Osteopathic clinical reasoning for the diagnosis and management of pelvic girdle pain associated with pregnancy: An interpretive descriptive study
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Abstract

Background: There is an increase in the amount of research on clinical reasoning in a wide range of healthcare professions but the availability of clinical reasoning literature in osteopathy remains limited. Pregnant women consult osteopaths for pelvic girdle related issues, although there appears to be no research investigating clinical reasoning of osteopaths with these women.

Aims: (1) To explore the osteopathic clinical reasoning for the diagnosis and management of pelvic girdle pain (PGP) in pregnancy; and (2) To identify the key differences between the clinical reasoning of experienced osteopaths with and without, a specific interest in obstetrics.

Methods: Five consultations were video recorded and followed by an audio-recorded semi-structured interview reflecting on the video previously recorded. Each interview was transcribed for further thematic analysis.

Results: Three themes were identified from the data which represented the different facets/aspects of clinical reasoning: (1) Setting up the field to activate the process of clinical reasoning (2) The dynamics of reasoning: the strategies used to organise and interpret information and (3) A subtle difference shaped by contextual variances.

Conclusion: Osteopathic clinical reasoning for the diagnosis and management of PGP was somewhat similar from one practitioner to another. However, key elements such as faster access to a broader knowledge base, higher certainty and ability to prioritize questioning for patient’s safety were found in experienced osteopaths with specific interest in obstetrics. Further research should be undertaken regarding the similarities and differences between osteopaths with different levels of experience in clinical management of women with pregnancy related PGP.

\[^1\] In this present research the term ‘obstetrics’ will refer to osteopath practitioner treating pregnant women.
Preface

Health professionals such as physiotherapists, chiropractors and osteopaths have shown growing interest in the process of clinical reasoning (Doody & McAteer, 2002; Thomson, Petty & Moore, 2011a; Amorin-Woods & Parkin-Smith, 2012; Thomson, Petty & Moore, 2013). Clinical reasoning has been defined as “a dynamic process, which occurs throughout the patient encounter, and moves beyond the point of diagnosis formation” (Thomson et al., 2011a, p. 72). Clinical reasoning is intertwined with the interaction of patients, family and other healthcare practitioners to make clinical decisions, of which diagnosis is one (Doody & McAteer, 2002; Thomson et al., 2011a; Thomson et al., 2013). The Department of Health Quality Agenda in the United Kingdom in 1998 (The Department of Health, 2000) was one of the organisations that decided to shift towards an evidence-based practice (EBP) in healthcare professions. This change was intended to make clinical practice more credible and clear for the patients and also for the practitioners (Thomson et al., 2011a).

This research project explores the osteopathic clinical reasoning for the diagnosis and management plan of pregnant women with PGP. The thesis is divided into three sections.

Section 1 comprises two chapters. Chapter one is a literature review to inform the reader about the available research regarding the topic of clinical reasoning in osteopathy and its relation to the osteopathic management of pregnant women experiencing PGP. Chapter two is a description of the methodology and method used. Section 2 consists of a manuscript following the formatting and referencing style required for publishing in the International Journal of Osteopathic Medicine. In Section 3, Appendices for the whole thesis are collated.
Overview and thesis outline

The purpose of this study was to get a greater insight into osteopathic clinical reasoning for the diagnosis and treatment of PGP associated with pregnancy. This section provides a brief overview of each chapter.

Section 1: Literature review, methodology and methods

Chapter 1 includes a review of the literature introducing clinical reasoning within its historical context and its use in osteopathy. This chapter also includes a review of the literature on management of PGP in pregnancy by various healthcare practitioners including osteopaths. At the end of the chapter the rationale and aims of this thesis are outlined.

Chapter 2 describes and justifies the use of the chosen methodology and method for this specific research project. The method section also contains an outline of the analysis and interpretation processes used for the research. The inclusion and exclusion criteria for the participating participants are outlined as well as the ethical procedures involved. Finally findings are introduced which are then further discussed in the manuscript following section one.

Section 2: The Manuscript

The manuscript is prepared for submission to the International Journal of Osteopathic Medicine. The limited format means that material is succinctly presented. The findings are explained in detail and organised in three different themes, followed by a discussion reviewing and contrasting each of them with the current literature. Additional information relating to analysis and interpretation is provided in the appendices to allow the reader to evaluate the processes and results.
SECTION 1: Literature review, methodology and methods
Chapter 1: Literature review

Introduction

Higgs and Jones (2000) proposed that clinical reasoning could be said to be the groundwork of all health related professions. Similarly, mentors approve that clinical reasoning is a fundamental component in which practitioners need to be considered competent and it is often recommended that clinical reasoning should be taught and examined (Norman, 2005). The latter author gives crucial insight about the evolution and trends of methodology used to study clinical reasoning and will be later cited in relation to knowledge and expertise. Clinical reasoning research has been conducted for over 30 years and has only recently attracted attention within the osteopathic profession. Oliver Thomson and his colleagues (Thomson et al., 2011a; Thomson et al., 2013; Thomson, Petty, Ramage & Moore, 2011b) have completed numerous studies on osteopathic clinical reasoning and this research has given a great insight about the different processes involved in clinical reasoning for osteopaths, giving the impetus for further research.

In this literature review Joy Higgs (an experienced physiotherapist) and Mark Jones (psychiatrist and manual therapist) are often cited as their relevant knowledge and experience in the clinical reasoning field was of great value. Also, these two authors have played an important role in defining clinical reasoning through research and their work has been fundamental in improving the understanding of this otherwise invisible process.

This literature review explores osteopathic clinical reasoning for the diagnosis and treatment of PGP associated with pregnancy. Firstly a definition of osteopathy will be given in its historical context. The principles of osteopathy and the place given to evidence-based practice will also be discussed. The second section will give an insight of the different types of clinical reasoning processes that have been described. These processes will then be examined in the context of three different manual therapies (osteopathy, chiropractic and physiotherapy). The investigation of these processes is essential and necessary to facilitate the understanding of clinical reasoning underlying the management of PGP in pregnancy.

Pelvic girdle pain is one of the common problems encountered during pregnancy (Röst, Kaiser, Verhagen & Koes, 2006; Stuber & Smith, 2008). Several management plans have been proposed, but only a few are underpinned by evidence-based clinical reasoning (Stuge, Lærum, Kirkesola & Vøllestad, 2004; Eggen, Stuge, Mowinckel, Jensen & Hagen, 2012). Furthermore,
Lee (2007) states that the significant focus on quantitative research in manual therapy fails to explore the qualitative portion of the patient-clinician interaction which has been shown to play a crucial role on patient outcome and function. Therefore, investigating how osteopaths cognitively process information received, either from their pregnant women during the case history or palpation during examination, may bridge a gap between what is known and what would be known. It would then directly improve quality of care and management delivery for pregnant women suffering from PGP (Lee, 2007).

**Osteopathy, a definition**

**History and principles of osteopathy in relation to obstetrics**

The founder of osteopathy was a physician called Andrew Taylor Still (A. T. Still) who practised in the United States (Peterson, 2003). In 1887, A. T. Still opened the American School of Osteopathy and students were educated according to the osteopathic principles (Peterson, 2003). Students were schooled on the importance of using palpation as a diagnostic tool, and the importance of palpation in clinical reasoning will be further discussed later in this literature review.

A. T. Still outlined the initial osteopathic method for treatments during pregnancy. He discussed the state of pregnancy, labour, and delivery and mentioned “an up-to-date osteopath must have a masterful knowledge of anatomy and physiology. He [sic] must have brains in osteopathic surgery, osteopathic obstetrics, and osteopathic practice…..” (Jones & Lockwood, 2008, p. 28). A. T. Still considered obstetrics as one of the three main parts to osteopathic practice; in the early nineteen hundreds specialities and ‘sub-disciplines’ of osteopathy such as cranial and visceral treatments began to emerge (Collins, 2005) and are still in use. In caring for pregnant women, practitioners are guided by osteopathic principles as they plan care. These changes are explained below:

Osteopathic principles [see Appendix 1] have guided osteopaths in their practice (Rogers et al., 2002; Sprafka, 2003). The notions of patient-centredness and evidence-based practice have been objects of attention in the last two decades. In 2002 the principles listed in appendix 1 were updated (Rogers et al., 2002). The intention was to make them more aligned with patient-centredness and evidence-based practice (Rogers et al., 2002). The principles now include the categories of ‘practice’ and ‘patient’ tenets (Rogers et al., 2002), and are shown in appendix 2. These tenets place the patient at the centre of the consultation and the interaction between the practitioner and the patient seems to be more in a collaboration position than a ‘passive’ patient.
management. In relation to obstetrics, Kuchera (1988) as cited in King (2000) expanded on these osteopathic principles stating that:

1. “There are mechanical, physiological, and biological stresses inherent even in the patient who is destined to have a normal pregnancy.
2. The body has self-regulatory mechanisms which will provide optimal compensation for the stresses of pregnancy if they are free to work efficiently.
3. Distinctive osteopathic care is based upon the belief and clinical observations that structure and function are reciprocally interrelated”. (King, 2000, p. 27)

However, there is a limited amount of information regarding the role of these principles in osteopathic clinical reasoning with Thomson et al. (2011a) suggesting further research investigating their use in osteopathic treatment. There is also no clear evidence to suggest that the use of principles lead to a more accurate diagnosis or appropriate management although they are widely used in the diagnosis and treatment of PGP in pregnant women.

As introduced earlier, the notion of EBP has drawn attention in the last two decades and it has been suggested that a profession is required to have reliable evidence to show credibility and legitimacy (Rogers et al., 2002; Higgs, Richardson & Dahlgren, 2004). Osteopaths across the world have also been asked to integrate EBP into their practice and reasoning (Thomson et al., 2011b). However, some osteopaths practicing in the UK questioned the effect of using EBP in osteopathy as it may fail to preserve the properties of osteopathy such as the integration of the osteopathic principles (Humpage, 2011) and the patient-centred approach to healthcare (Stone 1999; Butler 2010). This supports the importance of investigating reasoning in osteopathy. It will not only allow osteopaths to demonstrate a progressive and reflective profession, but also give a better understanding of what osteopathy does (Thomson et al., 2011a).

**Current use and benefit of osteopathy during pregnancy**

This following section gives first an insight into the type of treatments sought by pregnant women when suffering from low back and PGP. An early study cites Dr Sandler (founder of the Expectant Mothers Clinic at The British School of Osteopathy) who noted the prevalence of PGP during pregnancy and the results of a study done in 1996 shows the benefit of osteopathy for pregnant women suffering from PGP (McIntyre & Broadhurst, 1996). During the process of reviewing the literature, no research could be found on PGP in pregnancy and clinical reasoning
since that cited above. Research on clinical reasoning for low back pain, however, has been more common than PGP ones. Also, recommendation for treatment, rather than diagnosis, of PGP in pregnancy has previously been done more often in other health professions than osteopathy (van Benten, Pool, Mens & Pool-Goudzwaard, 2014; Langridge, Roberts & Pope, 2015).

Bailes (2002) investigated the views of 80 pregnant women regarding osteopathic treatment during pregnancy. Eighty women attended antenatal classes and prenatal exercises classes at the BMI Portland Hospital for Women and Children and Holmes Place gyms respectively. Bailes’s research showed that of 62.5% of participants who suffered from low back pain, only 26.2% had any kind of treatments for it. Of these women who received treatments, osteopathy was reported to be the second most effective and second most widely chosen treatment during pregnancy. Massage was the most widely used treatment with physiotherapy and chiropractic treatment being third and fourth respectively (Bailes, 2002). He also proposed that the main reason women did not consider osteopathy as first choice was due to their uncertainty regarding the type of treatments that osteopaths provide.

In 2000, Dr Sandler was interviewed by Green and stated that 85% of pregnant women who have low back issues usually suffer from sacroiliac or pelvic-related pain. He goes on to say that osteopathy can help pregnant women with pelvic torsion and recommends these women to be checked pre-pregnancy to effectively treat chronic issues. Furthermore, results from a study by McIntyre and Broadhurst (1996) showed that 53% of women in their study reported low back pain; 85% had sacroiliac joint (SIJ) pain and 15% had iliolumbar ligament pain. Three sessions using “mobilising techniques” were given to the pregnant women in conjunction with home exercise. Seventy-five percent had no pain and the rest had a greater than 50% improvement in their pain. Sandler (2009) sees the role of the osteopath as “supporting the obstetric and midwifery services” (2009, p. 5) with no ambition to replace them” and this view was previously asserted by Stone in 2007.

Below, clinical reasoning is defined in greater detail and the major clinical reasoning processes are introduced and described.
Clinical reasoning

This section first defines clinical reasoning and outlines its evolution within the field of research. Secondly, the concept of knowledge and expertise will be described followed by an explanation of the main clinical reasoning strategies used during a consultation. Finally, clinical reasoning by physiotherapists, chiropractors and osteopaths will be discussed.

Clinical reasoning: A definition and its evolution within the research field

Clinical reasoning has been defined very differently in the literature, and various terms have been used interchangeably to define the same process (Simmons, 2010; Thomson, 2013; Norman, 2005). Simmons, (2010) also suggests that clinical reasoning is a complex term to define and is often used synonymously with ‘decision-making’ and ‘clinical judgment’ (p. 1156). Initially, clinical problem-solving was the term that was used in the medical profession to describe "the cognitive process medical doctors employed to ‘solve’ patients’ problems" (Elstein et al., 1978). However, the above definition does not seem to correlate with the recent emphasis put on patient-centredness and patient involvement during the decision-making process (Edwards, Jones, Higgs, Trede & Jensen, 2004a). Thomson (2013) also describes this clinical problem-solving approach as ‘health and disease view’ in which the practitioner emphasises the physical and physiological aspects of the patient's problem and therefore less importance is put on the patient's yellow flags (emotional and psychological experiences), treatment and management.

In 2003, Simmons, Lanuza, Fonteyn, Hicks, and Holm, in a qualitative descriptive study exploring the cognitive strategies used by experienced nurses, suggested that the terms decision-making and problem-solving represent an endpoint to the thinking process. They added that the term clinical reasoning and diagnostic reasoning are the cognitive processes of thinking about healthcare information prior to this endpoint. Therefore, ‘clinical decision-making’ can be considered both an outcome and a component-process of clinical reasoning (Smith, Higgs & Ellis, 2008). As mentioned by Thomson (2011a), clinical reasoning has been described as “a dynamic process, which occurs throughout the patient encounter, and moves beyond the point of diagnosis formation” (p. 72).
As previously introduced, Norman (2005) has reviewed the evolution and trends of methodology used to study clinical reasoning and as Patel and Arocha suggested (2000), approaches to clinical reasoning studies have significantly evolved. From quantitative to qualitative interpretive research, the change has been obvious but it is in the hope that the diversity of the methods used in this field will contribute to an overarching view of clinical reasoning (Norman, 2005).

In the early 1970’s two research institutions focused on clinical problem-solving where, both practitioners and patients were asked to explain their clinical reasoning process either via think-aloud or review of a video-tape of their consultation with a patient (Norman, 2005). The main benefit of the think-aloud procedure allow for a “live” commenting of the practitioner’s cognitive process (Lundgrén-Laine & Salanterä, 2010). However, a weakness of this protocol is that practitioners might find difficult to comment or explain their thoughts once their cognitive process becomes more efficient (Fowler, 1997), especially when they reach a certain level of experience (Groen & Patel, 1985). Also, authors such as Elstein, Shulman and Sprafka, (1978) and Neufeld, Norman, Barrows and Feightner (1981) agreed that the clinical reasoning process that emerged from these two studies was too broad and not specific to experts or novices. Therefore, in the 1980’s, researchers changed their point of focus towards expertise knowledge rather than expertise process. From there, the concept of memory as a tool for expertise was questioned as it was previously shown to be a successful asset in chess players (Burns, 2004; Norman, 2005). Unfortunately, research in medicine has shown that there was no advantage from memorizing large amount of data which lead to the question of why is memory such an asset and measure of expertise in chess but not in medicine. This paradox has led to another trend of studying clinical reasoning in expertise. Because experts were not found to formulate faster or more hypotheses and their total amount of knowledge was not a characteristic of expertise, then they must organise their knowledge more efficiently. The mental representations of knowledge were, therefore, described in the 1990’s and are explained in greater details below due to their contemporary relevance.

**Knowledge and clinical reasoning**

Different types of knowledge have been related to clinical reasoning in the literature and the following question has been suggested: "to what extent is clinical reasoning a consequence of the application of specific knowledge?" (Norman, 2005, p. 419). Simmons (2010) agreed that clinical reasoning involves discipline-specific knowledge as well as cognition and metacognition to process the patient information and take the most appropriate decision. Jones (1995) suggests that knowledge is probably the most important variable affecting clinical reasoning which is later
affirmed by Higgs and Jones who commented that “strong discipline-specific knowledge base, comprising propositional knowledge and non-propositional knowledge, is necessary for sound and responsible clinical reasoning” (Higgs & Jones, 2008, p. 5). In 2004, Higgs et al. described clinical reasoning as "a bridge between practice and knowledge" (Higgs et al., 2004b, p. 181). Thomson et al. (2011a) pointed out the importance of developing and understanding the relationship between knowledge, clinical reasoning and actions to allow osteopathy to continue developing professionally.

Norman (2005) suggests that the current understanding of clinical reasoning has evolved from hypothetico-deductive reasoning (1970) to knowledge representations (1990), via the golden age of problem-solving (late 1970) and memory (1980). It seems relevant to have a basic understanding of the different types of knowledge before introducing the concept of expertise, as experts were not found to have more knowledge but rather they had different kind of knowledge, more organised and more accessible. A section on expertise will follow this section.

Four types of knowledge have been proposed in the literature (Higgs & Titchen, 1995; Jensen, Gwyer, Shepard & Hack, 2000) and are described as propositional, non-propositional, personal and practice knowledge. Details of their unique characteristics are outlined below:

**Propositional knowledge** was described as the type of knowledge that can be proven, found in books, or also known as the science knowledge (Eraut, 1994; Higgs et al., 2004c). Surprisingly this type of knowledge did not appear to be used as much as it was expected during expert clinical reasoning (Mattingly & Fleming, 1994; Jensen et al., 2000; Unsworth, 2001).

**Non-propositional knowledge** can be divided into two groups: professional craft knowledge and personal knowledge (Higgs & Titchen, 1995). Professional craft knowledge is generated from practice experience, such as knowledge gained from real-life patients and can be distinguished from propositional knowledge in that sense (Higgs & Titchen, 1995). Rycroft-Malone and colleagues (2004) suggested that non-propositional knowledge could potentially become propositional knowledge "once it has been articulated by individual practitioners, then debated, contested and verified through wider communities of practice in the critical social science tradition of theory generation” (p. 83).

**Personal knowledge** was described as the type of knowledge that significantly influences the practitioner's clinical experience from their behaviour and beliefs to their role as healthcare providers. Having a great awareness of their own personal knowledge would allow the
practitioners to manage the complexity of some decisions they have to make in professional practice (Higgs & Titchen, 2001).

**Practice knowledge:** Researchers found that expert clinicians developed more knowledge from real life patients in their practice than from the academic textbook learning of anatomy, biomechanics or pathologies (Jensen et al., 2000). This type of knowledge seemed to be the most important source and form of knowledge (Jensen et al., 2000; Unsworth, 2001) and incorporates the 'knowing how' (non-propositional) and the 'knowing that' (propositional) (Gustavsson, 2004; Higgs et al., 2008). Also part of the matrix of practice knowledge are, theoretical knowledge (which explains and interprets) and emancipatory knowledge (which empowers people) (Higgs & Titchen 2001; Higgs et al., 2004c). The same authors suggest that any type of knowledge can be translated from one category to another: for example, propositional knowledge may be used in clinic practice and therefore becomes part of the practitioner's personal experience (non-propositional knowledge). In relation to evidence-based practice, the use of propositional knowledge has been emphasised but in real life both propositional and non-propositional knowledge should be used together. Sackett (2000) suggests that “clinical evidence can inform, but never replace, individual clinical expertise” (p. 73).

**Expertise in clinical practice**

It might appear obvious to say that experience would lead to expertise. However, one study by Resnik and Jensen (2003) consisted in describing the characteristic of practitioners who were classified as expert or average practitioners based solely on their patients’ outcomes rather than the years of practice. Such research had not been done before as most of previous research using this population was based on years of experience or reputation (Resnik & Jensen, 2003). The results of their study showed that practitioners characterised as experts were not distinguished by their amount of years in practice but rather by other attributes such as their ability to consider their practice as artistry and not as technical rationality (Resnik & Jensen, 2003).

Research investigating the nature of clinical reasoning in experts has made significant progress towards understanding the road to expertise (Patel, Kaufman & Magder, 1996). First it seems sensible to give a definition of expertise, and in research it is often "defined in a very pragmatic way as someone who performs at the level of an experienced professional" (Richman, Gobet, Staszewski & Simon, 1996). This definition seems to conflict with Resnik and Jensen (2003) suggesting that experts were not characterised by their amount of years in practice.
Dreyfus (2004) suggests that experts are able to see what needs to be done and immediately know how to deal with it, which makes the whole process of clinical reasoning more efficient. Additionally, experts have the ability to process information automatically, without having to consciously think about the answer, which would be different with a more difficult or unusual case (Richman et al., 1996). Furthermore, as described by Patel and Groen in 1991 and later cited by Patel et al. (1996) in Ericsson’s book (2014), two types of expertise exist and are described as generic expertise (for example: general medicine) and specific expertise (for example: gynaecologist). A practitioner can possess both or only generic expertise. Medical training and internship allow the individual to develop generic expertise (Patel & Groen, 1991). This same individual may choose to specialise through specific branch training, where he/she will acquire specific expertise, while continuing to develop generic expertise (Patel & Groen, 1991).

In relation to expertise 'mental representations' were introduced and developed (Norman, 2005). When memory was shown to contribute to expertise in chess but failed to prove the same in medicine, researchers proposed that experts might have different kinds of knowledge, more organised and more accessible rather than a large array of knowledge (Richman et al., 1996).

In the context of expertise experts were found to have three distinct ways of representing their knowledge (Feltovich & Barrows, 1984; Schmidt, Norman & Boshuizen, 1990; Cox, Irby & Bowen, 2006) which are basic science, illness scripts and exemplars.

**Basic science** or biomedical knowledge, describes causal mechanisms regarding the functioning and dysfunctioning of the human body. This type of knowledge includes physiology, anatomy, and microbiology.

**Illness scripts** were proposed by Feltovich and Barrows (1984) and developed by others over time (Schmidt et al., 1990). Illness scripts are described as an encapsulated story-like of a classic or typical case generated by reading and exposure to patients (Cox et al., 2006). Therefore, as long as the information collected during the consultation match an existing illness script, the practitioner does not require additional searching steps within the script as other elements within the script are activated immediately and automatically (Boshuizen & Schmidt, 2008). Illness scripts also generate expectations about other signs and symptoms the patient may have and provide a list of elements to look for during the case history and examination (Cox et al., 2006; Boshuizen & Schmidt, 2008).
Exemplars are based on experience from past cases and can also be referred to as experiential knowledge. In daily living, for example, when we must classify an element or object we unconsciously go through our memory to retrieve a similar prior example. To show the benefit of having exemplar, a research testing dermatology residents and medical students was divided in two phases: a learning phase in which a list of exemplars is learned and a test phase where these exemplars are challenged. The results showed that having experienced a similar case prior, resulted in greater accuracy of approximately 40% with residents (Regehr, Cline, Norman & Brooks, 1994) and 28–44% with medical students (Kulatunga-Moruzi, Brooks & Norman, 2001).

In the context of expertise, Dreyfus and Dreyfus (1986) investigated the processes needed to gain skills in various domains such as chess, airplane pilots and automobile drivers. The Dreyfus model of skill acquisition (Dreyfus & Dreyfus, 1980; Dreyfus & Dreyfus, 1986) emerged from their study investigating airplane pilots going through the various level of learning and recognizes experience and knowledge (intuitive, tacit and implicit) as key elements to develop expertise. This model acknowledges five stages through which a person, in any possible fields of learning may evolve from novice, advanced beginner, competent, proficient and to expert (Dreyfus & Dreyfus, 1986; Dreyfus, 2004; Norman, 2005; Boshuizen & Schmidt, 2008; Peña, 2010). Boshuizen and Schmidt (2008) outlined the progress of medical students through the different stages which may help us understand whether osteopaths go through similar stages. Initially, students new to the field acquire a large amount of knowledge about the biomedical basic sciences and start making initial links between each element of this knowledge (Boshuizen & Schmidt, 2008). By the end of this stage, which can take much longer than anticipated, the students can make even more connections within this network of knowledge. This step is called 'knowledge encapsulation' and results in the next stage of acquisition of expert clinical reasoning in which the biomedical knowledge gets integrated into the clinical knowledge. At this stage, the students do not use as much biomedical knowledge and tend to make direct links between the patient's findings and clinical concepts in form of hypothesis. If the case was to become very complicated, the encapsulated knowledge could be unfolded. Almost simultaneously, illness scripts (expanded below) take place. At this point the individual is considered expert. His or her cognitive thinking happens much faster than a novice who still has to rely only on basic knowledge which is less rich and less easy to activate than experts’ illness scripts. In this instance, novices require more information before they can start generating hypotheses, simply because they have very limited connections between their knowledge and the possible conditions.
involved. Finally the use of exemplars suggests that the physician has definitely reached a level of expertise.

Patel, Evans and Kaufman (1989) suggested that experts use forward reasoning which involves relating clinical features to diagnostic solutions with minimal use of causal or biomedical reasoning. Patel and Groen (1991) suggested that experts who use forward reasoning can strongly be prone to error in absence of knowledge. Researchers also showed that experts had better diagnostic accuracy by using exemplars and analogy than by using basic science. On the other hand, novice had better results by using basic science. However, it is suggested that basic science might play an important role in the treatment and patient management reasoning (Kuipers, Moschowitz & Kassirer, 1988; Patel et al., 1996). The concept of ‘tentative diagnosis’ was introduced in the context of expert forward reasoning. This concept consists of the initial hypothesis that experts make on immediate initial presentation of some symptoms and usually wait for further information before reaching for the final diagnosis (Richman et al., 1996). Specialised practitioners (specific expert) use pattern recognition and have a different perception of the presenting case compared to non-specialised practitioners (King & Bithell, 1998). In the context of the research being reported in this thesis it is important to osteopathy and to clinical practice to establish the differences between experienced and novice practitioners with and without a specific interest in obstetrics. This will identify the variance of clinical reasoning strategies between the different groups and particularly as no similar research has been identified (Smith et al., 2008). This might help to improve the accuracy of diagnoses, and consequently, the management of women experiencing PGP.

The concepts of pattern recognition and hypothetico-deductive have briefly been mentioned in the above paragraph in relation to expertise. The following section goes in greater detail about these two processes and additional clinical reasoning processes such as collaborative reasoning, patient-centred model and metacognition are outlined.

**Models of clinical reasoning**

**Diagnostic reasoning: Pattern recognition and Hypothetico-deductive**

The hypothetico-deductive description is largely based upon Elstein and colleagues’ initial investigation of how expert medical practitioners solve problems Elstein et al. (1978). In using this model, the practitioners aim to gather information and generate hypotheses that would be further modified according to the new data collected (Edwards, Jones, Carr, Braunack-Mayer &
The nature of this cognitive processing was associated with the term ‘analytic thinking’, through which generation of hypotheses is followed by hypotheses testing, or deducing, in order to formulate a diagnosis (Weiss, 2011). This model is also referred to backwards reasoning as the practitioners start with multiple hypotheses and end up with a specific conclusion (Edwards et al., 2004a). Hypothetico-deductive reasoning has been contrasted with pattern recognition (forwards reasoning) where the practitioners recognise specific elements and quickly establishes a diagnosis from a collection of observations (Edwards et al., 2004b; Thomson et al., 2011b).

The hypothetico-deductive process is used by both novice and experienced practitioners. The latter also use pattern recognition (Unsworth, 2001) due to their greater level of clinical skill. Jensen et al. (2000) suggested that the actual difference between novice and expert lies in the ability to remember specific knowledge. It is worth noting that pattern recognition can lead to errors if used mechanically without mindful thought. It can also contribute to a reduction of innovative thinking (Norman & Eva, 2010). Hypothetico-deductive and pattern recognition models have been associated to a type of learning, called instrumental, which aims to relate cause and effect, resulting to predictions about clinical events that are right or wrong (Edwards et al., 2004b).

**Patient-centred model**

The use of the patient-centred model has increased in significance in the past four decades (Engel, 1977; Oates et al., 2000). Despite growing in popularity, this model has not found a universal definition, which contributes to the following terms being used interchangeably: patient-centredness, patient-centred care, or patient-centred approach. What unites the terms is an opposition to a ‘one-size fits all’ approach to health care provision. This model reflects the ability of the practitioner to make decisions while considering the patient’s individual biopsychosocial factors and outlook (Engel, 1977; Thomson et al., 2011a). The model also incorporates an active interaction between the practitioner and the patient in finding common solutions for treatment and management plan (Oates et al., 2000).

A patient-centred approach cannot and should not be applied in the same way for every patient, simply because each individual is different and has different needs. By applying the same patient-centred approach with each patient the practitioner would actually be employing a non-patient-centred, patient-centred approach (Zandbelt, Smets, Oort, Godfried & de Haes, 2006). In
this case it might be important to be cautious when analysing the degree of centredness that a practitioner uses in their practice, as one may seem to be less patient-centred simply because the patient chose to abdicate responsibility in the decision-making process and has no desire to receive information about their treatment. Therefore, it is a matter of adjusting and being flexible for the individual patient and “paradoxically, this may mean that in some situations it may be patient-centred to take a less patient-centred approach” (Zandbelt et al., 2006, p. 900).

**Metacognition**

The process of metacognition is defined as the reflection process that is used by experts to analyse the gap or link between the data that has been gathered, their clinical experience and the clinical reasoning process (Jensen et al., 2000). In addition to metacognition, knowledge and thinking (cognition) are the essential elements used throughout the clinical reasoning process (Jensen et al., 2000; Higgs & Jones, 2004).

**Collaborative model of clinical reasoning**

In 1995 Edwards revisited Jones' model (1992) which described the cyclical and dynamic nature of clinical reasoning of healthcare practitioners without taking into account the patient during their decision-making process. This revisited model is the ‘Collaborative model’ which considers the patient as a whole throughout the entire consultation and during the reasoning process. Later, Jones (1995) comments that “responsibility is shared between the patient and the therapist, with the patient being encouraged taking an active role in the management, increasing the likelihood of continued self-management” (p. 21). The ‘cooperative model’ was then developed by Moore in 2004, emphasising the patient-practitioner relationship even more than the preceding models, shifting the position of the patient within a more psychosocially orientated care. This model also encompasses the mutual decisions of patient-practitioner regarding the goals and treatments (Edwards et al., 2004a).

In relation to expertise described in the previous section, the importance of the mutual agreement about clinical decisions is supported by Jensen and colleagues (1990; 1992) who investigated expertise in physical therapy practice in the USA. The results showed that being able to maintain control and focus throughout the consultation whilst maintaining attention to the patient was characteristic of experienced practitioners (Jensen et al., 1990; Jensen et al., 1992).
Analysis of clinical reasoning in three different professions with interest in musculoskeletal healthcare and factors affecting their practice

The different reasoning strategies explained above are widely used by physiotherapists, chiropractors and osteopaths. The literature reveals the need for further investigations to improve the comprehension and use of these processes. This section explores the clinical reasoning strategies used across the three aforementioned professions.

a) Physiotherapists: hypothesis and collaboration

Clinical reasoning in physiotherapy is similar to that which occurs in medicine (Jones, Jensen & Rothstein, 1995), but physiotherapists are reported to hold several additional strategies for clinical-decision making (Doody & McAteer, 2002). The latter authors studied the clinical reasoning of 10 expert and 10 novice physiotherapists. To do so the participants were observed and audio-recorded during a real consultation with a new patient. Each audiotape was reviewed post consultation during a semi-structured interview. The results showed that all practitioners used the well-known hypothetico-deductive strategy and also pattern recognition by experts. However, they also closely related their hypotheses to their treatment plan; which they subsequently used as a method to further test their hypotheses (Doody & McAteer, 2002).

Therefore, limiting the understanding of decision making to hypothetico-deductive and pattern recognition does not represent the nature of decision making that is carried out in physiotherapy. These practitioners also use collaboration2 "in order to arrive at management decisions that attend holistically to all relevant aspect of an individual's health" (Higgs & Jones, 2004, p. 126). The combination of these two clinical reasoning strategies is known, in this context, as a paradigm of knowledge and is used simultaneously with different reasoning strategies3. Edwards et al. (2004b) completed the early research that described the intrinsic relationship between the two paradigms of knowledge and the reasoning strategies, also known as dialectical reasoning, which is essential for optimal care of patient. Indeed, this dialectical reasoning was explained as a reasoning that shifts between the diagnosis process required to accurately diagnose and manage patient physical disability and pain and the non-diagnosis process, essential to understand what the patient experiences through his/her disability and pain (World Health Organization, 2001; Edwards et al., 2004b). Metacognition was also commonly identified as part of clinical decision making (Jensen et al., 2000; Resnik & Jensen, 2003; Edwards et al., 2004b; Thomson et al., 2011a).

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2 (non-diagnostic, (communication, narrative) suggesting psychological, social and cultural aspects of the patient's problem)
3 Diagnosis, procedural, interactive, collaborative, teaching, predictive and ethical/pragmatic reasoning
Some physiotherapists have shown to continually revise their hypothesis during the treatment; the author claims this process as unique to the profession, and useful as another way to test hypothesis further (Doody & McAtee, 2002). In saying that revising hypotheses is unique to physiotherapists, these authors appear to be unaware that all professionals who make diagnoses must continually revise with new information before and after treatment.

b) **Chiropractors: The three questions model**

Clinical reasoning in chiropractic practice is reported to be under-researched and requires development if the chiropractors are to gain legitimacy and improve integration within the healthcare field (Amorin-Woods & Parkin-Smith, 2012). The 3-questions model and patient-centred model were shown to be part of chiropractors’ clinical reasoning.

Chiropractors are likely to see patients with undiagnosed disorders\(^4\) in their role as primary healthcare provider (Amorin-Woods & Parkin-Smith, 2012). Therefore, chiropractors are required to make decisions about screening, examining, and differentiating conditions that may necessitate referral to a medical professional (Amorin-Woods & Parkin-Smith, 2012). The role of chiropractors in making accurate diagnosis in areas other than musculoskeletal health has shown poor results (Humphreys, Sulkowski, McIntyre, Kasiban & Patrick, 2007). However, this may not be unexpected, as traditionally chiropractors are not required to, and actually should not, make diagnoses outside their scope of practice (Amorin-Woods & Parkin-Smith, 2012). In contrast to this traditional view the United Kingdom and Australian chiropractic regulatory agencies mentioned that chiropractor may be in trouble for failing to make a diagnosis (Amorin-Woods & Parkin-Smith, 2012). This statement does not validate chiropractors’ ability to make accurate diagnosis outside of their scope of practice and is an indication that research should be done to clarify the situation.

'The 3-questions model' has been introduced to chiropractors to facilitate their clinical reasoning (Amorin-Woods & Parkin-Smith, 2012). It mainly advises chiropractors to evaluate their ability to treat a patient and be able to decide if the patient requires referral to another health practitioner. Also, the patient-centred process was considered when making clinical decisions, as well as balance of benefit and harm. Similar to physiotherapists, the chiropractors need not only to select the relevant information about the history and prognosis of the patient's complaints, but

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\(^4\) myocardial infarction, aortic aneurysm, pulmonary embolisms
also evaluate the likelihood of recurrence or need for long term management (Amorin-Woods & Parkin-Smith, 2012).

c) Osteopathy: A development towards established clinical reasoning strategies

Clinical reasoning research and studies in osteopathy have been commonly carried out by Thomson and research colleagues (Thomson, et al., 2011a; Thomson et al., 2011b; Thomson et al., 2013). Osteopathic principles\(^5\) have guided osteopaths throughout the years (Rogers et al., 2002; Sprafka, 2003). However, "little is known about how these principles might drive osteopathic decision-making in practice. What role do the osteopathic principles play in clinical reasoning, if any?” (Thomson et al., 2011a, p. 74). Therefore, it may suggest that osteopaths rely on other strategies to make clinical decisions which will be discussed further in this literature review.

Despite the need for osteopaths to integrate clinical reasoning in their practice (Thomson et al., 2011b; Thomson et al., 2013) little is known about the clinical reasoning process utilised. Clinical reasoning is a complex process, and osteopaths interact with patients who have complex problems. Therefore, having a greater understanding of the clinical reasoning processes will facilitate more efficient and safe practice and will also help bridge the gap between osteopathic principles and practice (Thomson et al., 2011a).

Thomson et al. (2011a) and Sprafka, (2003) have successfully identified several strategies used by osteopaths. These two authors (Thomson et al., 2011a; Sprafka, 2003) demonstrated that osteopaths have been using a cyclical process of data gathering, hypothesis generation, and cue interpretation, to establish diagnosis and management plans. Sprafka (2003) identified strategies which were not commonly mentioned in other articles reviewed for this literature review, such as probabilistic reasoning and biological principles.

*Probabilistic reasoning:*

This type of reasoning helps the practitioners to prioritise the hypothesis based on: 1) their understanding of the problem prevalence and the cost of the intervention, and 2) the gravity and life-threatening status of the condition (Sprafka, 2003).

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\(^5\) 1) the body is a unit, 2) the body possesses a self-regulatory mechanism, 3) structures and function are reciprocally interrelated, 4) rationale therapy is based on an understanding of body unity, self-regulatory mechanism, and the interrelationship between structures and function
Hypothetico-deductive and pattern recognition strategies:

In common with medicine and physiotherapists, osteopaths appear to use hypothetico-deductive and pattern recognition processes (Sprafka, 2003; Thomson et al., 2011). Also, similar to what has been described for the physiotherapist’s clinical reasoning, osteopaths appear to continue making hypotheses during the patient’s treatment and management. However, little is known about the type of strategies they use, thus, future research in this area would be beneficial (Thomson et al., 2011a). By demonstrating that osteopaths keep reflecting and making hypotheses during the treatment, the argument that was raised about physiotherapists being the only one to do so is challenged.

Use of biological principles:

Biological principles are only used in case of highly complex problems that may rely on knowledge about physiology, biochemistry and microbiology (Sprafka, 2003). This process gives detailed information about the patient and accelerates the generation of diagnostic hypothesis. While this strategy is used in Chinese medicine (Van der Greef et al., 2010) there is limited evidence that osteopaths use this principle in a conscious way.

Osteopaths’ perception of clinical practice and its relation to their therapeutic approach and clinical decision making

Technical rationality and professional artistry

Practitioners in the medical field who tend to consider the patients’ problem as a deviation from normal without considering their psychological and social cues (Marcum, 2004) correlate with the definition of a technical rationality-practice approach⁶, which was investigated by various authors (Schön, 1987; Fish, 1998) and described by Fish and Coles as: “a basic matter of delivering a service to clients through a pre-determined set of clear-cut routines and behaviours” (as cited in Banks & Gallagher, 2008, p. 83). This finding is consistent with research investigating the clinical reasoning of musculoskeletal physiotherapists (Noll et al., 2001; Thornquist, 2006; Cruz, Moore & Cross, 2012). Therefore, practitioners who consider their practices as such would be expected to use the hypothetico-deductive and pattern recognition processes when making clinical decisions. Practitioners who see their profession as professional artistry tend to consider the patient as a whole and take into account more factors than just the

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⁶ This can be related to instrumental process of decision making (reminder: hypothetico-deductive and pattern recognition are instrumental processes).
patient's body cues (Jensen et al., 2000; Edwards et al., 2004b; Paterson, Higgs & Wilcox, 2006) while including patient’s opinion when making decisions.

Technical rationality appears more frequently in the context of the undergraduate student, where the routine is predictable and the practice is more practitioner-centred with a passive patient (Jensen, et al., 1992; Unsworth, 2001; Smith et al., 2008). The current osteopathic education is more of a technical rationality than professional artistry as students are usually asked to practice treatment techniques on their peers (Vaughan et al., 2012). This approach can contradict the way an osteopath’s practice is understood: patient-centred and biopsychosocially orientated (World Health Organization, 2001; Osteopathic Council of New Zealand, 2010; Osteopathy Board of Australia, 2011). Postgraduate students appear to view their practice as professional artistry, but there is limited research regarding exploration into how postgraduate education improves clinical reasoning skills (Thomson et al., 2013).

Overall, it was found that less experienced practitioners tended to use a more technical rationality approach than more experienced practitioners and emphasised the use of hypothetico-deductive and pattern recognition processes. In relation to PGP, multiple factors have to be taken into account, such as possible inability to use specific positions and increased joint laxity (Sandler, 1996). This consequently affects the way to approach the treatment and management of these women (Sandler, 1996). Therefore, investigating the clinical reasoning processes used when treating pregnant women with PGP was found intriguing and relevant to investigations.

**Pelvic girdle pain in pregnancy and its relation to osteopathy**

**Pelvic girdle pain in pregnancy: a definition**

PGP is described as the pain arising from the symphysis pubis and/or from the regions of one or both sacro-iliac joints and gluteal region (Vermani, Mittal & Weeks, 2010). While several definitions are available this literature review uses the definition above.

PGP was found to affect approximately 45% of women during pregnancy and 25% of them postpartum (Wu et al., 2004). Twenty-five percent of the women diagnosed with PGP had severe pain, and 8% had severe disability (Wu et al., 2004). Previous history of PGP, low back pain, strenuous work (Bastiaanssen, de Bie, Bastiaenen, Essed & van den Brandt, 2005) and trauma to the pelvis (Vleeming, Albert, Östgaard, Sturesson & Stuge, 2008) have been shown as predisposing factors for developing PGP in pregnancy (Bastiaanssen et al., 2005; Vleeming et al., 2008). The hormone relaxin was shown to increase the laxity of the pelvic joints (Wu et al.,
2004; Vleeming et al., 2008), which may then be implicated in causing PGP. Earlier research revealed that the asymmetrical laxity of the pelvic joints was the actual mechanism of pain (Damen et al., 2001). To ensure that the underlying mechanisms of the PGP are assessed with validity, a number of orthopaedic tests\(^7\) can be used (Vøllestad, Torjesen & Robinson, 2012). However, some of the tests have a low sensitivity which may compromise their reliability. Due to the difficulties in diagnosing PGP, the management of PGP has been problematic (Stuge et al., 2004; Eggen et al., 2012) underpinning the need to research the osteopathic clinical reasoning for diagnosis and managing of PGP.

Thus, the following section will give a greater insight about the available literature reviewing the effectiveness and efficacy of manual therapy and osteopathy for the treatment and management of pregnant women with PGP.

**Factors that influence osteopaths’ clinical reasoning for pelvic girdle pain diagnosis and management in pregnancy**

Factors such as the way osteopaths perceive their practice and the amount of experience they have seemed to have affected the way their reason and make decisions when treating pregnant women with PGP.

PGP disorders were shown to be often misdiagnosed and managed inadequately (O’Sullivan & Beales, 2007a). Evidence that PGP disorders are clinically unique is increasing and this evolution suggests a need for distinctive management strategies (O’Sullivan & Beales, 2007a). When making clinical decisions, practitioners need to gather a significant amount of information in order to diagnose and adequately manage conditions such as PGP (Lee, 2007; O’Sullivan, & Beales, 2007b; Vleeming et al., 2008).

**Clinical examination of the patient**

The case history is essential for the diagnosis and classification of PGP as the patient may consciously or unconsciously give cues to the practitioners (O’Sullivan, & Beales, 2007b). The classification of PGP has shown a recent interest and will be further discussed (O’Sullivan, & Beales, 2007b; Vleeming et al., 2008). The importance of including a biopsychosocial\(^8\) model in

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\(^7\)Posterior Pelvic Pain Provocation (‘P4’), Active Straight Leg Raise (ASLR) tests, compression test, distraction test, Patrick-Faber test, palpation of the pubic symphysis and long dorsal sacroiliac ligament.

\(^8\) Fear avoidance behaviours and catastrophising for example.
PGP treatment and management is highlighted when examples of poor patient outcomes following a technical rationality approach are considered (O’Sullivan, & Beales, 2007a). Also, chronicity of PGP can be explained by patient's beliefs and behaviours about their complaints (Lee, 2007).

*Physical examination of the patient and diagnosis*

The physical examination consists of gathering information from palpation of muscles or other tissues and orthopaedic testing (Vleeming et al., 2008; Thomson et al., 2011). However, as mentioned earlier these orthopaedic tests have shown poor sensitivity, which challenges their reliability and validity in making a diagnosis (Vleeming et al., 2008). Paterson (2011) confirmed that there have been no empirical studies investigating the reliability of these tests. However, the combination of different tests can provide useful information. Further research about diagnostic tests is then still required (Vleeming et al., 2008).

*Classification of PGP*

Classification of PGP consists in categorising the different underlying mechanisms that cause and maintain pain (rather than signs and symptoms) within a biopsychosocial-based framework. Once the mechanisms are identified, the choice of a management plan will be facilitated (Lee, 2007; O’Sullivan & Beales, 2007a). Factors such as hormones, genetics, neurophysiological and psychological can contribute to the expression of PGP disorders (O’Sullivan & Beales, 2007a).

O’Sullivan and Beales (2007b) proposed a hypothetical ‘mechanism-based’ classification system for PGP. These authors developed this classification from a combination of current evidence and personal clinical observations. Two categories emerged from the classification 'specific' and 'non-specific' PGP disorders. Non-specific PGP disorders are further divided into centrally-mediated and peripherally-mediated (O’Sullivan & Beales, 2007b). Vleeming et al. (2008) agreed with the definition given by O’Sullivan and Beales (2007b) in regards to ‘specific’ PGP which they describe as a disorder including inflammatory arthritis, infections, sacroiliitis and fractures. While the validity of this classification is emerging, further research is needed. Also, a limitation of this classification observed by Lee (2007) is that patient may present multiple aspects from each category and fail to fit into a specific category. This same author suggests that

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9 Inflammatory pain disorders of the SIJs, such as sacroiliitis, (Maksymowych et al., 2005) that do not benefit from manual therapists as their practice does not target the underlying mechanisms.

10 No identified pathoanatomical basis.
the classification should, for this reason, stay flexible and dynamic, in order to adapt to the patients and changes, but also be used as a guide for management plan.

Vermani et al. (2010) did a review that focused on the diagnosis and management of PGP and pregnancy related LBP. Despite showing positive results, the available strategies to help diagnosing and managing the condition are not commonly used because practitioners still do not feel comfortable enough with the reasoning behind these strategies and repercussion of these treatments on the developing foetus (Vermani et al., 2010). Therefore, further research is needed regarding the next step of classification and clinical reasoning of PGP. This may aid reducing practitioners’ fear, non-compliance, and improve patient outcomes (Lee, 2007; Vleeming et al., 2008). The next section introduces the effectiveness and efficacy of manual therapy and osteopathy for the treatment and management of PGP in pregnancy.

**Review of effectiveness and efficacy of manual therapy and osteopathy regarding the treatment and management of pregnant women with PGP**

In this section, the treatment and management of pregnant women suffering from PGP by different manual therapists will be discussed and contrasted.

In a cross-sectional survey in 2005, 950 pregnant women were enrolled and 61.7% of the participating pregnant women said they would accept complementary and alternative medicine (CAM) therapy as treatment for PGP during their pregnancy (Wang, Zinno, Fermo, William, Caldwell-Andrews, Bravemen & Kain, 2005). Similarly, 61% of the providers of prenatal health care included in the study considered these treatments appropriate for women with PGP (Wang et al., 2005). Massage (61.4%), acupuncture (44.6%), relaxation (42.6%), yoga (40.6%), and chiropractic (36.6%) were the most common CAM therapies recommended for low back pain (LBP) and PGP in pregnancy by the health care providers participating in the study (Wang et al., 2005).

**Physical therapy**

A study evaluated two groups on factors such as bodily pain, physical function, and general health (Stuge et al., 2004). Results indicated that specific stabilising exercises (SSE) targeting transverse and oblique abdominus muscles with coactivation of the lumbar multifidus at the

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11 orthopaedic tests and classification processes

12 (physical therapy with (Specific Stabilizing Exercises) SSE where intensity of the workout was increased throughout the intervention period; and individualised physical therapy without SSE (control group))
lumbosacral region, training of the gluteus maximus, adductors and abductors, but also the latissimus dorsi, the erector spinae and the quadratus lumborum muscles were beneficial for women with PGP after pregnancy (Stuge et al., 2004). The treatment group reported increased quality of life, lowered pain intensity and disability and these results were maintained one year postpartum (Stuge et al., 2004). Comparably, the participants in Eggen et al. (2012) group-based exercises had one 60 minute session per week with a physical therapist. This session was intended to improve participants’ ability to control and stabilize their lumbopelvic region, as well as improve the motor control of pelvic girdle muscles (Eggen et al., 2012). Additionally, the same group were to perform three home exercises daily and record their training in a diary. However, data from the diaries were not collected by the researchers therefore important information about exercise compliance may have been omitted. Both the trained and control group were allowed to exercise on their own which may have altered the results. Group exercises during pregnancy did not show improvement of PGP although individualised exercises after pregnancy showed positive results (Eggen et al., 2012). The results of these two studies have highlighted interesting avenues for further research regarding the effectiveness of individualised physical therapy and exercises on PGP during pregnancy (Stuge et al., 2004; Eggen et al., 2012).

**Chiropractors**

According to Borggren (2007) and Stuber and Smith (2008), chiropractic care is safe during pregnancy and the published evidence even indicates that regular chiropractic care may improve the probability of successful natural parturition (Vallone, 2002). The Webster Technique is a chiropractic method that is thought to correct musculoskeletal causes of intrauterine constraint, usually found in women eight months pregnant with a breech presentation (Borggren, 2007). Despite studies showing positive results for chiropractic treatment for LBP in pregnancy, the quality of evidence is low, establishing the need for higher quality observational studies and controlled trials to determine its efficacy (Stuber & Smith, 2008).

**Osteopathy**

Osteopathic Manipulative Treatment (OMT) utilizes techniques such as balanced ligamentous tension, counterstrain, sacroiliac joint articulation, myofascial release and Muscle Energy Technique (MET) to treat PGP (Licciardone, Brimhall & King, 2005). The latter two are considered the best techniques to treat LBP and PGP in pregnancy (Licciardone et al., 2005).
**Muscle Energy Technique and myofascial release:**

Licciardone et al. (2005) reported that pregnant women in the obstetric care and OMT group showed a reduction of both back pain and deterioration of back-specific function, in comparison with the non-OMT group. Even if OMT has been shown to have positive results, it is important to consider contra-indications that can potentially happen: placental abruption, ectopic pregnancy, preterm labor, unstable vital signs of the pregnant mother, elevated maternal blood pressure or deep vein thrombosis (Abbasi & Zito, 2013).

A significant challenge when treating pregnant women is the limitation of positions in which the patient can be put to be treated. The best way to treat pregnant women is side-lying or seated to avoid pressure from the uterus on the inferior vena cava (Sandler, 1996; Elden, Ladfors, Olsen, Ostgaard & Hagberg, 2008).

**High-Velocity Thrust Technique (HVTT):**

In a prospective cohort, 69 postpartum women sought physical therapy for LBP and or PGP. The cohort had for objective to develop a clinical prediction rule for identifying postpartum women with LBP and/or PGP whose functional disability scores would improve with a HVTT. If two of three criteria for treatment failure are present, an alternative treatment method should be recommended (Al-Sayegh et al., 2010). However, 80% of these women (n=55) demonstrated a reduction in pain levels following a HVTT to the lumbopelvic region (Al-Sayegh, George, Boninger, Rogers, Whitney & Delitto, 2010). Further research is necessary to address an alternative management for patients who are less likely to improve with the mobilization technique.

Although researchers have reported that the use of HVTT on pregnant women is the best choice when dealing with facet restrictions (Sandler, 1996; Stuber & Smith, 2008), there is a little amount of information available about the effects of HVTT during pregnancy. Nonetheless, there has not been any report of miscarriage due to HVTT reported in the literature from 2008 to present (Stuber & Smith, 2008). In the context of HVTT, Stuber and Smith (2008) have reviewed six studies investigating chiropractic care, including spinal manipulation, for pregnancy-related low back pain (LBP). Each had a low-to-moderate quality of evidence, lacking randomization and control group which makes it difficult to generalize the results. Given the common use of chiropractic care by pregnant women, it is necessary to undertake further research to gain higher quality of evidence.

If a therapist decides to use HVTT on a pregnant woman, it is recommended that he/she should make sure to use a minimum amount of force, as with too much flexion the localization of forces...
will be impossible (Sandler, 1996). Furthermore, it will be difficult to use the bottom part of the body as a lever due to the growing foetus, requiring the therapist to perform the thrust from the top. An alternative for SIJ pain treatment is the supine Chicago technique which is more comfortable for the woman (Sandler, 1996).

**Soft tissue:**

Soft tissue treatment can be used to alleviate tension and pain in tissues of the body. During pregnancy, focusing on erector spinae, quadratus lumborum and gluteal muscles can be used to release tensions around the pelvis and this will positively affect SIJ pain. A combination of MET, isometric contraction and cross fibre soft tissue to the piriformis was shown to be relevant, as it is often found to be tight in women with SIJ pain (Sandler, 1996).

Overall, the osteopathic management of PGP in pregnancy typically comprises addressing multiple factors including emotional, psychological and structural aspects (Tettambel, 2007). After examining and diagnosing the patient with PGP, the osteopath should educate the patient regarding the condition, and also encourage them to maintain a proper posture while doing everyday activities, in order to reduce misalignment and overload of their spine (Katonis et al., 2011). In research pregnant women were often treated after their 20th week of pregnancy up to their last week, but definitely not during their 12th and 16th week as it is commonly understood to be the time of highest risk of spontaneous abortion (Sandler, 1996; Licciardone et al., 2010; Lavelle, 2012). However, further research should be done to inform practitioners about the safest weeks of gestation to treat pregnant women.

**Literature search process**

The search was initiated with the broad terms; “clinical reasoning”, “manual therapy” “pregnancy management” as keywords. The Google scholar search engine was the primary source of information. If only the article abstract was available for review, the Unitec library database, in combination with EBSCOhost (Medline, AMED, Health Business Elite, and Health source) were used as secondary sources. The ‘Pearl Growing’ strategy was also used. Before searching further for the full version, the relevance of the article was critically assessed by reviewing the title and abstract. Articles’ reference lists were also used to broaden the number of articles to review. The Pubmed mesh database was used as an aid in refining the search of

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13 Process in which the reference list of a relevant article is used to find additional articles of the same topic (Ramer, 2005).
keywords once the desired topic had emerged. The final search process used the terms “pelvic girdle pain, clinical reasoning”. A Prisma flowchart is available in the ‘supplementary documents’ section and describes the research process in more details.

**Rationale and research question**

In conclusion, clinical reasoning is the process used by health practitioners to make clinical decisions. Various processes have been identified, and shown to be influenced by different factors such as experience, expertise, knowledge and perception of practice. Overall, a picture of the ideal practitioner can be addressed and defined as a practitioner who incorporates the metacognition strategy while considering their practice as a professional artistry and patient-centred approach. These criteria, therefore, have been used to describe expertise. Clinical reasoning in osteopathy is still far from being well understood. Further research is required to improve the credibility of osteopathy and the general understanding of the profession which will allow osteopaths to practice more efficiently and safely, but also help bridge the gap between osteopathic principles and practice. Pregnancy-related PGP diagnosis has shown to be inconsistent and problematic due to inadequate orthopaedic tests (Stuge et al., 2004; Eggen et al., 2012). This lack of information suggests the need for further investigations. On a similar topic, more detailed and appropriate research on PGP classification is needed, to better accompany clinical reasoning and management of this condition.

This review provided an insight into the currently available research on clinical reasoning thus giving the impetus for future research. The relevance of integrating evidence-based practice in osteopathy and other healthcare professions has been shown, while identifying future areas to investigate. The author proposed that research into this area should be undertaken using the methods of video-recorded observation and semi-structured interview of osteopaths in their day-to-day practice as initiated in Thomson et al. (2011a), and the recommendation for replication, taking into account all the elements explained in this literature review. It is hoped that this present research will gather new information to benefit management and patient outcomes with PGP. Thomson (2013) suggested that without research on clinical reasoning, many questions are left un-answered such as ‘How do novice and experienced osteopaths make clinical decisions? ‘Are there variations in clinical decision-making and practice approaches amongst practitioners’? ‘What are the attributes of osteopathic expertise and how can practitioners develop them”? These questions are essential and should be answered to allow osteopathy to develop within the expected standards of a healthcare profession.
**Research question**

Despite the increase of available literature about clinical reasoning in osteopathy, the literature is unclear about the osteopathic clinical reasoning behind the management and treatment of pregnant women with PGP. Research and reflection in this field may then help us getting a better understanding of how osteopaths formulate and make clinical decisions for the diagnosis and management of lumbopelvic pain associated with pregnancy but also to know if clinical reasoning differs from one practitioner to another. Research should also give an insight into the key differences in clinical reasoning of experienced practitioners with and without a specific interest in obstetrics. If these questions can be answered, there will be a positive impact on management and outcomes of patient presenting with PGP to osteopaths.

**Conclusion**

Clinical reasoning is the process used by health practitioners to make clinical decisions. Various strategies have been identified, and shown to be influenced by different factors such as experience and perception of practice. Clinical reasoning in osteopathy is still far from being well understood. Therefore, further research is advised to improve the osteopathic credibility and the general understanding of the profession; which will also allow osteopaths to reason more efficiently and safely. A useful insight into the currently available research on clinical reasoning has been gained, thus giving the impetus for future research. This literature review has demonstrated the relevance of integrating evidence-based practice in osteopathy and other healthcare professions, while identifying future areas to investigate. Research in this area should be undertaken using the methods of video-recorded observation and semi-structured interview of osteopaths in their day-to-day practice as initiated in Thomson et al. (2011) whilst taking into account all the elements explained in this literature review.
Chapter 2: Methodology and methods

The following chapter outlines the methodology and methods implemented for this research investigating the way by which osteopaths formulate a diagnosis and management plan for pregnant women with PGP. First, an explanation of why interpretive descriptive qualitative method was deemed appropriate for this study is presented, followed by a description of the research process. The process of data analysis is also outlined in this section.

Methodology

Qualitative research

Qualitative research methods are appropriate when investigating complex human activities such as clinical decision making because these methods are intended to describe, explore and understand thoughts or phenomena (Vivar, McQueen, Whyte & Armayor, 2007). Clinical reasoning research studies can either be quantitative or qualitative (Thomson et al, 2011b). Quantitative approaches may be more appropriate for a more comparative investigation of clinical reasoning which usually involves numerical results that arise from a specific research question; these results are often used to form models and theories which enhance the generalizability of collected data (Thomson et al., 2011a; Thomas & Magilvy, 2011).

In contrast, qualitative methods give an insight into factors that contribute to a practitioner's clinical reasoning and thoughts (Thomson et al., 2011b). 'How do osteopaths establish a treatment plan for their patients?' is then a good example of a qualitative research question. Additionally, qualitative research methodology is more appropriate for projects that have the objective of seeking an insight into the practitioners’ cognitive process. However, Elliott and Timulak (2005) have discussed possible biases in qualitative research methods. It has been suggested that gaining familiarity and background knowledge of the topic of interest prior to conducting the research could create a source of bias as the researcher may generate preconceptions and alter their interpretation of the data (Elliott & Timulak, 2005). However, research has shown that this form of bias is inevitable and that it is impossible to gain knowledge without prior familiarisation with the topic (Elliott & Timulak, 2005). To reduce bias the researcher can consciously identify existing experience and knowledge via processes such as interview and reflection (Lester, 1999). In addition, having a better understanding of the topic before starting a research is argued as beneficial, as it gives the researcher an insight about the topic and increases the likelihood that the study will be guided by informed expectations rather
than ignorant ones (Elliott & Timulak, 2005). Thus, qualitative approaches for explorative studies outweigh the risks of bias, particularly when these are mindfully managed (Starks & Trinidad, 2007).

**Interpretive descriptive method**

In the current research project, it was proposed that using an interpretive descriptive method would allow the researcher not only to formulate a text that gives additional information about the chosen topic or phenomenon studied, but also the meaning associated with it. Qualitative research methods comprise mainly five sub-groups; hermeneutic, discourse analysis, grounded theory, ethnography and phenomenological study (Starks & Trinidad, 2007; Smith et al., 2008). Hermeneutic design was originally used to interpret biblical texts but is now used to investigate human action in practice. Ethnographic study describes and interprets a cultural or social group by analysing the day-to-day lives of people (Vivar et al., 2007), while discourse analysis considers the use and role of language and words (Starks & Trinidad, 2007; Nicholls, 2009). Grounded theory tends to draw theories from information received during the study, but as it involves lengthy and reiterative processes during data collection, it was deemed to be unsuitable for this time-limited study (Starks & Trinidad, 2007; Nicholls, 2009; Thomson et al., 2011b). Finally, phenomenology studies aim to analyse the meaning of individual experiences (Vivar et al., 2007; Nicholls, 2009) and to illuminate the identified phenomena. Interpretive description, as a phenomenological method, was chosen as it is appropriate for early studies that map the ground of knowledge in an area, represents the voice of the participants faithfully and builds a coherent account of a phenomenon. Interpretive description method is also adequate to discovering practitioner meanings of the dynamic and complex process of clinical decision making (Ploeg, 1999).

An adequate sample is important in all types of research. In interpretive descriptive research it is not unusual to use small numbers, as the goal is to get an insight of the lived experience rather than to produce generalizable findings. Smith (2007) advised that five or six participants is an appropriate number for an interpretive descriptive study as it is advantaged by purposive sampling rather than quantity based. He further suggested (2015) that interpretive descriptive method goes through purposive sampling to find a more defined group to answer the research question(s) at best (Roots, 2014; Smith, 2015). Therefore the sample size of five participants was appropriate for an interpretive descriptive study using in-depth interviews as a data collection method.
Overview of the research process

In this study, five osteopathic consultations were reviewed to analyse osteopaths’ clinical reasoning when making decisions and managing pregnant women with PGP. In total, four osteopaths consulted one patient each, with one osteopath consulting two patients. In this research, the participants are osteopathy practitioners and will be referred as ‘practitioner’ throughout this research. The consultation was recorded using a small high-definition digital video camera positioned on their desk (HERO3, GoPro Inc., San Mateo, CA, USA), focussed solely on the practitioner throughout the consultation. Post consultation, an audio-recorded semi-structured interview alongside a review of the video taken during the consultation was undertaken. Each recording of the interviews was then professionally transcribed and thoroughly analysed, following a specific analysis process as explained in the following section.

Methods

Sample
For this research project it was thought to be more appropriate to recruit both practitioners and patients so they could have a real consultation followed by a post reflective interview instead of having to ask the practitioners to recall their experience treating pregnant women. In this case the video-playback of the consultation during the semi-structured interview post consultation enables the practitioners to efficiently reflect and trigger thought processes “live”; which directly enhances the validity of the data collected (Laitinen-Väännänen, Talvitie & Luukka, 2008). This powerful method of data recording (Pelaccia et al., 2014) is explained in the data collection section.

The patients
The recruitment began with inviting pregnant women with PGP to participate in the study. The use of posters in each room of the Unitec osteopathic clinic 41, flyers at the reception and a Facebook page were implemented. These advertisements included the aim of the research, inclusion and exclusion criteria, email address and phone number. After showing interest, each individual had a meeting with the researcher to give them the opportunity to ask their questions. The women’s input was limited to their side of the consultation, and formed the background against which the practitioner’s reasoning took place. Four out of the five selected patients were unknown from the participating practitioners and only one of the five pregnant women was an
existing patient of the clinic 41. Once enrolled, the patients were asked to sign the consent form and were given a petrol voucher and three free treatments at the clinic. The appointments were set up with the practitioners, ideally on the same day as the post consultation interview could be undertaken. One of the practitioner who had seen the patient a few times prior to this study was asked to reflect on past diagnosis decisions, and present clinical decisions. However, as the validity of the diagnosis must be re-evaluated at each appointment, it was expected that the osteopath was still reflecting and making decisions about the diagnosis during each consultation. Regarding the inclusions and exclusions criteria, each pregnant woman was asked to confirm that they were within their 20th and 30th week of pregnancy and that they were experiencing lumbopelvic pain. Pregnant women were not eligible for this research project if they had a high risk pregnancy [see Appendix 4] as determined by their lead maternity carer. They were also required to have an adequate level of English to communicate their symptoms/experience to the practitioner.

The practitioners

The recruitment of the final four practitioners was initiated by searching on Google for Auckland osteopaths who advertised care for pregnant women. A total of nine osteopaths were contacted via phone calls and only one agreed to participate. Due to this poor response, it was thought more appropriate to recruit the rest of the practitioners via convenience sampling. Therefore, three tutors from the student osteopathy clinic at the tertiary institution, all of whom had experience and one of them had post graduate training were approached and agreed to participate. One of the tutors had previously participated in a very similar research. They were sent an email with full information sheets and consent forms [see Appendix 6 & 7]. From there the practitioners had up to 5 days to think about it, read the protocol of the research and respond yes or no. They were all randomly assigned new patients who were also recruited for the research. The practitioner who was not a clinic tutor asked one of her patients if she wanted to be part of a study, and the woman agreed. This practitioner had multiple post graduate training and specialised in treating pregnant women. During the recruitment, the researcher tried to get a similar amount of practitioners with and without post graduate training in order to see preliminary trend in clinical reasoning within these 2 sets of people.

In order to participate in this study, practitioners were required to satisfy the following criteria: (1) hold a registration with the Osteopathic Council of New Zealand (2) hold a current Annual Practising Certificate; and (3) have at least 5 years of clinical experience and treat a minimum of 6 pregnant women a month.
Data collection

The recording of the consultation

In an interpretive descriptive study, the researcher is interested in the precise analysis of the practitioner’s real-life experience and therefore, a flexible data collection method is required (Smith, 2007). In-depth semi-structured interviews have been shown to be the most reasonable choice amongst other instruments (Smith, 2007). This method was also used in Thomson et al.’s studies on clinical reasoning in osteopathy (Thomson et al., 2011a; Thomson, Petty & Moore, 2013). The latter also used a combination of the following methods: written material from the practitioner, video-recording of the consultation and followed by audio-recorded interview-debriefing (Thomson et al., 2011a).

Interview debriefing methods have some inherent limitations such as bias of results through using semi-structured interviews as the practitioners might try to formulate ‘ideal’ answers rather than explaining what they really think. In a previous study the researcher sought to address this issue by reminding the practitioners that there were no right or wrong answers (Thomson et al., 2011a). The use of a head-mounted camera removes some of the objections to normal video recording such as the physical intrusiveness of the equipment, as explained by Unsworth (2005).

Therefore, in the present research project, the data were generated by recording a real consultation between the expecting mothers suffering from PGP and the practitioner by using a GoPro camera. The camera was positioned in such a manner that the privacy of the patient was maintained. The practitioners were shown how to use the camera and were in charge to turn it on and off and no negative issues were encountered. The consultation videos were 30 to 70 minutes in length. At the end of the consultation, the practitioners gave the camera to the researcher who then saved it to a secured file on her laptop. While the researcher was preparing the video and the audio recorders for the post consultation interview, the practitioner rebooked the patients for their remaining two free appointments. Furthermore, Thomson et al. (2011a) recommended that in ideal conditions, conducting the interviews directly after the practitioner-patient interaction, as already mentioned before, allow the information to be kept fresh and the practitioner does not get time to prepare ideal answers. Following Thomson’s practical advice, all interviews in this study were conducted immediately after the consultation.
The post-consultation interviews

Interviews were practiced several times with fellow students before the actual start of data collection in order to polish the questioning and the flow of the interviews. A question guide is attached in appendix 8. Debrief and reflection on the flow and content of the interviews were performed after each practice run.

The interviews comprised different elements that needed to be managed simultaneously: the questioning/interaction with the practitioner-researcher, the audio-tape recording of the interview, the video of the consultation itself, and taking notes. At the beginning of the interview, the video of the consultation was opened on the laptop, and then two audio-tape recorders were used in case one was to not work (tablet and phone). The practitioner was asked to start by giving a general overview of the patient before watching the video of the consultation. Reflection on the first interview resulted in some modifications to the subsequent interviews. When watching the video of the consultation, either party could request to stop the video to allow questioning, discussion and explanations. Interviews lasted between 40 to 100 minutes depending on the length of the consultation. At the end of the interview the recorders and the video were stopped and were both saved in a protected electronic file. The audio-recorded post consultation interviews were given to a professional transcriber for transcription.

Data analysis

Thematic analysis

There are many ways to analyse the data in qualitative research. Depending on the sub-type of study chosen, the method can vary (Thorne, 2000; Edwards et al., 2004b; Starks & Trinidad, 2007). As described by Braun and Clarke (2006) “thematic analysis is a method for identifying, analysing, and reporting patterns (themes) within data” (p. 6). Results from studies have shown that thematic analysis can either be inductive or deductive (Boyatzis, 1998; Crabtree & Mill, 1999; Braun & Clarke, 2006). Themes found from an inductive approach are closely related to the data (Boyatzis, 1998); whereas themes found from a deductive approach are more driven by theories and less descriptive (Crabtree & Mill, 1999). For this present research project it was thought more appropriate to use an inductive approach which contributes to rigour as it ensures the close relationship between the data and the themes.
In the present case of interpretive descriptive study, the first step consisted of the researcher gaining familiarity with the data and settings, followed by a ‘synthesising’ phase, where the first themes and stories emerged (Finlay, 2011). The third step mainly consisted in reflecting and interpreting the data in a deep manner to extract cognitive meaning out of the data. These steps are very similar to what Thorne, Kirkham and MacDonald-Emes (1997) advice, which consisted of repeated immersion in the data before commencing coding, classifying, or linking cases to each other. Therefore, the process of analysis consisted of synthesizing, theorizing, and re-contextualising the data. In this latter phase the recordings were read and listened to over and over again. This process allowed the researcher to get a thorough familiarisation with the content of the recording, and therefore the ability to reflect on the relevant aspects. By knowing the content of the recordings the researcher was able to put aside any irrelevant part of the interview, which in this case, was essentially the general conversation between the patient and the practitioner, and therefore save time (Finlay, 2011). Giving evidence and strength to the data is another aspect of interpretive descriptive study (Smith, 2011). For that, the researcher might use the ‘voice’ of the practitioners by quoting them. The above process should be done in a slow manner to test the strength of emerging ideas and thoroughly reflect on the data rather than doing a pure description of facts (Finlay, 2011). Finally, the aforementioned author stated that “the key question is: does the analysis bring the phenomenon to life?” (2011, p. 244). If the researcher is able to answer a potential ‘yes’ to this question, it should be taken as a positive sign.

**Description of thematic analysis**

**Initial coding and synthesising:** The transcripts were simultaneously read and listened to check accuracy and then for familiarisation and identifying key ideas. The use of colour for each theme made the synthesis phase easier and more organised. Primary level codes were identified through the use of colors and note taking on each transcript. To organise and synthesise the data, a book of codes was created in which primary level codes, later refined into secondary level codes, were given a broad name. A period of stepping back from the data followed the previous step for a week before going back into it. This allowed the researcher to assimilate all the information and be more critical and reflective when going back into it, which is consistent with Braun and Clarke (2006) who add that “analysis involves a constant moving back and forward between the entire data set, the coded extracts of data that you are analysing, and the analysis of the data that you are producing” (p. 15). The potential themes were critically reviewed and
challenged by supervisors (RM and EN) and fellow students [see Appendix 9]. Some of the themes were discarded and some merged together.

**Interpretation and determining final themes:** The interpretation phase began with creating a document in which the attitude and clinical reasoning process of each practitioner were analysed in order to help understand the meaning of the themes and add context to them. A few diagrams were made to explain the process of clinical reasoning and the researcher was then able to contrast experienced practitioners both with and without a specific interest in obstetrics. The process allowed the data to become even more refined and specific quotes from the written transcripts were used to illuminate the data. The interpretation of the data was guided by several questions such as: in what way(s) are the practitioners’ goals similar or different? What is the relationship between the patient and the practitioner? How do osteopaths use their knowledge or experience in regard to diagnosing and managing their patients? What strategies did this osteopath used in comparison to the others?

Journaling enabled reflection (Ortlipp, 2008) on emerging thoughts and helped the researcher keep control of the data and future tasks to achieve in the due course. Also visual representations of the emerging themes using the whiteboard as previously shown in appendix 9 and diagrams helped in making sense of the data and finding the best way to bring the data to life. The journal was also found essential for the process of analysis and interpretation to be recorded and examined, checked and reviewed, leading to confidence in the findings.

The themes identified were reviewed to evaluate their relevance to the research questions. The three themes were finally named as follows: (1) Setting up the field to activate the process of clinical reasoning (2) The dynamics of reasoning: the strategies used to organise and interpret information and (3) A subtle difference shaped by contextual variances. In the findings section of the manuscript, the researcher’s interpretation of the data is provided in an organised manner while using quotes to enrich the data. More examples of quotes for each theme are provided in appendix 11 which was excluded from the manuscript due to limited word count in journals. At all times the researcher’s method was strongly focused to maintain rigour and consistency in the data analysis and interpretation.

**Rigour in qualitative research**

The concept of rigour and how to achieve it is explained in this section. In the field of health research, qualitative research is often criticised for their lack of scientific rigour, but also for the
inability to generalize the results due to small sample sizes (Koch & Harrington, 1998). Gearing (2004) also notes that there is a tendency for authors to state what was done without explaining the process, which can challenge the rigour of the study.

Koch and Harrington (1998) discuss that reflective, self-interpretive research in combination with detailed explanations on data analysis and theme identification is the basis for rigour in qualitative research. A range of criteria for evaluating rigour has been developed (Sandelowski, 1986; de Witt & Ploeg, 2006) such as truth value, applicability, consistency and neutrality (Sandelowski, 1986). Alternative criteria have also been included and are described as follows: credibility; fittingness or transferability; auditability or dependability; and confirmability (Lincoln & Guba 1985; Houghton, Casey, Shaw & Murphy, 2013). These criteria are often used as universal standards for qualitative research, but are sometimes uncritically adopted within the nursing field of research. The previous statement correlates with the literature (Koch & Harrington, 1998; Annells, 1999; Corben, 1999, Draucker, 1999, Kahn, 2000; Maggs-Rapport, 2001; Whitehead, 2004) where these authors argue that disagreement on these criteria suggests they are not sufficient enough to establish the rigour of interpretive descriptive research (de Witt & Ploeg, 2006). Therefore, it seems essential to further research about the necessity and efficacy of these criteria.

Each criterion is briefly introduced in the next paragraph and explained in the context of the current study:

**Credibility** refers to the value and believability of the findings (Lincoln & Guba, 1985; Leininger, 1994; Polit & Beck, 2006) and often includes prolonged engagement, persistent observation, triangulation, peer debriefing and member checking (Houghton et al., 2013).

Credibility was ensured in this study by spending sufficient time studying the data in order to fully understand the phenomenon of clinical reasoning of each practitioner. On-going journal reflections and regular meetings with the supervisors helped maintaining the rigour. Peer researchers were extremely useful as they allowed the data to be looked from a broader perspective.

**Fittingness or transferability** is defined as the extent to which the data can be applied to another group, population or situations which is similarly described as generalisability (Bryman, 2008). To allow transferability in the current study, findings were presented with direct quotes from the transcripts, being consistent with the literature (Graneheim & Lundman, 2004).
Quotations allow the reader to develop their own judgement and interpretation of the data and therefore, enhance their critique of the data (Graneheim & Lundman, 2004).

**Auditability or dependability** is explained by Koch & Harrington (1998) as the record or visibility of the decisions made by the researcher during each step of the research process and relates to reliability of the process. The reader can follow each step, confirming that it is logical and adequate for this data in this study.

The term dependability is closely linked to **confirmability** which refers to accuracy of the data (Tobin & Begley, 2004) in relation to the research question and methods implemented for the collection and analysis of the data (Harding & Whitehead, 2013). In the present research dependability was achieved through the researcher reflecting via audio recorded meetings and written reflections in a journal. More detailed descriptions and developing ideas regarding the themes are provided in appendix 9. Confirmability, on the other hand was achieved by reviewing the literature regarding the best fitted method for this project and research questions were explored when appropriate.

The following section gives an insight of the ethical considerations regarding the participants (both practitioners and patients) confidentiality, consent and safety.

**Ethical considerations**

Ethical considerations for this study related to minimising participant harm, informed consent, data collection, anonymity and confidentiality, data security and withdrawal from the study. These guidelines include confidentiality, consent and safety and are consistent with the Treaty of Waitangi.

**Confidentiality**

All information such as consent form, interview recordings, transcripts, emails and analysed data was kept confidential at all times. Hence, a password-protected folder was created to store the data files. Only the researcher and named supervisors were able to access the data at any time. Name and personal information concerning the participants, both practitioners and patients, were kept confidential. A formal application was made to the Unitec Research Ethics Committee and was approved (2014-1038); [see Appendix 5]. All the data, both electronics and hard copies, will be kept for five years following completion of this research project in accordance with Unitec Institute of Technology’s regulations for research projects. After this time, all electronic files will be deleted and any hard copy information will be securely destroyed.
Participant consent
The participants were aware of the full process of this research project and what they needed to provide or do from the document that was sent to them [see Appendix 6 and 7]. At any point in the data collection stage, the participants had the right to withdraw at any time up until 2 weeks after the interview was completed and were able to decline to answer any particular questions in the study. Practitioners and patients also had the right to withdraw one week post consultation. The participants also had the right to ask for the transcript of their consultation but none of them did.

Safety
The care provided was in no way different from standard care for women with this condition, and thus, fit within standards for patient care in NZ legislation.


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SECTION 2: The manuscript
Osteopathic clinical reasoning for the diagnosis and management of pelvic girdle pain in pregnancy

Running head: osteopathic clinical reasoning in pregnancy

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Abstract

Osteopathic clinical reasoning for the diagnosis and management of pelvic girdle pain in pregnancy

Background: Despite an increase in the amount of research on clinical reasoning in a wide range of healthcare professions, the availability of clinical reasoning literature in osteopathy is limited. Pregnant women consult osteopaths for pelvic girdle related issues, although there appears to be no research investigating clinical reasoning of osteopaths with these women.

Aims: (1) To explore the osteopathic clinical reasoning for the diagnosis and management of pelvic girdle pain (PGP) in pregnancy; and (2) To identify the key differences between the clinical reasoning of experienced osteopaths with, and without, a specific interest in obstetrics.

Methods: Five consultations were video recorded and followed by an audio-recorded semi-structured interview reflecting on the video previously recorded. Each interview was transcribed for further thematic analysis.

Results: Three themes were identified from the data which represented the different facets/aspects of clinical reasoning: (1) Setting up the field to activate the process of clinical reasoning (2) The dynamics of reasoning: the strategies used to organise and interpret information and (3) A subtle difference shaped by contextual variances.

Conclusion: Osteopathic clinical reasoning for the diagnosis and management of PGP was somewhat similar from one practitioner to another. However, key elements such as faster access to a broader knowledge base, higher certainty and ability to prioritize questioning for patient’s safety were found in experienced osteopaths with specific interest in obstetrics. Further research should be undertaken regarding the similarities and differences between osteopaths with different levels of experience in clinical management of women with pregnancy related PGP.

Key words: Clinical reasoning, pregnancy, pelvic girdle pain, osteopathy

14 In this present research the term ‘obstetrics’ will refer to osteopath practitioner treating pregnant women.
Implication for practice:
The reader should then have a better understanding of:

1) The methods implemented by osteopaths during clinical reasoning
2) The key factors affecting osteopath’s clinical reasoning in 4 participating osteopaths
3) The relevance of having further interest in obstetrics when diagnosing and treating pregnant women with PGP.
Introduction

Clinical reasoning has been defined by various authors and a range of terms have been used interchangeably to define the same process (Simmons, 2010; Thomson, 2013; Norman, 2005). Thomson et al. (2011a) have described clinical reasoning as “a dynamic process, which occurs throughout the patient encounter, and moves beyond the point of diagnosis formation” (p. 72). Clinical reasoning extends beyond the practitioner and patient, and includes interaction of patients, family and other healthcare practitioners to make clinical decisions (Doody & McAteer, 2002; Thomson et al., 2011a; Thomson et al., 2013). Simmons (2010) describes clinical reasoning as an ambiguous term that is often used synonymously with decision-making and clinical judgment. Since Elstein et al first investigated the diagnostic clinical reasoning in medicine (Elstein, Shulman & Sprafka, 1978), clinical reasoning has also been investigated in a range of other health professions including physiotherapy (Payton, 1985; Jones, 1992; Doody & McAteer, 2002), nursing (Benner & Tanner, 1987; Benner, 1984/2001), chiropractic (Amorin-Woods & Parkin-Smith, 2012) and more recently in osteopathy (Thomson et al., 2011a; Thomson et al., 2013). Emerging research interest in clinical reasoning within osteopathy has lead to investigation of osteopaths’ conception of clinical practice (Thomson et al., 2013; Thomson, Petty & Moore, 2014a, 2014b), the application of clinical reasoning strategies (Thomson, Petty & Moore, 2014c), and also the education and evaluation of clinical reasoning (Fryer, 2008; Stone, Boud & Hager, 2011; Moore, Grace, Orrock, Coutts, Blaich & Vaughan, 2014). However, all this research in osteopathy has been conducted within the last seven years, suggesting that clinical reasoning is a new and emergent topic of interest within osteopathy, therefore highlighting the need to continue research in this field.

Research in clinical reasoning has often resulted in listing the types of strategies used during the formulation of a diagnosis; “telling us how practitioners should reason rather than how they do reason” (Norman, 2005). The most common strategies described are hypothetico-deductive reasoning, pattern recognition, collaboration reasoning and metacognition (Elstein et al., 1978; Edwards, Jones, Higgs, Trede & Jensen, 2004a; Sprafka, 2003; Thomson et al., 2011a). However, this research has largely failed to explore the cognitive process employed by a practitioner during a consultation. Thomson et al. (2011a), Sprafka, (2003) and Roots, Niven and Moran (2015) have identified that osteopaths use a cyclical process of data gathering, hypothesis generation and cue interpretation to establish diagnosis and management plans, therefore employing both hypothetico-deductive and pattern recognition.
The notions of patient-centredness and evidence based practice have been the subject of attention in osteopathy over the last two decades and a major revision of osteopathic principles positioned the patient at the centre of the consultation (Rogers et al., 2002). However, to effectively contribute to this mutual collaboration, osteopaths need to have a well-developed knowledge base, and an understanding of how practitioners make clinical decisions (Thomson, 2013). In relation to obstetric practice, King (2000) expanded on the osteopathic principles [see Appendix 3] and suggested that their application could not only improve the accuracy of the diagnosis of women with PGP in pregnancy, but also prevent aggravation of symptoms and positively affect the management and experience of pregnancy. Although osteopathic principles are widely used to diagnose and treat PGP in pregnant women, there is currently no evidence to suggest that the principles lead to a more accurate diagnosis or appropriate management (King, 2000).

Pelvic girdle pain is a common problem encountered during pregnancy (Röst, Kaiser, Verhagen & Koes, 2006; Stuber & Smith, 2008) and affects approximately 45% of women during pregnancy and 25% of postpartum women (Wu, Meijer, Uegaki, Mens, Van Dieen, Wuisman & Östgaard, 2004). Several therapeutic interventions have been indicated for PGP, but only a few are underpinned by evidence-based clinical reasoning in disciplines such as physiotherapy (Stuge, Lærum, Kirkesola, & Vøllestad, 2004; Eggen, Stuge, Mowinckel, Jensen, & Hagen, 2012; van Benten, Pool, Mens & Pool-Goudzwaard, 2014), chiropractic (Elden, Fagevik-Olsen, Ostgaard, Stener-Victorin, Hagberg, 2008), and osteopathy (Licciardone et al., 2010). Lee (2007) states that the focus on quantitative research in manual therapy fails to explore the qualitative portion of the patient-clinician interaction which has been shown to have a “significant and meaningful impact on patient outcome and function” (p. 2). Therefore, investigating osteopaths’ reasoning processes during clinical interaction with pregnant women would be useful to advance understanding and facilitate the learning and development of clinical reasoning of novice osteopaths. Therefore, the aims of this research were to: (1) explore the clinical reasoning of several osteopaths during the diagnosis and management of pregnant women with PGP; and (2) to identify the key differences between the clinical reasoning of experienced osteopaths both with and without a specific interest in obstetrics.
Methods

Methodological approach

An interpretive descriptive approach was used to analyse the meaning of individual experiences (Thorne, 2000; Vivar, McQueen, Whyte & Armayor, 2007; Nicholls, 2009). Interpretive description has been shown to inform, support and challenge information gathered (Lester, 1999), and is appropriate for exploratory studies that map the ground of knowledge in an under-researched area, represent the voice of the participants faithfully and build a coherent account of a phenomenon. Interpretive descriptive methods are also key to uncovering practitioners’ meaning of the complex and dynamic process of clinical decision making (Ploeg, 1999).

Participants

Recruitment

The recruitment of practitioners was initiated by online Google search for Auckland osteopaths who advertised care for pregnant women. Nine osteopaths were contacted by telephone with one agreeing to participate. Due to this low response, it was thought more appropriate to recruit the remaining participant via convenience sampling and three osteopaths who worked as supervisory tutors in the institutional teaching clinic were invited to participate. One of them had previously participated in a very similar research. During the recruitment, the researcher tried to get a similar amount of practitioners with and without post graduate training in order to see preliminary trend/effect on/ in clinical reasoning within these 2 sets of people. They were sent an email with information about the study [see thesis Appendices 6 and 7]. Each practitioner was assigned a new patient who was also recruited for the research. Five pregnant women complaining of PGP were recruited through distributing fliers to the patients seen in the clinic, posters in the clinic and word of mouth. Four out of the five selected patients were unknown from the participating practitioners and only one of the five pregnant women was an existing patient of the clinic 41. Respondents to advertising were invited to a meeting where further information about the research was given and their eligibility was assessed. The women’s participation was limited to attending the consultation, and formed the clinical consultation in which the practitioner’s reasoning took place.
Eligibility criteria

Practitioners:
In order to participate in this study, practitioners were required to satisfy the following criteria: (1) hold registration with the Osteopathic Council of New Zealand, (2) hold a current Annual Practising Certificate; and (3) have at least 5 years of clinical experience and routinely treat a minimum of 6 pregnant women a month.

Patients:
For inclusion, patients were required to fulfil the following criteria: (1) Gestation between the 20th and 30th week of pregnancy; and (2) experiencing lumbopelvic pain. Pregnant women were not eligible for this research project if they had a high risk pregnancy as determined by their lead maternity carer.

Ethical considerations
All participants (both osteopaths and patients) gave written informed consent before participating. Ethics approval for the study was granted from the institutional ethics committee (UREC (2014-1038) [see Appendix 5].

Data collection
Recording of the consultation
Data were collected by video-recording each consultation between patient and the practitioners using a small high-definition digital video camera positioned on a desk (HERO3, GoPro Inc., San Mateo, CA, USA), focussed solely on the practitioner. The consultation videos were 30 to 70 minutes in length. Each practitioner was assigned one patient, except for one practitioner who undertook two consultations.

Post-consultation interviews
Immediately following the consultation, each practitioner underwent an interview with the principal investigator (J.R.). These interviews commenced by the osteopath providing a general overview of the consultation, followed by a viewing of the consultation video. The video was paused at the request of either party to allow questioning, discussion and detailed explanation.
These interviews were audio recorded, and took between 40 and 100 minutes. At the end of the interviews the audio and video data was saved in a protected electronic file. The audio-recorded post consultation interviews were sent to a professional transcriber for transcription.

**Data extraction and analysis**

*Initial coding and synthesising*

The transcripts were simultaneously read while listening to the audio file to check accuracy and then reviewed repeatedly for familiarisation and identifying key ideas. Primary level codes were identified through the use of colors and note-taking on each transcript. To organise and synthesise the data, a book for codes was created in which primary-level codes, which were then later refined into secondary level codes, were given a broad name. A period of stepping back from the data followed the previous step for a week before going reengagement with the data. This allowed the brain to assimilate all the information and be more critical and reflective when going back into it which is consistent with Braun and Clarke’s (2006) processes. The potential themes and sub-themes were critically reviewed and challenged by supervisors (R.M. and E.N.) and other colleagues [see Appendix 9]. As a result, some themes were discarded and some merged and refined.

*Interpretation and determining final themes*

The method of thematic analysis was implemented for this research based on the approach developed by Braun and Clarke (2006).

The interpretation phase began with creating a document in which the type of practice and clinical reasoning process of each practitioner were analysed in order to help understand the meaning of the themes and add context to them. Diagrams were made to explain the process of clinical reasoning and the researcher was then able to identify differences that distinguished experienced practitioners with specific interest in obstetrics, from those without a specific interest. Quotes from the transcripts were selected to illustrate the findings and this process allowed a further check of strength and significance of the themes.

Journaling by the principal investigator (J.R.) enabled reflection on emerging thoughts and helped the researcher maintain control of the data and future tasks (Houghton, Casey, Shaw and Murphy, 2013). Further, visual representations of the emerging themes using the whiteboard
and diagrams [see Appendix 9] helped make sense of the data and finding the most appropriate way to bring the data to life. The journal was essential for the process of analysis and interpretation to be recorded and examined, checked and reviewed, contributing to an audit trail, thus contributing to confidence in the findings.

**Promotion of rigour**

Rigour was promoted by implementing four approaches. Firstly, throughout the research process the principal investigator (J.R.) kept track of the research progress and maintained a reflective journal (Houghton et al). Secondly, rigour was promoted by regularly meeting with the supervisors to critically assess the validity or credibility of each emerging thoughts, concepts and themes in relation to the research questions. Thirdly, the investigator went back to the raw data to confirm the meaning of the extracted themes. Finally, the method implemented in this research was explained as accurately as possible to enable its transferability (Bryman, 2008).

**Findings**

Three themes were extracted from the data: Theme 1: Setting up the field to activate the process of clinical reasoning, Theme 2: The dynamics of reasoning: the strategies used to organise and interpret information and Theme 3: A subtle difference shaped by contextual variances. Theme 1 and 2 are actions and behaviours happening within specific clinical phases of the consultation, and Theme 3 illustrates factors influencing Theme 1 and 2. Table 1 illustrates how Theme 1 and 2 are described in relation to the five clinical phases observed in each consultation: (a) Initial interaction (b) Case history, (c) Examination, (d) Diagnosis hypothesis and (e) Treatment and management plan. Each theme is supported by a minimum of one quote selected from the commentary transcripts. [See additional quotes in Appendix 11]. In this research, P3 and P4 were treating pregnant women on a more regular basis than P1 and 2 and had a stronger interest in this field.
<table>
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<th>Table 1. The use of clinical reasoning within different stage of the consultation</th>
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<td><strong>Theme 1:</strong> Setting up the field to activate the process of clinical reasoning</td>
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Theme 1: Setting up the field to activate the process of clinical reasoning

During data analysis it was noticeable that each practitioner had a similar way of processing, confirming or refuting their thoughts which was used throughout the consultation. The practitioners began by giving a clinical picture of their patient while justifying their thoughts by using basic knowledge, experience and physical examination. When describing the ‘big picture’, the patients’ feelings were used to inform the diagnosis which emphasised the notion of patient-centredness. The order in which each component was used varied from one practitioner to another. Descriptors such as ‘confirm’, ‘going back’, and ‘I wanted to know’ revealed the dynamic process that practitioners were going through when trying to formulate a diagnosis and management plan for women with PGP.

a) Patient’s clinical presentation:

All practitioners involved in this research appeared to start with the patient’s clinical presentation as part of their clinical reasoning. It helped them structuring their thoughts and gave them a ‘starting point’. Having a broader picture of the patient appeared to be common to each practitioners when initiating the thinking-aloud process of their clinical reasoning.

P1, 2 and 4 were focused on the musculoskeletal aspect of the picture:

**P4**: “She came in today for predominantly lower, left lower back pain”.

P3 focused on the biopsychosocial aspect of the clinical presentation:

**P3**: “She hurt herself last year when she was lifting a massage table […] and everything else that's happened since I think is just aggravating that first injury”.

b) Using basic knowledge/evidence:

After outlining the patient’s clinical presentation, practitioners used their basic knowledge to back up their initial thoughts about a diagnosis and helped them gauge how likely it was to be A or B, rather than C. The use of basic knowledge was implemented each time a new finding or piece of information was collected from the patient, showing that practitioners were constantly reflecting.
P4: “In the literature I think, a lot of terms refer to the PPP, Posterior Pelvic Pain. So again, from a classification perspective, to my understanding there’s not as many people that have the PPP versus the lower back pain”

c) Relating to experience
Similar to using basic knowledge, experience played a crucial role in guiding practitioners’ thoughts regarding a potential diagnosis. Practitioners were able to use what they have seen before to inform their reasoning.

P1: “I would expect, from comparison with other pregnant women that I’ve treated”.

d) Processing thoughts
When practitioners explained what they were thinking, it appeared to be a non-linear process. They were frequently reasoning back and forth and a dynamic process was visible.

P3: “If I treat the pelvis I'm always thinking of the psoas. So that'll always be there in the back of my mind and she's complaining of groin pain and pain going down the front”.

P1: “it started to tie back into what I was thinking before”.

e) Physical examination
Examination was used to confirm or refute ideas about diagnosis and the management plan and was guided from the information gathered during the case history. Words such as “the examination told me”, and “to confirm it” show that they are working towards a diagnosis with examination informing them of what to do next.

P2: “I did a passive exam just to confirm it”.

P3: “That’s probably the connection between the psoas and the pelvis. So I'll hold that in my mind, and then you carry on with your investigation”.

f) Focusing on the patient
The patient as a person was taken into account in diverse ways for each practitioner and informed their decisions differently. However, practitioners 1, 2 and 4 involved their patient similarly and it was more obvious after they gathered enough information to formulate a
diagnosis and management plan. For P3 it started from the beginning were she included the patient’s past experiences into her diagnostic reasoning, as demonstrated below:

**P3:** “Three years ago, she fell down some stairs. [She lost consciousness, she fainted, so she was very floppy when she fell,] and she fell onto her left hip. And for me, that is a pretty major significant situation there”.

Patient-centredness is also demonstrated by the practitioners educating and informing their patients. The following quotes show how practitioners included their patients within their reasoning process:

**P3:** “The only, obviously thing she does is walking which we’ve already established with her is something that she likes and makes her feel better”.

The following section introduces the various methods practitioners use during the consultation to arrive to a diagnosis and management plan. Each method is illustrated with quotes from the practitioners’ transcripts.

**Theme 2: The dynamics of reasoning: the strategies used to organise and interpret information**

Numerous methods helped practitioners arriving at a diagnosis and management plan and are explained below in the order they were used. However, practitioners did not always use them all.

a) **Getting an idea/Anticipation:**

The expressions “getting an idea” and “I expect” were often used by the practitioners showing the importance of having a general picture of the patients to establish a diagnosis and management plan.

**P3:** “You can’t sometimes say what it is at the beginning; you’re just getting a picture”.
b) **Seeking the mechanism behind the pain:**
P1, 2 and 4 often attempted to identify the mechanisms behind the pain production to explain their diagnostic reasoning but also to inform their management. This is not something that P3 implemented in her practice.

**P1:** “I tend to want to know specifically which tissues are causing that problem because it informs my treatment as best. If you have pelvic girdle pain; I’m going to do X, Y, Z”.

c) **Prioritizing:**
All four practitioners appeared to use prioritizing in clinical reasoning and when making decisions it was not a matter of ruling out. Overall, experienced practitioners with interest in obstetrics prioritized their questions to arrive to a diagnosis (P3 and 4), compared with experienced practitioners without a specific interest in this field who went through a less specific case history and prioritizing of their differential diagnoses;

**P4:** “I needed to ascertain that there wasn't anything dangerous happening. So elimination of things like preeclampsia, any infections, any fractures, pre-term labours”.

Also, different levels of thought processes were noticed: ‘fore-front of my mind’, ‘front of my mind’, ‘at the back of my mind’, which indicated they were continually processing relevant information.

d) **Assessing through palpation:**
Practitioners emphasised on the benefit of having great level of palpation and its role in helping formulating a diagnosis and management plan. It informs the practitioners about which tissues are involved in causing the problem.

**P3:** “I'm feeling her breathing, if she breathes, and I get a rotation through the diaphragm, I know there's an asymmetry probably through the psoas or DL or something”.

**P2:** “I used my hands to feel and you can feel the tissue quality, have a sense of the tissue. [...] It's more about what did you feel and you could feel whether a muscle or a ligament is giving you symptoms”.
e) Processing the findings

Throughout the entire consultation, pattern recognition and hypothetico-deductive methods, played an important role in identifying key elements for the diagnosis and management plan of their patients.

P4: “Initially thinking, a kind of a facet irritation. Again because it's predominantly one side, sharp quality, again walking, she said was an issue”.

Often the information gathered during the examination played a crucial role in the practitioners’ diagnostic reasoning, which helped them in differentiating, challenging and refuting their thoughts regarding their diagnosis:

P3: “Okay, this is what's happening. That's probably the connection between, the psoas and the pelvis. So I'll hold that in my mind, and then you carry on with your investigation”.

Clinical reasoning methods used during the dynamic consultation have been presented and differences between the two sets of osteopaths studied in this research have been introduced in the first two themes. The diagram below illustrates the contrast between these two groups (figure 1).
Getting an idea/anticipation

Group A starts to get an idea straight from the beginning

Faster than group B

Slower than group A due to lack of illness scripts

Faster than group B due to experience

Seeking the mechanism behind the pain

Prioritizing

Processing the findings

Assessing through palpation

Group A did not seem to rely on finding the mechanism behind the pain as much as group B

Similar to group A, but affected by their practice view

Prioritizing the questions by using shortcuts (illness scripts)

Broad questioning

Mild prioritizing

The diagnosis is already found

Ranking of the possible diagnoses

Very variable depending on practice view

Similar to group A, affected by practice view

Hypothetico-deductive and pattern recognition was similarly used between the two groups. With some prominence towards the use of pattern recognition from group A.

Hypothetico-deductive and pattern recognition was similarly used between the two groups. With some prominence towards the use of hypothetico-deductive from group B.
Caption for the table: Differences in clinical reasoning strategies used by experienced osteopaths with (purple boxes) and without (blue boxes) a specific interest in treating pregnant women. The height of the boxes illustrates the importance given for each method, by each group. The length of the boxes indicates the time when the chosen method was used during specific step(s) of the consultation.

The following theme illustrates the common factors affecting clinical reasoning with the help of a diagram and quotes.

Theme 3: A subtle difference shaped by contextual variances

Different factors were found to affect practitioners’ clinical reasoning throughout the consultation. These factors are as follows: professional and osteopathic views, knowledge and education. Experienced practitioners with a specific interest in obstetrics versus osteopath without a specific interest in obstetrics seemed to have a different way of reasoning and will be presented below.

The first two factors listed above were originally discussed in Thomson thesis (2013) and the findings from this present research revealed very similar results, supporting the arguments and findings that Thomson described.

Professional’s view of their practice and themselves

  a) Health and disease view:

Health and disease view comprises the biomedical and biopsychosocial views. Practitioners who focused on the biomedical aspect of health and disease seemed to focus on the mechanism of pain generation, tissue causing pain and biomechanics of the body. They made more reference to the propositional knowledge to inform their practice and emphasised less on the patient’s emotions.

P4: “I am looking for any nerve root or discal issues that are giving those symptoms [...] Disca involvement tends to be a little more central”.


Practitioners applying a biospychosocial view tend to emphasise on the patient’s past history, illnesses and sometimes, their socioeconomic status, to inform and shape their clinical reasoning.

**b) Views of traditional osteopathic theories and principles:**

P1 and P2 verbally included the osteopathic principles in their practice while P 3 and 4 did not make any reference to them, which may suggest that they either did not play an important role in their practice or that they did not feel they were relevant in the context of their patient at the time. P3 and 4 had further training in osteopathic care in obstetrics and seemed more confident managing pregnant women. P3 was making less reference to the propositional knowledge and theories while appearing to be more comfortable developing her own approaches and ideas of practice:

**P1:** “Osteopathically, to me, it still makes more sense to figure out what kind of pelvic girdle pain they've got because you can be that much more efficient”.

**P3:** “So my initial treatment was very much just about getting to know her system and about contacting her system and getting her system to know me and trust me”.

**c) Practice view:**

Each section of the consultation varied in length depending on the practitioners’ style of practice. Three different practice styles were observed, namely mostly hands on; communicative and hands-on; and educative practice and hands-on.

Combining communication and hands-on enables the practitioners to understand the patient’s problem in context, their expectations and view about their complaint. The practitioners who prioritized the communication over palpation seemed to build a better rapport.

**P3:** “So my initial treatment was very much just about getting to know her system and about contacting her system and getting her system to know me and trust me”.

All practitioners educated their patients. However, three of the four practitioners consistently explained their diagnosis and management plan (P1, 2 and 4), while P3 wanted the patient to have a deep understanding of the situation and solutions to manage it.
**P3:** “So you know what the psoas look like? They run on either side of your uterus. As the uterus grows like a big balloon, the psoas muscles are like the rails of the uterus. They guide the position of the uterus and if you've got an asymmetry in the tension of the psoas, then you will have maybe a rotation of the uterus or maybe the baby will sit slightly differently”.

**Osteopathic views**

There are three osteopathic views introduced by Thomson (2013), which include practitioner-centred, collaboration and empowerment. Some practitioners portrayed characteristics of one or two categories simultaneously at some stages of the consultation.

P1 and 4 placed specific osteopathic theories, hands-on techniques and propositional knowledge at the centre of their practice. In relation to the professional views, they seem to have a view of health and disease which focused on patients’ biomedical impairment.

**P1:** “Normally when I find out that the pain they had is similar to what they had in their past pregnancy, I am aware that for a diagnosing perspective, it will be relatively easy to find”.

All practitioners placed different values on working with patients to make decisions. For some, this behaviour was more obvious after the formulation of their diagnosis.

**P3:** “There's not endless money there. We have come to an agreement and I ask her every time what she wants to do now”.

Practitioners who considered patient empowerment emphasised educating through sharing knowledge, but were also reassuring. They considered the patient’s problem in the context of their daily lives and how it affected their day-to-day functioning.

**P3:** “She came to me for pelvic pain in pregnancy [...] and she wants to work on it now and see if she can get it to change before she gets too pregnant”.

**Knowledge and education**

Knowledge and education affected the practitioners’ clinical reasoning and was reflected in their ability to access relevant knowledge in a faster manner. P3 used different types of testing compared with the other three practitioners and her clinical reasoning was better
controlled which seemed to reflect the benefit of having post graduate training in the obstetric field.

**P3:** “That's really important for me and that's because I'm an ESO trained osteopath and I don't think one thing's the better thing than the other”.

The following quote shows that knowledge is crucial when treating patient, but even more during pregnancy as the practitioner is dealing with two people, the mother and her baby:

**P4:** “I think that a pregnant person, their bodies are going through quite a number of changes, and so you need to be aware of what's happening to the spine, the cardiovascular, respiratory systems, the bowels, all of the systems to get an appreciation of what to expect”.

**Experienced practitioner with a specific interest in obstetrics versus osteopath without a specific interest in obstetrics**

P1 and 2 seemed to be comfortable with safely treating pregnant women, but their clinical reasoning did not seem to differ, even marginally, from treating non-pregnant women when compared with P3 and 4 who treated pregnant women on a more regular basis and had a specific interest in obstetrics. P4 suggested that it might not be necessary to be a “specialised osteopath” to treat pregnant women but it might certainly be useful and save time if the case were to be more complicated.

**P4:** “You just need to be aware of certain procedures that you wouldn't necessarily do and then you have the patient in certain positions [...] From that perspective, to a pregnant person to a non-pregnant person essentially, you're asking the same questions, but if you get a positive answer with a pregnant lady, then it could have a significant meaning”.
Figure 2: Factors influencing the clinical reasoning process of participating osteopaths in relation to the clinical reasoning strategies.
Figure caption: There were some discrepancies in the strategies practitioners used to arrive at a diagnosis and management plan which was related to the variation in patient’s involvement within the consultation. These variations were affected by the different osteopathic views practitioners hold but also by their previous experience, education and special interest in obstetrics.

The information in the red boxes was discussed and illustrated by Thomson (2013) and were commonly observed in this present research. The information in the green boxes was findings from this present research. The dashed lines were used to divide the table into two different sections as identified as professional artistry and technical rationality.

Discussion

The aim of this study was to explore the osteopathic clinical reasoning for the diagnosis and management of pelvic girdle pain (PGP) in pregnancy. A secondary aim was to identify the key differences between the clinical reasoning of experienced osteopaths with, and without, a specific interest in obstetrics.

The key findings of this research were the identification of three themes: 1) Setting up the field to activate the process of clinical reasoning, 2) The dynamics of reasoning: the strategies used to organise and interpret information; and 3) A subtle difference shaped by contextual variances.

The findings from this study suggest that several methods can be implemented during the process of clinical reasoning and are discussed here in context of the wider literature. One of the methods used by the practitioners when meeting a patient for the first time was to try to get a general picture of what was going on. From past experiences they had an idea of what to expect and some of them were able to anticipate the complexity of the case and the questions they had to ask. The concept of anticipation and expectation during clinical reasoning is consistent with the literature investigating the role of ‘illness scripts’ as knowledge that allows practitioners to make predictions about features that may be encountered during the consultation and act appropriately (Mattingly & Fleming, 1994; Charlin, Boshuizen, Custers & Feltovich, 2007; Unsworth, 2001). In this research, anticipation was most apparent amongst experienced practitioners who had a specific interest in treating pregnant women.
Clinical methods such as focusing on the tissue causing symptoms and the mechanism behind pain generation were used by practitioners. They made frequent reference to propositional knowledge to inform their practice, and there was less emphasis on patient mood. This finding is consistent with Thomson’s findings (2013) where osteopaths used propositional knowledge to determine the cause of the problem by seeking the mechanism behind the pain generation. Smart and Doody (2007) propose that mechanism-based reasoning seems to influence some practitioners’ examinations and prognosis reasoning which correlate with the findings of this present research. Also, the findings that some practitioners used a more biomedical approach ties in with the concept of identifying somatic dysfunction, described by some North American authors as an important goal of the osteopathic practitioner (DiGiovanna & Schiowitz; 1997; Greenman, 2003; Kappler, 2003). The use of a biomedical approach in healthcare practice conflicts with the growing trend towards application of a biospsychosocial approach (Thornquist, 2001; Cruz, Moore & Cross, 2012). Engel (1977) has criticised the use of a biomedical approach as ‘reducing’ the patient to a collection of signs and symptoms that fails to fully understand the patient as a “person with emotions”. Similarly, Rogers et al (2002) noted that the use of a biomedical approach is in conflict with the osteopathic principles that recognise the close relation of the mind, body and spirit. However, the findings of this present research and Thomson’s findings (2013) suggest that osteopathy practitioners who implement a biomedical approach seemed to have relied on the principles of osteopathy to guide and shape their decisions. This is obviously in contradiction with what Engel (1977) and Rogers et al (2002) claim, and also differs from Penney (2010) who suggests that osteopathic principles are generally congruent with the biospsychosocial model. Also it is notable that practitioners who had a more specific interest in obstetrics appeared to rely more on their own well-developed practice wisdom than on application of established osteopathic principles. In saying that, it was not uncommon to see practitioners use both approaches depending on the situation or step of the consultation.

In this study, all practitioners prioritized key elements of their clinical reasoning process, for example the questions they asked, the examination they performed, and the diagnoses they found. This process of prioritizing was described by Cox, Irby and Bowen (2006) as an analytical process, similar to hypothetico-deductive reasoning, which is more commonly used amongst novices.
Hypothetico-deductive reasoning and pattern recognition are well described and recognised as diagnostic strategies. Similar to previous findings in osteopathy (Sprafka, 2003), and physical therapy (Edwards et al., 2004b), most of the practitioners engaged both processes to gather information and generate hypotheses that would be then modified according to further collected information. However, Thomson, Petty and Moore (2011a) noted that little is known regarding the processes used by osteopaths after they reach a diagnosis. The findings gathered in Theme 2 inform this statement and shows that practitioners used multiple methods simultaneously throughout the consultation to diagnose and manage pregnant women with PGP. The practitioners used hypothetico-deductive and pattern recognition processes throughout the whole consultation (figure 2) which helped them further inform their decisions and management plan. Similar findings were identified by Roots et al (2015) who suggested that hypothetico-deductive and pattern recognition were used throughout the whole consultation for the diagnosis of acute LBP.

The role of palpation appeared to be an important component of diagnostic reasoning (see Theme 2d), and was used as a confirmatory tool especially when faced with uncertainty. These findings support Esteves and Spence’s (2014) suggestion that palpation has a fundamental function in osteopathic clinical decision making. Also, practitioners used palpation and conversation continuously during the consultation, to inform their clinical reasoning. Muscolino (Muscolino, 2008) suggests that therapists often view palpation and treatments as two different entities and that, instead, therapists should use them together. Practitioners can gain sensory input during the examination and use the information gathered during the examination to tailor the treatment and management plan (Muscolino, 2008). Therefore, the practitioners can still gain valuable assessment information while treating that will further inform their diagnosis.

In this research several factors were found to affect clinical reasoning. The first three factors were illustrated in red in figure 2 and were initially concepts established by Thomson (2013) but also observed in this research. The remaining two factors were knowledge/education and the presence of a specific interest in obstetrics.

Theme 3 demonstrated there was variation in how practitioners emphasised their patient’s involvement which was dependent on whether the practitioner applied a professional artistry or a biomedical approach. Therefore, practitioners who began with a biomedical approach appeared to demonstrate processes characteristic of ‘technical rationality’ as explained by Thomson (2013), where practitioners placed themselves at the centre of the consultation. As
found in Thomson (2013), practitioners emphasised the use of palpation (hands-on) and focused largely on biomechanics of the patient's body and the mechanisms of pain and symptoms generation to inform their diagnosis. However, once they had formed a diagnosis, these practitioners became more engaged in informal conversation, but which did not seemingly inform the diagnosis but was clearly important for rapport building.

Practitioners who appeared to employ a more biopsychosocial approach demonstrated processes more aligned to the notion of ‘professional artistry’ (Fish & Coles, 1998; Thomson, 2013). In that case, practitioners were either educating or collaborating with their patients while still using hands-on (see Figure 2). In a collaborative approach, the patient's involvement was shared with the practitioner, while in the educational approach patient empowerment was apparent. This is consistent with Fish and Coles (1998), who suggested that collaborative practitioners closely relate to their patients and develop a deeper sense of who the patients are as persons and their problems. In contrast, practitioners who empowered their patients placed more emphasis on understanding their patients’ functional impairments in relation to their everyday lives and helped facilitate their self-management. This is consistent with the findings from research in manual and physical therapy that suggests that practice views and professional views affect practitioners’ ways of practising (Thornquist 2006; Lindquist, Engardt & Richardson, 2010).

Another factor that was found to influence the practitioners' clinical reasoning was their knowledge and education. Educational experiences, and type of knowledge (practice knowledge, propositional knowledge and non-propositional knowledge) gained across the years has been previously identified as contributing to shaping practitioners conception of practice (Richardson, 1999a; Richardson, 1999b; Richardson, Lindquist, Engardt & Aitman, 2002). This was also apparent in the current study (see Theme 3, knowledge and education). Different practice conceptions and knowledge affected the clinical reasoning strategies that practitioners chose (figure 2). In this research, practitioners who had a specific interest in obstetrics did not rely on the propositional knowledge as such, but rather on their personal and practice knowledge. In contrast, practitioners without a specific interest in treating pregnant women relied on propositional knowledge and direct application of theories and principles. Similar findings were observed in Thomson’s research (2013). Also, practitioners suggested that each institution seem to develop its own preferences with emphasis on a particular aspect of osteopathic practice influencing the way osteopaths practice. This phenomenon was described by Blumer (1986) and Charon (2010) as the symbolic
interactionism theory which proposes that “an individual’s behaviour is likely to be influenced by the culture and context in which the social interaction is situated”. These findings are consistent with the present research findings.

The second aim of this research was to identify the key differences in clinical reasoning of experienced practitioners with and without a specific interest in obstetrics. One main difference between the two groups was the process of prioritizing. It appeared that experienced practitioners with a specific interest for obstetrics prioritized their questioning, so ‘shortcutting’ to a diagnosis, whereas practitioners who treated pregnant women less often went through a more thorough generic case history, trying (also known as the ‘exhaustion strategy’\textsuperscript{15}) to find cues regarding the patient’s complaint and then prioritized their differential diagnoses from the most relevant to the least.

The process of prioritizing diagnostic possibilities is described in the literature as being beneficial in developing the ability to create pertinent ‘illness scripts’ for the practitioner’s repertoire of knowledge. Illness scripts are a characteristic of higher level expertise (Cox et al., 2006). Also, experts tend to use more disconfirmatory hypothesis than novices who tend to confirm their hypotheses by collecting a wide amount of information rather than testing a hypothesis with the use of disconfirmatory hypotheses (Unsworth, 2001). These differences were evident in the four practitioners in this study, distinguishing them into two groups.

In this research, practitioners’ opinion on being ‘specialised’ in obstetrics to treat pregnant women showed that most believed it is not generally necessary but where a pregnant woman presents with a difficult case, being specialised would be advantageous and the accuracy of the diagnosis and management plan may be more enhanced. They also suggested that a key difference between the two groups lies in the ability to process information and judge what should be considered relevant for the formulation of the diagnosis and management plan. This is congruent with the claims of Johnson, Wilcox & Moidel (1967) and Curran, Campbell & Rugg (2006) who suggest that experienced practitioners are able to ‘sift out’ what is relevant and what is not significant. Practitioners proposed that osteopaths who treat pregnant women on a regular basis have accumulated more knowledge in the obstetric field across the years through training and practice. Their ability to act faster is consistent with Johnson et al (1967) who noted that the practice of specialist practitioners is distinguished by their knowledge and cognitive ability to process information (Johnson et al., 1967).

\textsuperscript{15} This strategy involves first gathering all the data possible and then looking for a diagnosis through the data. Often novices use this strategy, but it can also be used when the diagnosis is rare or under fatigue.
The literature is still consistent with a later study in which the findings suggest that gastroenterologists specialists caring for patients with gastro-intestinal bleeding and diverticulitis, diagnosed their patients more accurately than generalists and under their care, the length of hospital stay was significantly shorter (Provenzale, Ofman, Gralnek, Rabeneck, Koff & McCrory, 2003). The same study did not notice any difference in terms of procedures between specialised and non-specialised and no difference in the outcomes of patients seen by specialists or nurses. In this present research, similar findings were found in regards to treatments where all practitioners, with or without a specific interest in obstetrics, seemed to use common elements in their treatments after using different strategies to diagnose their patients. A question for further research arising from this observation is whether osteopaths who treat pregnant women on a more regular basis get better results from treatment than the ones who do not?.

Limitations and further work:

During the research process, several limitations were identified. Small sample is not uncommon in interpretive descriptive research, however, the small sample size in this study (4 practitioners, 5 pregnant women) limits the volume and complexity of the data, therefore the findings should be viewed cautiously. Further studies in this field would allow the refinement of the themes that emerged in the present research and the discovery of potential new ones. In addition, one of the aims of this research was to contrast osteopaths with, and without, a specific interest in treating pregnant women in order to contrast their clinical reasoning. However, due to the small sampling size, it was not possibly to extensively contrast these two groups. Therefore, further research contrasting these two groups with a larger sample size is recommended. Also, it would be useful to investigate the clinical reasoning of one osteopath consulting a large number of patients. The results of a deep exploration of one practitioner treating multiple patients may show different results from what was found in this research and some interesting patterns may emerge.

A further limitation of this research was that some of the practitioners had previously participated in a similar study prior to this one. This may have biased the answers the practitioners gave in that they would have previously discussed their clinical reasoning in depth. To reduce this possibility the interview focused on the new clinical situation. Therefore, it could be relevant to ask the practitioners if they ever participated in such research and reconsider the inclusion criteria in that case.
Conclusion

This study described the osteopathic clinical reasoning of four osteopath practitioners in relation to diagnosis and management plan of pregnant women with PGP. Literature around the topic of clinical reasoning in pregnancy is limited despite clear evidence that pregnant women often seek osteopaths at some point during their pregnancy. This qualitative research allowed the exploration of the otherwise invisible process that is clinical reasoning and added values to the currently limited pregnancy osteopathy literature. Three themes emerged from this study and are summarised below:

1) Setting up the field to activate the process of clinical reasoning
2) The dynamics of reasoning: the strategies used to organise and interpret information
3) A subtle difference shaped by contextual variances
References


Ploeg, J. (1999). Identifying the best research design to fit the question. Part 2: qualitative designs. *Evidence Based Nursing*, 2(2), 36-37. doi: 10.1136/ebn.2.2.36


Thorne, S. (2000). Data analysis in qualitative research. *Evidence based nursing, 3*(3), 68-70. doi:10.1136/ebn.3.3.68


SECTION 3: Appendices
Appendix 1: Four major osteopathic principles
The table below describes what are now considered to be the four major principles of osteopathy:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The body is a unit; the person is a unit of body, mind and spirit.</td>
</tr>
<tr>
<td>2.</td>
<td>The body is capable of self-regulation, self-healing, and health maintenance.</td>
</tr>
<tr>
<td>3.</td>
<td>Structure and function are reciprocally interrelated.</td>
</tr>
<tr>
<td>4.</td>
<td>Rational treatment is based upon an understanding of the basic principles of body unity, self-regulation, and the interrelationship of structure and function.</td>
</tr>
</tbody>
</table>
Appendix 2: Practice and patient tenets
Practice tenets
1. A person is the product of dynamic interaction between body, mind, and spirit;
2. An inherent property of this dynamic interaction is the capacity of the individual for maintenance of health and recovery from disease
3. Many forces, both intrinsic and extrinsic to the person, can challenge this inherent capacity contribute to the onset of illness
4. The musculoskeletal system significantly influences the individual’s ability to restore inherent capacity and therefore to resist disease processes

Patient tenets
1. The patient is the focus of healthcare
2. The patient has the primary responsibility for his or her health
3. An effective treatment programme for patient care is founded on these tenets

Updated tenets of osteopathy (Rogers et al. 2002)
Appendix 3: Osteopathic principle in obstetrics
1. There are mechanical, physiological, and biological stresses inherent even in the patient who is destined to have a normal pregnancy.

2. The body has self-regulatory mechanisms which will provide optimal compensation for the stresses of pregnancy if they are free to work efficiently.

3. Distinctive osteopathic care is based upon the belief and clinical observations that structure and function is reciprocally interrelated”.

(King, 2000, p. 27)
Appendix 4: Additional information for the exclusion criteria for participating patients
The patients:

Exclusion criteria:

- Week 12 and 16 due to perceived risk of spontaneous abortion (Sandler, 1996)
- High risk pregnancy as determined by the lead maternity carer
- Recurrent miscarriage
- Previous preterm delivery
- Cervical incompetence
- Placenta praevia > 28 weeks
- Epilepsy
- Intrauterine growth restriction
Appendix 5: Ethic approval letter
25.6.14

Dear Jessica,

Your file number for this application: 2014-1638
Title: Osteopathic clinical reasoning and decision making for the diagnosis and treatment of
lumbopelvic pain associated with pregnancy: An interpretive descriptive phenomenological study

Your application for ethics approval has been reviewed by the Unitec Research Ethics
Committee (UREC) and has been approved for the following period:
Start date: 29.5.14
Finish date: 25.5.15

Please note that:

1. The above dates must be referred to on the information AND consent forms given to all
   participants.

2. You must inform UREC, in advance, of any ethically-relevant deviation in the project.
   This may require additional approval.

3. Organisational consent/s must be cited and approved by your primary reader prior to
   any organisations or corporations participating in your research. You may only conduct
   research with organisations for which you have consent.

You may now commence your research according to the protocols approved by UREC.
We wish you every success with your project.

Yours sincerely,

[Signature]
Gillian Whalley
Deputy Chair, UREC

cc: Elizabeth Niven
Cynthia Almeida
Appendix 6: Participants information sheets
Information sheet for practitioners

Osteopathic Clinical decision making for the diagnosis and treatment of lumbopelvic pain associated with Pregnancy: Interpretive descriptive phenomenological study.

About this research:

You (the osteopath) are invited to take part in a study which explores the osteopathic clinical reasoning and decision making for the diagnosis and treatment of lumbopelvic pain associated with Pregnancy. We are interested in researching this topic from the perspective of the osteopaths treating pregnant women. The information gathered from this research project will allow us to gain an understanding of the cognitive process used by osteopaths when diagnosing and treating pregnant women with lumbopelvic pain, and also allow osteopaths to demonstrate a progressive and reflective profession. If you have a minimum of four years full time osteopathic experience in treating pregnant women, your participation will be greatly appreciated. Your involvement in this project will help us understand the clinical reasoning and decision making process that osteopaths use to manage women with lumbopelvic pain in pregnancy, and any influence this may have on management outcomes. The knowledge gained from this project will help health care practitioners and Masters Students in osteopathy to improve the quality and efficacy of their management of pregnant women.

The Researcher:

Jessica Rioufrays, Master of Osteopathy Student, Unitec.

This project is being supervised by Dr. Elizabeth Niven.

Taking part in the project:

This project will investigate the osteopathic clinical decision making for the diagnosis and treatment of lumbopelvic pain associated with pregnancy. For this, a poster will be placed to attract the pregnant women’s attention and placed in the selected osteopaths’ waiting rooms. Women willing to participate can then show interest to their osteopath, who in turn will tell them if they satisfy the criteria to be included. In other words, the osteopath’s role will be to assess the eligibility of the patients to participate in the study, according to an inclusion criteria list provided at the start of the patient selection process. Once the potential patients fit the criteria and have been given all the necessary information about the study, they will be given a consent form that they will have to read and sign if they agree with the content and idea of the project. The osteopath may request the pregnant woman’s details so that I (the researcher) can directly email the pregnant woman rather than waiting for an email showing interest for the study. An appointment will be made with the practitioner, the patient and the researcher. At this stage, the researcher must explain the full process of the study comprising the method of data collection, which partially includes the video-recording of the consultation and the consent forms. In case some of the pregnant women do not fit the criteria, the practitioner will have to explain the patients that they do not meet the criteria and so it is best for them not to participate. This will not, in any case, affect their usual management. The women’s input is limited to their side of the consultation, and forms the background against which the practitioner’s reasoning takes place. If an
immediate consultation is to be recorded (for example if the woman is a suitable and willing participant but is making only one visit to the osteopath) the consent form will be discussed and completed by both the practitioner and patient. The recruitment of patients will consist of enrolling pregnant women who are currently under the care of the enrolled osteopathic practitioner or pregnant women who have either seen the advertising material or have been invited into the study by the osteopath. The osteopath will be requested to consult with two participants who fulfil the study’s criteria.

To investigate the osteopathic clinical decision making for the diagnosis and treatment of lumbopelvic pain associated with pregnancy, the consultation with a suitable patient will be undertaken and video-recorded by the osteopath, who will be given a recording GoPro device prior the consultation (the video-recording of the consultation will be exclusively orientated on the practitioner, which will allow complete physical privacy of the pregnant woman). This will be followed by an audio-recorded in-depth semi-structured interview; taking approximately 60 minutes. The video-recording will be used as a reflective support for the in-depth interview. Jessica, I, the researcher, will conduct the interview in the osteopath’s office or other place of their choice as soon as possible after the consultation, but in all cases within 24 hours. To allow optimal rigour of the data, the researcher may organise a follow-up interview with the practitioner to confirm the findings.

Information:

During the audio-recorded semi-structured interview questions will be asked about the clinical decisions and reasoning the osteopath used during the consultation. All information conveyed during the interview will be confidential and anonymised immediately. A transcription service will be used to transcribe the audio-recorded semi-structured interviews. The transcripts of the interview can be sent to the practitioners on request for additional comments. You are able to withdraw from the study up to two weeks following the receipt of the transcript.

Any concerns:

If you have any further questions or concerns please feel free to contact me directly on 02102543911 or at jesswind@hotmail.fr. If you wish you may also contact my principal supervisor Dr. Elizabeth Niven on 021 654 935 or eniven34a@gmail.com

Please keep a copy for your records

UREC REGISTRATION NUMBER: 2014-1038

This study has been approved by the UNITEC Research Ethics Committee from 1st of June 2014 to 31st of May 2015. If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary on: (0064) 09 815-4321 ext 8551. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.
Information sheet for patients

Osteopathic clinical decision making for the diagnosis and treatment of lumbopelvic pain associated with Pregnancy: Interpretive descriptive phenomenological study.

About this research:

You are invited to take part in a study which explores osteopathic clinical reasoning and decision making for the diagnosis and treatment of lumbopelvic pain associated with Pregnancy. We are interested in researching this topic from the perspective of the osteopaths treating pregnant women. The information gathered from this research project will allow us to gain an understanding of the process used by osteopaths when diagnosing and treating pregnant women with lumbopelvic pain.

If you are a pregnant woman between 20th and 30th week of pregnancy, and think you have or have been diagnosed with lumbopelvic pain your participation will be greatly appreciated. Your involvement in this project will contribute to the understanding of clinical reasoning and decision making process that osteopaths used during the consultation he/she had with you.

The knowledge gained from this project will help health care practitioners and Master students in osteopathy to improve the quality and efficacy of their management of pregnant women.

The Researcher:

Jessica Rioufrays, Masters of Osteopathy Student, Unitec.

This project is being supervised by Dr. Elizabeth Niven.

Taking part in the project:

This project will investigate the osteopathic clinical decision making for the diagnosis and treatment of lumbopelvic pain associated with Pregnancy. The consultation’s length will vary from one osteopath to another (from 30 to 90 minutes). Your role in this study is to simply be a patient, being treated for lumbopelvic pain which will later allow the osteopath to reflect on his/her present experience treating you. Therefore, your input is limited to the side of the consultation, and forms the background against which the practitioner’s reasoning takes place. The consultation will be video-recorded to allow an in-depth review of the information that helps in decision-making. The video-recording of the consultation will be exclusively orientated on the practitioner, which will allow your complete physical privacy. The practitioner will explain to me (the researcher), how he/she made his/her decision for the diagnosis and management of the complaint you are presenting with. By volunteering in this research, you are giving us the chance to gather rich data and therefore contribute to the improvement of healthcare practitioner ability to treat pregnant women. All information conveyed during the interview, as well as age, number of children and previous osteopathic treatments will be confidential and anonymous. They will also be kept secure and if it is deemed necessary to refer to your data in the reports from the study, it will be anonymised. It will be possible to ask...
questions at any time. You are able to withdraw from the study up to two weeks following the consultation.

Any concerns:

If you have any further questions or concerns please feel free to contact me directly on 02102543911 or at jesswind@hotmail.fr. If you wish you may also contact my principal supervisor Dr. Elizabeth Niven on 021 654 935 or eniven34a@gmail.com

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Appendix 7: Participants consent forms
Consent form for practitioners

Osteopathic clinical decision making for the diagnosis and treatment of lumbopelvic pain associated with Pregnancy: Interpretive descriptive phenomenological study.

This research project will investigate Osteopathic clinical reasoning and decision making for the diagnosis and treatment of lumbopelvic pain associated with pregnancy. The research is being conducted by Jessica Rioufrays, a Masters of Osteopathy student at Unitec, and is supervised by Dr Elizabeth Niven.

I have read the information sheet for both the practitioner and the patient taking part in the study of osteopathic clinical decision making for the diagnosis and treatment of lumbopelvic pain associated with pregnancy. I also discussed the project with Jessica. I am aware of being the person to record the consultation with the GoPro provided by the researcher. I am satisfied with the explanations I have been given and understand that I may obtain further information if I wish. I understand that taking part in this project is my choice and that I may withdraw from the project at any time up until 2 weeks after the interview is completed. I understand that I can decline to answer any particular questions in the study.

I understand that participation in this study is confidential and that no material that could identify me or my patient will be used in any reports on this study.

I have had enough time to consider whether I want to take part.

I know who to contact if I have any questions or concerns about the study.

The principal researcher for the study into osteopathic clinical decision making for the diagnosis and treatment of lumbopelvic pain associated with pregnancy is Jessica Rioufrays who is contactable by phone on 02102543911, or by email, jesswind@hotmail.fr.

Name of Participant: ____________________
Participant Signature: ________________
Date: / / 2014

Project explained by: ____________________
Signature: ________________
Date: / / 2014

Thank you for participating in this research project.
Any concerns:
If you have any further questions or concerns please feel free to contact me directly on 02102543911 or at jesswind@hotmail.fr. If you wish you may also contact my principal supervisor Dr. Elizabeth Niven on 021 654 935 or eniven34a@gmail.com

Please keep a copy for your records

UREC REGISTRATION NUMBER: 2014-1038

This study has been approved by the UNITEC Research Ethics Committee from 1st of June 2014 to 31st of May 2015. If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary on: (0064) 09 815-4321 ext 8551. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.
Consent form for patients

Osteopathic clinical decision making for the diagnosis and treatment of lumbopelvic pain associated with Pregnancy: Interpretive descriptive phenomenological study.

This research project will investigate the Osteopathic clinical reasoning and decision making for the diagnosis and treatment of lumbopelvic pain associated with pregnancy. The research is being conducted by Jessica Rioufrays, a Masters of Osteopathy student at Unitec, and is supervised by Dr Elizabeth Niven.

I have read the information sheet for the patient for this research project. I am aware of the presence of a GoPro video-recording device, which will be focused on the practitioner. I am satisfied with the explanations I have been given by the researcher and understand that I may obtain further information if I wish. I understand that taking part in this project is my choice and that I may withdraw from the project at any time up until 2 weeks after the consultation. I understand that I can decline to answer any particular questions in the study.

I understand that participation in this study is confidential and that no material that could identify me or the osteopath will be used in any reports on this study.

I have had enough time to consider whether I want to take part.

I know who to contact if I have any questions or concerns about the study (021 025 43911 or 021 654 935).

The principal researcher for the study into osteopathic clinical decision making for the diagnosis and treatment of lumbopelvic pain associated with pregnancy is Jessica Rioufrays who is contactable by phone on 02102543911, or by email, jesswind@hotmail.fr.

Name of Participant: ___________________    Participant Signature: ________________
Date:     /     / 2014

Project explained by: _________________________    Signature: __________________        Date:    /     / 2014

Thank you for participating in this research project.
Any concerns:

If you have any further questions or concerns please feel free to contact me directly on 02102543911 or at jesswind@hotmail.fr. If you wish you may also contact my principal supervisor Dr. Elizabeth Niven on 021 654 935 or eniven34a@gmail.com

Please keep a copy for your records

UREC REGISTRATION NUMBER: 2014-1038

This study has been approved by the UNITEC Research Ethics Committee from 1st of June 2014 to 31st of May 2015. If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary on: (0064) 09 815-4321 ext 8551. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.
Appendix 8: Interview questionnaire template
These questionnaires have been adapted from Thomson et al. (2011).

**Initial interview guide: Questions about the initial thoughts regarding the clinical reasoning for the diagnosis and management of the condition.**

“Before watching the video could you please describe what happened during this consultation and your initial thoughts regarding what is potentially going on with the patient?”
- Could you describe how you would structure an examination plan with this patient?
- Tell me how you go about deciding on what treatment approaches/techniques to use with your pregnant patients complaining of lumbopelvic pain.

**Guide reflective interview (based on the audio-recorded consultation)**

- Can you share your thoughts on that clinical experience?
- What were your initial aims with your patient? Why? How did you intend to meet those aims?
- Could you comment on the information gathered from that action (e.g. patient discussion or treatment, examination procedure)
- What are your feelings and thoughts about the patient at this time?
- Through the course of treating this patient, did you come to see their situation in a different way? How?
- How did you decide to examine the patient in that way?
- What were you thinking when you were carrying out that action (e.g. examination or treatment procedure)?
- What are your overall thoughts about the information you have obtained from this part of the examination?
- How do you think you can help this patient?
- Where did you focus your treatment approach? Why, can you tell me a little bit more?” (Thomson et al., 2013).
Appendix 9: Initial brainstorm of the emerging themes
THEMES

1. Body language: Leasing/taking time to make a decision/drawing from experience.
   Language to express their cognitive process (clinical reasoning).

2. Language showing the source of many problems. (range of factors:
   - Professional attitudes and professional rationality.
   - Disease/health view of
   - Quality/health view of
   - Cognitive aspect view
   - Psychosocial view

3. Can almost be considered as a theme itself where it can be linked to patients.
   Other criteria for these themes to be themes.
   These themes were related to the various themes.

4. Knowledge/Experience/Anatomy/Physiology/Expertise:
   - Pattern recognition/hypothetical-deductive/deductional reasoning/
   - Probabilistic matrices.

5. Types of education (Speciality or non-speciality).

6. Testing:
   - Can directly talk about the orthopaedic tests of a patient.
   - Clinical reasoning was a constant question in conducting the patient.
   - Flow chart to the above themes explained as completing the 3rd theme.
   - This flow chart shows where each theme is used during this stage of the consultation.

Expenses do not relate to professional anywhere.
A nurse can be part of the pyramid.

In my research, the patient must have a lot of self-interest.
Specific cases that their main learning is universal.

- A lot of correlation on vegetable (Use Humor).
- The technical multitasking.
- A lot of correlation on vegetable (Use Humor).

- Communication

- Education: To explain what is happening.

- Experience: Is the patient has a better understanding.

- Summary in my research.
Appendix 10: Table of quotes
<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub theme</th>
<th>Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theme 1:</td>
<td>a) Patient’s clinical presentation</td>
<td>P1: “Her pregnancy-related pain was centred from what she was describing right at the base of the spine, and then that would radiate out along the lines of her innominate to sort of a lateral midline”.</td>
</tr>
</tbody>
</table>
| The ingredients used in clinical reasoning | b) Using basic knowledge/evidence | P2: “It is very common in pregnancy that the lower back’s unstable”  
P1: “We normally associate that more with muscular type cause of pain, but in pregnancy, especially at the 20, sort of 25 week mark, that can start being ligamentous as well because of the laxity”. |
| | c) Relating to experience | P4: “… “Definitely in the pregnant women that I've worked with, a lot of them come in with that type of presentation””. |
| | d) Processing thoughts | P4: “I needed to ascertain that there wasn't anything dangerous happening. So elimination of things like preeclampsia, any infections, any fractures, pre-term labours, those types of things. Providing that there's none of the dangerous red flaggy type symptoms and it's a matter of just trying to find out what musculoskeletal issues is going on”.  
P1: “I asked questions in relation to the lumbar spine and the pelvis to get an idea of what the rest of her AP curves were”. |
| | e) Physical examination | P1: “So, what the examination told me was that we had probably a reasonably big amount of tissue tethering through the bottom” |
f) Focusing on the patient

P3: “I have to be very gentle with her. So my initial treatment was very much just about getting to know her system and about contacting her system and getting her system to know me and trust me.”

P1: “it is more based on what you told me, more than what I found”.

P2: “I'll just get an overall impression from sitting which makes them a bit more comfortable and just breaks a few initial stresses that the patient might have about being half-naked or whatever”.

Theme 2: Strategies

a) Getting an idea/Anticipation

P1: “I was also then trying to get an idea of when it got bad, how long that would tend to last”.

P4: “We are trying to diagnose the patient but also trying to also get an idea as to how the rest of the pregnancy is going to go and also if there are potentially going to be problems with the baby as well, when the baby is born”.

P3: “What else can it be? I think if the whole thing doesn't expand then you know both sides are tight. And if that's happening then you're a bit worried about the birth”.

b) Seeking the mechanism behind the pain

P1: “so what I was trying to get to when I was asking those questions was to try and figure out essentially the process behind her pain generation.

P2: “So, as far as the pregnancy, I don't...”
believe there is quite one diagnosis, because tissues causing symptoms will change more than likely from week to week”.

c) Prioritizing

P1: “My next question is about to try to know whether SIJ is more less likely compare to the structures around that can also give you some pain, so I have started to differentiate hip pain and SIJ”.

P2: “Everything felt hot and tender, but I think the SIs themselves were the main symptomatic problem, the muscles in the lumbo-sacral joint, second, secondary to that”.

P3: “Okay, that's probably the connection between, the psoas and the pelvis." So I'll hold that in my mind, and then you carry on with your investigation”.

d) Assessing through palpation

P2: “I palpate at the same time to get a general overall impression of the tissues”.

P1: “The same type of pain on palpation, which was good”

P2: It's more about what did you feel and you could feel whether a muscle or a ligament is giving you symptoms.

e) Processing the findings

P1: “And then, that (the questioning) it informs, what I was thinking in terms of neurogenic symptoms,

P4: “So looking for signs of preeclampsia. Again, through the interview or the case history process, I ask some more things like swelling, problems with her vision. Looking
for urinary tract infections, pyelonephritis, that sort of thing”.

P3: “So following a bit more again to that left side just gives you another little confirmation of everything that you're feeling”.

| Theme 3: Factors | 1) Practitioner’s view of their practice and themselves |

**a) Health and disease view:**

P1: “There is a series of questions to try to figure out what was causing the radiation down the lower extremity, the thigh. Obviously the close relationship of the SIJ, ligaments and L5-S1 joint with S1 nerve root… but also piriformis involvement in terms of pelvic stability, especially in pregnancy and its relation to the sciatic nerve. So therefore I was trying to figure out if it was whether front or back and how far down and if there was any associated symptoms etc”.

**b) Views of traditional osteopathic theories and principles:**

P2: “I maybe should have explored that a bit more osteopathically”

**c) Practice view:**

- Mostly hands-on:

P1: “What I found, however, palpatory wise though, was that the gluteals were very hypertonic”.

- Educating and hands-on:
2) Osteopathic views

**P2:** “I am going to do some work through your lower back and pelvis, it is just a little bit boggy and inflamed, so we are trying to get rid of that. And then I will give you a few exercises for your gluts. There are actually strong when you stand on one leg, and they stay nice and stable, they are clearly fine”.

**Practitioner-centered:**

“It was much of a case of, I’m going to try to prove that it is the sciatic nerve just being irritated as opposed to being compressed etc”.

**Empowerment:**

**P3 to her patient:** “I would say that's a fairly normal response because the first time, we see what's wrong, we make a bit of a change, but we have to help your body to do a little bit more of that change every time and it will start to hold more.

3) Knowledge and education

**P3:** “Yes, there is that, but it's a much deeper neutral than that, and that's something, it's postgrad. I recommend you wait until you've done a few fundamentals courses, and have a few years under your belt because it's very non-structural”.

**P4:** “if you had done some study or some further qualifications you might automatically think those areas and you are checking those areas as opposed to trying to cast the wide net and seeing what comes up”.

Specific vs non-specific interest in obstetric care in osteopathy:

**P4:** “From a pregnant person to a non-pregnant
person essentially, you're asking the same questions, but if you get a positive answer with a pregnant lady, then it could have a significant meaning. There are a few things that can go wrong with pregnancy and again although they're not very common, as to say you just need to be aware of them”.

P4: “if you had done some study or some further qualifications you might automatically think those areas and you are checking those areas as opposed to trying to cast the wide net and seeing what comes up”.

P4: “If a student was coming out of university to go into practice by themselves, I think I wouldn't necessarily be 100% comfortable with that, because there are a lot of considerations you need to take into place. I think there should still be something in the curriculum, or I feel it is an area that needs to be either A taught or B really looked into from your own personal stance”.
SECTION 4: Supplementary documents
Records initially identified: Database: 
Ebsco, Pubmed, Science Direct, 
Cochrane: 

“Manual therapy and pregnancy”  
(n= 23 989)  

“Clinical reasoning”  
(n= 71 463)  

“Pelvic girdle pain in pregnancy”  
(n= 1543)  
Without any limitation due to lack of research in some of the areas 

Additional records identified through other sources with the additional “osteopathic clinical reasoning” keyword: 
Search engine: Google Scholar  
(n= 233 760) 

Records after duplicates removed  
(n = 94 501) 

Records screened  
(n = 850)  

Records excluded  
(n = 93 651) 

Full-text articles assessed for eligibility  
(n = 632)  

Full-text articles excluded, with reasons: irrelevance, to old compared to more recent research  
(n = 218)  

Studies included in qualitative synthesis  
(n = 115)  

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Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

Domain 1: Research team and reflexivity

Personal Characteristics

1. Interviewer/facilitator - Which author/s conducted the interview or focus group?
Jessica Rioufrays (Principal researcher)

2. Credentials - What were the researcher’s credentials? E.g. PhD, MD
BAppSc (Human Biology), Master of Osteopathy student.

2. Occupation - What was their occupation at the time of the study?
Student

3. Gender - Was the researcher male or female?
Female

5. Experience and training - What experience or training did the researcher have?
Two years of experience as an osteopath clinic student; no previous experience in research

Relationship with participants

6. Relationship established - Was a relationship established prior to study commencement?
The researcher knew the four clinic tutors who participated in the research from time as an undergraduate student and during clinic hours within the Master program

The researcher did not know the participating patients prior the commencement of the research

7. Participant knowledge of the interviewer - What did the participants know about the researcher? E.g. personal goals, reasons for doing the research
All participating osteopaths and patients recruited for this research were informed that the researcher was completing this study to partially fulfil the requirements for the Master of Osteopathy program

8. Interviewer characteristics - What characteristics were reported about the interviewer/facilitator? E.g. Bias, assumptions, reasons and interests in the research topic
The researcher had always been interested in knowing how osteopaths proceed when treating pregnant women, and clinical reasoning was introduced to the researcher in the third year of the undergraduate program, which she got interested in very quickly
Domain 2: study design

Theoretical framework

9. Methodological orientation and Theory - What methodological orientation was stated to underpin the study? E.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis
Interpretive descriptive study

Participant selection

10. Sampling - How were participants selected? E.g. purposive, convenience, consecutive, snowball
Convenience

11. Method of approach - How were participants approached? E.g. face-to-face, telephone, mail, email
Practitioners: Phone calls
Patients: Word of mouth, fliers at the Unitec osteopathic clinic 41. This was followed up with a formal emails exchange and face-to-face meeting for additional information and general questions

12. Sample size - How many participants were in the study?
Practitioners: n=4
Patients: n=5
Total participants n= 10

13. Non-participation - How many people refused to participate or dropped out? Reasons?
Setting
One practitioner refused to participate as too busy with own practice and one patient dropped out without giving a reason

14. Setting of data collection - Where was the data collected? E.g. home, clinic, workplace
At the Unitec osteopathic clinic 41 with the three clinic tutors and at the personal clinic of the fourth practitioner

15. Presence of non-participants - Was anyone else present besides the participants and researchers?
No

16. Description of sample - What are the important characteristics of the sample? E.g. demographic data, date
New Zealand European women who were within their 20th and 30th week of pregnancy
Data collection

17. Interview guide - Were questions, prompts, guides provided by the authors? Was it pilot tested?

The questions were taken from Thomson et al (2013) and modified to fit the present study. The questionnaire was then piloted prior to data collection with the help of two postgraduate student osteopaths not involved in the study.

18. Repeat interviews - Were repeat interviews carried out? If yes, how many?

None were repeated

19. Audio/visual recording - Did the research use audio or visual recording to collect the data?

Both audio and video recording was used to collect the data. Video for the consultation, Audio for the interview.

20. Field notes - Were field notes made during and/or after the interview or focus group?

A few notes were made during the interview

21. Duration - What was the duration of the interviews or focus group?

Audio recorded video-assisted commentaries lasted between 30 and 60 minutes.

22. Data saturation - Was data saturation discussed?

Data saturation was discussed with the supervisor and the researcher, and after the first two interviews it was thought that a total of five participants would generate enough information to achieve the research aim.

23. Transcripts returned - Were transcripts returned to participants for comment and/or correction?

Transcripts were only returned on request. None of the participant requested their transcript, but the researcher discussed their interviews with each practitioner making sure that the right meaning was understood.

Domain 3: analysis and findings

Data analysis

24. Number of data coders - How many data coders coded the data?

Only one – the principal researcher, Jessica Rioufrays

25. Description of the coding tree - Did authors provide a description of the coding tree?

26. Derivation of themes - Were themes identified in advance or derived from the data?

The themes were derived from the data but they were then contrasted and discussed within the literature.
27. **Software** - *What software, if applicable, was used to manage the data?*
No software was used.

28. **Participant checking - Did participants provide feedback on the findings?**
Yes- the researcher provided practitioners an opportunity to give feedback

**Reporting**

29. **Quotations presented - Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? E.g. participant number**
Yes quotes were used to illustrate the themes and used as follow: Participant number (P1): “quote”

30. **Data and findings consistent - Was there consistency between the data presented and the findings?**
Yes

31. **Clarity of major themes - Were major themes clearly presented in the findings?**
Yes

32. **Clarity of minor themes - Is there a description of diverse cases or discussion of minor themes?**
Yes, three major themes were identified. No minor theme was identified.