yes	How do you differentiate between the pilot study and the main study?
	b) Is the recruitment process feasible?	Yes	
	c) Will the sample size provide meaningful data once analysed?	Yes	The sample size is small but well justified
5.	**Design:** a) Is the design stated?	Yes	
	b) Is there a rationale for the approach?	Yes	The design is clearly substantiated
6.	**Methodology:** a) Are the methods chosen appropriate?	Yes	Methodological options were compared and contrasted and there is a clear rationale for selection of a grounded theory approach.
	b) Is the protocol of procedures clear?	Yes	
7.	**Research tools:** Are the research tools (such as equipment, questionnaires and interviews) well structured, informed, and suitable for analysis?	?	How confident are you that the themes for the focus groups will address the objectives? How might objective 1 be more tightly aligned to your focus group schedule?
8.	**Analysis:** a) Is there an effective analytical plan?	Yes	
	b) Quantitative methods – are statistical tests appropriate?	n/a	
	c) Qualitative methods – are methods of analysis appropriate?	Yes	In accordance with a grounded theory design

Research Planning & Practice			
Questions:		Yes / No	Specific Comments
9.	**Project management:** a) Is there evidence of a well-structured and achievable plan?	Yes	
	b) Is the timetable realistic?	Yes	Timeframe is tight but achievable
	c) Is the project manageable given the resources identified?	Yes	
10.	**The investigating team:** Does the research team (including supervisors & collaborators) have the appropriate experience/skills to undertake the study?	Yes	
11.	Is there evidence of appropriate statistical support, where appropriate?	n/a	

Please use the boxes below to summarise your general comments, any specific changes you require and then select your overall assessment below and complete the signature box.

General comments
Overall, a valuable proposal as the project succeeds in identifying a gap in literature and therefore holds the potential to explore a relatively uncharted component of health care, the reasoning processes informing assessment of low back pain. This is a well-composed proposal and it is clear that the study was designed with care and consideration.
Specific Changes Required **(Please use numbers for points from previous pages)**
1) In order to ensure tight alignment of the design and theoretical content, how might you underpin the introduction and background according to an interpretative paradigm to achieve theoretical congruence throughout your proposal?

1) Objectives map a potentially constructive research pathway. How might you link the introduction & objective 1 to ensure the central argument maintains its clear logical flow?

2) When weaving your objectives through the proposal, how might you make objective 1 more visible in your focus group schedule?

3) Would you clarify the implementation and recruitment plan slightly?

The pilot group and main focus group/s appear interwoven i.e. what is your sample size for the pilot group? As you compare and contrast reasoning strategies, how might you justify your decision to include both types of practitioners in one focus group rather than facilitating separate groups for them? When clustering extended scope physiotherapists and musculoskeletal physiotherapists together in one focus group, what implications might this hold for the type of data gathered? How might the one type of practitioner influence how the other type of practitioner talks about their reasoning strategies?

4) What term/name will best summarise your chosen sampling strategy?

Peer Reviewer: Do you wish to remain anonymous?
No **(please delete as necessary)**

University of Southampton
School of Health Sciences

Peer Review: Overall Assessment	
	Accept (will be returned **electronically** to the student/researcher)
Yes	**Minor revisions** - will be returned **electronically** to the applicant: **IF** a student: revisions to be checked by main supervisor **OR** if a researcher: revisions to be checked by PI **OR** if a PI: revisions to be checked by Head of Research Group **OR** if a Head of Research Group: revisions to be checked by Director of Research. The 'authorised person' (Supervisor/PI/Head of Research Group/Director of Research) completes the final sign-off* below to notify RESO that revisions are satisfactory.
	Revisions required (will be returned **electronically** to the supervisor for discussion / researcher and PI for discussion with revisions to go back to peer reviewer via the RESO). When the Peer Reviewer can confirm the revisions are satisfactory the Peer Reviewer completes the final sign-off* below to notify RESO.
	Reject (will be returned **electronically** to the supervisor/PI/Head of the Research Group/Director of Research for discussion)

Name of Applicant	Neil Langridge
Title of Proposal	The clinical reasoning processes of extended scope physiotherapists assessing patients with low back pain
Name of Reviewer	Laetitia Zeeman
Reviewer's Signature	
Date review completed	14 July 2009

* Final sign off when no amendments necessary	
Name of authorised person	
Signature of authorised person	
Date of final sign off	

Thank you for taking the time to complete this project review.
Please return the completed form via email to Sonia Bryant (sb13@soton.ac.uk) / Zena Galbraith (zg@soton.ac.uk).
Please also post the signed last sheet to Research & Enterprise Services Office, School of Health Sciences, Building 67, University of Southampton, Highfield, Southampton, SO17 1BJ

Building 67, School of Health Sciences, University of Southampton, Highfield Campus, Southampton SO17 1BJ United Kingdom.
Tel: +44 (0)23 8059 7979 Fax: +44 (0)23 8059 7900 www.southampton.ac.uk

Building 67, School of Health Sciences, University of Southampton, Highfield Campus, Southampton SO17 1BJ United Kingdom.
Tel: +44 (0)23 8059 7979 Fax: +44 (0)23 8059 7900 www.southampton.ac.uk

Sponsor form – phase one

University of Southampton

03 December 2009

Dear Mr Langridge

RGO Ref: 6865

Project Title 'The Clinical Reasoning Processes of Extended Scope Physiotherapists Assessing Patients with Low Back Pain.

I am writing to confirm that the University of Southampton is prepared to act as sponsor for this study under the terms of the Department of Health Research Governance Framework for Health and Social Care (2nd edition 2005).

The University of Southampton fulfils the role of Research Sponsor in ensuring management, monitoring and reporting arrangements for research. I understand that you will be acting as the Principal Investigator responsible for the daily management for this study, and that you will be providing regular reports on the progress of the study to the Research Governance Office on this basis.

I would like to take this opportunity to remind you of your responsibilities under the terms of the Research Governance Framework, and the EU Clinical Trials Directive (Medicines for Human Use Act) if conducting a clinical trial. We encourage you to become fully conversant with the terms of the Research Governance Framework by referring to the Department of Health document which can be accessed at:

http://www.dh.gov.uk/assetRoot/04/12/24/27/041224

In this regard if your project involves NHS patients or resources please send us a copy of your NHS REC and Trust approval letters when available.

Please do not hesitate to contact me should you require any additional information or support. May I also take this opportunity to wish you every success with your research.

Yours sincerely

Insurance form – phase one

UNIVERSITY OF Southampton

RGO REF - 6865

02 December 2009

Dear Mr Langridge

Professional Indemnity and Clinical Trials Insurance

Project Title The Clinical Reasoning Processes of Extended Scope Physiotherapists Assessing Patients with Low Back Pain.

Participant Type:	No Of Participants:	Participant Age Group:	Notes:
Healthy volunteers	18	Adults	

Thank you for forwarding the completed questionnaire and attached papers.

Having taken note of the information provided, I can confirm that this project will be covered under the terms and conditions of the above policy, subject to written informed consent being obtained from the participating volunteers.

If there are any changes to the above details, please advise us as failure to do so may invalidate the insurance.

Yours sincerely

Ethical approval – phase one

National Research Ethics Service
SOUTHAMPTON & SOUTH WEST HAMPSHIRE
RESEARCH ETHICS COMMITTEE (B)
1ST Floor, Regents Park Surgery
Park Street, Shirley
Southampton
Hampshire
SO16 4RJ

Tel: 023 8036 2466
023 8036 3462
Fax: 023 8036 4110

Email: sosha.SWHRECB@nhs.net

HMCC/hph/sta

08 February 2010

Dear Mr Langridge

Study Title: **The clinical reasoning processes of extended scope physiotherapists assessing patients with low back pain.**

REC reference number: **10/H0504/3**

Protocol number: 1

The Research Ethics Committee reviewed the above application at the meeting held on 27 January 2010. Thank you for attending to discuss the study.

Ethical opinion

The members of the Committee present gave a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

For NHS research sites only, management permission for research ("R&D approval") should be obtained from the relevant care organisation(s) in accordance with NHS research governance arrangements. Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk. Where the only involvement of the NHS organisation is as a Participant Identification Centre, management permission for research is not required but the R&D office should be notified of the study. Guidance should be sought from the R&D office where necessary.

Sponsors are not required to notify the Committee of approvals from host organisations.

University of Southampton
School of Health Sciences

Research and Enterprise Services Office
Form PR1/Feb 2010/V1.5

Peer Review Form

IMPORTANT

- Timeframe for this process: ***minimum** 3 weeks (AND allow extra time in case amendments are recommended by the peer reviewer)*
- Please make sure that you use the most up to date version of this information by checking with the Research and Enterprise Services Office (RESO) before you start.
- If you have any queries please contact the Head of Research & Enterprise Services (Susan Rogers, ssr@soton.ac.uk or 023 8059 7942).

Part 1: To be completed by the applicant

Guidance Notes:
Please complete the Investigator Details and Enclosures sections overleaf and submit the whole form and the relevant enclosures **via email** to the Research and Enterprise Services Office (sohsreso@soton.ac.uk). The subject of your e-mail should be "Peer Review" and documents should be labelled appropriately, e.g. protocol "**J Bloggs, Protocol, v1.0, 17Jul08**".

The RESO will contact a peer reviewer and notify you when the reviewer has completed their task. Please ensure you leave sufficient time to incorporate any changes the peer reviewer recommends or requires.

The peer reviewers is asked to complete the review within three weeks from receiving your documentation, however, you should allow extra time in case amendments are recommended by the peer reviewer.

Please make sure you arrange for a final check of the proposal and supporting documents with your project supervisor(s)/project lead before submission.

If the outcome of the initial peer review requires you to submit amendments for further review you should submit your amended protocol together **with an amendment sheet, for the latter please follow the exemplary format below** (copy relevant row/section from reviewer's form and indicate page number/s on revised protocol):

2.	Research Question/Hypothesis: Is there a clear hypothesis/ question/purpose which leads on from the background and literature?	No	Literature review emphasises spousal care givers, but this is not specified in study inclusion criteria. **Eg Amendments (i.e. your changes/reply to reviewer): For the purposes of the study 'care-givers' are defined as the person who provides the main source of support for the person with MS. The term 'spousal' has been omitted to avoid confusion.** **pp. 2, 5, 6**

Investigator Details		Enclosures	
Name:	Neil Langridge		Please tick
Address:	[redacted]	Full Proposal	☐✔
Tel No:	[redacted]		
Email:	[redacted]	Other documentation (e.g.):	
Student (Y/N)	y	• Information sheet(s)	☐✔
Level (e.g. PhD):	DClinP	• Invitation letter(s)	☐✔
Other investigators / collaborators:		• Consent forms	☐✔
Supervisors:	Dr Lisa Roberts/Prof Catherine Pope	Please confirm that your supervisor/s have reviewed your Peer Review application	☐✔
Title of proposal	The clinical reasoning processes of extended scope physiotherapists assessing patients with low back pain.		✔

Part 2: to be completed by the Reviewer

Please would you provide a Peer Review of the enclosed research proposal on behalf of the Faculty. This is required before the project can be submitted to Ethics.

Please complete your assessment **electronically** on the enclosed form and qualify your views where necessary. You are not asked to assess the ethical issues in this review. However, if you feel specific issues are likely to be queried by an internal or external ethics committee please note them in the general comments section with possible solutions.

Please return your assessment by : date on email request
Please provide your views on the project proposal, commenting specifically on the areas identified in the left hand column.

Research Quality			
Questions:		**Yes / No**	**Specific Comments**
1.	**Background & Literature:** Is the current state of knowledge outlined, well structured, coherent and well referenced?	Yes	
2.	**Research Question/Hypothesis:** Is there a clear hypothesis/ question/purpose which leads on from the background and literature?	Yes	
3.	**Objectives:** Are the objectives: a) stated clearly?	Yes	
	b) appropriate?	Yes	
	c) achievable?	Yes	

Questions:		Yes / No	Specific Comments
4.	**Sample:** a) Is the sample population described?	Yes	
	b) Is the recruitment process feasible?	Yes	
	c) Will the sample size provide meaningful data once analysed?	Yes	
5.	**Design:** a) Is the design stated?	Yes	
	b) Is there a rationale for the approach?	Yes	
6.	**Methodology:** a) Are the methods chosen appropriate?	Yes	
	b) Is the protocol of procedures clear?	Yes	
7.	**Research tools:** Are the research tools (such as equipment, questionnaires and interviews) well structured, informed, and suitable for analysis?	Yes	
8.	**Analysis:** a) Is there an effective analytical plan?	Yes	
	b) Quantitative methods – are statistical tests appropriate?	N/A	
	c) Qualitative methods – are methods of analysis appropriate?	Yes	

Research Planning & Practice			
Questions:		**Yes / No**	**Specific Comments**
9.	**Project management:** a) Is there evidence of a well-structured and achievable plan?	Yes	
	b) Is the timetable realistic?	Yes	
	c) Is the project manageable given the resources identified?	Yes	
10.	**The investigating team:** Does the research team (including supervisors & collaborators) have the appropriate experience/skills to undertake the study?	**Yes**	
11.	Is there evidence of appropriate statistical support, where appropriate?	**N/A**	

Please use the boxes below to summarise your general comments, any specific changes you require and then select your overall assessment below and complete the signature box.

General comments
Specific Changes Required **(Please use numbers for points from previous pages)**
P. 4 Please change 'care of elderly' to 'care of older people'

UNIVERSITY OF Southampton
School of Health Sciences

Peer Review: Overall Assessment	
X	**Accept** (will be returned **electronically** to the student/researcher)
	Minor revisions - will be returned **electronically** to the applicant: **IF** a student: revisions to be checked by main supervisor **OR** if a researcher: revisions to be checked by PI **OR** if a PI: revisions to be checked by Head of Research Group **OR** if a Head of Research Group: revisions to be checked by Director of Research. The 'authorised person' (Supervisor/PI/Head of Research Group/Director of Research) completes the final sign-off* below to notify RESO that revisions are satisfactory.
	Revisions required (will be returned **electronically** to the supervisor for discussion / researcher **and PI** for discussion with revisions to go back to peer reviewer via the RESO). When the Peer Reviewer can confirm the revisions are satisfactory the Peer Reviewer completes the final sign-off* below to notify RESO.
	Reject (will be returned **electronically** to the supervisor/PI/Head of the Research Group/Director of Research for discussion)

Name of Applicant	Neil Langridge
Title of Proposal	The clinical reasoning processes of extended scope physiotherapists assessing patients with low back pain.
Name of Reviewer	
Reviewer's Signature	
Date review completed	

* Final sign off when no amendments necessary	
Name of authorised person	
Signature of authorised person	
Date of final sign off	

Thank you for taking the time to complete this project review.
Please return the completed form via email to: Sohsreso@soton.ac.uk

Please also post the signed last sheet to Research & Enterprise Services Office, Faculty of Health Sciences, Building 67, University of Southampton, Highfield,

Building 67, Faculty of Health Sciences, University of Southampton, Highfield Campus, Southampton SO17 1BJ United Kingdom.
Tel: +44 (0)23 8059 7979 Fax: +44 (0)23 8059 7900 www.southampton.ac.uk

Sponsor form – phase two

UNIVERSITY OF Southampton

06 January 2011

Dear Mr Langridge

RGO Ref: 7744

Project Title **The Clinical Reasoning Processes of Extended Scope Physiotherapists Assessing Low Back Pain**

I am writing to confirm that the University of Southampton is prepared to act as sponsor for this study under the terms of the Department of Health Research Governance Framework for Health and Social Care (2nd edition 2005).

The University of Southampton fulfils the role of Research Sponsor in ensuring management, monitoring and reporting arrangements for research. I understand that you will be acting as the Principal Investigator responsible for the daily management for this study, and that you will be providing regular reports on the progress of the study to the Research Governance Office on this basis.

I would like to take this opportunity to remind you of your responsibilities under the terms of the Research Governance Framework, and the EU Clinical Trials Directive (Medicines for Human Use Act) if conducting a clinical trial. We encourage you to become fully conversant with the terms of the Research Governance Framework by referring to the Department of Health document which can be accessed at:

http://www.dh.gov.uk/assetRoot/04/12/24/27/04122

In this regard if your project involves NHS patients or resources please send us a copy of your NHS REC and Trust approval letters when available.

Please do not hesitate to contact me should you require any additional information or support. May I also take this opportunity to wish you every success with your research.

Yours sincerely

Corporate Services, University of Southampton, Highfield Campus, Southampton SO17 1BJ United Kingdom
Tel: +44 (0) 23 8059 4684 Fax: +44 (0) 23 8059 5781 www.southampton.ac.uk

Insurance form – phase two

UNIVERSITY OF Southampton

RGO REF - 7744

06 January 2011

Dear Mr Langridge

Professional Indemnity and Clinical Trials Insurance

Project Title **The Clinical Reasoning Processes of Extended Scope Physiotherapists Assessing Low Back Pain**

Participant Type:	No Of Participants:	Participant Age Group:	Notes:
Healthy volunteers	10	Adults	

Thank you for forwarding the completed questionnaire and attached papers.

Having taken note of the information provided, I can confirm that this project will be covered under the terms and conditions of the above policy, subject to written informed consent being obtained from the participating volunteers.

Insurance will only be activated when we have received a copy of the Ethics Committee approval and you must not begin your project prior to this. Please forward a copy of the Ethics Committee approval letter as soon as it is to hand to complete the insurance placement.

If there are any changes to the above details, please advise us as failure to do so may invalidate the insurance.

Yours sincerely

cc: File

Finance Department, University of Southampton, Highfield Campus, Southampton SO17 1BJ United Kingdom
Tel: +44 (0) 23 8059 5000 Fax: +44 (0) 23 8059 2195 www.southampton.ac.uk

UNIVERSITY OF Southampton

Research Passport Statement

Issued: 01/12/2009

Mr Neil Langridge *Status For Project:* Student PG

RGO Project ID 6865 *Project Role* Researcher

Project Title: The Clinical Reasoning Processes of Extended Scope Physiotherapists Assessing Patients with Low Back Pain.

I have reviewed this study and confirm that it falls into the Risk Assessment Tool category number 15. The hosting NHS Trust may require you to have a Research Passport Application with the following

Type of Research Passport:	Project specific
Risk Assessment Tool Category	15
Description of project activity	Direct contact with staff (e.g. interviews)
CRB Clearance	No
Occupational Health Clearance	No (Level 1)
Employer Screening Clearance	No
Line Manager Declaration	Yes
Local Supervisor Req'd?	A minimum of local approval is required.
If Applicant has NHS Contract...	Individual Letter of Access and/or Agreement with NHS Employer
If Applicant has no NHS Contract...	Individual Letter of Access and/or Agreement with Substantive Employer/ Responsible Organisation
Photo ID required?	No
UK Permit to work	Required if researcher is not of UK nationality
Current Professional registration	If available, may be required by hosting organisation
Exploration of Employment Gaps	Yes
Notes	

Additional checks/comments:

For more information about the Research Passport, a Research Passport Application form and an Occupational Health Review form, please go to our website: http://www.soton.ac.uk/corporateservices/rgo/respassport/about.html

Please note that any supporting documents submitted with your application must be originals, not copies; these will be returned to you.

Yours sincerely,

NHS
National Research Ethics Service
NRES Committee South Central - Southampton B
Level 3 Block B
Whitefriars
Lewins Mead
Bristol
BS1 2NT

Tel: 0117 3421384
Fax: 0117 3420445

25 April 2011

Dear Mr Langridge

Study title:	**The clinical reasoning processes of extended scope physiotherapists assessing patients with low back pain.**
REC reference:	**10/H0504/3**
Protocol number:	**6865**

This study was given a favourable ethical opinion by the Committee on 08 February 2010.

It is a condition of approval by the Research Ethics Committee that the Chief Investigator should submit a progress report for the study 12 months after the date on which the favourable opinion was given, and then annually thereafter. To date, the Committee has not yet received the annual progress report for the study, which was due on 07 February 2011. It would be appreciated if you could complete and submit the report by no later than 07 March 2011.

Guidance on progress reports and a copy of the standard NRES progress report form is available from the National Research Ethics Service website.

The NRES website also provides guidance on declaring the end of the study.

[Failure to submit progress reports may lead to the REC reviewing its opinion on the study.]

10/H0504/3:	**Please quote this number on all correspondence**

Yours sincerely

NHS
National Research Ethics Service
NRES Committee South Central - Southampton B
Level 3 Block B
Whitefriars
Lewins Mead
Bristol
BS1 2NT

Telephone: 0117 3421384
Facsimile: 0117 3420446

20 April 2011

Dear Mr Langridge

Full title of study: **The clinical reasoning processes of extended scope physiotherapists assessing and managing low back pain.**

REC reference number: **11/SC/0008**

Thank you for your letter in response to favourable Opinion with Conditions. I can confirm the REC has received the documents listed below as evidence of compliance with the approval conditions detailed in our letter dated 23 February 2011. Please note these documents are for information only and have not been reviewed by the committee.

The documents have been perused by a representative of the chair, and given Favourable Opinion.

Documents received

The documents received were as follows:

Document	*Version*	*Date*
Participants Opt-in Reply Slip	1	20 January 2011
Covering Letter		15 March 2011

You should ensure that the sponsor has a copy of the final documentation for the study. It is the sponsor's responsibility to ensure that the documentation is made available to R&D offices at all participating sites.

11/SC/0008	**Please quote this number on all correspondence**

Yours sincerely

NHS
National Research Ethics Service
Southampton & South West Hampshire REC (B)
Building L27
University of Reading
London Road
Reading
Berkshire
RG1 5AQ

Telephone: 0118 918 0566
Facsimile: 0118 918 0569

07 March 2011

Dear Mr Langridge

Study Title:	**The clinical reasoning processes of extended scope physiotherapists assessing and managing low back pain.**
REC reference number:	**11/SC/0008**
Protocol number:	**N/A**

The Research Ethics Committee reviewed the above application at the meeting held on 23 February 2011. Thank you for attending to discuss the study.

Ethical opinion

Mr Neil Langridge was invited to join the discussion and thanked for attending. He was asked the following questions by the Committee:

- *The Committee asked for clarification on the recruitment process.* The researcher explained that there were a number of sites with local collaborators who will agree to send out the PIS and Consent Form to potential participants who will then contact the researcher and arrange an interview. The participants will contact the researcher by phone, email or letter but an opt-in reply slip could be added.
- *The Committee asked when Consent would be taken.* Consent will be taken directly before the interview in the presence of the researcher.
- *The Committee asked what experience the researcher has with qualitative studies.* The first phase of this study was involving focus groups and was conducted last year. The analysis is ongoing and has informed this study.
- *The Committee asked if private practitioners would be included as this is mentioned in the PIS.* The researcher explained that they may be at a later date, depending on analysis. There are some private companies which offer these types of services so it is possible that he will approach this cohort.

The members of the Committee present gave a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.

Collaborator letters

Hampshire Community Health Care

Lymington New Forest Hospital
Wellworthy Road
Lymington
Hampshire
SO41 8QD

Mobile: [redacted]
Fax: 01590 663264

Ref: JS/AS

4th August 2009

Dear Neil

Further to your email of the 16th July I am writing to confirm that I am very happy to agree in principal to support your Clinical Reasoning Study that you are carrying out as part of your Doctoral Study. Orthopaedic Choice would be prepared to offer in principal a potential number of sites that you could use for your study if this is appropriate.

I am very happy to discuss this further with you in person should you wish.

With kind regards,

Yours sincerely

NHS

Southampton Community Healthcare

Department Title
First address line
Second address line
Third address line
Fourth address line
Postcode

Tel: 000 0000 0000
Tel: 000 0000 0000
www.southamptoncommunityhealthcare.nhs.uk

9th September 2009

Dear Neil

Thank you for you letter dated 16th July 2009. The Musculoskeletal staff here at the Stoneham Centre have expressed interest in participating in your research, and therefore the Stoneham Centre would be willing to offer itself as a potential site for data collection.

We look forward to hearing from you again shortly

Kind regards

Southampton Community Healthcare is hosted by NHS Southampton City
NHS Southampton Headquarters, Oakley Road, Southampton, SO16 4GX
Telephone: 023 8029 6904 Fax: 023 8029 6990 Website: www.southamptoncommunityhealthcare.nhs.uk

Hampshire Community
Health Care
8 Sterne Road
Tatchbury Mount
Calmore
Southampton
Hampshire
SO40 2RZ

Tel: 023 8087 4270
Fax: 023 8087 4275

www.hampshirepct.nhs.uk

4 March 2010

Dear Mr. Langridge

The clinical reasoning processes of extended scope physiotherapist assessing patients with low back pain
Research Ref: MWP/010/10

I am pleased to tell you that the above project has been approved by Hampshire Community Health Care to recruit patients under the care of the Trust.

R&D approval is separate from ethics approval and is also essential for the conduct of research within NHS trusts. It is subject to the following requirements.

1) It is a condition of the approval that the project is carried out according to Good Clinical Practice and within the guidelines of the NHS Research Governance Framework. You have responsibility for ensuring that all participants give informed consent and that you and any co-workers adhere to the protocol agreed by the ethics committee.

2) If there are any alterations to the protocol after the study has commenced, you must inform the Research Ethics Committee and the Shared RM & G Service for Primary Care, Hampshire & Isle of Wight Comprehensive Local Research Network, 2nd Floor, Adelaide Health Centre, William Macleod Way, Southampton, SO16 4XE.

3) It is our duty to remind you that as Principal Investigator you will be required to provide us, at least annually, with project monitoring and outcome information.

Southampton City NHS
Primary Care Trust

Shared Research Management & Governance Service
2nd Floor, Adelaide Health Centre
Western Community Hospital Campus
William Macleod Way
Southampton
SO16 4XE

Tel: 023 8060 8925

sharedrmandg@sccpct.nhs.uk

Thursday, 18 March 2010

Dear Mr Langridge

Study: The clinical reasoning processes of extended scope physiotherapists assessing patients with low back pain

Research Ref: MWP/010/10

I am pleased to tell you that the above project has been approved by the Southampton City Primary Care Trust.

R&D approval is separate from ethics approval and is also essential for the conduct of research within NHS trusts. It is subject to the following requirements.

1) It is a condition of the approval that the project is carried out according to Good Clinical Practice and within the guidelines of the NHS Research Governance Framework. You have responsibility for ensuring that you and any co-workers adhere to the protocol agreed by the ethics committee.

2) If there are any alterations to the protocol after the study has commenced, you must inform the Research Ethics Committee and the Trust Research Management & Governance (RM&G) Office.

3) It is my duty to remind you that as Chief Investigator you may be required to provide us with project monitoring and outcome information.

In the event that you have applied to have this study adopted onto the UKCRN Clinical Research Portfolio, we take this opportunity to remind you of your responsibility for uploading accrual data for our organisation should adoption subsequently be confirmed and we become a participating site. (http://www.ukcrn.org.uk/index/clinical/portfolio_new/P_accrual.html)

Please do not hesitate to contact us should you require any additional information or support.

Yours sincerely

Trust Headquarters, Oakley Road, Southampton SO16 4GX
Telephone: 023 8029 6804 Fax: 023 8029 6960
Website: www.southamptonhealth.nhs.uk

Poole Hospital NHS
NHS Foundation Trust

20 April 2010

Dear Mr. Langridge

Re: Physiotherapy Focus Group – The clinical reasoning processes of extended scope physiotherapists
REC reference number: 10/H0504/3
NIHR CRN Portfolio Number: N/A

The above named research project has been reviewed against the Research Governance Framework for Health and Social Care (2005 2nd edition) and I am pleased to advise you that permission to undertake the proposed project at Poole Hospital NHS Foundation Trust has been granted.

Financial Arrangements
The financial information review and arrangements for funding are:

• This project is funded by	The Chief Investigator will cover research costs
• This funder is classified as	Non-commercial
• Grant	
Cost Centre Details:	
Reference:	Physio Focus Group – 75166 – Neil Langridge
Remittances to:	Mary Burrows, Research Governance Manager

Supporting Departments
These Departments have agreed to support this study.
None

Conditions under which this approval is granted are attached. Please notify the Research Governance Department if there are any changes in the above named study relating to these conditions.

Yours sincerely

Please send all correspondence relating to this study to:
Research Governance Manager
Research Governance Department
Poole Hospital NHS Trust
Longfleet Road
Poole, DORSET, BH15 2JB

Research Governance Department, Cornelia House, Poole Hospital NHS Foundation Trust, Longfleet Road, Poole, Dorset BH15 2JB

Chelsea and Westminster Hospital NHS
NHS Foundation Trust

Research and Development Support Office

27/05/2011

Dear Mr Neil J Langridge

R&D Number: C&W11/032
IRAS ID: 66785
Study Title: The clinical reasoning processes of extended scope physiotherapists assessing and managing low back pain

I am pleased to inform you that the R&D review of the above project is now complete, and the project has been formally approved to be undertaken at Chelsea and Westminster Hospital NHS Foundation Trust under the terms of the enclosed Site Investigator Agreement.

The duration of this approval extends to the date specified in the SSI Form. Please let us know should you wish to extend the duration of your project. Also please be reminded that you must notify us of any amendments and the study closure.

I wish you well in your research. Please do not hesitate to contact us should you need any guidance or assistance.

Yours sincerely

cc. Finance Department, Chelsea and Westminster Hospital NHS Foundation Trust
Dr David William John Urquhart, Local Collaborator
Ms Karen Robertson, Divisional Director of Operations
Dr Michael Weston, Divisional Medical Director
Prof. Masao Takata, Divisional R&D Lead

Enc. Site Investigator Agreement

Chelsea and Westminster Hospital NHS
NHS Foundation Trust

Research and Development Support Office

Site Investigator Agreement for non-IMP Studies between

Mr Neil J Langridge Clinical Specialist Physiotherapist Hampshire Community Healthcare Physiotherapy Department Lymington Hospital Wellworthy Road Lymington SO40 8DQ Hants	and Chelsea and Westminster Hospital NHS Foundation Trust 369 Fulham Road LONDON SW10 9NH
The Principal Investigator	**The Trust**

in respect to the research study:

Study Title: The clinical reasoning processes of extended scope physiotherapists assessing and managing low back pain
R&D Reference Number: C&W11/032
Research Ethics Committee Number: 11/SC/0008
Date of Issue: 20/05/2011

Please quote the above reference numbers in any communications relating to this project.

Whilst undertaking the above research study at the Trust, the Principal Investigator agrees to:

	Principal Investigator – Please Initial
Compliance with regulations • Ensure that no research activities are undertaken at the Trust before the study is granted R&D Approval by the Trust • Conduct and manage the above research according to the Research Governance Framework for Health and Social Care (2nd Ed.) • Comply with the Human Tissue Act 2004, if the above study involves human tissue or other human biological samples • Ensure compliance with Ionising Radiation (Medical Exposure) Regulations 2000, if the above study involves ionising radiation • Comply with the Mental Capacity Act 2005, if the above study involves subjects who lack capacity to consent • Ensure compliance with the Data Protection Act 1998 and the Caldicott Principles • Report all Serious Adverse Events (SAEs) in accordance with the study protocol and REC requirements • Report all project related incidents via the Trust incident procedure, with copies being sent to Research and Development Support Office for information.	NL
Amendments • Notify the Research and Development Support Office of all amendments to the study, providing the amendment forms and	

supporting documents in parallel with the REC submission • Provide approval documentation from the REC when available. The Research and Development Support Office will acknowledge the receipt • Notify the Research and Development Support Office of any amendments to financial arrangements • Notify the Research and Development Support Office of any changes to the study team • Implement the amendments and instigate change control processes once REC approval has been obtained, provided that the implementation of the said amendments does not incur additional costs to the Trust • Obtain approval from the Research and Development Support Office before implementing amendments that have financial implications to the Trust. If amendments do not incur additional costs to the Trust, they can be implemented once relevant regulatory permissions have been obtained. However, the Trust reserves the right to suspend or terminate its R&D approval for the above study if an amendment cannot be accommodated by the Trust.	
Study processes • Adhere to the study protocol and its subsequent amendments approved by the Research Ethics Committee (REC) in the management and conduct of the above study • Provide timely recruitment data to the NIHR CRN directly or via the Chief Investigator or the Sponsor, if this study is part of the NIHR CRN Portfolio • Provide recruitment data, when requested, to the Research and Development Support Office • Notify the Research and Development Support Office when the study closes • Comply with the Trust's Medical Records Policies and Procedures • Assist the Research and Development Support Office with audits and inspections, conducted internally or by external regulators and monitors	

Failure to comply with the above terms will render your R&D approval invalid.

Signed on Behalf of the Trust:	**Signed by the Principal Investigator**
Print Name:	**Print Name:**
Date:	**Date:**
Position:	
Research Operations Manager	

Please return this agreement to the R&D Support Office along with your application for R&D approval. The agreement will be countersigned and returned to you along with the R&D approval letter.

Chelsea and Westminster Hospital NHS
NHS Foundation Trust

Research and Development Support Office
Chelsea and Westminster Hospital NHS Foundation Trust
Unit 101 1st Floor Harbour Yard
Chelsea Harbour
London
SW10 0XD

Incare

Hants

27/05/2011

Dear Mr Langridge

RE: The clinical reasoning processes of extended scope physiotherapists assessing and managing low back pain (Ref: C&W11/032)

This letter confirms your right of access to conduct research through Chelsea and Westminster Hospital NHS Foundation Trust for the purpose and on the terms and conditions set out below. This right of access commences on **27/05/2011** and ends on **31/08/2011** unless terminated earlier in accordance with the clauses below.

Please be advised that should you require access to the Trust's premises and/or patients, you must report to your line manager within the Trust before conducting any research activities. You must bring a copy of this letter and your passport.

You have a right of access to conduct such research as confirmed in writing in the letter of permission for research from this NHS organisation. Please note that you cannot start the research until the Principal Investigator for the research project has received a letter from us giving permission to conduct the project.

The information supplied about your role in research at Chelsea and Westminster Hospital NHS Foundation Trust has been reviewed and you do not require an honorary research contract with this NHS organisation. We are satisfied that such pre-engagement checks as we consider necessary have been carried out.

You are considered to be a legal visitor to Chelsea and Westminster Hospital NHS Foundation Trust premises. You are not entitled to any form of payment or access to other benefits provided by this NHS organisation to employees and this letter does not give rise to any other relationship between you and this NHS organisation, in particular that of an employee.

While undertaking research through Chelsea and Westminster Hospital NHS Foundation Trust, you will remain accountable to your employer **Hampshire Community Healthcare** but you are required to follow the reasonable instructions of **Dr David William John Urquhart** in

NHS

Sussex NHS Research Consortium

Research Consortium Office
Worthing Hospital
Lyndhurst Road
Worthing
West Sussex
BN11 2DH

Tel: 01903 285027
Fax: 01903 209884
www.sxrc.nhs.uk

10/06/2011

Dear Mr Langridge,

Our ID: 1438/NOCI/2011
TITLE: The clinical reasoning processes of extended scope physiotherapists assessing and managing low back pain.

Thank you for your application to the Sussex NHS Research Consortium for research governance approval of the above named study.

I am pleased to inform you that the study has been approved, and so may proceed. This approval is valid in the following Organisations:

- **Western Sussex Hospitals NHS Trust - Worthing Hospital.**
- **Western Sussex Hospitals NHS Trust - Southlands Hospital, Shoreham-by-Sea.**

The final list of documents reviewed and approved is as follows:

- Response to email clarifications (dated 24/05/2011)
- Covering letter (signed and dated 21/04/2011)
- NHS R&D form (submission code: 66785/217154/14/341, signed and dated 24/05/2011)
- NHS Site Specific Information (SSI) form (submission code: 66785/209177/6/558/81297/211535, signed and dated 21/04/2011)
- Protocol (version 1, dated 20/01/20110
- Participant Information Sheet (version 1, dated 20/01/2011)
- Participant Consent Form (version 1, dated 20/01/2011)
- Letter of invitation to manager (version 1, dated 20/01/2011)
- Letter of invitation to staff member (version 1, dated 20/01/2011)
- Opt-in reply slip (version 1, dated 20/01/2011)
- CV for Neil Langridge (signed and dated 16/03/2011)
- University of Southampton confirmation of sponsorship letter (signed and dated 06/01/2011)
- University of Southampton indemnity letter (21/03/2011)
- University of Southampton peer review form (signed and dated 08/12/2010)
- LRDO sign-off (unsigned and dated 09/06/2011)
- Southampton & South West Hampshire REC (B) letter of favourable opinion with conditions (signed and dated 07/03/2011)
- Response to REC request for further information letter (unsigned and undated, received 26/04/2011)
- NRES Committee South Central – Southampton B acknowledgement of conditions met letter (signed and dated 20/04/2011)

Your research governance approval is valid providing you comply with the conditions set out below:

1. Mr. Neil Langridge (CI) will require an NHS Letter of Access before approaching potential participants or carrying out any research in Western Sussex Hospitals NHS Trust.

2. You commence your research within one year of the date of this letter. If you do not begin your work within this time, you will be required to resubmit your application.

3. You notify the Consortium Office should you deviate or make changes to the approved documents.

4. You alert the Consortium Office by contacting me, if significant developments occur as the study progresses, whether in relation to the safety of individuals or to scientific direction.

5. You complete and return the standard annual self-report study monitoring form when requested to do so at the end of each financial year. Failure to do this will result in the suspension of research governance approval.

6. You comply fully with the Department of Health Research Governance Framework, and in particular that you ensure that you are aware of and fully discharge your responsibilities in respect to Data Protection, Health and Safety, financial probity, ethics and scientific quality. You should refer in particular to Sections 3.5 and 3.6 of the Research Governance Framework.

7. You ensure that all information regarding patients or staff remains secure and strictly confidential at all times. You ensure that you understand and comply with the requirements of the NHS Confidentiality Code of Practice, Data Protection Act and Human Rights Act. Unauthorised disclosure of information is an offence and such disclosures may lead to prosecution.

Good luck with your work.

Yours sincerely,

cc.: Dr. Lisa Roberts, Doctorate in Clinical Practice, University of Southampton.
Mr Chris Mercer, Consultant Physiotherapist, Western Sussex Hospitals NHS Trust.

Sussex NHS Research Consortium

Research Consortium Office
Worthing Hospital
Lyndhurst Road
Worthing
West Sussex
BN11 2DH

Tel: 01903 285027
Fax: 01903 209884
www.sxrc.nhs.uk

03/08/2011

Dear Mr Langridge,

Our ID: 1438/NOCI/2011
TITLE: The clinical reasoning processes of extended scope physiotherapists assessing and managing low back pain.

Thank you for your application to the Sussex NHS Research Consortium for research governance approval of the above named study.

I am pleased to inform you that the study has been approved, and so may proceed. This approval is valid in the following Organisations:

- **Sussex Community NHS Trust**

The final list of documents reviewed and approved is as follows:

- Covering email (dated 15/06/2011)
- Response to request for further information email (dated 15/07/2011)
- NHS R&D form (submission code: 66785/217154/14/341, signed and dated 24/05/2011)
- NHS Site Specific Information (SSI) form (submission code: 66785/227100/6/263/116010/216853, electronically signed and dated 28/06/2011)
- Protocol (version 1, dated 20/01/20110
- Participant Information Sheet (version 1, dated 20/01/2011)
- Participant Consent Form (version 1, dated 20/01/2011)
- Letter of invitation to manager (version 1, dated 20/01/2011)
- Letter of invitation to staff member (version 1, dated 20/01/2011)
- Opt-in reply slip (version 1, dated 20/01/2011)
- CV for Neil Langridge (signed and dated 16/03/2011)
- University of Southampton confirmation of sponsorship letter (signed and dated 06/01/2011)
- University of Southampton indemnity letter (21/03/2011)
- University of Southampton peer review form (signed and dated 08/12/2010)
- LRDO sign-off (unsigned and dated 02/08/2011)
- Southampton & South West Hampshire REC (B) letter of favourable opinion with conditions (signed and dated 07/03/2011)
- Response to REC request for further information letter (unsigned and undated, received 26/04/2011)
- NRES Committee South Central – Southampton B acknowledgement of conditions met letter (signed and dated 20/04/2011)

Your res ernance approval is valid providing you comply with the conditions set out below:

1. **Mr. Ne idge will require an NHS Letter of Access before approaching potential particip carrying out any research in Sussex Community NHS Trust.**
2. You cc ce your research within one year of the date of this letter. If you do not begin your work with s time, you will be required to resubmit your application.
3. You nc e Consortium Office should you deviate or make changes to the approved documents.
4. You alert the Consortium Office by contacting me, if significant developments occur as the study progresses, whether in relation to the safety of individuals or to scientific direction.
5. You complete and return the standard annual self-report study monitoring form when requested to do so at the end of each financial year. Failure to do this will result in the suspension of research governance approval.
6. You comply fully with the Department of Health Research Governance Framework, and in particular that you ensure that you are aware of and fully discharge your responsibilities in respect to Data Protection, Health and Safety, financial probity, ethics and scientific quality. You should refer in particular to Sections 3.5 and 3.6 of the Research Governance Framework.
7. You ensure that all information regarding patients or staff remains secure and strictly confidential at all times. You ensure that you understand and comply with the requirements of the NHS Confidentiality Code of Practice, Data Protection Act and Human Rights Act. Unauthorised disclosure of information is an offence and such disclosures may lead to prosecution.

Good luck with your work.

Yours sincerely,

cc.: Dr. Lisa Roberts, Doctorate in Clinical Practice, University of Southampton.
Mrs Lorraine Southby, R&D Manager, Sussex Community NHS Trust.
Mrs Lynn Buckingham, Physiotherapist, Surrey and Sussex NHS Trust.

Participant consent form – phase one

Title of project: Clinical Reasoning Study
Name of researcher – Neil Langridge

UNIVERSITY OF Southampton
School of Health Sciences

PARTICIPANT CONSENT FORM

Ethics Number: 10/H0504/3 Site Number: Please Initial Box

1. I confirm that I have read and understood the **Participant Information Sheet "Clinical reasoning study" v1.0 Dated 25/02/09** for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and without prejudice. ☐
3. I agree to take part in a focus group that will be audio recorded. I understand that my name will not be identified on any written reports. ☐
4. I understand that anonymous quotations from this interview may be used in reports, papers and presentations arising from this study. ☐
5. I agree all discussions in the Focus Group will be confidential. ☐
6. I agree to take part in the above study. ☐
7. I understand that all information/data collected from me as part of the study will be retained by the University of Southampton for 15 years in line with University policy. ☐

Name of Participant	Date	Signature
Name of Researcher	Date	Signature

One copy to be held by participant, one copy to be held by researcher.

Invitation letter – phase one

Title of project: Clinical Reasoning Study
Name of researcher - Neil Langridge

UNIVERSITY OF Southampton
School of Health Sciences

Dear Sir/Madam

RE: Research project entitled – Clinical reasoning study

My name is Neil Langridge and I am currently undertaking clinical doctoral research sponsored by the University of Southampton. I am writing to invite you to take part in a study looking at the clinical reasoning of extended scope physiotherapists.

I aim to explore the clinical reasoning processes that extended scope physiotherapists and musculoskeletal physiotherapists use in the diagnosis and management of people with low back pain. The way in which I hope to gain insight into this is via a focus group. The focus group will also involve extended scope physiotherapists and musculoskeletal physiotherapists who do not work in an extended role. Before considering whether to take part, it is important that you understand why the research is being carried out, and what it will involve. Please read the attached information sheet. If anything is unclear, or you would like further information, please do not hesitate to contact me. If you are interested in attending could you please make contact with the clinical collaborator who will tell you the time and date of the group.

Thank you for reading this.

Please contact Neil Langridge on [redacted] via the E-mail address below, if you would like to ask any questions.

Yours sincerely

Neil Langridge

DclinP Student

Participant information form – phase one

Title of project: Clinical Reasoning Study
Name of researcher - Neil Langridge

UNIVERSITY OF Southampton
School of Health Sciences

Ethics Number: 10/H0504/3

Participant Information Leaflet

I wish to invite you to take part in a research study. Before you decide whether to do so, please read the following information carefully and discuss it with friends, colleagues and any others you may wish. Please ask me if there is anything that is not clear, or if you would like more information.

What is the purpose of this study?
I am studying how extended scope physiotherapists clinically reason the diagnosis and management plan for patients with low back pain patients. The therapists that I wish to recruit are physiotherapists who work in extended roles assessing low back pain, and also musculoskeletal physiotherapists in non extended roles who also assess low back pain patients. The purpose of this research is to aid in the development and education of these roles. Similar research has been conducted with outpatient musculoskeletal physiotherapists, but not specifically the extended physiotherapist role.

Why have I been invited for the focus group?
You have been invited to take part as you work as a physiotherapist who assesses patients with low back pain in either an extended role or in an outpatient musculoskeletal department. I aim to conduct three focus groups: two in a primary care setting and one in a secondary care setting. I am interested in clinical reasoning and the selection of diagnoses and management plans for patients' reporting low back pain. I also would like to ask you about your professional background and influences on your clinical practice.

What will happen if I decide to take part?
If you agree to participate I would ask you for some work contact details (sheet enclosed) so I may arrange the focus group with you. I will then arrange the focus group at a convienient time for you and your service. The focus group will take approximately 1 hour and will be in room near to or at your place of work. Before the focus group starts I will explain the study to you and answer any questions or concerns that you may have. You can contact me via the number on the information sheet in normal working hours. The consent form and contact details sheet that I have also enclosed can then be completed on the day of the group if you agree to take part. The session will be informal, like a conversation. If you agree to take part in the study I will ask about how you assess low back pain, what cues you look for to help make a diagnosis, what has influenced your reasoning process, the use of physical tests and how the information combines to create a diagnosis and management plan.

I will not be asking anything about specific patients or patient records. With your permission I will audio-record the focus group. I will answer questions before the focus group and will be happy to tell you more about the study at any time. You can decide not to take part in the focus group and can leave during the focus group if you do not wish to continue without giving a reason or prejudice.

Title of project: Clinical Reasoning Study
Name of researcher - Neil Langridge

Do I have to take part?
Participation is voluntary; it is up to you whether or not to take part. You may refuse to participate or withdraw from the study at any time. You do not need to tell me why you do not want to take part. If you choose to withdraw or not to participate, your decision will in no way affect your employment or practice now or in the future.

About the Focus Group
To facilitate the focus group, I will come to your work-place or a suitable local alternative. If we need to ask you to join another group, travel expenses would be paid for. I will set up a group session where you and five colleagues would sit down with me for approximately 1 hour to discuss clinical reasoning. The session will be audio-recorded. I will ask a number of questions but there may be other points that emerge as the discussion continues. One non-participating observer from the University will be present taking notes. There may be direct discussions with the group with the opportunity to contribute or listen. I will be aiming to facilitate and will not expect you to answer if you feel you do not want to.

Are there any risks involved?
If you agree to take part in this study, I will try to minimise any inconvenience to you. The main disadvantage is the time taken for the focus group. If at any time you are unhappy or have questions about any aspect of the research, you are encouraged to ask for more information.

Are there any costs involved?
No. Not to you directly. Your service will have lost your time for the period of the focus group. This will have been agreed by your manager. If you have had to travel to the group I will supply travel expenses.

Confidentiality
All of the data collected will be kept strictly confidential by myself and my supervisors at the University of Southampton. All participants will, as part of the consent form, agree to keep all discussions confidential. Focus group recordings, typed transcripts of the interviews and observation notes will only be accessed by myself and University supervisors and will be kept in password-protected computer files and/or a locked filing cabinet. All personal details and information that can identify individuals will be removed from the data when it is being analysed and reported. The study will be carried out in full compliance with all relevant guidance from the NHS Research ethics committee, NHS research governance, and Data Protection legislation. The only circumstances under which confidentiality will not be guaranteed would be those where I am legally or professionally obliged to act in the interests of protecting patient and public safety, such as the disclosure of abuse or negligent practice. In these circumstances I would follow the relevant procedures in place within your organisation/profession for managing such incidents.

What are the possible benefits of taking part?
There are unlikely to be direct personal benefits to you from this study. Some people enjoy participating in this kind of research and welcome the opportunity to reflect on their work. I would feed back my findings and inform you of the study findings if you wish to receive a brief report.

Who is funding and organising the research?
The research is being sponsored by the University of Southampton.

What will happen to the results of the research study?
The results of this study will be written up for peer review publications in academic journals that are likely to be accessed by health professionals, professional organisations and other researchers. It will also be written up for my clinical doctorate thesis.

Title of project: Clinical Reasoning Study
Name of researcher – Neil Langridge

Who has reviewed the study?
The study has been reviewed by the University, the National Research Ethics Service and your local Trust in accordance with the Research Governance Framework.

Who can I contact if I have a concern or complaint about this study?

If you have a concern or a complaint about this study you should contact Dr Martina Prude Head of Research Governance, Research Governance Office, George Thomas Building, Room 4055, University of Southampton, Highfield, Southampton, SO17 1BJ ; Tel: +44 (0)23 8059 28848; (Email: M.A.Prude@soton.ac.uk) If you remain unhappy and wish to complain formally Dr Prude can provide you with details of the University of Southampton Complaints Procedure.

Participant consent form – phase two

Title of project – clinical reasoning study. Name of researcher – Neil Langridge

UNIVERSITY OF Southampton
School of Health Sciences

PARTICIPANT CONSENT FORM

Ethics Number: 11/SC/0008 Site Number: Please initial box

1. I confirm that I have read and understood the **Participant Information Sheet "Clinical reasoning study" v1.0 Dated 11/10/10** for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and without prejudice. ☐
3. I agree to take part in an interview that will be audio-recorded. I understand that my name will not be identified on any written reports. ☐
4. I understand that anonymous quotations from this interview may be used in reports, papers and presentations arising from this study. ☐
5. I agree to take part in the above study. ☐
6. I understand that all information/data collected from me as part of the study will be retained by the University of Southampton for 15 years in line with University policy. ☐

Name of Participant	Date	Signature
Name of Researcher	Date	Signature

One copy to be held by participant, one copy to be held by researcher.

Invitation letter – phase two

UNIVERSITY OF Southampton
School of Health Sciences

Dear Clinician

RE: Research project entitled – Clinical reasoning study

My name is Neil Langridge and I am currently undertaking clinical doctoral research sponsored by the University of Southampton. I am writing to invite you to take part in a study looking at the clinical reasoning of extended scope physiotherapists.

I am aiming to explore the clinical reasoning processes that extended scope physiotherapists use in the diagnosis and management of people reporting low back pain. The way in which I hope to gain insight into this is via an interview. Before considering whether to take part, it is important that you understand why the research is being carried out, and what it will involve. Please read the attached information sheet. If anything is unclear, or you would like further information, please do not hesitate to contact me.

If, after reading the information sheet you feel that you are interested in participating could you please make contact with me so we can arrange a possible time for the interview?

Thank you for reading this.

Please contact Neil Langridge if you would like to ask any questions.

Yours sincerely

Neil Langridge

DClinP Student

Participant information form – phase two

UNIVERSITY OF Southampton
School of Health Sciences

Ethics Number: 11/SC/0008

Participant Information Sheet.

I wish to invite you to take part in a research study. Before you decide whether to do so, please read the following information carefully and discuss it with friends, colleagues and any others you may wish to. Please ask me if there is anything that is not clear, or if you would like more information.

What is the purpose of this study?
I am studying how extended scope physiotherapists clinically reason the diagnosis and management plan for patients with low back pain. The therapists that I wish to recruit are physiotherapists who work in extended roles assessing patients with low back pain. The purpose of this research is to aid in the development and education of these roles. Similar research has been conducted with outpatient musculoskeletal physiotherapists, but not specifically the extended physiotherapist role.

Why have I been invited for the interview?
You have been invited to take part as you work as an extended scope physiotherapist who assesses patients with low back pain. I aim to conduct a number of semi-structured interviews. This will involve primary care, secondary care and possibly private practitioners. I am interested in clinical reasoning and the selection of diagnoses and management plans for patients reporting low back pain.

What will happen if I decide to take part?
If you agree to participate I would ask you to contact me so we may arrange the interview with you. I will then arrange the interview at a convenient time for you and your service. The interview may take up to approximately 1 hour and will be in room near to or at your place of work. Before the interview starts, I will explain the study to you and answer any questions or concerns that you may have. You can contact me via the number below in normal working hours. The consent form that I have also enclosed can then be completed on the day of the interview if you agree to take part. The session will be informal, like a conversation. If you agree to take part in the study, I will ask about a patient that you have just assessed. The interview will be immediately after that assessment and I will ask you to describe and discuss the decisions you made regarding the patient, the resultant diagnosis and subsequent management plan. This may include what cues you look for to help make a diagnosis, what has influenced your reasoning process, the use of physical tests and how the information has combined to create a diagnosis and management plan.

With your permission I will audio-record the interview. I will answer questions before the interview and will be happy to tell you more about the study at any time.

Do I have to take part?
Participation is voluntary; it is up to you whether or not to take part. You may refuse to participate or withdraw from the study at any time. You may withdraw without giving a reason and without prejudice. If you choose to withdraw or not to participate, your decision will in no way affect your employment or practice now or in the future.

About the Interview.
The interview will be based upon a patient you have just assessed. I will ask you some questions about what has just happened. There will be no direct patient involvement. We may discuss some points, but what I am really interested in is your thoughts on your assessment. I will be aiming to facilitate and will not expect you to answer if you feel you do not want to.

Are there any risks involved?
If you agree to take part in this study, I will try to minimise any inconvenience to you. The main disadvantage is the time taken to participate in the interview. If at any time you are unhappy or have questions about any aspect of the research, you are encouraged to ask for more information.

Are there any costs involved?
There are no direct costs to you. Your service will have lost your time for the period of the interview. This will have been agreed by your manager. If you have had to travel to the interview I will supply travel expenses.

Confidentiality
All of the data collected will be kept strictly confidential by myself and my supervisors at the University of Southampton. Interview recordings, typed transcripts of the interviews and observation notes will only be accessed by myself and University supervisors and will be kept in password-protected computer files and/or a locked filing cabinet. All personal details and information that can identify individuals will be removed from the data when it is being analysed and reported. The study will be carried out in full compliance with all relevant guidance from the NHS Research Ethics Committee, NHS research governance, and Data Protection legislation. The only circumstances under which confidentiality will not be guaranteed would be where I am legally or professionally obliged to act in the interests of protecting patient and public safety, such as the disclosure of abuse or negligent practice. In such highly unlikely circumstances I would follow the relevant procedures in place within your organisation/profession for managing such incidents.

What are the possible benefits of taking part?
Some people enjoy participating in this kind of research and welcome the opportunity to reflect on their work. I would feed back my findings and inform you of the study findings if you wish to receive a brief report. I also will provide you with a certificate of participation; this may be of benefit for a continuing professional development file.

Who is funding and organising the research?
The research is being sponsored by the University of Southampton.

What will happen to the results of the research study?
The results of this study will be written up for peer review publications in academic journals that are likely to be accessed by health professionals, professional organisations and other researchers. It will also be written up for my clinical doctorate thesis.

Who has reviewed the study?
The study has been reviewed by the University of Southampton, the National Research Ethics Service and your local Trust / service in accordance with the Research Governance Framework.

Who can I contact if I have a concern or complaint about this study?

If you have a concern or a complaint about this study you should contact Susan Rogers, Head of Research & Enterprise Services, at the Faculty of Health Sciences (Address: University of Southampton, Building 67, Highfield, Southampton, SO17 1BJ ; Tel: +44 (0)23 8059 7942; Email: S.J.S.Rogers@soton.ac.uk). If you remain unhappy and wish to complain formally Susan Rogers can provide you with details of the University of Southampton Complaints Procedure."

Thank you for taking the time to read this information sheet.

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