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Title: EFFECTS OF AN E-LEARNING PROGRAMME ON OSTEOPATHS' BACK PAIN ATTITUDES: A MIXED METHODS FEASIBILITY STUDY

Name: JERRY REMI FABRICE DRAPER-RODI

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J. R. F. DRAPER-RODI

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EFFECTS OF AN E-LEARNING PROGRAMME ON OSTEOPATHS’ BACK PAIN ATTITUDES: A MIXED METHODS FEASIBILITY STUDY

by

Jerry Rémi Fabrice DRAPER-RODI

A thesis submitted to the University of Bedfordshire, in fulfilment of the requirements for the degree of Professional Doctorate.

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Abstract

i. **Background**

Guidelines recommend the biopsychosocial (BPS) model for managing non-specific low back pain (NSLBP) but the best method for teaching this model is unclear. Printed material and face-to-face learning have limited effects on practitioners' attitudes to back pain. An alternative way is needed and e-learning is a promising option. E-learning is becoming an important part of teaching, but little guidance is available to the osteopathic profession.

ii. **Purpose**

This study had four aims. First to assess the feasibility of running a main trial to test the effectiveness of an e-learning programme on the BPS model for NSLBP on experienced practitioners' attitudes to back pain; secondly, to assess the acceptability of the e-learning programme and the use of the internet as a mode of CPD; thirdly to provide an effect size estimate; and finally to explore the participants' views on the e-learning programme and its possible impact on their reported behaviour.

iii. **Methods**

First a scoping review of the BPS factors and assessment methods for NSLBP was conducted. It informed the content of an e-learning programme that was designed and developed, and informed by a behaviour change model and an e-learning developmental model. An explanatory mixed methods feasibility study was conducted: first, a pilot Randomised Controlled Trial (RCT) assessed experienced osteopaths' attitudes before and after the intervention, using the Pain Attitudes and Beliefs Scale (PABS) and the Attitudes to Back Pain Scale for musculoskeletal practitioners (ABS-mp); then semi-structured interviews explored participants' views on the e-learning programme and its possible impact on their reported practice behaviours.

iv. Results

45 osteopaths, each with at least 15 years of experience consented to, and took part in, the study. The two trial arms were: a 6-week e-learning programme (intervention group) and a waiting-list group (control group). 9 participants were interviewed for the qualitative strand. The feasibility of conducting a main trial was good, the intervention was well accepted and the adherence to the intervention was good. An effect size estimate was calculated to inform sample size for a main trial. In the qualitative strand, participants' views on the BPS model fell in with the themes of being *Not structural enough*, being *Part of existing practice* and being *Transformative*.

v. Conclusion(s)

This study provided new knowledge that had not been reported before in several areas:

- how an e-learning programme for experienced manual practitioners should be developed,
- a new intervention was reported (e-learning programme), including its design and acceptability,
- osteopaths' views on using the internet as a form of CPD,
- information on the challenges faced in implementing a BPS approach.

Declaration

I declare that this thesis is my own unaided work. It is being submitted for the degree of Professional Doctorate at the University of Bedfordshire. It has not been submitted before for any degree or examination in any other University.

Name of candidate: Jerry Draper-Rodi

Signature:

Date:

Portfolio

The work presented in this thesis has been submitted and presented at professional conferences and to professional groups:

Peer-reviewed article

- Draper-Rodi J, Vogel S, Bishop A. (2016). Identification of prognostic factors and assessment methods on the evaluation of non-specific low back pain in a biopsychosocial environment: a scoping review. Manual Therapy (*submitted*)

Peer-reviewed abstracts

- Draper-Rodi J, Vogel S, Bishop A. (2015). "The effects of a biopsychosocially structured e-learning programme for non-specific low-back pain on experienced osteopaths' attitudes to back pain: A mixed-method pilot randomised-controlled trial and qualitative study." European Journal of Integrative Medicine **7**(6): 685.
- Draper-Rodi J, Vogel S, Bishop A. (2016). "What are the biopsychosocial obstacles to recovery for non-specific low back pain? Results of a scoping review." Orthopaedic Proceedings 98-B(SUPP 6): 14.
- Draper-Rodi J, Vogel S, Bishop A. "Impact of an e-learning programme on the biopsychosocial model for non-specific low-back pain on experienced osteopaths' attitudes to back pain: A mixed-methods study." Manual Therapy 25: e167-e168.

Conferences

- Draper-Rodi J, Vogel S, Bishop A. (2015) The effects of a biopsychosocially structured e-learning programme for non-specific low-back pain on experienced osteopaths' attitudes to back pain: A mixed-method pilot randomised-controlled trial and qualitative study. Presented at *CAMSTRAND conference*, London, UK 10th June.
- Draper-Rodi J, Vogel S, Bishop A. (2015) What are the biopsychosocial obstacles to recovery for non-specific low back pain? Results of a scoping

review. Presented at the *Society for Back Pain Research conference*, Bournemouth, UK 6th November.

- Draper-Rodi J, Vogel S, Bishop A. (2015) Non-specific low-back pain: how can we assess it in a biopsychosocial context? Presented at the *Institute for Osteopathy Convention*, Egham, UK 21st November.
- Draper-Rodi J, Vogel S, Bishop A. (2015) Presentation of the development of an e-learning programme on the biopsychosocial model for non-specific low-back pain. Presented at the *British School of Osteopathy Education Conference*, Egham, UK 21st November.
- Draper-Rodi J, Vogel S, Bishop A. (2016) Impact of an e-learning programme on the biopsychosocial model for non-specific low-back pain on experienced osteopaths' attitudes to back pain: a pilot randomised-controlled trial. Presented at the *Osteopathic European Academic Network Open Forum Conference*, Vienna, Austria, 22nd April.
- Draper-Rodi J, Vogel S, Bishop A. (2016) Impact of an e-learning programme on the biopsychosocial model for non-specific low-back pain on experienced osteopaths' attitudes to back pain: a mixed methods feasibility study. Presented at the *International Federation of Orthopaedic Manipulative Physical Therapists conference*, Glasgow, UK, 8th July.

<u>Presentations to professional groups</u>

- Draper-Rodi J, Vogel S, Bishop A. (2016) E-learning programme development: content development, programme development and mixed methods study. Presented at the *British School of Osteopathy faculty weekend*. Woking, UK, 16th January.
- Draper-Rodi J, Vogel S, Bishop A. (2016) Non-specific low-back pain: how can we assess it in a biopsychosocial context? *The British School of Osteopathy Roadshow*, Bristol, UK, 16th April.
- Draper-Rodi J, Vogel S, Bishop A. (2016) Non-specific low-back pain: how can we assess it in a biopsychosocial context? Presented at the *Oxfordshire Osteopathic Network CPD*, Oxford, UK, 19th January.

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Definitions, list of abbreviations

ABS-mp: Attitudes to Back pain Scale for musculoskeletal practitioners

- LS: Limitations on sessions
- PS: Psychology
- CHS: Connection to Health care System
- CC: Confidence and Concern
- RA: Reactivation
- BM: Biomedical

ADDIE: Analysis, Design, Development, Implementation and Evaluation

BCW: Behaviour Change Wheel

BPS: Biopsychosocial

BSO: British School of Osteopathy

CAM: Complementary and Alternative Medicine

CI: Confidence Interval

COM-B: Capability Opportunity Motivation – Behaviour

CPD: Continuous Professional Development

CSI: Central Sensitisation Inventory

GOsC: General Osteopathic Council

iO: Institute of Osteopathy

IQR: Interquartile Range

IT: Information Technology

LBP: Low Back Pain

LO: Learning Objective

MRC: Medical Research Council

NCOR: National Council for Osteopathic Research

NSLBP: Non-Specific Low Back Pain

OEI: Osteopathic Educational Institution

PABS: Pain Attitudes and Beliefs Scale

PS: Psychosocial

RCT: Randomised controlled trial

SD: Standard deviation

Accompanying material: E-learning programme access

http://bone.bso.ac.uk/LBP

Username: student

Password: student30

(Conditional activity deactivated)

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1. Introduction

Thesis organisation:

- Chapter 1 provides an overview of the thesis
- Chapter 2 introduces background information
- Chapters 3 to 6 relate to the conducting of a scoping review
- Chapters 7 to 11 relate to a mixed methods feasibility study and include a chapter (no. 8) on the development of the intervention (e-learning programme)
- Chapter 12 discusses the professional implications of this work
- Chapter 13 concludes the thesis
- An afterword describes the researcher's learning journey during the professional doctorate

This chapter compiles the summaries of the thesis chapters to provide an overview of the work and to provide the structure of the thesis:

Chapter 2. Background and rationale

This chapter describes the impact low back pain (LBP), especially chronic LBP, has at both the individual and the societal level. The similar effectiveness of different management options and guideline recommendations is reviewed, including the biopsychosocial (BPS) model that is advised for LBP management. A possible risk factor for chronicity for LBP is related to practitioners' attitudes to back pain. How practitioners' attitudes may affect their clinical behaviour is appraised, leading to discussion of how practitioners' attitudes can be measured. Previous training programmes designed to influence practitioners' attitudes to back pain are synthesised to provide guidance for the development of a new training programme. Discussion on osteopathy, its status, its training and CPD regulation leads to analysis of the profession's suitability for participation in this study. Finally a brief statement of the problem, the research questions and a statement of the purpose of the research are presented.

Chapter 3. Scoping review introduction

This chapter describes the aim of the review, explains the differences between different types of literature review, discusses the choice of methodology and describes from which professions' body of knowledge the literature was drawn.

Chapter 4. Scoping review methods

This chapter describes the methods used to identify factors from the existing literature to be considered for inclusion in an evidence-based e-learning programme teaching evaluation of NSLBP in a BPS environment in a manual therapy context. This scoping review followed Arksey and O'Malley's framework (Arksey and O'Malley 2005) with the recommendations of Levac et al. (2010) and Daudt et al. (2013). This scoping review informed the e-learning programme design.

Chapter 5. Scoping review results

This chapter describes the results of the scoping review: it details how many articles were included in the scoping review, and how many BPS factors and assessment procedures were drawn from them. This chapter also discusses the rationale behind the inclusion of these factors or their exclusion from the e-learning programme.

Chapter 6. Scoping review discussion

This chapter summarises the key findings of the scoping review, discusses the influence of psychosocial factors on NSLBP, analyses the need to include biological factors in the list of possible obstacles to recovery, and discusses the examination assessment findings. The scoping review's results are then compared with content used in previous BPS training interventions, and with articles published since the scoping review was conducted. The scoping review's limitations and strengths and research implications are then discussed.

Chapter 7. Mixed methods introduction

This chapter discusses why a feasibility study using a mixed methods design was chosen. First a definition of feasibility studies is provided and reasons for conducting them are reviewed. Then recommendations for conducting mixed methods research are discussed including the variety of designs and methods. Finally, sample sizes used in previous mixed methods feasibility studies are reviewed.

Chapter 8. Intervention development

This chapter describes how the ADDIE model and Behaviour Change Wheel model were used to develop the e-learning programme. The different stages of the e-learning development are described. This chapter also details how two aspects of the e-learning programme were assessed before conducting the mixed methods feasibility study: a content evaluation and a quality evaluation.

Chapter 9. Evaluation of the e-learning programme: methods

This chapter describes the methods used to evaluate the e-learning programme developed on NSLBP and the BPS model, detailed in chapter 8. The mixed methods sequential explanatory design consisted of both quantitative and qualitative strands. The quantitative strand was a feasibility RCT that evaluated the feasibility and acceptability of the e-learning programme with experienced osteopaths. The qualitative strand explored a sample of participants' views on the e-learning programme using semi-structured interviews. Philosophical assumptions and theoretical foundations are discussed in this chapter.

Chapter 10. Evaluation of the e-learning programme: results

This chapter details the results of the mixed methods feasibility study. Results from the questionnaires (demographics, ABS-mp and PABS), the satisfaction survey and the semi-structured interviews are organised according to the aims. The first section describes the participants in the quantitative and qualitative strands. The second section describes the feasibility of running a main trial. The third section describes the feasibility and acceptability of the e-learning programme. The last section explores the impact of the e-learning programme on experienced osteopaths' attitudes to back pain and reported behaviour.

Chapter 11. Evaluation of the e-learning programme: discussion

The feasibility study used mixed methods research to assess the feasibility of running a full-scale study and the acceptability of the intervention. This section follows recommendations on what should be discussed in a feasibility study discussion (Thabane, Ma et al. 2010): the first section interprets the feasibility and acceptability of the study, the second section contextualises the findings, the third section discusses the research implications of the study and the last section analyses the limitations and strengths of this mixed methods feasibility study.

Chapter 12. Thesis professional implications

This chapter discusses the professional implications of this work. The first section is about the BPS approach: first the biomedical heritage of the profession is examined, then the possible heritage impact on the participants' perceptions of the BPS model; it then discusses which practitioners might be more suitable for managing patients with NSLBP, and finally the need for BPS training. The second section focuses on e-learning, looking first from the point of view of the participants and then from the CPD providers' point of view. The last section discusses the implications of the mixed methods study particularly, including evidence and osteopathy, and explores CPD that would need to be developed to support the profession's development.

Chapter 13. Conclusion

The work presented in this research investigated the feasibility of running a main trial to assess the effectiveness of an e-learning programme for non-specific low back pain (NSLBP) informed by the biopsychosocial (BPS) model in a manual therapy context. After summarising the problem and the gap in the knowledge, this chapter provides a summary of the key findings.

2. Background and rationale

2.1. Introduction summary

This chapter describes the impact low back pain (LBP), especially chronic LBP, has at both the individual and the societal level. The similar effectiveness of different management options and guideline recommendations is reviewed, including the biopsychosocial (BPS) model that is advised for LBP management. A possible risk factor for chronicity for LBP is related to practitioners' attitudes to back pain. How practitioners' attitudes may affect their clinical behaviour is appraised, leading to discussion of how practitioners' attitudes can be measured. Previous training programmes designed to influence practitioners' attitudes to back pain are synthesised to provide guidance for the development of a new training programme. Discussion on osteopathy, its status, its training and CPD regulation leads to analysis of the profession's suitability for participation in this study. Finally a brief statement of the problem, the research questions and a statement of the purpose of the research are presented.

2.2. Low back pain

Low-back pain (LBP) affects up to 80% of the adult population during their lifetime (Walker, Muller et al. 2004) and affects a third of the UK population each year, leading 20% to consult their general practitioner, i.e. 1 in 15 of the population (Savigny, Kuntze et al. 2009). Non-specific LBP (NSLBP) can have an even more serious impact on people's life when it becomes a persistent problem (Dagenais, Caro et al. 2008) and at least since 1990, has been the main cause of years lived with disability (Vos, Barber et al. 2015). It also has a major impact at a societal level: musculoskeletal conditions are one of the greatest causes of losses of production (March, Smith et al. 2014) with LBP indirect costs, related to losses of production and informal care, estimated to be between two to eight times greater than direct costs, related to treatment (Walker, Muller et al. 2003, Katz 2006, Dagenais, Caro et al. 2008). In 1998, the direct health care cost of back pain in the UK was estimated at £1,632 million and the indirect cost was estimated to be 6.5 times greater (£10,668 million) (Maniadakis and Gray 2000).

2.3. Clinical guidelines

Clinical guidelines offer, in an evidence-informed manner, guidance to practitioners on best care and advice for patients. Low back pain symptoms improve similarly following different management options including medication, manual therapy, exercises and psychotherapy (Artus, van der Windt et al. 2010) which explains why guidelines on LBP management include different management modalities. They have increasingly included more manual therapy including osteopathy. In 2006, the European guidelines for managing chronic non-specific LBP recommended considering short courses of manipulation/mobilisation (Airaksinen, Brox et al. 2006). In 2009, the NICE guidelines suggested multimodal approaches for early management of persistent non-specific LBP including manual therapy, defined as chiropractic treatment, osteopathy or physiotherapy (Savigny, Kuntze et al. 2009). Another key component of the 2009 NICE guidelines was the recommendation to consider patients' biopsychosocial (BPS) environment in NSLBP care. NICE guidelines for low back pain and sciatica that are at a consultation stage during the writing of this thesis even more strongly recommend the BPS model for the management of patients with LBP (NICE 2016).

In summary, LBP is a substantial problem for individuals and at a societal level. Current guidance recommends treatments including manual therapy such as osteopathy provided within a BPS context of care. However, there is a lack of clarity as to the explicit nature of BPS care. The next section explores what the

BPS model is, how it was developed and its current challenges and opportunities.

2.4. The biopsychosocial model

In the mid-1840s, the emergence of pathologic anatomy as the fundamental science of medicine provided clearer information on symptoms, examination findings, prognosis and response to treatment. This biomedical model of care improved greatly patients' treatments while separating the "disease" from the patient: the "disease" could be studied independently in order to provide a medical or surgical intervention to reverse or prevent a process (Weiner 2008). However, this externalisation of the disease prevents the biomedical model being effective with some medical problems for which no specific anatomical lesions can be identified, leading ultimately to poor patient outcomes. One example is NSLBP and the reason is that NSLBP is complex. The BPS model was developed by Engel as an alternative to the biomedical paradigm, introducing psychosocial factors into medical assessment (Engel 1977). It advocates integrating the assessment and treatment of relevant biological, psychological and social factors based on individual patient needs (Waddell 1987, Waddell 2002). The biomedical paradigm was sustained by simple, linear clinical reasoning based on normative views of biological variables: a symptom had a cause and a treatment was supposed to have a beneficial consequence on either the cause or on the symptom itself. This reasoning is still relevant today, particularly in acute care, e.g. fractures, where there is a clear cause and intervention, but has its limits with chronic care or non-specific symptoms, e.g. NSLBP (Gatchel, Peng et al. 2007, p.17) or medically unexplained symptoms. A precise cause of LBP can be identified in only 5-10% of patients (Krismer and van Tulder 2007), and the search for a cause has been inadequate in most LBP presentations. The unsuitability of the biomedical paradigm for NSLBP has therefore led to the development of the BPS model for LBP (Waddell 1987) that is now recommended in guidelines (Savigny, Kuntze et al. 2009). This model has been found to be more effective in cases of chronic LBP than the usual care or physical treatments for pain and disability (Kamper, Apeldoorn et al. 2014).

2.4.1. BPS model challenges

The BPS model has been criticised on two levels: as being difficult to implement and not being a radical enough shift from the biomedical paradigm. This section analyses these criticisms and appraises how the model has grown from these criticisms. It discusses the difficulties in implementation, then how the BPS model may still be providing a narrow picture of people's experience and finally the lack of a major shift from the biomedical paradigm's philosophical and theoretical foundations.

2.4.1.1. Difficulties in implementation

In 1972 the Royal College of General Practitioners began encouraging its practitioners to use an approach similar to the BPS model, which would soon be described, assuming that "diagnoses will be composed in physical, psychological and social terms". Twenty years later, a study revealed that GPs were using a bio(psycho) rather than a BPS model. Examples of patient presentations seemingly challenging for GPs were chronic LBP, cardiac neurosis (psychological), dietary advice (health promotion), neighbour and housing problems (social). This study also revealed that GPs felt they should deal mainly with acute physical illness (Dowrick 1996). In 2010, a qualitative study analysed British pain clinic practitioners' use of the BPS model. All multidisciplinary pain clinics had BPS-informed practice but their pain management was dualistic. Chronic pain was only managed with psychological interventions and no intervention was aimed at biological factors, e.g. through manual intervention, and interventions omitted social factors, e.g. access to social support network (Harding, Campbell et al. 2010). A possible reason for the difficulty in implementing the BPS model is the lack of understanding from practitioners of what the BPS model is. A qualitative descriptive study of the Australian physiotherapists' assessment of patients' psychosocial status revealed that participants were unclear on what psychosocial meant, needed help to understand the relevance of psychosocial factors in their patients' clinical presentations and felt a need for formal training and tools to use in practice (Singla, Jones et al. 2015). This leads to another difficulty which is that of training practitioners in the BPS model. BPS training involves practitioners changing their attitudes and beliefs with regard to back pain and also how they interact and communicate with patients. Within a biomedical framework the clinical reasoning is mainly diagnostic, aimed at finding which tissue is causing the symptom, whereas a narrative approach to reasoning is more suitable in a BPS framework (Jones, Edwards et al. 2002). Another challenge is to offer firm guidance that practitioners can use to manage psychosocial barriers to recovery that they might encounter during the management of patients with NSLBP (Overmeer, Boersma et al. 2011). At present this is difficult to do as there is a lack of guidance as to what constitutes BPS management for NSLBP.

2.4.1.2. Patient-centred vs. person-centred

The BPS model for LBP proposes a multifaceted understanding of symptoms. This implies a patient-centred approach and has been mainly focussed on intrapersonal processes, i.e. biological and psychological factors internal to the patient that may affect their symptoms. Less attention has been given to the interpersonal features of pain that are embedded in complex social environments (Hadjistavropoulos, Craig et al. 2011). This has possibly led to underestimating the impact practitioners may have on their patients through the relationship they build with their patients (O'Keeffe, Cullinane et al. 2016, Testa and Rossettini 2016). Another issue is the underestimation of the impact of the social environment on disability: barriers to return to work for example, are often wider than individual or psychological factors. The underestimation of the influence of the social environment may have led sufferers to experience blame for absences from work focussing on individual or psychological factors rather than exploring the social barriers to returning to work (Shakespeare, Watson et al. 2016). Considering the person and their environment rather than focussing on the patient and their symptoms may be a better way to consider the various BPS elements influencing a NSLBP experience.

2.4.1.3. Philosophical and theoretical foundations

The BPS model emerged as a reaction to a model that was perceived as being inadequate. Its development was informed by systems theory (Engel 1980) and favoured a complex view of health in which different levels of the BPS environment could interact depending on the person involved and their situation. The model became simplified perhaps to enhance its usability and application. At the beginning of the twenty-first century the model became widely accepted but as an add-on to the biomedical paradigm. It lacked flexibility and could be compared to a three-legged stool: a patient needed to have “good” biological and “good” psychological and “good” social characteristics to be considered healthy. This checklist arguably improved on the biomedical paradigm, adding psychosocial factors, but kept most of its limitations. Philosophically, the BPS was not clearly distinct from the biomedical paradigm: this three-legged stool was informed by reductionism, breaking down complex phenomena to find meaning in the simpler constituents (Butler, Evans et al. 2004). This biomedical approach to incorporating psychosocial factors was missing the multi-faceted complex interactions of these different factors (Stewart, Kempenaar et al. 2011). The BPS model is now described both as a philosophy of clinical care and a practical clinical guide (Borrell-Carrio, Suchman et al. 2004). Philosophically, it is a way of understanding one’s suffering incorporating different factors affecting it (e.g. personal and societal) whilst practically it provides more accurate tools to evaluate, establish a prognosis and inform management decisions.

2.4.2. Opportunities for the BPS model

The BPS model’s application is returning to Engel’s concepts informed by systems theory. It is considered to be a more organic, more holistic approach, incorporating patient expectations rather than seeking a standardised conceptualisation of the patient. Using systems theory to inform the model's application also counters the dichotomist approach where acute care refers to biological aspects and chronic to psychosocial ones (Harding, Campbell et al. 2010). The current BPS model also incorporates new concepts, like complexity (Stewart, Kempenaar et al. 2011, Ford and Hahne 2013), that are difficult to define and describe but important in everyday practice: they provide an opportunity to acknowledge the complex multivariate nature of non-specific conditions like LBP; acknowledging this complex interplay is useful as an opportunity to enhance patient understanding of their own situation. After being discarded with the emergence of the BPS model, pathoanatomical factors are being re-introduced into the BPS model (Weiner 2008, Ford and Hahne 2013). Interestingly, the same challenges faced by pathoanatomical factors within the biomedical paradigm are now being faced by psychosocial factors, e.g. identifying valid subgroups that are more responsive to targeted treatments (Ford and Hahne 2013). Some have begun to address this issue by developing stratified approaches to delivering care based on risk assessment. The STarT Back trial examined this approach by comparing the clinical and cost effectiveness of a stratified management approach with current practice, finding the former more effective (Hill, Dunn et al. 2010, Main, Sowden et al. 2012). A non-randomised controlled trial in a clinical environment confirmed that this approach has better outcomes than usual care for high-risk patients (Murphy, Blake et al. 2016). This stratified management is mainly based on assessing the presence of psychosocial and some physical risk factors, thereby informing the best treatment option. The STarT Back trial follows Gatchel's call (2008) to understand the pathoanatomical and pathophysiological factors influencing LBP, as well as the psychosocial factors. Psychological factors hindering recovery have been narrowed down (Foster, Thomas et al. 2010) and psychological and biological factors are better amalgamated when looking at their shared interdependent relationships (Foster and Delitto 2011).

In summary, the BPS model has been shown to be difficult to implement in practice with examples of dualistic approaches where manual therapy is used for acute NSLBP and psychological interventions for chronic NSLBP. This implementation challenge may be due to the difficulty of teaching the BPS model owing to a lack of clear guidance on how the BPS should be put in practice. Whilst being a step forward from the biomedical paradigm, it may be overly rooted in the theoretical and philosophical biomedical paradigm's foundations, leading to a lack of understanding of the whole context of the individual. These challenges have informed the BPS model's developmental stages during its forty years of existence. Whilst the current model offers clear practical implications for NSLBP prognosis and management with considerations of all biological as well as psychosocial influences, different back pain models are being used. The next section is going to explore how these back pain models relate to practitioners' attitudes to back pain, what the impact of these different attitudes to back pain is in practice, and how practitioners' attitudes to back pain can be measured.

2.5. Attitudes, beliefs and behaviour

2.5.1. Attitudes: pre-requisite to behavioural change?

Research into the effects of practitioners' attitudes and beliefs on practice style is increasing, but the mechanisms underlying the effect of attitudes and beliefs on behaviours are not yet fully understood (Bishop 2007). Attitudinal change may be a pre-requisite for behavioural changes. Different professions' attitudes and behaviours have been studied: orthopaedic surgeons (Rainville, Carlson et al. 2000), physiotherapists (Houben, Ostelo et al. 2005, Houben, Gijsen et al. 2005, Bishop, Foster et al. 2008), general practitioners (Rainville, Carlson et al. 2000, Coudeyre, Rannou et al. 2006, Bishop, Foster et al. 2008, Fullen, Baxter et al. 2011) and rheumatologists (Poiraudeau, Rannou et al. 2006); the findings are similar across these different professions in different countries (Ireland, France, Netherlands, UK and US). There are different tools for measuring attitudes and behaviour. Those for attitudes to back pain are discussed in section 2.5.3. Similar tools were used to evaluate clinical behaviour in the studies mentioned above: either vignettes or video scenes. These tools are intended to offer an indication of what practitioners would recommend in a clinical situation and therefore only provide reported, rather than observed, behavioural findings. It is unclear how the biomedical and BPS views of back pain directly impact on behavioural practice, but the findings from these studies suggest that practitioners with a reported biomedical view of back pain and/or with fear avoidance beliefs are more likely to consider daily activities and work as being harmful and to advise bed rest for back pain. As well as having an impact on the advice those practitioners provide, their attitude also affects the examination they perform and treatments they offer. The exact mechanism to explain the influence of practitioners on patients' outcomes is unclear, as practitioners' treatment orientations do not seem to influence directly the message perceived by patients (Overmeer and Boersma 2016), but healthcare practitioners have a strong influence on patients' attitudes and beliefs (Darlow, Dowell et al. 2013). There is also some evidence that the impact of practitioners' beliefs and attitudes on their behaviour contributes to the success or failure of their interventions (Pincus, Foster et al. 2007, Darlow, Fullen et al. 2012).

In summary, the mechanism on how attitudes influence behaviour is still unclear but attitudes and reported behaviour seem correlated: practitioners with a more biomedical view of back pain tend to provide advice and treatments that are less in line with clinical guidelines. The next section discusses the implications and challenges of not following guidelines.

2.5.2. Practitioners' attitudes and guidelines

Practitioners' adherence to guidelines is poor, despite wide promulgation (Bekkering, van Tulder et al. 2005, Pincus, Foster et al. 2007, Bishop, Foster et al. 2008, Evans, Breen et al. 2010). Attempts to change practitioners' attitudes to back pain to bring them more in line with guideline recommendations or to be more BPS orientated have also shown little effect so far (Stevenson, Lewis et al. 2006, Evans, Breen et al. 2010). This is a challenge as following clinical guideline recommendations is associated with better clinical outcomes, lower costs (Dagenais, Tricco et al. 2010) and less risk of exposing patients to unnecessary treatments, thus delaying their recovery and leading to unnecessary expense (Monie, Fazey et al. 2016). There are numerous reasons leading practitioners not to follow guidelines, including questioning the validity of the guidelines, practitioners' experience, preserving the therapeutic relationship, professional responsibility, practical issues and guideline format (Cabana, Rand et al. 1999) (Carlsen, Glenton et al. 2007). Different training methods have been tested to determine the most effective approach. Active training, compared to passive guideline dissemination, has shown no difference in patient outcomes (Bekkering, van Tulder et al. 2005). Another possible explanation is a misunderstanding of how practitioners inform their clinical reasoning with guidelines. Mindlines might be a more accurate representation of the sources that inform practitioners' clinical choices. Mindlines refer to practitioners' knowledge informed by their early training, their discussion with peers, patients and experts, brief reading and other sources of tacit knowledge (Wieringa and Greenhalgh 2015). This model philosophically shifts the conception of knowledge away from the Cartesian view where knowledge is a sum of facts that are verifiable. In this model, clinical guidelines are only one of the various sources that influence practitioners' clinical judgements (Bishop, Dima et al. 2015). Poor practitioners' adherence to guidelines remains a considerable problem, and poses regulatory challenges to ensure patients receive the best available care from registered practitioners.

As the practice of practitioners with a more biomedical view of back pain may be less in line with guideline recommendations, a training programme was developed to promote the use of the BPS model for the management of patients with NSLBP and by implication to promote adherence to clinical guidelines. The next section discusses which tools are available for measuring

practitioner attitudes to back pain and attitudinal changes that may result following the training programme.

2.5.3. Practitioners' attitudes to back pain measurement questionnaires

For the evaluation of practitioners' attitudes, the use of robust psychometrically measures is important. There are a number of questionnaires but few have been fully evaluated. A systematic review (Bishop 2007) showed that the most tested was the Pain Attitudes and Beliefs Scale (PABS). The Attitudes to Back Pain scale for musculoskeletal practitioners (ABS-mp) is a less tested questionnaire but was developed from qualitative methods, as recommended for questionnaire development. This section describes these two questionnaires and the rationale for using both in the study.

2.5.3.1. Attitudes to Back Pain Scale for musculoskeletal practitioners (ABS-mp)

The ABS-mp is a self-administered 19-item questionnaire using a seven-point-scale for each item (Pincus, Vogel et al. 2006). It contains two sections: Personal (including items on 'Limitations on sessions', 'Psychological', 'Connection to healthcare system' and 'Confidence and concern') and Treatment Orientation (including items on 'Re-activation' and 'Biomedical') (Pincus, Foster et al. 2007). The majority of the items have good face validity (Bishop 2007). Cronbach's α is a common tool to assess reliability of a scale and 0.7 is an accepted cut-off point (Terwee, Bot et al. 2007). However there is some disagreement: 0.7 is sometimes described as acceptable only for newly designed tools and 0.8 should be the cut-off for widely used scales (Lance, Marcus et al. 2006), and other authors use 0.6 as an acceptable level and 0.7 as a good level (Mutsaers, Peters et al. 2012). The reliability of the ABS-mp has not yet been reported (Bishop 2007), apart from the Psychology domain where internal consistency has been shown to be good, based on Terwee et al.'s cut-off point, with a Cronbach's α of 0.77 (Valjakka, Salanterä et al. 2013).

2.5.3.2. Pain Attitudes and Beliefs Scale

The PABS is a self-administered 19-item questionnaire and each item has an associated six-point scale (Houben, Ostelo et al. 2005). The questionnaire aims at assessing two treatment orientations of health care practitioners towards LBP: 'biomedical', where disability and pain are consequences of specific tissue pathology and treatment is aimed at treating the pathology; and 'behavioural', where practitioners believe in a BPS model of disease, in which pain does not have to be a sign of tissue damage and can be influenced by social and psychological factors (Ostelo, Stomp-van den Berg et al. 2003). There is evidence for content and construct validity, internal consistency, reliability and responsiveness (Ostelo, Stomp-van den Berg et al. 2003, Houben, Ostelo et al. 2005, Bishop 2007, Bowey-Morris, Purcell-Jones et al. 2010, Mutsaers, Peters et al. 2012). The biomedical subscale has been shown to be stable and robust but the behavioural subscale is more problematic (Ostelo, Stomp-van den Berg et al. 2003, Bishop 2010). Ostelo et al. recommended modifying the questions related to the behavioural subscale to improve its reliability. The questionnaire was then adapted and shows better reliability for the behavioural subscale than the initial questionnaire (Houben, Ostelo et al. 2005) but internal consistency is still below recommended levels (Bishop 2010): Cronbach's α of the Biomedical domain is 0.84 and Cronbach's α for the amended version of the behavioural domain is 0.68 (Ostelo, Stomp-van den Berg et al. 2003, Houben, Ostelo et al. 2005). The modified version of the PABS (Houben, Ostelo et al. 2005) is used in the research presented in this thesis.

2.5.3.3. Rationale for using both the ABS-mp and PABS

The validity of the ABS-mp and PABS has been assessed, and signs are encouraging (Ostelo, Stomp-van den Berg et al. 2003, Houben, Gijsen et al. 2005, Pincus, Vogel et al. 2006, Bishop 2007, Mutsaers, Peters et al. 2012), but the PABS behavioural subscale internal consistency is currently problematic and the ABS-mp remains a recently developed questionnaire requiring further assessment (Bishop 2010). To strengthen the validity of this research's results, both questionnaires were used to overcome their current limitations. The PABS is the most tested questionnaire, currently the best questionnaire available, and the most commonly used tool (Bishop 2007): it was used to compare the results of this study with other studies(Bishop 2007). The ABS-mp is the only tool that has been used in a UK population of healthcare professionals and the most comprehensively developed tool (Bishop 2007): it was used because cultural differences in attitudes may exist in different countries and this one has been previously used in the UK.

2.5.3.4. Factors influencing treatment orientations

While the findings can be inconsistent on the relationship between treatment orientation; and gender, age and number of years in practice, CPD and specialism, the overall evidence supports an influence of these factors on treatment orientation (Ostelo, Stomp-van den Berg et al. 2003, Fullen, Baxter et al. 2011, Innes, Werth et al. 2015). Personal experience of LBP and work setting do not seem to be associated with treatment orientations (Ostelo, Stomp-van den Berg et al. 2003). Activity and work recommendations have been shown to be correlated with treatment orientations (Rainville, Carlson et al. 2000, Houben, Ostelo et al. 2005) and independent predictors of activity and work recommendations include interest in LBP, LBP specialism, and special education in LBP (Al-Obaidi and Al-Sayegh 2014).

In order to describe characteristics of participants and to offer the opportunity to explore associations between these factors and attitudes, the participants' age, gender, and specialism were recorded for this study.

In summary, there are different attitudinal measurement questionnaires available. The ABS-mp was rigorously developed but its reliability is unknown. The PABS is the most commonly used and most thoroughly tested questionnaire available but the behavioural subscale internal consistency is problematic. Both questionnaires were used to strengthen the validity of the

results. Participants' age, gender, and specialism were recorded for this study to offer the opportunity to explore associations between these factors and attitudes. The next section reviews the effects of previous attempts to train practitioners in the BPS model.

2.6. Effects of training in the BPS model

Whilst BPS model use is strongly advocated in the literature (Savigny, Kuntze et al. 2009, Linton and Shaw 2011, Nijs, Roussel et al. 2012, Penney 2013), until recently, interventions to increase practitioners' provision of psychosocial interventions have had little effect on patient outcomes (Hay, Mullis et al. 2005, Jellema, van der Windt et al. 2005, Stevenson, Lewis et al. 2006, Overmeer, Boersma et al. 2011). More recent attempts to train practitioners in a BPS approach have been more successful in physiotherapy/physical therapy (Asenlof, Denison et al. 2009, Overmeer, Boersma et al. 2009, Sullivan and Adams 2010, Hill, Whitehurst et al. 2011, Vibe Fersum, O'Sullivan et al. 2013, Beneciuk and George 2015). A study comparing the impact of BPS training and biomechanical training on physical therapy students showed a reduction in fear-avoidance and pain impairment beliefs, and showed an improvement in their recommendations for activity and work in the BPS group, whereas the biomechanical group showed opposite trends (Domenech, Sánchez-Zuriaga et al. 2011). Using a BPS approach in the management of NSLBP is in line with clinical guideline recommendations (Savigny, Kuntze et al. 2009) and effective educational interventions are needed to enhance practice in this area.

The following section describes the characteristics of previous training programmes and the impact on practitioners' attitudes to back pain.

2.6.1. Duration

In the choice of duration of a programme both cost and effectiveness need to be considered: the goal is to find what the optimal impact is with the least burden and cost. A 5-hour programme showed no differences in clinical management between the intervention and the control group (Stevenson, Lewis et al. 2006), and the duration of the training programme is described as a possible limitation of the intervention in the study (Williams, Phillips et al. 2014). Four studies that showed a positive impact on practitioners' attitudes to back pain all described training programmes with a duration of over 5 hours. The range was between 6 and 64 hours and there was no linear relationship between duration and the effects of training programmes on attitudes (Overmeer, Boersma et al. 2009, Domenech, Sánchez-Zuriaga et al. 2011, O'Sullivan, O'Sullivan et al. 2013, Beneciuk and George 2015).

2.6.2. Needs and content

Needs analysis helps to determine if training is needed to fill a gap in professional knowledge; and content analysis determines which content is relevant and accurate and should be included in a training programme (Ghirardini 2011). Conducting needs and content analyses before developing a programme shows better outcomes on practitioners' attitudes to back pain. Lack of needs analysis prior to developing a programme can lead to participants being taught content which is accurate, but which they already know (e.g. Stevenson, Lewis et al. 2006). Content of studies that showed positive impact on practitioners' attitudes or behaviour (Overmeer, Boersma et al. 2009, Domenech, Sánchez-Zuriaga et al. 2011, O'Sullivan, O'Sullivan et al. 2013, Beneciuk and George 2015) was informed by a variety of sources including books on the BPS model, systematic reviews, clinical guidelines for low back pain, stratified care system, or on the limited evidence that spinal structural damage has an impact on pain.

2.6.3. Sample sizes

The sample size required in a study is associated with the effect size: large effects require small samples and small effects require large samples to see changes accurately. Practitioners commonly show poor adherence to guidelines (Bishop 2007) and in order to show differences before and after an intervention, changes in attitude and behaviour need a large sample of subjects. No attitudinal changes were found after an evidence-based educational programme and the authors listed the small sample size (n=30) as a possible limitation (Stevenson, Lewis et al. 2006). Studies that showed attitudinal changes following taking educational programmes used between 42 and 150 participants; either participants were randomly allocated (Overmeer, Boersma et al. 2009, Domenech, Sánchez-Zuriaga et al. 2011) or there was no control group (O'Sullivan, O'Sullivan et al. 2013). These studies did not provide power calculations, therefore it is currently unknown if these studies were adequately powered to ensure that findings would be reproducible. A study with a preliminary design had a 12-participant sample (Beneciuk and George 2015); the conclusion focuses on effectiveness but the design used does not permit the assessment of effectiveness, since preliminary studies only assess the feasibility of running a trial and the acceptability of an intervention, leading to a high risk of type I error in the results of their study.

2.6.4. Other commonalities of previous BPS training studies

So far, no studies have explicitly stated if their learning packages were informed by any behavioural change frameworks. Poor description of interventions is a common issue with randomised controlled trials (Michie, Abraham et al. 2011) and the same issue applies to the existing reports of BPS training programmes in published studies. Another common characteristic of previous studies on BPS training is the delivery method implemented: face-to-face; either compared to usual care or sending practitioners an information package. A posted information package shows small effects on beliefs and behaviour of musculoskeletal practitioners (Evans, Breen et al. 2010) but the cost is very low, suggesting that it could still have a utility in a large population.

In summary, BPS training interventions with no impact on practitioners' attitudes or behaviours were brief, lacked needs and content analyses and used small samples. Studies all used face-to-face interventions or posted

packages and have not reported so far being informed by a behavioural change model. The work in this thesis developed a BPS training programme using an alternative mode of delivery: e-learning.

2.7. Development of a new BPS training programme

The literature has informed the design of a new BPS training programme using an innovative delivery method in this field (e-learning). It was developed following a rigorous framework and a behavioural change model. This section defines e-learning, synthesises evidence for e-learning, assesses e-learning quality and discusses how e-learning can be used for the BPS model and e-learning financial and pragmatic considerations.

2.7.1. E-learning

E-learning is otherwise known as online learning and is a continuation of the kinds of distance learning that were first provided by means of correspondence courses, educational television and videoconferencing. E-learning is defined as "the use of computer and internet technologies to deliver a broad array of solutions to enable learning and improve performance" (Ghirardini 2011). E-learning offers increased accessibility to education, efficacy, cost effectiveness, learner flexibility and interactivity (Sinclair, Kable et al. 2016). E-learning is the fastest growing trend in educational uses of technology (Means, Toyama et al. 2009) and is a mode of delivery that follows good practice advice for medical education (Cutting and Saks 2012). It is a versatile tool that can present information in different ways (Harden and Laidlaw 2012) and is a good option when there is a large amount of content to deliver to geographically dispersed participants with limited daily time to devote to learning (Ghirardini 2011). An e-learning course can be tailored to students' individual needs: content is accessible several times if needed, at the pace that best suits the learner; the learner can decide when and also from where to start (Harden and Laidlaw 2012). Using the internet to acquire knowledge is part of every student's and professional's habits and not just a technologist fad (Harden and Laidlaw 2012).

There are two general approaches to e-learning (Ghirardini 2011). The first one is *self-paced*: participants can learn at their own pace and define their own learning paths based on their needs. This does not require scheduling, managing or tracking participants by the provider but there is a potential to track participants' actions. The content is informed by a set of learning objectives and is delivered using a variety of media, including text, audio and video. E-mailed technical support is usually offered to participants. Self-paced e-learning is a form of asynchronous e-learning as online learning can take place at any time. The second general approach to e-learning is *instructor-led* where a linear curriculum is developed, scheduled and led by an instructor. It can include assignments, collaborative activities and communication tools (such as emails, forums or chats).

2.7.1.1. Evidence on effectiveness of e-learning

A meta-analysis and review of online learning studies found that learners who take all or part of a course online perform better than those taking the same course face-to-face (Means, Toyama et al. 2009). The authors interpreted the difference between the two modes of delivery as also being due to the difference in learning time spent: e-learning offer participants the opportunity to access lessons as necessary. This effectiveness is found in undergraduates, graduate students and professionals (Means, Toyama et al. 2009, Sinclair, Kable et al. 2016). E-learning is a useful tool for developing practical skills (Cantarero-Villanueva, Fernandez-Lao et al. 2012, Preston 2012), developing knowledge (Lee and Lin 2013) and changing clinician behaviour (Sinclair, Kable et al. 2016).

A meta-analysis of e-learning in the health professions (Cook, Levinson et al. 2008) found that it is associated with significant positive effects compared with no intervention. A systematic review and meta-analysis published in 2013 (Lahti, Hatonen et al. 2014) concluded similarly that the preliminary evidence shows individualized, tailored e-learning approaches are more effective than traditional interventions. E-learning has good student satisfaction (Hickey, Johnson et al.

2011, Abendroth, Harendza et al. 2013) but there is lack of data in meta-analyses on participants' adherence (Cook, Levinson et al. 2008, Lahti, Hatonen et al. 2014). Studies have shown an overall good adherence of the participants. A study with physiotherapists showed 91% of the participants using their e-learning tool at least once (Preston 2012), though the results from this study are probably not transferable to the research presented in this thesis as participants did not have to complete a course. Lee and Lin (2013) had 349 participants who completed their study out of 357 who voluntarily participated (98%).

There is a growing body of literature to support e-learning programme development (Raymond and Iliffe 2012, Tam and Eastwood 2012, Asarbakhsh and Sandars 2013) but how can the quality of an e-learning programme be assessed?

2.7.1.2. Quality assessment

The quality of an e-learning programme depends on five main criteria (Ghirardini 2011): (1) learner-centred content: the content should be relevant and specific to the participants; (2) granularity: the content should be segmented to facilitate learning of new knowledge and flexibility should be allowed in the scheduling; (3) engaging content: different media should be used to develop an engaging and motivating learning experience; (4) interactivity: frequent learner participation is necessary to keep their attention; and (5) personalisation: the programme should be customisable to match participants' needs and interests. E-learning programme quality can be assessed using the ECBCheck, a quality improvement scheme for E-Learning programmes providing a criteria analysis toolkit (see Appendix M - ECBCheck Tool result). Data on the reliability and validity of the ECBCheck are not available (Ehlers 2010) but the tool has been extensively used by UNESCO, the World Food Programme, the Austrian Ministry of Education and several universities to assess their e-learning programmes (ECBCheck 2014). The tool analyses a variety of indicators about a programme, requiring information about the programme (general description, objectives and programme organisation; and organisational and technical requirements), target group orientation, quality of the content, programme/course design (learning design and methodology, motivation/participation, learning materials, e-Tutoring, collaborative learning, assignments and learning progress, and assessment and tests), media design, technology, and evaluation and review. Each criterion is either graded as M (minimum criteria) or E (Excellence criteria), and E is subdivided into four grades from 0, not met, to 3, met excellently.

The e-learning programme developed for this thesis was assessed using the ECBcheck tool to evaluate the programme's quality, described in section 8.7.2.

2.7.1.3. E-learning and BPS model

An interactive program has been shown to be more successful than a didactic one to promote BPS orientation in family practice, when looking at knowledge, management intentions and attitudes (Margalit, Glick et al. 2005). E-learning can be interactive as this uses an engaging interface to present information and can be designed to make the learner active, using his/her own experience, thus facilitating the learning experience (Bransford, Brown et al. 2000, p.10). An e-learning programme on pain education was developed for health science students; and although its design and development have been reported there has been no report of the impact or effectiveness of the e-learning programme (Lax, Watt-Watson et al. 2011). A study protocol for an e-learning programme has recently been published on a BPS educational tool on patients with chronic low back pain. This is currently being designed and developed using a mixed methods study (Valenzuela-Pascual, Molina et al. 2015), and the results are not yet published.

2.7.1.4. Financial considerations

E-learning represents a cost-effective tool for healthcare professionals and institutions. It might be particularly suitable for osteopaths, who often work in practices with small numbers of clinicians and therefore have to maintain clinical cover: they can participate from their home or practice. Whilst the initial development cost may be high, the long term cost would probably be less than repeated face-to-face teaching to a limited number of participants.

2.7.2. Development framework

A comprehensive guide for designing and developing e-learning programmes for adult learners was funded by the Food and Agriculture Organization of the United Nations (Ghirardini 2011). This guide describes the five stages e-learning programme development should follow, described in the ADDIE model: Analysis, Design, Development, Implementation and Evaluation stages. Each stage has sub-stages (see Figure 2.1 - ADDIE model from Ghirardini 2011).

The analysis stage aims at defining the audience and content of the e-learning programme (lacking in some of the studies with no impact on practitioners' attitudes (Bekkering, van Tulder et al. 2005, Engers, Wensing et al. 2005)).

The design stage defines learning objectives and the order in which the learning objectives should be achieved, called sequencing. This stage also includes the selection of instructional, media, evaluation and delivery strategies.

The development stage is the actual production of the e-learning programme. It includes 3 sub-stages: content development, storyboard development and courseware development. An e-lesson should not take more than 30 minutes of learning time and should only use direct, simple and clear language style. Content can be presented with different techniques, including storytelling and scenario-based approaches; and examples can be delivered in an inductive (from example to theory) or deductive (from theory to example) way. Different media elements can be used, such as text, audio and video media. The e-learning development can include integration of practice and assessment questions in order to reinforce the achievement of the learning objectives.

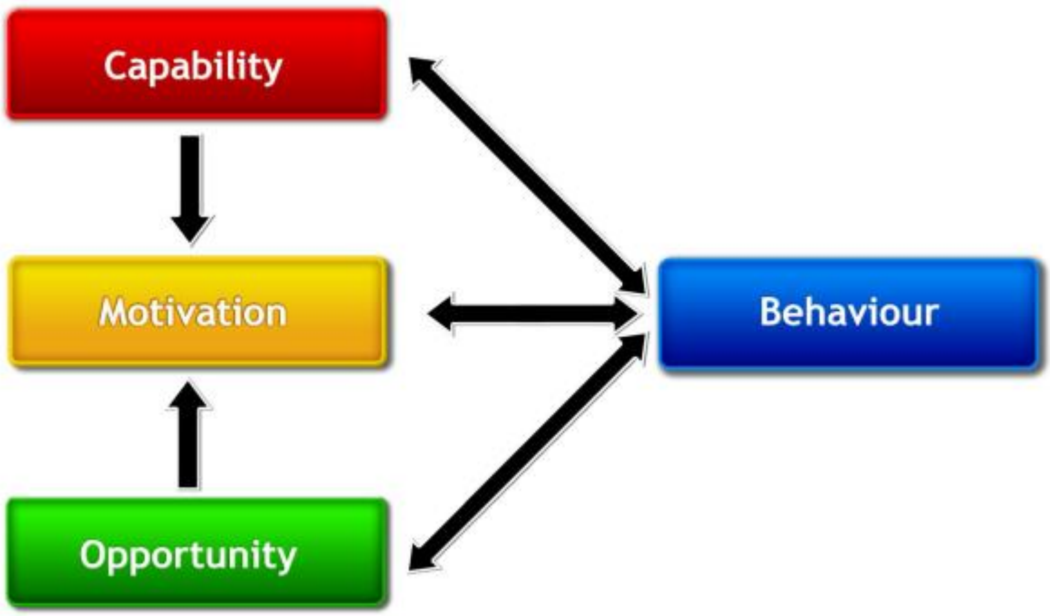
The last two stages are the implementation and evaluation of the e-learning programme.

Figure 2-1 - ADDIE model from Ghirardini 2011
(rights to use obtained)

2.7.3. Behavioural change model

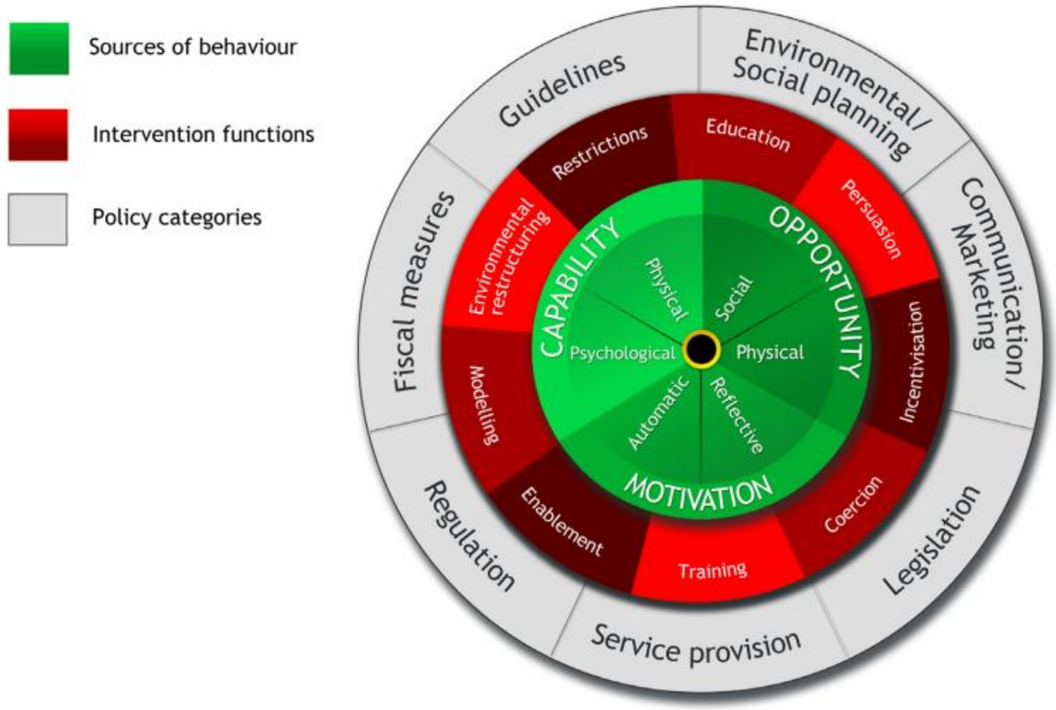
The e-learning programme in this thesis aimed to update experienced osteopaths' knowledge with the current best evidence on NSLBP and the BPS model. Improving the implementation of evidence-based practice depends on behaviour change but changing behaviour is a challenge (Grimshaw, Eccles et al. 2004). To meet this challenge, this e-learning programme was informed by a framework specifically developed to characterise and design behaviour change interventions (Michie, Van Stralen et al. 2011). The Behaviour Change Wheel (BCW) was developed following systematic searching and evaluation of previous frameworks. The BCW was used reliably to characterise two interventions: the English Department of Health's 2010 tobacco control strategy and the NICE's guidance on reducing obesity (Michie, Van Stralen et al. 2011). One of the aims of this framework is to have comprehensive coverage of behaviour change determinants to enable its application to interventions which aim to change behaviour. The framework is linked to an overarching model of behaviour named COM-B (Capability Opportunity Motivation – Behaviour) (see Figure 2-2 - COM-B system).

Figure 2-2 - COM-B system
(from (Michie et al 2011), under creative commons licence)



Capability is defined as the individual's capacity to engage in the activity. Motivation constitutes all brain processes that energise and direct behaviour; these include habitual processes, emotional responding and analytical decision-making. Opportunity is all the factors that lie outside the individual and make the behaviour possible or prompt it. These three components are then subdivided, e.g. into physical and psychological for Capability; physical and social for Opportunity; and reflective processes and automatic processes for Motivation. Behaviour is influenced by and influences capability, motivation and opportunity. Motivation is influenced by both capability and opportunity. The BCW provides functions that interventions could use in order to influence the COM-B system: Education, Persuasion, Incentivisation, Coercion, Training, Enablement, Modelling, Environmental restructuring, and Restriction (see Figure 2-3 - The Behaviour Change Wheel).

Figure 2-3 - The Behaviour Change Wheel
(From Michie et al. 2011, under creative commons licence)



The professional environment of osteopaths fulfils some BCW characteristics offering a strong foundation for the implementation of the e-learning programme. *Capability – psychological capacity*: this course can form part of the continuous professional development (CPD) required by the General Osteopathic Council from all osteopaths practising in the UK. It is part of an osteopath's routine professional life to attend CPD and has been compulsory for 15 years, since the regulation of osteopathy. *Capability – physical capacity*: taking a course online to acquire knowledge is part of every professional's habits and not just a technologist fad (Harden and Laidlaw 2012). E-learning is a useful way of delivering CPD and has the advantage of removing physical barriers. *Motivation – reflective process*: osteopaths are reminded every year by the regulatory body to submit their CPD record. This study will provide free CPD for experienced osteopaths to use toward the required CPD hours. *Motivation – automatic process:* the topic of the programme will probably be of high interest to the osteopaths invited to take part in this project as LBP is the most common symptom encountered by osteopaths in the UK (Fawkes 2010). Osteopaths' previous experience will automatically be engaged. *Opportunity - physical:* having access to a computer and the internet is becoming part of everyone's life in the UK. In a 2014 survey from the Office for National Statistics (Office for National Office for National Statistics 2014) 38 million adults (76%) in Great Britain reported having accessed the internet every day, 21 million more than in 2006. Osteopaths are required to keep patients records and this can be done either manually or electronically. The GOsC explicitly requires osteopaths who use an electronic method to register with the Information Commissioner as "information that is held on computer, or is intended to be held on computer, is data" and is therefore protected by the Data Protection Act (Information Commissioner's Information Commissioner's Office 2015). There is a high chance that osteopaths invited to take the e-learning programme will have access to a computer and the internet either at home or at their practice, and furthermore they will receive the invitation by email which implies that they have access to the internet. *Opportunity - social:* the GOsC's encouragement of osteopaths towards the need to take regular CPD, the general move of the profession toward an evidence-based approach, the current proposal to have a three-year programme for CPD and the possible interaction of osteopathy in the evidence-based system of the NHS are factors that may influence osteopaths' social opportunity.

In summary, e-learning programmes can be more effective than traditional interventions and participants' satisfaction is high. Methodologies exist to support the development of e-learning programmes and tools to assess their quality. Considering the training needs reported by practitioners on the BPS model, e-learning is an appropriate, cost-effective tool that can offer an engaging interface and tailored learning environments. In order to make the development of the e-learning programme transparent and to maximise the chance to develop an intervention that can have an impact on attitudes, the e-learning programme was informed by a development framework (ADDIE) and a behavioural change model (BCW model). This e-learning programme was

offered as a CPD to experienced osteopaths. The following section describes the context of osteopathy in the UK, the models used by osteopaths for back pain, and training and CPD in osteopathy.

2.8. Osteopathy

Osteopathy is a manual therapy included under the umbrella term of Complementary and Alternative Medicine (CAM). It is one of the most commonly used CAMs for back pain (Murthy, Sibbritt et al. 2015) and there is evidence for its effectiveness for NSLBP (e.g. Bronfort, Haas et al. 2010, Licciardone, Gatchel et al. 2016). LBP is the most common symptom encountered by osteopaths in the UK (36%) (Fawkes 2010) and in Australia (27.3%) (Orrock 2009).

UK osteopathy's statutory regulation (Osteopath's Act 1993) was enacted in 2000. The General Osteopathic Council (GOsC) is the UK regulator. Osteopaths must comply with GOsC standards of practice to remain registered and therefore allowed to practise as osteopaths in the UK. In May 2016, there were 5,100 UK osteopaths, half male, half female, and the majority were aged between 31 and 50 (range: 21-70). They see around 30,000 patients each working day, 80% of whom fund their own treatment (GOsC 2016). Patients' confidence in their osteopaths is high (96%) but general public awareness of osteopathy is low (GOsC 2015).

2.8.1. Back pain models

Although osteopaths have long claimed to use holistic approaches (Cole 1960, Szmelskyj 1990, Baum 2010), arguably a biomedical paradigm focussing on simple biomechanics and the musculoskeletal system has predominated. A qualitative study explored experienced osteopaths' therapeutic approaches and described a continuum of practice from technical rationality (practitioner-centred and focussing on the body) to professional artistry (empowerment and patient-led) with a third category in the middle (collaborative, person-centred and shared decision-making) (Thomson, Petty et al. 2014). A recent qualitative study has explored clinical educators' views on clinical reasoning in different osteopathic educational institutions (Grace, Orrock et al. 2016). There was a general agreement that the purpose of osteopathic clinical reasoning may not be to name a single diagnosis but more to obtain a working diagnosis that could inform patient management and this was described as a collaborative process between the practitioner and the patient. Participants described clinical reasoning in two phases: first, to rule out any pathology; second, to "look at what's happening in the physical body". This study highlighted how clinical educators' views of health are grounded in mechanical reasoning. There was no mention of the non-somatic health attributes that are included in the BPS model which confirms findings from a survey of UK manual practitioners: osteopaths are less willing to engage in psychosocial issues with their patients than physiotherapists and chiropractors and believe that there is an underlying structural cause to NSLBP (Pincus, Foster et al. 2007).

2.8.2. Training

Osteopathic training lasts 4 years full-time or 5 years part-time in the UK (GOsC 2016). In depth study of the BPS model is a relatively new phenomenon. It is possible that experienced osteopaths would not have received training in this field or that the way this subject was taught has since radically changed. The BPS model has developed largely over the last 15 years and evidence informing the model's key elements has also appeared recently. Although BPS-informed approaches have started appearing in recently published articles (Moran 2010, Penney 2010, Penney 2013) accessible to GOsC-registered osteopaths, it is unlikely that simple self-directed reading would provide sufficient experience to enhance practice competence in this complex field. The osteopathic profession in the UK also suffers from a lack of translation of research into practice (Rushton, Fawkes et al. 2014), making it less likely that experienced osteopaths would adopt a BPS approach from having read published literature. It is as yet unclear how the BPS model is acted out in clinical practice, but it is asserted as underpins osteopathic practice and encompasses the new CPD requirements described below (GOsC 2016).

2.8.3. CPD

Osteopaths must currently meet Continuous Professional Development (CPD) expectations before renewing registration to assure patients that practitioners meet the profession’s standards. The GOsC is implementing a new CPD scheme based on a three-year cycle. This scheme will provide guidance on topics osteopaths will have to cover: e.g. CPDs will need to include activities relevant to all four themes of the Osteopathic Practice Standards (communication and patient partnership; knowledge, skills and performance; safety and quality in practice; and professionalism), having at least one activity focussing on communication and consent (GOsC 2016). Half of the thirty hours of CPD required from osteopaths has to be learning with others, e.g. courses or conferences, and e-learning is a form of CPD that can offer both individual study and learning with others.

In summary, osteopathy is a regulated manual therapy and osteopaths see approximately 10,000 patients for LBP each working day. Osteopaths use a variety of back pain models, including biomedical and BPS models, with a strong heritage of biomechanical theories. Experienced osteopaths may not have received training in the BPS model. CPD is compulsory for osteopaths to remain registered with the GOsC and e-learning may be a useful tool offering flexibility to participants and access to everyone with an internet connection.

2.9. Statement of the problem

1. Applied BPS approaches to back pain are warranted and relevant to osteopaths,

2. Learning and implementing BPS approaches is challenging due to a strong osteopathic biomechanical heritage, under developed curriculum in the past and weaknesses in current offers in this area,

3. There is a need for CPD to promote best evidence informed practice, including use of a BPS approach, within the osteopathic profession and e-learning offers one potential solution within the context of CPD regulation and opportunities for professional development.

2.10. Overall research question

What is the acceptability, feasibility and likely impact of a biopsychosocially structured e-learning programme for non-specific LBP on experienced osteopathic practitioners' attitudes to back pain?

2.11. Purpose statement

The overall aim is to assess the feasibility of running a main trial on the impact of an evidence-based and BPS-informed e-learning programme on experienced osteopaths' attitudes to back pain; and to assess the acceptability of using an e-learning programme for experienced osteopaths as a CPD in order to address the need for applied BPS models of practice in the context of managing NSLBP. This aim was achieved in three stages:

1/ conducting a scoping review on the BPS prognostic factors and assessment methods for NSLBP that should be included in an evidence-based educational intervention for experienced osteopaths

2/ developing an e-learning programme informed by the aforementioned review

3/ testing this e-learning programme with mixed methods research using an explanatory sequential design:

- conducting a feasibility RCT using two attitudinal questionnaires (ABS-mp and PABS) to measure participants' attitudes to back pain
- conducting semi-structured interviews to gather participants' views on the content, acceptability and practicality of the e-learning programme.

3. Scoping review introduction

3.1. Chapter introduction

This chapter describes the aim of the review, explains the differences between different types of literature review, discusses the choice of methodology and describes from which professions’ body of knowledge the literature was drawn.

3.2. Introduction

Many previous studies have used a BPS educational intervention to influence practitioners’ attitudes or behaviour and have shown variable effects (Asenlof, Denison et al. 2005, Hay, Mullis et al. 2005, Jellema, van der Windt et al. 2005, Stevenson, Lewis et al. 2006, Asenlof, Denison et al. 2009, Overmeer, Boersma et al. 2009, Hill, Whitehurst et al. 2011, Vibe Fersum, O'Sullivan et al. 2013). A key limitation of the studies that showed no effect was the content of the training programmes. Content analysis is the most critical step in the development of a course (Ghirardini 2011) but the content in these studies was drawn from literature that participants were likely to be aware of and the authors of these studies hypothesise that this partly explains the absence of difference between the intervention and control groups (Jellema, van der Windt et al. 2005, Stevenson, Lewis et al. 2006). In order to train manual therapists to develop their clinical judgement and their ability to prognosticate accurately with patients presenting with NSLBP, there is a need to review the BPS assessment methods and prognostic factors for NSLBP that have been shown to be supported by evidence or included in clinical guidelines.

3.3. Aim of this review

NICE guideline recommendations include care which may be delivered by osteopaths and using the BPS model of care for persistent non-specific LBP (Savigny, Kuntze et al. 2009). The implementation of the BPS model for NSLBP has not been precisely described, which limits the feasibility of developing an intervention to train practitioners in this approach. The aim of this scoping review (stage 1) was to identify key elements that should be included in an evidence-based e-learning programme on the evaluation of NSLBP in a BPS environment in a manual therapy context. This scoping review informed the learning package content used in stage 2 of this research.

3.4. Methodology

3.4.1. Narrative and systematic reviews of the literature and meta-analyses

The three most common approaches to summarise and disseminate research findings in allied health and rehabilitation have been traditional or narrative literature reviews, systematic literature reviews, and meta-analyses (Rumrill, Fitzgerald et al. 2010). A narrative literature review usually has a focussed research question, or a research question that becomes focussed during the process of undertaking the review, and usually is selective in the material it uses. Selection criteria for articles are not always clearly stated to the readers (Green, Johnson et al. 2006, Cronin, Ryan et al. 2008). While narrative review is a good educational tool in the classroom, as it is often more up to date than textbooks and exposes students to peer-reviewed literature, it is becoming less popular with journals due to a lack of systematic methods, a risk of bias and an overemphasis on authors' perspectives (Green, Johnson et al. 2006) and is no longer accepted for publication by many of them. Systematic literature review is a viewpoint focussing on a specific clinical problem: therapeutic, diagnostic or prognostic (Biondi-Zoccai, Lotrionte et al. 2011). It includes different steps that are explicitly and clearly stated to allow independent reproduction by other researchers: formulating a research question, developing a research protocol, searching the literature, extracting data, when appropriate data-pooling according to statistical methods (called meta-analysis), and appraising quality, analysing data and finally interpreting the results (Wright, Brand et al. 2007, Biondi-Zoccai, Lotrionte et al. 2011). Systematic reviews typically focus on a well-defined question where appropriate study designs can be identified in advance and the research question is answered by a relatively narrow range of quality-assessed studies. The greater strength of systematic literature reviews is the minimisation of bias in the review process and the identification of sources of bias in the included studies (Furlan, Pennick et al. 2009, Higgins JPT & Green S (editors) 2011, Rushton, Calvert et al. 2011). Another strength is their ability to pinpoint weaknesses and fallacies in apparently sound primary studies (Biondi-Zoccai, Lotrionte et al. 2011). Systematic literature reviews also have limitations. It can be challenging to decide when to pursue meta-analytical methods and to decide if the studies included are sufficiently homogeneous for pooling. Systematic literature reviews may only retrieve a few low-quality studies that answer the research question; analysing them in a systematic literature review may mislead readers about the strength of the evidence. Finally, small study effects are impossible to completely discard; small study effects resulting from small primary studies with significant results being more likely to be published than small non-significant studies. The lack of external validity of systematic reviews can also be challenging in a clinical setting, i.e. knowing if results from systematic literature reviews can be applied to a single individual (Rothwell 2005, Biondi-Zoccai, Lotrionte et al. 2011).

3.4.2. Scoping review

A third way of summarising and disseminating research findings has become increasingly popular in the last decade: scoping reviews. Different authors have offered definitions of scoping reviews and the most recent, and most commonly reported is: “A scoping review or scoping study is a form of knowledge synthesis that addresses an exploratory research question aimed at mapping key concepts, types of evidence, and gaps in research related to a defined area or field by systematically searching, selecting, and synthesizing existing knowledge" (Colquhoun, Levac et al. 2014). Scoping reviews are becoming increasingly popular: of all the scoping reviews published between 1999 and 2012, 70% were published after 2009; and 75% of scoping reviews addressed a health topic (Pham, Rajić et al. 2014). There are four main reasons why a scoping study can be undertaken: to examine the extent, range and nature of research activity; to determine the value of undertaking a full systematic review; to identify research gaps in the existing literature; and to summarise and disseminate research findings to policy makers, practitioners and consumers who might otherwise lack time or resources to undertake such work themselves (Arksey and O'Malley 2005). For the first two reasons, the scoping review might be part of an ongoing process possibly leading to a systematic review. For the last two reasons, a scoping study might be used as a method in its own right leading to publication and dissemination of research findings (Arksey and O'Malley 2005). While there are no clearly defined methodological procedures for scoping reviews (Garcia, Ali et al. 2015), Arksey and O'Malley published the first methodological framework for conducting a scoping study (Arksey and O'Malley 2005). They described five stages and an optional sixth one. The framework has since been refined by different authors: the most extensive recommendations were published by Levac et al. (2010) who provided greater detail on how to conduct each stage of the framework, and Daudt et al. (2013) who guided researchers on how to set achievable goals. Recommendations on how to enhance the framework were also provided by Anderson et al. (2008), Rumrill et al. (2010) and Armstrong et al. (2011). The following description of the six stages is based on Arksey and O'Malley's framework (2005) and includes the further recommendations from the above-mentioned authors. A detailed description of these stages in the current study is presented in the Chapter 4.

Stage 1. Identifying the research question: the research question is broad in nature as the focus of scoping reviews is to summarise the breadth of evidence. The broad research question can be linked to a more specific purpose.

Stage 2. Identifying relevant studies: Studies should be identified by a team that can provide context expertise in order to make decisions on breadth and comprehensiveness. The objective is to map out the literature as it stands, this means plotting it out in time (e.g. last ten years), space (e.g. UK or worldwide), and source (e.g. mainly peer-reviewed journals and/or grey literature).

Stage 3. Study selection: the selection of studies is an iterative process where inclusion and exclusion criteria are developed and refined during familiarisation with the literature; a transparent and replicable process needs to be described; at least two researchers need to independently review abstracts yielded from the search; and two reviewers should independently review the full articles for inclusion with help from a third reviewer when disagreements occur.

Stage 4. Charting the data: charting is a technique for sifting, charting and sorting material according to key issues and themes. A spreadsheet or database may be used to create data charting forms; these are developed by the research team to determine which variables to extract. Two researchers should independently extract data from a limited number of studies using the data charting form and meet to determine consistency of data extraction. Synthesis of material is critical as scoping reviews are not a short summary of many articles.

Stage 5. Collating, summarising and reporting the results: scoping reviews seek to present an overview of all material reviewed, the aim being not to synthesise evidence but to present an account of the existing literature. Findings should be presented in two ways: first a descriptive numerical summary should be provided, including the overall number of studies included, types of study design, and years of publication. Secondly the literature should be organised thematically. The analysis phase needs to be described in systematic steps in order to report the findings in a rigorous manner.

Stage 6. (optional) Consultation Exercise: this stage follows recommendations for systematic literature reviews to include practitioners' and consumers' contributions to the work. This stage offers additional sources of information, perspectives, meanings and applicability to scoping studies, but there is a lack of guidance on when, how, and why to consult stakeholders and how to analyse and integrate these data with the findings.

These four approaches to summarising and disseminating research findings have their own application and should be used appropriately by researchers depending on the purpose of their research (Arksey and O'Malley 2005, Green, Johnson et al. 2006, Walach, Falkenberg et al. 2006, Cronin, Ryan et al. 2008, Brien, Lorenzetti et al. 2010, Levac, Colquhoun et al. 2010, Biondi-Zoccai, Lotrionte et al. 2011, Daudt, van Mossel et al. 2013, Colquhoun, Levac et al. 2014, Pham, Rajić et al. 2014).

3.4.3. Methodology of this review

The BPS model and NSLBP are complex fields with a vast amount of literature dedicated to these topics. Bastian et al. (2010) reported that every day 75 trials and 11 systematic reviews are published with no signs of this slowing down. In addition to primary research, there are numerous secondary sources that have reviewed primary sources on NSLBP but it can be challenging for practising osteopaths to make sense of the literature as the BPS model is available in separate pieces rather than as a whole. In order to appreciate the extent of the BPS model, one should look at and merge the results from studies on the biological factors, the psychological factors and the social factors of NSLBP in order to get a general picture of the BPS model for NSLBP. This study aimed to inform an evidence-based intervention on the evaluation of NSLBP in a BPS environment for manual therapists and required a profile of the existing literature in this area. In order to achieve this, the research question of this review was broad, which favoured the use of a scoping review approach.

3.4.4. Content

3.4.4.1. Manual therapy

The research and knowledge base for osteopathy is limited and the manual therapy disciplines draw on each others' research and practice. To develop an e-learning programme for osteopathy, literature from all manual therapy disciplines was included, but decisions about relevance to osteopathy were judged by the researcher and his supervisors. It was also informed by two surveys published in 2010 that assessed the use of spinal and pelvic procedures within the British osteopathic profession; one survey was about the assessment of the spine and pelvis (Fryer, Johnson et al. 2010) and one about their treatment (Fryer, Johnson et al. 2010). The McKenzie method (Mechanical Diagnosis and Therapy), Yoga and Pilates were not listed in the reported procedures used by British osteopaths in these surveys and were therefore added as exclusion criteria.

3.4.4.2. Inclusion of secondary sources

For two main reasons, only high level evidence secondary sources were included, i.e. guidelines, systematic reviews and diagnostic studies. Firstly, including only secondary sources had practical reasons because of the vast amount of literature available on NSLBP. A fine balance had to be found between the laborious nature of study identification and the need for comprehensiveness, and with the need to complete a scoping study in a reasonable time frame (Levac, Colquhoun et al. 2010, Daudt, van Mossel et al. 2013). This balance can be achieved by making decisions on where to search for articles and which articles to include when conducting scoping reviews (Armstrong, Hall et al. 2011). Secondly, evidence drawn from sources with higher levels of evidence was adequate to inform an evidence-based intervention teaching on the evaluation of NSLBP in a BPS environment in a manual therapy context (Ghirardini 2011). Whilst the researcher was aware that systematic reviews vary in quality, the factors drawn from guidelines and systematic reviews were triangulated on the basis of the frequency of their appearance in the literature, in order to decide on content inclusion/exclusion. Their inclusion/exclusion was also based on agreement between the researcher and his supervisors.

3.5. Chapter summary

Narrative reviews, systematic reviews and scoping reviews have specific indications in summarising and disseminating research findings, and should be used appropriately by researchers depending on the purpose of their research. To identify key elements that should be included in an evidence-based e-learning programme on the evaluation of NSLBP in a BPS environment in a manual therapy context, a scoping review was conducted following Arksey and O'Malley (2005)'s framework including recommendations provided since then from Levac et al. (2010), Daudt et al. (2013), Anderson et al. (2008), Rumrill et al. (2010) and Armstrong et al. (2011). Literature from all manual therapies was included focussing on secondary sources.

4. Scoping review methods

4.1. Chapter summary

This chapter describes the methods used to identify factors from the existing literature to be considered for inclusion in an evidence-based e-learning programme teaching evaluation of NSLBP in a BPS environment in a manual therapy context. This scoping review followed Arksey and O'Malley's framework (Arksey and O'Malley 2005) with the recommendations of Levac et al. (2010) and Daudt et al. (2013). This scoping review informed the e-learning programme design.

4.2. Chapter introduction

The chapter describes how the first five stages of Arksey and O'Malley's framework were followed: identifying the research question, identifying relevant studies, study selection, charting the data, and collating, summarising and reporting the results.

4.3. Aim

The aim of this study was to identify biopsychosocial factors and their assessment methods from the existing literature to be considered for inclusion in an evidence-informed training intervention on the BPS approach for NSLBP in a manual therapy context using a scoping review method.

4.4. Stage 1. Identifying the research question

Which biopsychosocial factors and assessment methods should be included in an evidence-informed training intervention on the BPS approach for NSLBP in a manual therapy?

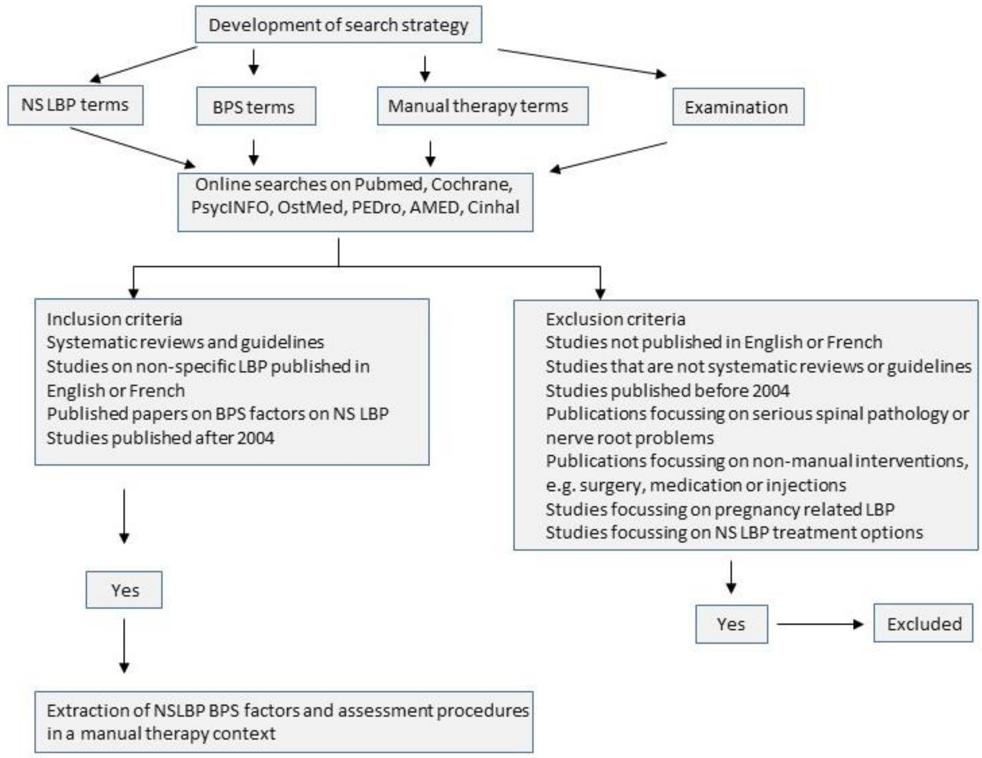
The research question is broad in nature, which accords with attributes of scoping reviews research questions (Arksey and O'Malley 2005), and is linked to a more specific purpose: informing stage 2 of this research, the development of an e-learning programme.

4.5. Stage 2. Identifying relevant studies

A search strategy was developed by the researcher. The aim was to develop a search strategy with a high sensitivity in order to try to identify all relevant publications, and then apply exclusion criteria. The initial search strategy was piloted on Medline and AMED databases in order to enrich the list of keywords. Medline offers the possibility of developing long search strings and AMED offers more limited search options. Working on these two databases helped to develop different search strategies in order to adapt to the requirements of different online databases' search engines (details on the specific searches per database can be found in Appendix A -search terms). After exclusion of duplicates, 1488 primary and secondary sources were identified during this scoping phase, contributing to the decision to include only high quality secondary sources that reviewed primary sources on NSLBP or diagnostic assessment: i.e. guidelines and systematic reviews on biological, psychological or social factors, and methods of assessment of NSLBP. The literature used for this review was identified from different manual therapy professions that may use different words to describe the same concepts (Pillastrini, Vanti et al. 2015). Discussion with both supervisors, from different manual therapy professions, helped to diversify the keywords. Physical therapy was added to the keywords in order to include articles published in the USA. This pilot search also helped to refine the inclusion and exclusion criteria based on what would be relevant to manual therapy. Help from an expert librarian in the manual therapy field was sought on how to minimise the risk of excluding articles that could have been indexed incorrectly on electronic databases. The search filters used on the electronic databases included systematic reviews and guidelines. It was decided to add reviews as a filter, as systematic reviews are sometimes labelled as reviews rather than systematic reviews. Both Boolean operators were used depending on which database the search was done and how long the search string was (see Appendix A - search terms for details).

The author then performed a systematic online search on seven electronic databases: Medline, Cochrane, PsycINFO, OstMed, PEDro, AMED and Cinhal. The online search was performed between September and October 2014. The final search strategy included terms around four topics: NSLBP, manual therapy, the BPS model and examination. The search strategy was adapted slightly for each database to ensure the greatest yield. A list of the search terms can be found in Appendix A – search terms. The review process is summarised in Figure 4-1 - Flowchart of the review process.

Figure 4-1 - Flowchart of the review process



4.6. Stage 3. Study selection

Results from searches on each database were downloaded into a Reference Management Software, Endnote (version X4.0.2), and duplicates were removed. Titles and abstracts were screened and irrelevant articles were removed. After an initial screening by the researcher, the list of abstracts was sent to both supervisors and after their individual screening, decisions of inclusion/exclusion of the articles were made in a meeting with both supervisors to increase the consistency of the application of the inclusion and exclusion criteria (see Table 4-1 - Inclusion / exclusion criteria). Articles in reference lists of included articles that fulfilled inclusion criteria were also examined and included if appropriate.

Table 4-1 - Inclusion / exclusion criteria

Inclusion criteria: • Systematic reviews and guidelines • Published papers on NSLBP published in English or French • Published papers on BPS factors on NS LBP • Studies published after 2004 Exclusion criteria • Studies not published in English or French • Studies that are not systematic reviews or guidelines • Studies published before 2004 • Publications focussing on serious spinal pathology or nerve root problems • Publications focussing on non-manual interventions, e.g. surgery, medication or injections • Studies focussing on pregnancy related LBP • Studies focussing on NS LBP treatment options

Articles were then categorised according to their methodologies: guidelines or systematic reviews (see Appendix G - Papers categorised per methods); were allocated an identification number, and were then collected for full text review. Full text papers were obtained for those that met the inclusion criteria and for those where it was unclear whether or not the abstract and title met the inclusion criteria. Inclusion and exclusion criteria were applied to all titles, abstracts and full papers. If more recent or updated version of guidelines than those gathered from the search were available, the more recent ones replaced those initially found.

4.7. Stage 4. Charting the data

A study eligibility form and evidence form (see Appendix B – Eligibility form and Appendix C – Evidence table, for Seffinger et al. (2004)'s article as an example) were designed to extract data consistently from the articles. The study eligibility form assessed whether each article fulfilled the inclusion criteria (type of paper, subject, language and year of publication) and the evidence form provided a consistent extraction tool for the factors or assessment methods described in the articles included. The following data were extracted from each article when information was available: authors, publication title, journal name, year of publication, country, design, dates of inclusion of sources, inclusion and exclusion criteria, details of population studied, profession that carried out the research. The following data were extracted for each item when information was available: type of item, item description, use in practice, strength of evidence. The researcher and one of the supervisors piloted these forms by reviewing together three articles. This process allowed the development of an appropriate synthesis method with these forms. This method was then reviewed with the second supervisor. Once the method was agreed, the author completed a study eligibility form for each article and, if the article met the inclusion criteria, an evidence form. It was decided to use an inclusive strategy to fulfil the aim of summarising and disseminating research findings. In addition, only secondary sources were included and these were likely to include quality assessment of their primary sources. For these reasons, article quality was not appraised and followed scoping review guidelines (Arksey and O'Malley 2005). This allows the inclusion of articles of different methodologies and the summarising of a range of evidence in order to convey the breadth and depth of a field (Brien, Lorenzetti et al. 2010, Levac, Colquhoun et al. 2010, Armstrong, Hall et al. 2011). Scoping reviews can include quality appraisal when it is done as a first step towards conducting a systematic review (Daudt, van Mossel et al. 2013) but this remains a minority of published scoping reviews (less than 23%) (Pham, Rajić et al. 2014). After completion of the process, 3 articles, randomly selected, were analysed by one supervisor to assess consistency of information extraction with the primary reviewer's extraction.

4.8. Stage 5. Collating, summarising and reporting the results

After extraction of the different BPS factors in the evidence forms, a summary table named *summary table per category* was created to summarise which articles included which item (see Appendix D - Summary table for biological category, shown as an example).

A subsequent table, named *summary table per item*, was then created for each factor (see Appendix E - Summary table per item), summarising content from all articles that mentioned that particular factor, i.e. articles that were identified in the summary table per category. The factor was categorised as a biological, psychological or social factor, or an assessment method. A decision was then made to include or exclude each factor from the evidence-based intervention based on the clarity of its definition, the evidence provided for this factor, its prevalence in the literature and its applicability to manual therapy.

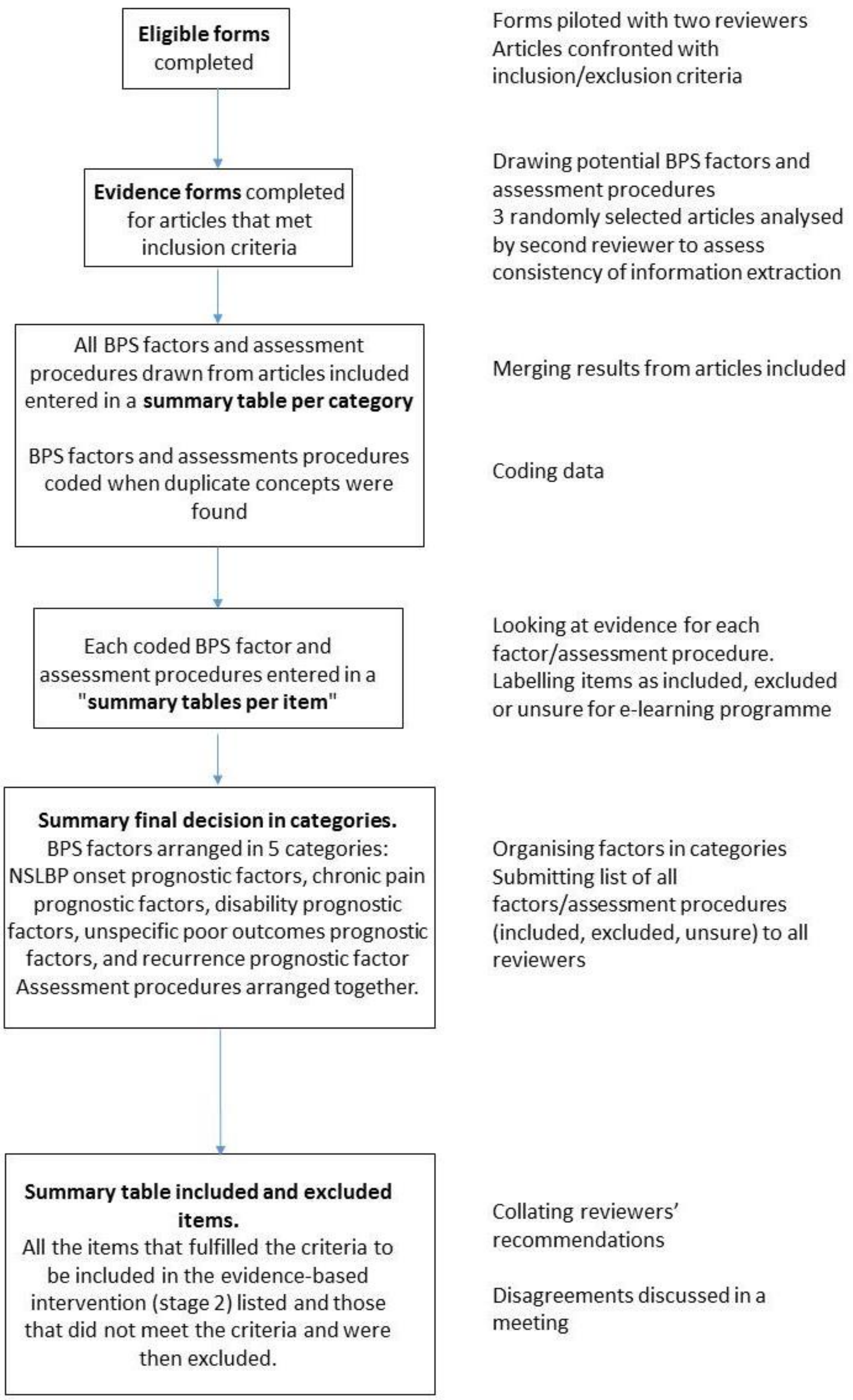
All the factors and assessment methods, both included and excluded, were then collected in a table, named *summary final decision* in which the author's decision for each factor was stated concerning the inclusion, exclusion or uncertainty. A table named *summary final decision in categories* presented the assessment methods and the BPS factors. BPS factors were organised according to the outcome they were influencing: onset of NSLBP, pain, disability, unspecific outcomes and recurrence. This list was then submitted to both supervisors to assess their agreement on the author's judgement of inclusion/exclusion choice on the factors. Supervisors reviewed the table independently and sent their recommendations about inclusion and exclusion to the author who collated the answers. Disagreements were discussed between the author and the two reviewers in a meeting. A final table named *summary table included and excluded items* (see Appendix F – List of items included and excluded) was produced in which a thumbnail listed all the items that fulfilled the criteria to be included in the e-learning programme (stage 2) and those that did not meet the criteria were then excluded.

This process is summarised in Figure 4-2 - Data extraction and synthesis process.

In summary, the factors/assessment methods drawn from guidelines and systematic reviews were triangulated on the basis of the level of evidence and the frequency of their appearance in the literature in order to decide

inclusion/exclusion of their content. Their inclusion/exclusion was also based on agreement between the three authors.

Figure 4-2 – Data extraction and synthesis process



4.9. Chapter summary

The scoping review followed Arksey and O'Malley's framework (Arksey and O'Malley 2005) and recommendations provided by Levac et al. (2010) and Daudt et al. (2013). A systematic literature search was performed on seven electronic databases around four themes: NSLBP, manual therapy, the BPS model and examination. A series of forms were used for collating, summarising and presenting the findings to offer rigour to the process and allow possible replication of the review.

5. Scoping review results

5.1. Chapter summary

This chapter describes the results of the scoping review: it details how many articles were included in the scoping review, and how many BPS factors and assessment procedures were drawn from them. This chapter also discusses the rationale behind the inclusion of these factors or their exclusion from the e-learning programme.

5.2. Chapter introduction

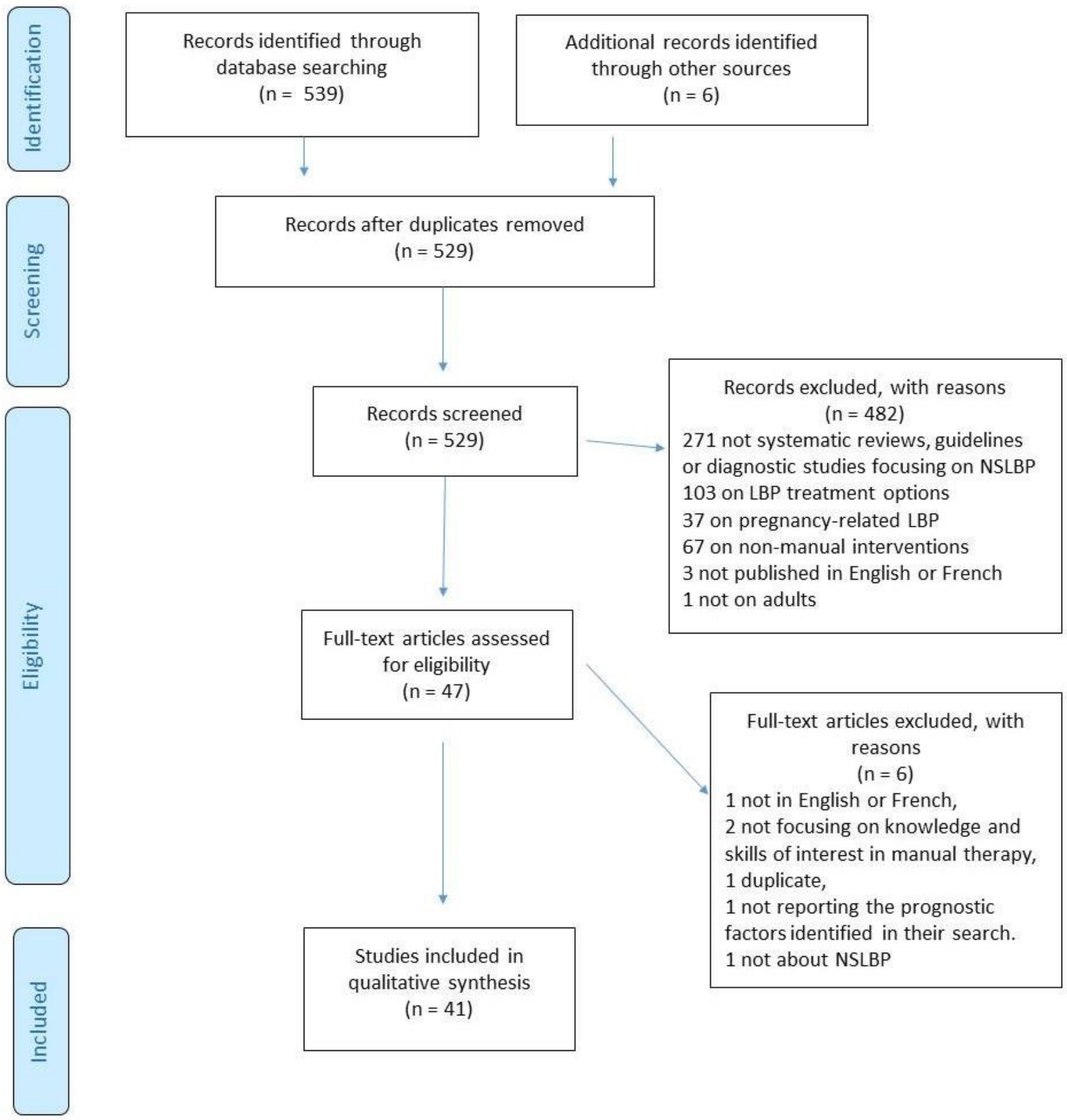
This chapter follows Arksey and O'Malley (2005)'s framework: the first section describes the results from stage 2 (identifying relevant studies) and stage 3 (study selection), and the second section describes the results from stage 4 (charting the data) and stage 5 (collating, summarising and reporting the results).

5.3. Results

5.3.1. Results from stages 2 and 3: Identifying relevant studies and study selection

The online database search identified 539 articles. 41 articles met the inclusion criteria based on their titles and abstracts and 6 potential articles were identified in the reference lists of the articles. The 47 articles were classified in two categories according to their methodology: 15 clinical guidelines or 32 systematic reviews (see Appendix G - Papers categorised per methods). The selection of the articles is documented in a PRISMA flow diagram (see Figure 5.1 - Flowchart).

Figure 5-1 - Flowchart



Articles were then read fully in the light of the inclusion criteria. 47 eligibility tables were filled in (see Appendix B – Eligibility form of item 40 as an example). 6 articles were excluded: 2 not focussing on manual therapy or knowledge and skills of interest in manual therapy consultation (Steenstra, Verbeek et al. 2005, Chou, Loeser et al. 2009), 1 not published in English or French (Guevara-Lopez, Covarrubias-Gomez et al. 2011), 1 duplicate due to the different order of the authors' names in two references (Verkerk, Luijsterburg et al. 2012), 1 not reporting the prognostic factors identified in their search (Kent and Keating 2008) and 1 not about NSLBP (Alqarni, Schneiders et al. 2011). One article was updated to its most recent version (Toward Optimized Practice 2009, Toward Optimized Practice 2011).

5.3.2. Results from stages 4 and 5: charting the data, and collating, summarising and reporting the results

41 papers were included in this review (13 guidelines and 28 systematic reviews) and 41 evidence tables were filled in (see Appendix C – Evidence table for item 40 as an example). The overall agreement between the researcher and one of the supervisors on the extraction of the three randomly selected studies (two systematic reviews and one guideline) was good. For one of two systematic reviews, one reviewer did not include items for which there was evidence of no effects on NSLBP. It was agreed that these items would have been excluded from the e-learning programme, therefore reporting them or not reporting them in the evidence forms did not have an impact on the process. For the other systematic review there was total agreement. For the third study which was a practice guideline, the agreement was moderate as one reviewer only extracted what seemed to have high levels of evidence and the other extracted all items cited in the guideline. This guideline did not have a clear classification system on levels of evidence, and agreement to include all items, even those with a lack of information about evidence, was reached after discussion in order to ensure a more inclusive review. The other supervisor's mediation was not required.

The content from the evidence tables was collated in a summary table per category, where 81 BPS factors and 14 assessment procedures were listed (see Appendix D - summary table for biological category, as an example). The 81 BPS factors were coded in 63 factors and the 14 assessment procedures were coded in 14 items.

63 summary tables were completed for the BPS factors: 20 for biological factors, 15 for individual factors and 28 for social factors. 14 summary tables were completed for the assessment procedures.

These 77 factors and assessment procedures were then entered in the summary final decision table. Five categories of BPS factors emerged during the data extraction and interpretation: NSLBP onset, Chronic pain, Disability, Unspecific poor outcomes and Risk of recurrence. The factors were presented in a table named *summary final decision in categories*. One of the 14 assessment procedures (named 'initial assessment procedure') was moved into the Disability BPS category and some BPS items had to be split between two categories, creating a total of 70 BPS items and 13 assessment procedures.

After agreement with both supervisors, 18 BPS factors and assessment procedures were excluded as being supported only by weak or mixed evidence (12), for a lack of applicability in osteopathy (3), for being a non-modifiable factor that would not influence clinical reasoning (1), for being duplicate factors (1), or for having an unclear definition of the factor (1) (see Table 5-1 - list of factors excluded for details).

Table 5-1 - List of factors excluded

Reasons for exclusion	Details on items excluded
Non-modifiable factor that would not influence clinical reasoning	- Female may be at higher risk of developing LBP, and at long term may have higher intensity pain but no differences at short term.
Weak or mixed evidence	- Deconditioning may contribute to persistent pain when associated with other factors. - Anecdotal mention of troubled childhood as being a risk factor for chronic disability - Somatisation is a predictor of failure to return to work at 3 months and a predictor of disability at one year but no longer at 4 years. - A psychiatric history may be a risk factor for chronic disability. - Lack of vocational directions is suggested as a risk factor for chronic pain and disability. - Near to retirement is a risk factor for chronic disability - A large number of visits to a health professional in last year (excluding the present episode of back pain) may suggest an increased risk of long-term disability and work loss. - Alcohol consumption and drug use (possibly as self-medication) are risk factors for chronicity and are associated with chronic and complex LBP. - Smoking may be associated with chronic LBP lasting more than a month in the last year but is not a risk factor of chronicity (consistent evidence). - Some consensus that lack of support or person to talk to about problems may be a risk factor of chronicity - There is moderate evidence that shorter job tenure is a predictor of chronicity. - At the best, weak evidence of effects of educational level on LBP outcome - Strong evidence of an association between healthcare professional's judgement at baseline of poor recovery and LBP recovery (This factor is mentioned only in one guideline and it is based on only one study. As there is conflicting evidence in current literature, it was decided to exclude this factor.)

Lack of applicability in osteopathy	-	Electromyography is not recommended for NSLBP management.
	-	No lab tests for NSLBP management
	-	High reliability of timed muscle endurance
Duplicate factors	-	Being a male, younger age, having less pain, lower physical demands, lower psychological demands, higher decision latitude at work, being a breadwinner, better general health, more job satisfaction, surgery in the first year of sick-listing, no treatment before sick-listing are positive prognostic factors for return to work.
	-	Fear of work activities, higher somatisation are negative prognostic factors for return to work.

Of these 83 BPS factors and assessment procedures, 65 remained: 55 BPS factors (19 biological, 13 psychological and 23 social) and 10 assessment procedures (see Table 5-2 - List of factors included for detail).

Table 5-2 - List of factors included

NSLBP onset prognostic factors	References	Biological factors	Psychological factors	Social factors	Assessment methods
Inconclusive evidence that poor trunk muscle strength can predict LBP	Delitto A. et al. 2012; Hamberg-Van Reenen HH. et al. 2007	x			
No relation between trunk muscle endurance and the risk of future low back pain.	Hamberg-Van Reenen HH. et al. 2007	x			
Obesity increases risk of LBP but is not a strong predictor. Association mainly with chronic LBP (but not a chronic risk factor).	Chiodo A. et al. 2010; Chou R. & Shekelle P. 2010; Ferreira PH. et al. 2013; Shiri R. et al. 2010	x			
LBP is not associated with leisure-time sport or exercises (strong evidence) or professional level exercises	Bakker EW. et al. 2009; Sitthipornvorakul E. 2011	x			
There is strong evidence that LBP is not associated with sitting. There is no evidence that sitting during leisure time or at work (independently or combined) is a risk factor for LBP and there is no dose-related response to sitting with LBP.	Bakker EW. et al. 2009; Chen SM. et al. 2009	x			
LBP is not associated with prolonged standing or walking (strong evidence)	Bakker EW. et al. 2009	x			
Depression is not a predictive factor for the onset of NSLBP.	Ashton J. et al. 2004; Chiodo A. et al. 2010; Chou R. et al. 2007; Dagenais S. et al. 2010; Delitto A. et al. 2012; Ferreira P. et al. 2013; Goertz M. et al. 2012; Hildebrandt J. et al. 2005; Janwantanakul P. & Sitthipornvorakul E. 2012; Oostendorp R. et al. 2004; Pincus T. et al. 2006; Ramond A. et al. 2011; Savigny P. et al. 2009; Toward Optimized Practice 2011; Van Tulder M. et al. 2004		x		
Conflicting evidence that higher physical work demands is a risk factor for LBP onset	Ashton J. et al. 2004; Bakker E. et al. 2009; Chiodo A. et al. 2010; Chou R. & Shekelle P. 2010; Delitto A. et al. 2012; Goertz M. et al. 2012; Janwantanakul P. & Sitthipornvorakul E. 2012; Luiisterburg P. et al. 2012; Ribeiro D. et al. 2012; Selbus F. et al. 2007; Wai E. et al. 2010			x	
There is high evidence that low job satisfaction is a risk factor for the development of LBP.	Ashton J. et al. 2004; Chou R. & Shekelle P. 2010; Fayad F. et al. 2004; Goertz M. et al. 2012; Lakke S. et al. 2009; Ramond A. et al. 2011; Slebus F. et al. 2007; Toward Optimized Practice 2011; Van Tulder M. et al. 2004			x	
Sedentary work and desk/chair set up are not risk factors for the onset of LBP.	Chen S. et al. 2009; Janwantanakul P. & Sitthipornvorakul E. 2012			x	

	References	Biological factors	Psychological factors	Social factors	Assessment methods
Chronic pain prognostic factors					
Presence of symptoms below the knee is a prognostic factor for the development of chronic pain	Delitto A. 2012	x			
Many structural changes (including OA, mild to moderate scoliosis, SIJ asymmetry, disc bulges) occuring on the LSp are asymptomatic.	Chiodo A. et al. 2010	x			
The more functional impairment the more likely chronic pain development.	Chou R. & Shekelle P. 2010; Fayad F. et al. 2004; Hildebrandt J. et al. 2005; Savigny P. et al. 2009	x			
Previous back surgery predicts possible future pain	Chiodo A. et al. 2010	x			
Preexisting sleep disturbances are strong predictors of higher reported pain intensities (substantial evidence) and once patients have developed CLBP it is associated with sleep problems (substantial evidence), including sleep disturbance, reduced sleep duration, decreased sleep quality, increased time to fall asleep and diminished day-time functioning as a consequence of poor sleep	Ashton J. et al. 2004; Bakker W. et al. 2009; Kelly G. et al. 2011	x			
There is currently insufficient evidence for a positive association between stress at work and LBP but lower psychological demands at work is a prognostic factor for return to work.	Ashton J. et al. 2004; Hartvigsen J. et al. 2004; Slebus F. et al. 2007			x	
Fear of work activities is a risk factor for pain intensity, delayed return to work. Belief that work is harmful is suggested to be a risk factor for pain chronicity and disability.	Ashton J. et al. 2004; Hartvigsen J. et al. 2004; Pincus T. et al. 2006			x	
Disability prognostic factors					
Younger age favourable prognostic factor, mainly for disability	Chou R. & Shekele P. 2010; Fayad F. et al. 2004; Janwantanakul P. & Sitthipornvorakul E. 2012; Luiisterburg P. et al. 2012; Oostendorp R. et al. 2004; Slebus F. et al. 2007	x			
Mutliple previous MSK complaints predict disability	Littlewood C. & May S. 2007	x			
The effects of genetics are higher from more complex and disabling LBP than acute and less disabling, and their effects range from 0% (age 11) to 67% (age 30).	Delitto A. et al. 2012; Ferreira P. et al. 2013	x			

	References	Biological factors	Psychological factors	Social factors	Assessment methods
Patients' pain misbeliefs may increase risk of long term disability and work loss. There is confliting evidence on catastrophising and fear-avoidance behaviour effect on LBP outcomes. Possible effects of catastrophising on long-term self-reported disability.	Ashton J. et al. 2004; Chiodo A. et al. 2010; Chou R. & Shekelle P. 2010; Delitto A. et al. 2012; Goertz M. et al. 2012; Lakke S. et al. 2009; Luiisterburg P. 2012; Oostendorp R. et al. 2004; Pincus T. 2006; Ramond A. et al. 2011; Savigny P. et al. 2009; Toward Optimized Practice 2011; Van Tulder M. et al. 2004		x		
Extreme symptom report is a predictor of chronicity, perhaps more for disability than pain.	Ashton J. et al. 2004; Chiodo A. et. 2010; Hildebrandt J. et al. 2005		x		
Compensation issues, previous sick leave on LBP, financial problems and delay to access income support are possible factors predictive of increased risk of disability and word loss.	Ashton J. et al. 2004; Chiodo A. et al. 2010; Goertz M. et al. 2012; Chou R. & Shekelle P. 2010; Ramond A. et al. 2011; Toward Optimized Practice 2011; Van Tulder M. et al. 2004		x		
Guidelines suggest that poor relationships with peers at work is a risk factor for chronic disability.	Ashton J. et al. 2004; Chiodo A. et al. 2010; Goertz M. et al. 2012			x	
Low socioeconomic status is a risk factor for chronic disability	Ashton J. et al. 2004; Chiodo A. et al. 2010; Ferreira P. et al. 2013			x	
Experience of conflicting diagnoses or explanations for back pain, resulting in confusion may increase the risk of long-term disability and work loss	Ashton J. et al. 2004			x	
Diagnostic language leading to catastrophising and fear (eg, fear of ending up in a wheelchair) may increase the risk of long-term disability and work loss. A careful initial examination may help in reassuring the patient.	Ashton J. et al. 2004; Van Tulder M. et al. 2004			x	
Patient expectation of a 'techno-fix', eg, requests to treat as if body were a machine may increase the risk of long-term disability and work loss	Ashton J. et al. 2004			x	
Lack of satisfaction with previous treatment for back pain may increase the risk of long term disability and work loss.	Ashton J. et al. 2004			x	
Advice from healthcare professional to withdraw from work may increase the risk of long-term disability and work loss.	Ashton J. et al. 2004			x	

	References	Biological factors	Psychological factors	Social factors	Assessment methods
Unspecific poor outcomes prognostic factors					
General health is not predictive of LBP and comorbidities may not impact LBP clinical course. LBP associated with various other diseases, including osteoporosis, asthma, diabetes and chronic headaches. Patients' poor self-perceived health is correlated with poorer LBP outcomes.	Chou R. & Shekelle P. 2010; Delitto A. et al. 2012; Ferreira P. Et al. 2013; Goertz M. et al. 2012; Janwantanakul P. & Sitthipornvorakul E. 2012; Ramond A. et al. 2011; Slebus F. et al. 2007	x			
Low intensity of LBP at baseline is a favourable prognostic factor. High intensity predicts worse outcomes at 3-6 months but not at 1 year.	Chou R. & Shekelle P. 2010; Delitto A. et al. 2012; Fayad F. et al. 2004; Goertz M. et al. 2012; Hildebrandt J. et al. 2005; Luiisterburg P. et al. 2012; Oostendorp R. et al. 2004; Slebus F. et al. 2007	x			
Passive coping strategies, including extended rest and excessive reliance on use of aids or appliances are unfavourable prognostic factor for LBP (LBP outcomes and disability)	Ashton J. et al. 2004; Chou R. et al. 2007; Delitto A. et al. 2012; Goertz M. et al. 2012; Oostendorp R. et al. 2004; Toward Optimized Practice 2011; Van Tulder M. et al. 2004		x		
Reduced activity level is an unfavourable prognostic factor	Ashton J. et al. 2004; Oostendorp R. et al. 2004; Van Tulder M. et al. 2004		x		
Patient's healthcare beliefs that do not fit best practice increase the risk of chronicity	Goertz M. et al. 2012; Toward Optimized Practice 2011		x		
Poor patients' expectations of recovery are a risk factor of chonicity. Positive patients' expectations of recovery is a favourable prognostic factor for LBP.	Goertz M. et al. 2012; Oostendorp R. et al. 2004; Ramond A. et al. 2011		x		
Fear of activity is an unfavourable prognostic factor, mainly for patients with subacute LBP for work-related outcomes.	Ashton J. et al. 2004; Dagenais S. et. 2010; Delitto A. et al. 2012; Oostendorp R. et al. 2004; Savigny P. et al. 2009; Toward Optimized Practice 2011; Wertli M. et al. 2014		x		
There is a strong consensus and evidence that depression is a predictive factor for NSLBP poor outcomes.	Ashton J. et al. 2004; Chiodo A. et al. 2010; Chou R. et al. 2007; Dagenais S. et. 2010; Delitto A. et al. 2012; Ferreira P. et al. 2013; Goertz M. et al. 2012; Hildebrandt J. et al. 2005; Janwantanakul P. & Sitthipornvorakul E. 2012; Oostendorp R. et al. 2004 Pincus T. et al. 2006; Ramond A. et al. 2011; Savigny P. et al. 2009; Toward Optimized Practice 2011; Van Tulder M. et al. 2004		x		

	References	Biological factors	Psychological factors	Social factors	Assessment methods
There is a general consensus that anxiety is a strong risk factor of poor outcome but there is conflicting evidence.	Ashton J. et al. 2004; Dagenais S. et. 2010; Goertz M. et al. 2012; Ramond A. et al. 2011; Savigny P. et al. 2009; Van Tulder M. et al. 2004		x		
Suggestion that high level of self-efficacy (coping skills) with regards to LBP or internal locus of control would be favourable prognostic factors for LBP	Oostendorp R. et al. 2004		x		
Current psychiatric comorbidity is a strong predictor of poor outcomes at 3 to 6 months.	Chiodo A. et al. 2010; Chou R. & Shekelle P. 2010		x		
General consensus that spouse and family may increase risk of developing chronicity by their behaviour (being over-protective, expressing frustration) or from spouse/family's negative expectations of recovery.	Ashton J. et al. 2004; Chiodo A. et al. 2010; Goertz M. et al. 2012; Toward Optimized Practice 2011			x	
Conflicting evidence that higher work demands predicts worse outcomes at 1 year. Lower physical demands at work is a prognostic factor for return to work. There is suggestion that history of specific manual works (including farming, nursing, truck driving) may be risk factors of chronicity but there is conflicting evidence that they are associated with LBP.	Ashton J. et al. 2004; Bakker E. et al. 2009; Chou R. & Shekelle P. 2010; Chiodo A. et al. 2010; Delitto A. et al. 2012; Goertz M. et al. 2012; Janwantanakul P. & Sitthipornvorakul E. 2012; Luiisterburg P et al. 2012 Ribeiro D. et al. 2012; Slebus F. et al. 2007; Wai E. et al. 2010			x	
There is conflicting evidence that low job satisfaction predicts worse outcomes; it can predict worse outcomes at 1 year but probably not earlier. More job satisfaction is a prognostic factor for return to work.	Ashton J. et al. 2004; Chou R. & Shekelle P. 2010; Fayad F. et al. 2004; Goertz M. et al. 2012; Lakke S et al. 2009; Ramond A. et al. 2011; Slebus F. et al. 2007; Toward Optimized Practice 2011; Van Tulder M. et al. 2004			x	
There is conflicting evidence on the effect of social support at work on LBP but the evidence is mainly against an association.	Ashton J. et al. 2004; Goertz M. et al. 2012; Hildebrandt J. et al.2005; Janwantanakul P. & Sitthipornvorakul E. 2012; Lang J et al. 2012; Lakke S et al. 2009; Ramond A. et al. 2011; Van Tulder M. et al. 2004			x	
General consensus that inflexible work schedule or unsociable hours are risk factors for chronicity.	Ashton J. et al. 2004; Goertz M. et al. 2012; Hildebrandt J. et al. 2005; Toward Optimized Practice 2011; Van Tulder M. et al. 2004			x	
Lack of job accomodations and absence of graduated return to work pathways are risk factors of chronicity.	Ashton J. et al. 2004; Goertz M. et al. 2012			x	
Recovery expectations have the strongest prediction of people at risk of poor outcome when done within the first 3 weeks of NSLBP.	Chiodo A. et al. 2010; Goertz M. et al. 2012; Iles R. et al. 2009			x	

	References	Biological factors	Psychological factors	Social factors	Assessment methods
Limited evidence that sedentary work is a risk factor for LBP. No evidence that sedentary behaviour at work and leisure time together is a risk factor of LBP. No dose-related response between sitting and LBP.	Chen S et al. 2009; Janwantanakul P. & Sitthipornvorakul E. 2012			x	
Strong evidence that worker having difficulty returning to normal occupational duties at 4-12 weeks, the lower the chances of ever retrurning to work.	Hildebrandt J. et al. 2005 ; Luiisterburg P. et al. 2012			x	
To avoid pejorative labelling of patients with Yellow Flags and sanctioning disability as this will have a negative impact on management.	Ashton J. et al. 2004			x	
If the clinician has fear-avoidance beliefs, he or she may transmit them to the patient and may increase the likelihood of delayed recovery.	Goertz M. et al. 2012			x	
Recurrence prognostic factors					
Excessive mobility in other joints is a prognostic factor for development of recurrent low back pain	Delitto A et al. 2012	**x**			
History of LBP is a strong predictor of recurrent episodes and chronic pain	Chiodo A et al. 2010; Fayad F et al. 2004; Goertz M. et al. 2012; Hildebrandt J. et al. 2005; Janwantanakul P. & Sitthipornvorakul E. 2012; Taylor J et al. 2014	x			
No evidence that decreased LSp mobility can predict LBP but there is high evidence that excessive spine mobility is a prognostic factor for recurrent LBP.	Delitto A et al. 2012; Hamberg-Van Reenen HH. et al. 2007; Lakke S et al. 2009	x			
Assessment					
Imaging should not be recommended for the management of NSLBP.	Ashton J. et al. 2004; Chiodo A. et al. 2010; Chou R. et al. 2007; Chou R & Shekelle P 2010; Delitto A. et al. 2012; Goertz M. et al. 2012; Hildebrandt J. et al. 2005; Koes B et al. 2010; Savigny P. et al. 2009; Toward Optimized Practice 2011; Van Tulder M. et al. 2004				x
The history taking should be thorough and should investigate pain characteristics, sensory changes, strength changes, job and activity associations, psychosocial factors that may delay recovery. Psychosocial factors and emotional distress should be assessed because they are stronger predictors of low back pain outcomes than either physical examination findings or severity and duration of pain. The healthcare practitioner should ask the patient if he or she has any specific questions or expectations from this visit.	Ashton J. et al. 2004; Chiodo A. et al. 2010; Chou R. et al. 2007; Goertz M et al. 2012; Toward Optimized Practice 2011				x

	References	Biological factors	Psychological factors	Social factors	Assessment methods
Clinical impressions are not sensitive enough to detect depression in patients with low back pain but there are several questionnaires easy to use in practice that are available for practitioners to assess depression or disability (details in summary table - questionnaires)	Chiodo A. et al. 2010; Delitto A. et al. 2012; Goertz M. et al. 2012; Oostendorp R et al. 2004; Pincus T et al 2006; Van Tulder M. et al. 2004				x
There is moderate to strong evidence of low reliability of the observation during the examination.	May S et al. 2006				x
Soft tissue palpation is not a reliable independent tool in the evaluation of NSLBP.	Chiodo A. et al. 2010; Clinical Guideline Subcommittee on LBP 2010; Hildebrandt J et al. 2005; May S. et al. 2006; Seffinger M. et al. 2004				x
Pain provocation tests are the most reliable of the palpatory tests, e.g. spring tests.	Delitto A. et al. 2012; Goertz M. et al. 2012; Hildebrandt J et al. 2005; Seffinger M. et al. 2004				x
Palpation of asymmetrical anatomic landmarks is part of the diagnosis of somatic dysfunction but palpation-based assessment has low reliability.	Clinical Guideline Subcommittee on LBP 2010; May S. et al. 2006; Hildebrandt J et al. 2005; Seffinger M. et al. 2004				x
There is a general consensus that active range of motion should be assessed. Observation of aberrant movements has demonstrated moderate to good reliability. Double-inclinometer is a valid method for assessing the total range of motion of the lumbar spine.	Chiodo A et al. 2010; Delitto A. et al. 2012; Goertz M et al. 2012; Littlewood C & May S 2007				x
General consensus in manual therapy that passive assessment of the lumbar spine is an integral part of the examination of patients with NS LBP. Passive range of motion (ROM) tests of the lumbar spine have a low reliability, regional ROM is more reliable than segmental ROM.	Chiodo A et al. 2010; Clinical Guideline Subcommittee on LBP 2010; Delitto A. et al. 2012; Hildebrandt J et al. 2005; May S. et al. 2006; Seffinger M. et al. 2004; Van Trijffel E. et al. 2005				x

Out of the 19 biological factors extracted, 11 had a prognostic value, 2 had a possible prognostic value and 6 had evidence for not having prognostic value. Out of the 13 psychological factors, 8 had a prognostic value, 4 had a possible prognostic value and 1 had evidence for not having prognostic value. Out of the 23 social factors, 8 had a prognostic value, 11 had a possible prognostic value and 4 had evidence for not having prognostic value. For NSLBP onset, 10 prognostic factors were extracted: 6 biological, 1 psychological and 3 social. For chronic pain, 7 prognostic factors were extracted: 5 biological and 2 social. For disability, 13 prognostic factors were extracted: 3 biological, 3 psychological and 7 social. For unspecific poor outcomes, 22 factors were extracted: 2 biological, 9 psychological and 11 social. For risk of recurrence, 3 factors were extracted: all biological. A summary of the biological, psychological and social factors for each category and their evidence is described in Table 5-3 - Number of items per category. Appendix F - List of items included and excluded provides a full list of the BPS factors and assessment procedures for inclusion in the e-learning programme.

Table 5-3 - Number of items per category

(red: evidence of an item not being a prognostic factor, green: evidence of an item being a prognostic factor, beige: some evidence or conflicting evidence for an item to be a prognostic factor)

NSLBP onset prognostic factors (10 items)	6 biological items	Evidence that 1 item is not a strong prognostic factor
		Inconclusive evidence for 1 item
		Evidence that 4 items are not prognostic factors
	1 psychological item	Evidence of 1 item not being a prognostic factor
	3 social items	Evidence that 1 item is a prognostic factor
		Conflicting evidence for 1 item
		Evidence that 1 item is not a prognostic factor
Chronic pain prognostic factors (7 items)	5 biological items	Evidence that 4 items are prognostic factors
		Evidence that 1 item is not a prognostic factor
	2 social items	Evidence that 1 item is a prognostic factor
		Some evidence that 1 item may be a prognostic factor
Disability prognostic factors (13 items)	3 biological items	Evidence that 3 items are prognostic factors
	3 psychological items	Evidence that 1 item is a prognostic factor
		Some evidence that 2 items may be prognostic factors
	7 social items	Evidence that 1 item is a prognostic factor
		Some evidence that 6 items may be prognostic factors
Unspecific poor outcomes prognostic factors (22 items)	2 biological items	Evidence that 1 item is a prognostic factor
		Some evidence that 1 item may be a prognostic factor
	9 psychological items	Evidence that 7 items are prognostic factors
		Some evidence that 2 items may be prognostic factors

Unspecific poor outcomes prognostic factors (22 items) (*Cont.)*	11 social items	Evidence that 6 items are prognostic factors
		Some evidence that 2 items may be prognostic factors
		Some evidence that 3 items may not be prognostic factors
Recurrence prognostic factors (3 items)	3 biological items	Evidence that 2 items are prognostic factors
		Evidence that 1 item is not a prognostic factor

5.4. Chapter summary

Of the 47 articles that met the inclusion criteria, 6 were excluded. After charting the data, collating and summarising the results and making decisions on inclusion and exclusion of items drawn from the literature, 55 biopsychosocial prognostic factors (19 biological, 13 psychological and 23 social) and 10 assessment procedures were listed for inclusion in an e-learning programme, and 18 BPS factors and assessment procedures were listed for exclusion. The overall agreement was good between the researcher and a second assessor (one of the supervisors) on the extraction process. Five categories of BPS factors emerged during the data extraction and interpretation: NSLBP onset, Chronic pain, Disability, Unspecific poor outcomes and Risk of recurrence.

6. Scoping review discussion

6.1. Chapter summary

This chapter summarises the key findings of the scoping review, discusses the influence of psychosocial factors on NSLBP, analyses the need to include biological factors in the list of possible obstacles to recovery, and discusses the examination assessment findings. The scoping review's results are then compared with content used in previous BPS training interventions, and with articles published since the scoping review was conducted. The scoping review's limitations and strengths and research implications are then discussed.

6.2. Chapter introduction

It is currently highly challenging to design a single predictive model for NSLBP outcomes (Kent and Keating 2008). Osteopaths need to develop an ability to identify risk factors and pathologies. One of the problems is the uncertainty regarding which prognostic factors are important due to contradictory, inconsistent and incomplete findings (Kent and Keating 2008). In order to train osteopaths to develop their clinical judgements and prediction ability with patients presenting with NSLBP, there was a need to review the prognostic factors and assessment methods for NSLBP that have been shown to be valid. The aim of this scoping review was to identify key elements that should be included in an evidence-based e-learning programme on the evaluation of NSLBP in a BPS environment in a manual therapy context. The methods of Arksey and O'Malley were followed resulting in 55 biopsychosocial prognostic factors and 10 assessment procedures. These were 19 biological, 13 psychological and 23 social factors (see Appendix F – List of items included and excluded).

6.3. Key findings

Understanding NSLBP with a dualistic approach where symptoms are either only biological, such as a specific tissue, or only psychological, such as psychogenic pain, is a limited model that does not allow a full understanding of a patient's experience. 5 categories of prognostic factors were derived from the scoping review results (NSLBP onset prognostic factors, Chronic pain prognostic factors, Disability prognostic factors, Unspecific poor outcome prognostic factors, Recurrence prognostic factors): when they are merged together, there is evidence for 11 biological, 8 psychological and 8 social factors being prognostic factors, there is some evidence for 2 biological, 4 psychological and 11 social factors possibly being prognostic factors, and there is evidence that 6 biological, 1 psychological and 4 social factors are not prognostic factors.

6.4. Psychosocial factors

The concept of NSLBP was not taught when osteopaths trained more than 15 years ago. Back pain was modelled with specific tissues causing symptoms. The BPS model is an alternative model that allows integration of a variety of prognostic factors (biological, psychological and social) in the understanding of patients' NSLBP experience. The results of this scoping review informed the development of an e-learning programme (chapter 8) designed for experienced osteopaths who were not directly trained in the BPS model for NSLBP.

6.4.1. Practitioners' views

Results from this scoping review highlight the array of research on NSLBP studying the possible contributions of biological, psychological and social factors, but this has not been fully translated into practice yet. In 2009, Australian manual therapists' assessment methods for NSLBP were surveyed (Kent, Keating et al. 2009). Physical impairment, pain and imaging were commonly assessed and activity limitation and psychosocial function were assessed less frequently: 100% of practitioners assessed physical impairment very frequently or often and only

7% assessed psychosocial function very frequently or often. Among the different manual therapy professions surveyed, it was osteopaths who used scales or questionnaires less frequently to assess patients with NSLBP. A survey showed that biomechanical factors were predominantly listed as possible triggers for LBP by physiotherapists with psychosocial factors rarely mentioned (Stevens, Steffens et al. 2016). A qualitative study on physiotherapists' assessment of patients' psychosocial status found that most of the participants reported not conducting any formal psychosocial assessment, but basing their judgement on 'gut feeling' (Singla, Jones et al. 2015). Gut feeling is considered "massively important" by extended scope physiotherapists when assessing patients with LBP (Langridge, Roberts et al. 2015). Practitioners may be becoming more aware of possible impacts of psychosocial factors on NSLBP, but making informal judgements is less accurate than using formal instruments (Kent, Keating et al. 2009, Newell, Field et al. 2013) and this may be a current obstacle to diagnosing and treating patients with NSLBP and psychosocial factors. Using specific tools to diagnose and allocate appropriate management, e.g. STarT Back screening tool, offers better clinical outcomes and cost effectiveness when compared with current practice (Hill, Dunn et al. 2010, Main, Sowden et al. 2012). Not using the STarT back screening tool restricts access to appropriate treatments for many patients with medium and high risk of developing chronic symptoms (Hill, Whitehurst et al. 2011). Singla et al.'s study (2015) reported that all the participants in their study agreed on the lack of training they had received on assessing patients' psychosocial status and wanted to see the development of Continuous Professional Development courses to improve their understanding and assessment of psychosocial factors. This was confirmed in a systematic review on physiotherapists' perceptions about the assessment and management of NSLBP psychosocial barriers to recovery, which revealed that physiotherapists recognise psychosocial factors as obstacles, but also feel unprepared to assess and manage them and have a preference for dealing with the more mechanical aspects of NSLBP (Synnott, O'Keeffe et al. 2015). The results of this scoping review informed an e-learning programme for osteopaths who have been in practice for at least 15 years in order to teach them in the biopsychosocial model of back pain and present them with tools such as the flag system (Kendall, Burton et al. 2009) or screening questions for depression (Haggman, Maher et al. 2004) to help them diagnose the psychological status of their patients.

6.4.2. The predominance of social factors

Most of the biopsychosocial factors identified in this scoping review were social ones: 19 social factors were identified when combining factors with evidence or some evidence. In comparison, 12 psychological factors and 13 biological factors were identified when combining factors with evidence or some evidence. The economic impact of LBP may explain why more work and productivity studies have been published (Maniadakis and Gray 2000, Katz 2006). Another possible reason is that early return to work is a positive prognostic factor for NSLBP but also that patients failing to return to work early are less likely ever to return to work, which has an impact on their NSLBP outcomes and LBP indirect costs. Paradoxically social factors are the ones for which practitioners have the fewest tools for assessing patients. A recent systematic review and meta-analysis of the impact of LBP on people’s lives recommended that future outcome measures for LBP should include social factors alongside the existing biological and psychological factors (Froud, Patterson et al. 2014). This scoping review identified 19 social factors for inclusion in an e-learning programme on NSLBP.

6.4.3. Therapeutic alliance

Six social factors listed in this scoping review were related to the therapeutic alliance, also known as therapeutic relationship. Therapeutic alliance is a predictor of treatment outcome in musculoskeletal care. A mixed methods study in osteopathy (Orrock 2016) and two systematic reviews in physiotherapy show that the therapist-patient relationship is influenced by the practitioner’s interpersonal and communication skills, their practical skills, their patient-centeredness and organisational and environmental factors (O'Keeffe, Cullinane et al. 2016); and the therapist-patient relationship has a significant positive association between therapeutic alliance and patients' global perceived effect of treatment, change in pain, physical function, patient satisfaction with treatment, depression, and general health status (Hall, Ferreira et al. 2010). Practitioners can also have a negative impact on their patient outcomes, e.g. when stigmatising patients with mental illness, which can then lead to social isolation and inability to work (Papadopoulos, Leavey et al. 2002). This highlights the intricacy of the different BPS factors: the therapeutic relationship may have positive (e.g. promoting self-efficacy) and negative (e.g. reinforcing disability or chronicity) impact on patient outcomes. Therapeutic alliance is embedded into concepts such as informed consent and shared decision-making. Documents have been designed to help patients and practitioners to share decisions in a clinical environment (Dagenais, Brady et al. 2012). Some osteopaths base their clinical reasoning on a collaborative relationship between practitioners and patients, embracing shared decision-making (Grace, Orrock et al. 2016). While the benefits of shared decision-making seem theoretically sound, precautions may need to be taken when applying it. Results from a pilot cluster randomised trial run in one clinic suggest that shared decision making packages need to be formally tested before use. This study tested a decision support package to help shared informed decision-making in NSLBP that had been previously externally peer-reviewed. Patients in the intervention group had worse outcomes compared with patients who had not used this package (Patel, Ngunjiri et al. 2014). This study provides unexpected insights into the risks of shared decision-making but being a pilot, the study is not designed to assess effectiveness (Teare, Dimairo et al. 2014).

Practitioners' attitudes to back pain influence the advice provided to patients (Rainville, Carlson et al. 2000, Buchbinder, Jolley et al. 2001, Linton, Vlaeyen et al. 2002, Houben, Ostelo et al. 2005) and specific patient characteristics can also influence what patients remember from practitioners' messages in the treatment room. Patients with higher levels of catastrophisation and depression are less likely to perceive a BPS message (Overmeer and Boersma 2016). This highlights the importance of practitioners adapting their message to each patient, hence developing a good therapeutic alliance. The impact of therapeutic alliance on patients' outcomes is complex. The scoping review presented in this thesis extracted 6 factors linked to therapeutic alliance that should be included in training programmes on NSLBP. These were:

- "Experience of conflicting diagnoses or explanations for back pain, resulting in confusion may increase the risk of long-term disability and work loss"
- "Diagnostic language leading to catastrophising and fear (e.g. fear of ending up in a wheelchair) may increase the risk of long-term disability and work loss. A careful initial examination may help in reassuring the patient."
- "Advice from healthcare professional to withdraw from work may increase the risk of long-term disability and work loss."
- "Patient's healthcare beliefs that do not fit best practice increase the risk of chronicity"
- "Avoiding pejorative labelling of patients with Yellow Flags and sanctioning disability as this will have a negative impact on management."
- "If the clinician has fear-avoidance beliefs, he or she may transmit them to the patient and may increase the likelihood of delayed recovery."

6.5. Biological factors reconsidered

While back pain was assessed within a biomedical model, research was mainly focussed on biological factors, but there was limited evidence in favour of this model. Disc degeneration is present on MRI of nearly half of young adults

(Takatalo, Karppinen et al. 2009) and asymptomatic individuals have a high prevalence of disc degeneration (ranging from 37% at 20 years old up to 96% at 80 years old), disc protrusions (29% to 43%) and annular fissures (19% to 29%) (Brinjikji, Luetmer et al. 2015). Lumbar osteoarthritis is also common in asymptomatic individuals and is very poorly correlated with levels of LBP (Nijs, Apeldoorn et al. 2015). The limited evidence for a positive association of back pain with pathoanatomical findings was one of the factors that contributed to the development of the BPS model with a shift to more psychosocially-oriented factors, and adoption of the term NSLBP. Tools were then designed to help practitioners to assess patients' risk of developing chronic pain and disability. One example is the flag system designed by Kendall (Kendall, Burton et al. 2009). This system is based on the red flag system that provides alert signs and symptoms indicative of possible serious underlying pathologies. Kendall's flag system lists the possible obstacles to recovery encompassing three domains: the person (yellow flags), the workplace (blue flags) and the context (black flags). This shift toward a solely psychosocial model of obstacles to recovery is described as being as excessive as the biomedical model was with its over focus on pathoanatomical findings, and a middle ground for the BPS model should be established (Weiner 2008, Jull and Sterling 2009). A survey study over a five-year period assessed biomechanical, organisational, psychosocial, and individual factors as prognostic factors for the onset of NSLBP on a large male-worker cohort (Ramond-Roquin, Bodin et al. 2015). The risk factors that were associated with later report of LBP were frequent bending, driving industrial vehicles, working more hours than officially planned and reported low support from supervisors. The authors concluded that biomechanical factors remain worth considering and offer possible solutions for preventive strategies. This study has several design strengths such as being a prospective study, when most studies are cross-sectional, and having a good response rate (60%) with a long follow-up period. The study mainly looked at biomechanico-occupational prognostic factors based on the argument that there was no strong association of the other

BPS factors with the onset of NSLBP in the literature. Comparing the results of the scoping review reported in this thesis, it could be argued that the same applies to biomechanical and occupational factors. E.g. in the scoping review reported in this thesis it was found that “there is strong evidence that LBP is not associated with sitting. There is no evidence that sitting during leisure time or at work (independently or combined) is a risk factor for LBP and there is no dose-related response to sitting with LBP”. The results of the scoping review reported in this thesis highlight the lack of evidence for BPS factors being causal in the onset of NSLBP.

Psychosocial factors are described as stronger predictors of low back pain outcomes than either physical examination findings or severity/duration of pain (Chou, Qaseem et al. 2007), and psychosocial factors have been emphasised in LBP clinical guidelines, with the most striking example being the New Zealand clinical guidelines for LBP (Ashton, Butler et al. 2004). However, this scoping review identified 13 biological factors as prognostic factors and 7 factors as non-predictors of NSLBP, namely: poor muscle trunk strength; poor trunk muscle endurance; leisure-time sport or exercises or professional level exercises; sitting; osteoarthritis; mild/moderate scoliosis and disc bulges; and general health and comorbidities. Even though they are not predictors for NSLBP it was decided to include them in the scoping review results and to use them in the e-learning programme as myth busters. This will give practitioners tools to bust myths believed by patients. This is supported by a previous qualitative interview study which explored patients’ attitudes, beliefs and perceptions of their own LBP. It showed that patients perceive their back as being vulnerable to injury and requiring protection by resting, being careful and avoiding dangerous activities (Darlow, Dean et al. 2015).

Two possible reasons could explain the emergence of biological prognostic factors for NSLBP in this review: 1/ there might be a variation in classification of factors, e.g. it could be argued that sleep disorders could be classified as psychological rather than biological. 2/ biological prognostic factors may have been neglected in recent times while there was more emphasis on psychosocial factors (Hancock, Maher et al. 2011). While it is of importance to assess and manage psychosocial issues, it may be time to include biological factors more explicitly as possible obstacles to recovery. Most of the biological factors that had a prognostic value were not modifiable within the context of manual therapy: e.g. previous back surgery, excessive mobility in other joints or history of LBP. However, they are valuable for informing the prognostic information given to patients and setting realistic therapeutic goals. It may be time for the BPS model of back pain to claim back its "B" as possible obstacles to recovery.

A systematic review on the BPS classification of NSLBP revealed a need to have a classification system that includes all biological, psychological and social factors (McCarthy, Arnall et al. 2004). Incorporating biological prognostic factors with psychosocial obstacles to recovery would provide a tool that would encompass all the domains of the BPS patients' context and help practitioners to assess possible obstacles to recovery of patients presenting with NSLBP. This could be accomplished by adding another flag along with the psychosocial flags (yellow, blue and black), e.g. green flags (see Table 6-1 - BPS flags).

Figure 6-1 - BPS flags

The factors identified in the scoping review have been included in an e-learning programme in order to provide experienced osteopaths with a list of all the possible obstacles to recovery for patients with NSLBP described in the literature.

6.6. Assessment methods

This scoping review extracted 10 assessment methods for NSLBP. A study examined the perception of usefulness and the reported use of assessment methods for the spine and pelvis by UK osteopaths (Fryer, Johnson et al. 2010), but it is currently unknown which tests osteopaths use to assess patients with NSLBP. Physiotherapists' assessment methods for NSLBP include neurological tests (McCarthy, Rushton et al. 2006), which were not included in the scoping review, as the focus was on NSLBP rather than LBP. Another difference is that this scoping review looked at evidence for tests used during the clinical examination (and highlighted the lack of reliability of most of them) while the results of McCarthy et al. represent what physiotherapists practise.

6.7. Content of other BPS training programmes

Poor description of interventions is a common issue with randomised controlled trials (Michie, Abraham et al. 2011) and the same issue applies to the existing reports of BPS training programmes in published studies. This presents a challenge when comparing the results from our study to the content of most previous interventions (Asenlof, Denison et al. 2005, Hay, Mullis et al. 2005, Asenlof, Denison et al. 2009). Jellema et al. (2005), Stevenson et al. (2006) and Overmeer et al. (2009) all report basing the content of their training on that described by (Kendall, Linton et al. 1997). Jellema et al. (2005) also use three other sources (Van der Horst, Schellevis et al. 1998, Main and Watson 2001, Pincus, Burton et al. 2002). Stevenson et al. (2006) do not provide detail on how these references informed the content of their training programme. Overmeer et al. also use (Linton 2000, Main and Watson 2001). These three studies emphasise psychosocial factors and do not mention biological factors. A more recent study matched patients to treatments based on prognosis or risk of poor outcome and practitioners were taught how to use a decision aid for this purpose (Hill, Whitehurst et al. 2011): practitioners managing patients at medium risk of developing chronic symptoms provide treatment targeting physical characteristics using manual therapy (Hay, Dunn et al. 2008); and practitioners managing patients at high risk of developing chronic symptoms received specific training that emphasised the role of psychological factors in the transition between acute and chronic pain (Main, Sowden et al. 2012).

One study that included biological factors shows relatively large effects on participants with chronic NSLBP (Vibe Fersum, O'Sullivan et al. 2013). It was informed by a BPS framework (O'Sullivan 2005) that is itself informed by a book chapter (Elvey and O’Sullivan 2004). The categories of factors in their BPS framework are quite consistent with the findings of the scoping review presented in this thesis. Their framework was developed pragmatically and this possibly led to two differences between their results and the results of the scoping review presented in this thesis: their framework does not provide a description of how these factors affect the course of an LBP episode. Factors are described as possible obstacles to recovery with no description of what might be affected (e.g. pain, disability or return to work). The framework also emphasises patho-anatomical factors but the scoping review presented in this thesis did not extract any patho-anatomical prognostic factors, following current guidance suggesting that there is insufficient evidence to diagnose a specific tissue in NSLBP (Airaksinen, Brox et al. 2006, Savigny, Kuntze et al. 2009). Their framework is based on what is practised and evidence, whilst the scoping review extracted factors and assessment methods from guidelines and systematic reviews.

In summary, the scoping review provided a systematic extraction of items and was likely to be more comprehensive than previous attempts. It was used as a summary of key factors to inform the e-learning programme content.

6.8. Publications subsequent to the scoping review

A recent study systematically reviewed clinical examination findings as prognostic factors in low back pain (Hartvigsen, Kongsted et al. 2015). Their findings were similar to those of this scoping study in that palpation for pain, tone or symmetry; spinal range of motion; sacro-iliac pain provocation; neurological signs and muscle endurance did not demonstrate an association with short-term or long-term outcomes. Psychosocial factors were associated with a long-term outcome of return to work. One different finding from this review was that symptom response classification (centralisation), part of a physiotherapy method known as the McKenzie method, was the only factor with consistent evidence of an association with short-term recovery from pain. This would not have been included in the scoping review as methods not used by osteopaths were excluded. A systematic review and meta-analysis has analysed the risk of developing a new episode of LBP when suffering from depression (Pinheiro, Ferreira et al. 2015). Their results bring new evidence on the effects of depression as a risk factor for the onset of LBP: patients with higher levels of symptoms of depression are at an increased risk of developing LBP. This study would have had an impact on the scoping review results in which depression was listed as not being a predictive factor for the onset of NSLBP.

6.9. Limitations and strengths

The factors/assessment methods drawn from the included clinical guidelines and systematic reviews are those that have been published in synthesised secondary sources, and not an exhaustive list of all the prognostic, non-prognostic factors and assessment methods related to NSLBP. Prognostic studies are difficult to identify and are more prone to publication bias (Altman 2001) and this may have had an impact on the results of the studies included in this scoping review (systematic reviews and guidelines). One of the systematic reviews included in this scoping review (Taylor, Goode et al. 2014) reports that 39% of its included studies were captured by hand search. The authors explain that finding search terms for risk factors related to LBP is a difficult process. This is a common issue in manual therapy research. To help with this problem, a study defined Pubmed search strings that could be used to efficiently retrieve studies on manual therapy (Pillastrini, Vanti et al. 2015). In addition, some of the factors were drawn from clinical guidelines which typically include expert opinion in addition to evidential review.

Another limitation is that the data extraction was only carried out by one reviewer. To minimise the possible effects of this, the process was verified on two levels. Firstly supervisors were from different manual therapy professions and were able to provide feedback according to their specific knowledge of the profession literature. Secondly, supervisors' feedback was obtained at several stages in order to minimise the effects of the researcher's judgement on the results: after completion of the extraction process by the researcher, one supervisor (SV) extracted data from three articles and the results were compared and there was good overall agreement; the list of factors extracted was submitted to both supervisors independently to get their decisions on inclusion and exclusion of the factors listed. Disagreements were discussed and consensus reached in a meeting.

The scoping review was conducted to inform the content of an e-learning programme: assessment of risk of bias and quality of articles are usually not recommended for scoping reviews aiming to disseminate research findings to practitioners (Arksey and O'Malley 2005, Daudt, van Mossel et al. 2013). Whilst this is usual practice, there is the potential that the extracted data and results may be less trustworthy without formal appraisal and rating of quality of the primary systematic reviews and clinical guidelines. This was mitigated to some extent by the decision to include/exclude factors and assessment methods being in part informed by their frequency of citation in published articles. Furthermore when there was conflicting information in from multiple sources, higher priority was given to systematic reviews than to guidelines. However, if this work was used as part of a different review approach such as a future systematic review, then assessing the risk of bias and quality appraisal would be an important addition to the scoping review methodology. It is recognised that, in the context of the scoping review presented in this thesis, a quality of bias was not feasible due to pragmatic considerations, but a systematic appraisal of the quality of the guidelines and systematic reviews may have slightly changed the selection of some content for the e-learning programme.

This scoping review was the first one to be done on this topic. Scoping review methodology allowed the presentation of an account of the existing literature and the collation of articles from various sources and various methodologies that were then arranged thematically in order to summarise and disseminate research findings to practitioners (Arksey and O'Malley 2005). One of its strengths is that it focussed on literature of high levels of evidence: systematic reviews and clinical guidelines commonly accessed by practitioners. It provided a synthesis of guidance and evidence useful to manual therapists managing patients with NSLBP and identified key elements to include in the next stage of the research: the development and design of an e-learning programme on the evaluation of NSLBP in a BPS environment. Previous studies that trained practitioners and assessed their attitudes to back pain did not explicitly state how the content of the teaching material had been chosen.

It is expected that the list of prognostic factors and assessment methods from this scoping review will need to be updated regularly as research in LBP is extensive.

6.10. Chapter conclusion

This scoping review identified key elements that should be included in an evidence-based e-learning programme on the evaluation of NSLBP in a BPS environment in a manual therapy context. It is likely that this approach was more comprehensive than other studies in the field in terms of identifying

content for education. 55 prognostic factors and 10 assessment methods for NSLBP were extracted. Prognostic factors were from various domains, including biological, individual and social factors. Practitioners recognise the importance of psychosocial factors for prognosis but feel unprepared and would like training in this field. There are more social than biological or individual factors, and social factors include the therapeutic alliance. Biological factors need to be included in training programmes as possible obstacles to recovery. The assessment methods listed lacked reliability.

The next chapter describes the development of the e-learning programme and the mixed methods study that was conducted to assess the feasibility of running a main trial and the acceptability of the e-learning programme.

7. Mixed methods introduction

7.1. Chapter summary

This chapter discusses why a feasibility study using a mixed methods design was chosen. First a definition of feasibility studies is provided and reasons for conducting them are reviewed. Then recommendations for conducting mixed methods research are discussed including the variety of designs and methods. Finally, sample sizes used in previous mixed methods feasibility studies are reviewed.

7.2. Chapter introduction

The e-learning programme development was informed by the Scoping Review results (chapter 5), i.e. it included psychosocial but also biological prognostic factors and assessment methods for non-specific low back pain (NSLBP). In order to enhance the impact of the e-learning programme, it was designed using a behaviour change model and an e-learning development framework. The study did not assess participants' behaviour but their attitudes as the cost of using behaviour observation as a measure was too high given the lack of preliminary proof of concept evidence for change. This work assessed attitudinal change to build proof of concept following the Medical Research Council guidance on development and evaluation of complex interventions (Craig, Dieppe et al. 2008). If attitudinal change is a pre-requisite to behavioural change (see section 2.5.1), the BCW may help to promote an attitudinal change. The e-learning programme was also informed by results and conclusions drawn from previous BPS training programmes. As there are no previous studies that assess the effectiveness and acceptability of an e-learning programme used as a Continuing Professional

Development (CPD) for experienced osteopaths, the design and methodology used was a feasibility mixed methods study (Craig, Dieppe et al. 2008).

This chapter details why a feasibility study was appropriate for this investigation and how mixed methods research provided information on the feasibility of running a main trial and acceptability of the e-learning as a CPD for the participants.

7.3. Study design justification

For the research presented in this study a new intervention was developed, the e-learning programme. It is currently not possible to run a definitive Randomised Control Trial (RCT) with osteopaths taking this e-learning programme for several reasons: 1/ sample size calculation is currently not possible; 2/ recruitment feasibility for an osteopathic online CPD is unknown, and 3/ the acceptability for osteopaths to take online courses as CPDs is unknown. For these reasons, it was decided to do a feasibility mixed methods study to assess the feasibility and acceptability of the intervention for a bigger study.

7.3.1. Feasibility study

Feasibility studies are conducted when there is uncertainty about future RCT feasibility. They help to design a further confirmatory study (Arain, Campbell et al. 2010). The Medical Research Council (MRC)'s recommendations for the development and evaluation of complex interventions include testing RCT designs with pilot studies to test procedures for their acceptability, to estimate recruitment and retention rates, and to determine sample sizes required in main trials (Craig, Dieppe et al. 2008). Feasibility studies do not evaluate effectiveness; this is left to the main study (Teare, Dimairo et al. 2014). The analyses are therefore mainly descriptive and focus on confidence interval estimations and not on inferential testing (Lancaster, Dodd et al. 2004, Leon, Davis et al. 2011, Moore, Carter et al. 2011, Lancaster 2015). Feasibility studies are divided into three subgroups: randomised pilot studies, non-randomised pilot studies (including qualitative studies) and feasibility studies that are not pilot studies (Thabane, Ma et al. 2010, Eldridge, Lancaster et al. 2016). Historically, feasibility studies were mainly conducted to determine initial data to perform sample size calculation for a larger trial (Lancaster, Dodd et al. 2004), but recently this has been discouraged as feasibility study sample sizes are small and therefore offer imprecise between-treatment group effect size estimates (Arain, Campbell et al. 2010, Leon, Davis et al. 2011). Feasibility studies' effect sizes can therefore produce inaccurate estimates of the true effect, resulting in an incorrect estimate of the sample size needed for the main trial (Kraemer, Mintz et al. 2006). If the true effect size was known with enough confidence before conducting the main trial, conducting the main trial would be clinically unethical. Sample size estimates for a main trial should instead be based on a clinically meaningful effect (Leon, Davis et al. 2011). In the context of the study presented in this thesis, the main issue is that there is currently no consensus on what constitutes a clinically meaningful change in practitioners' LBP beliefs using any validated questionnaire (O'Sullivan, O'Sullivan et al. 2013).

Lancaster et al. (2004) defined the objectives of conducting a feasibility study: to test the study protocol, the data collection, the randomisation procedure, the recruitment and consent procedures, the acceptability of the intervention and the feasibility of using selected outcome measures.

In summary, a feasibility study was designed and conducted using quantitative and qualitative methods. It aimed to provide information on the intervention strategies prior to conducting a main trial; to provide a deeper understanding of the feasibility of a conducting main trial and the possible barriers to participation; and to estimate response rates. The next section provides a summary of mixed methods.

7.3.2. Mixed methods justification

This feasibility study investigated the feasibility of running a main trial including the feasibility of the recruitment process, randomisation process and data collection; the feasibility and acceptability of the e-learning programme including the retention rates, participants' satisfaction and views on the e-learning programme; and finally the impact of the e-learning programme on the participants' attitudes to back pain and on their views on the BPS model. To gather this information a mixed methods study was the most appropriate as it offers the opportunity to bring different outcomes together, expanding the understanding of the problem, and is a useful tool to identify conflicting results (Fetters 2015). Mixed methods research can be used to assess and/or create an intervention (van Griensven, Moore et al. 2014) and is appropriate for assessing the use and evaluating the impact of an e-learning programme from the educators' perspective (Braye, Marrable et al. 2013).

7.3.2.1. Mixed methods introduction

Mixed methods research was first published in the 1950s mainly in psychology and sociology (Creswell and Clark 2011: 22-25) and, with increased popularity, has become more refined, with clearer guidance on how to conduct and report mixed methods research (Creswell and Clark 2011: 30-38). Mixed methods research can be conducted for different reasons: to triangulate results, to facilitate the results of different methods complementing each other, to develop one method from the results of another method, to seek the discovery of contradictory findings or to assess the extent, the breadth and the range of enquiry (Bryman 2006). There are six main mixed methods research designs: 1/ convergent parallel design (qualitative and quantitative data collection and analysis conducted simultaneously), 2/ explanatory sequential design (quantitative data collection and analysis followed by qualitative data collection and analysis), 3/ exploratory sequential design (qualitative data collection and analysis followed by quantitative data collection and analysis), 4/ embedded design (both quantitative and qualitative data collection included in a traditional quantitative or qualitative design), 5/ transformative design (one type of data may be converted to be used in the analysis of the other data, e.g. qualitative data converted to categorical data), and 6/ the multiphase design (can start with a qualitative data collection and analysis, followed by a quantitative data collection and analysis, informing a mixed methods data collection and analysis) (Creswell and Clark 2011, p.68-72, Green, Duan et al. 2015).

Guidelines on how to conduct mixed methods research to assess and address processes affecting implementation of evidence-based interventions have also been published (Green, Duan et al. 2015). It was often thought to be practitioners' own responsibility when they failed to take evidence-based approaches. This view has now shifted towards assigning some responsibility to inappropriately designed interventions; not taking into account organisational, clinical and social environments that affect evidence-based implementation. In order to improve interventions, a clearer understanding of the practitioners' experiences is required (Green, Duan et al. 2015). Mixed methods research offers a means of understanding, collaborating with and responding to practitioners. It also reduces each method's weaknesses, i.e. limited generalisability and depth of understanding.

7.3.2.2. Methods for conducting mixed methods

Mixed methods studies typically pair one or more quantitative methods (e.g. survey or questionnaires) with one or more qualitative methods (e.g. individual or group interviews, structured or not) to triangulate findings, improve validity and provide a deeper understanding of the quantitative results (Green, Duan et al. 2015). To enhance the rigour of the studies, using the same participants in both strands is recommended if the first strand is quantitative, but using different participants is recommended if the first strand is qualitative (van Griensven, Moore et al. 2014). Between 1994 and 2003, the two most popular methods used in mixed methods published articles were semi-structured interviews (used in 159 articles) and self-administered questionnaires (in 121 articles) followed by structured interviews (in 52 articles) (Bryman 2006).

Analysis of semi-structured interviews relies on adequate transcription methods. Verbatim transcription is a method used for interview and focus group interviews. Routinely reviewing the quality of transcripts before analysing them is considered good practice to enhance their trustworthiness (Poland 1995). The time, physical and human resources associated with verbatim transcription are significant and it is difficult to produce transcripts with no misinterpretation (Halcomb and Davidson 2006). An alternative method has been developed for semi-structured interviews employing a reflexive, iterative process of data management (Halcomb and Davidson 2006). This uses audio recordings, allowing the reviewing of the interviewer's performance, to fill in possible blanks in the transcription, to reduce interviewer bias by allowing supervisors or independent persons to certify that a transcript is true representation of the data and finally to provide the researcher with excerpts to include in a thesis and publication (Halcomb and Davidson 2006). Examples of the use of this method include a study on community health workers' interventions in low-income countries (Strachan, Kallander et al. 2015), a study on beliefs and practices of thermal care (Adejuyigbe, Bee et al. 2015), an analysis of possible biases in NICE guideline development due to possible conflicts of interests (Graham, Alderson et al. 2015) and a study assessing the impact of a training programme for parents of children with disability (Gaad and Thabet 2016). The six-step data management in this approach was adopted and is described in section 9.6.2.

7.3.3. Mixed methods feasibility study sample sizes

Feasibility studies need to justify their sample size but sample size calculation is usually not appropriate (Billingham, Whitehead et al. 2013). In an audit of feasibility studies the median sample size per arm was 36 ranging from 10 to 300 (Billingham, Whitehead et al. 2013). Previously published pilot mixed methods studies have had varied numbers of participants ranging from 39 to 50 in quantitative strands and from 9 to 16 in qualitative strands (Schuster, Butler et al. 2009, Payne, Weeks et al. 2014, Swendeman, Ramanathan et al. 2015). Feasibility studies do not assess effectiveness, therefore it is not essential to recruit a large number of participants, however, there needs to be enough to assess process outcomes e.g. the recruitment process and retention rate.

7.4. Chapter conclusion

In summary, there is no evidence on the effects of an e-learning programme on osteopaths' attitudes to back pain. Prior to testing the effectiveness of the e-learning programme, information on the feasibility of conducting a trial and the acceptability of the intervention was needed: a mixed methods feasibility study was therefore conducted.

The next chapter details the development of the e-learning programme.

8. Intervention development

8.1. Chapter summary

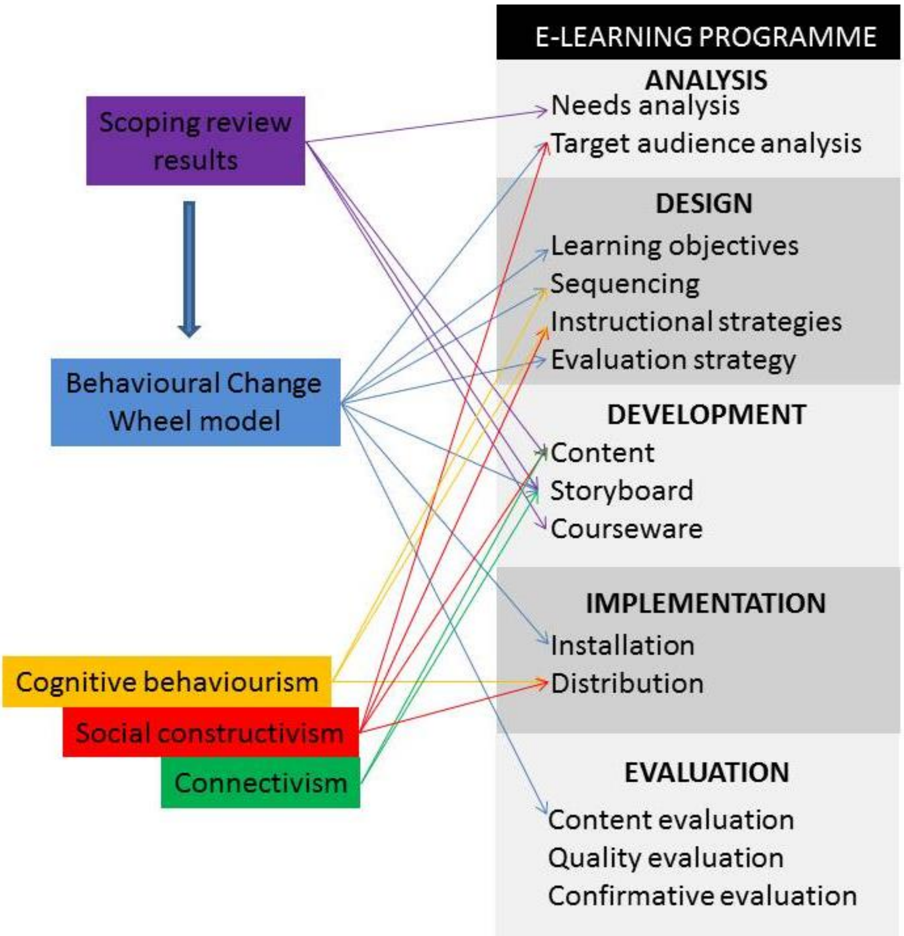
This chapter describes how the ADDIE model and Behaviour Change Wheel model were used to develop the e-learning programme. The different stages of the e-learning development are described. This chapter also details how two aspects of the e-learning programme were assessed before conducting the mixed methods feasibility study: a content evaluation and a quality evaluation.

8.2. Chapter introduction

Chapters 3 to 6 described the scoping review that found 55 biopsychosocial prognostic factors and 10 assessment methods for NSLBP. These findings were used to inform the e-learning programme. This chapter describes the methods used to develop an e-learning programme on the BPS model applied to NSLBP and the evaluation of this e-learning programme using a feasibility RCT design.

The development of the e-learning programme followed the stages and sub-stages of the ADDIE model (Molenda 2003, Ghirardini 2011): Analysis (needs analysis, target audience analysis, and content analysis), Design (learning objectives, sequencing, instructional strategy, delivery strategy, evaluation strategy), Development (content development, storyboard development, courseware development), Implementation (installation and distribution, and managing learner's activity), and Evaluation (reactions, learnings, behaviour, and results). The following sections explain these stages in detail. Figure 8.1 – intervention theoretical underpinning, details which stage(s) of the e-learning development was(were) informed by which theory. The directional arrows illustrate where the intervention was informed by theoretical underpinning. The theoretical underpinning includes the scoping review results, the behavioural change model and educational theories; and it is arranged following the ADDIE stages of the e-learning programme.

Figure 8-1 - intervention theoretical underpinning
Influences on the e-learning programme: scoping review (violet arrows), behavioural change wheel (blue arrows), and educational theories (yellow arrows for cognitive behaviourism, red arrows for social constructivism and green arrows for connectivism). The thick arrow represents the influences the scoping review results had on how the behavioural change wheel model was used.



To access the e-learning programme, please refer to the Accompanying material instructions p. xvi

8.3. Analysis

8.3.1. Needs analysis

A needs analysis helps to determine if training is required to fill a gap in professional knowledge and skills; and if e-learning is the best solution to deliver the training (Nagarajan and Wiselin Jiji 2010, Ghirardini 2011, Raymond and Iliffe 2012). NICE guideline recommendations include osteopathic care and use of the BPS model of care for NSLBP (Savigny, Kuntze et al. 2009). Osteopaths who trained more than fifteen years ago were educated predominantly using a biomedical model and so would not have been exposed to the BPS model in their undergraduate training.

8.3.2. Target audience analysis

LBP is the most common symptom encountered by osteopaths (Fawkes 2010). This e-learning programme was designed for those UK osteopaths who graduated with no direct exposure to the BPS model in their undergraduate training. A similar study with physiotherapists found that those with the most experience had the most negative LBP beliefs (O'Sullivan, O'Sullivan et al. 2013). The aim of the study presented in this thesis was to explore the impact of the e-learning programme on practitioners' attitudes to back pain for those with an undergraduate training that was more informed by a biomedical approach to back pain than a BPS one. A single sample profession (osteopathy) was included in this feasibility study to test the intervention. Osteopaths practising in the UK are required to complete 30 hours of Continuous Professional Development (CPD) per year to remain registered with the General Osteopathic Council (GOsC). There are currently no requirements from the GOsC to complete CPD on the BPS model or NSLBP. It is expected that most osteopaths practising in the UK will have access to the internet either at home, at work or at their local library.

8.3.3. Content analysis

Content analysis is the most critical step in the instructional design process (Ghirardini 2011). If information is not up to date then there is little value in finding the best instructional methods and media to use in training participants. Prior to developing the e-learning programme, a scoping review (stage 1, chapters 3 to 6) was completed in order to inform the content of the e-learning programme. The scoping review identified key elements that should be included in an evidence-based e-learning programme on the evaluation and management of NSLBP in a BPS environment in a manual therapy context.

In order to help participants to embrace a BPS approach to NSLBP, specific knowledge and several skills were identified to inform the development of the e-learning programme (see section 8.4.2.). Knowledge that needed to be developed or reinforced included understanding of LBP classification and what the term NSLBP implies (e.g. Waddell 1987, Pincus, Kent et al. 2013); the variety of prognostic factors for NSLBP (informed by results from stage 1 of this research: the scoping review); the difference between acute and chronic pain (e.g. Wand, Parkitny et al. 2011, Baliki MN 2012, Hashmi, Baliki et al. 2013); pain mechanisms for LBP (Smart, Blake et al. 2011); the paucity of evidence for the clinical examination of NSLBP (e.g. May, Littlewood et al. 2006); the effects of practitioners' explanations on patients' outcomes (e.g. O'Sullivan 2012), and the different management options available to patients with NSLBP (e.g. Savigny, Kuntze et al. 2009).

Skills that needed to be developed or reinforced included developing a diagnostic method to list possible obstacles to recovery (e.g. Ashton, Butler et al. 2004, Kendall, Burton et al. 2009), understanding how to communicate with patients with NSLBP to enhance their chances of recovery (e.g. Burton, Balague et al. 2006, Delitto, George et al. 2012) and understanding the different possible management options available in a BPS management of NSLBP (e.g. Savigny, Kuntze et al. 2009).

8.4. Design

The design stage provides the curriculum structure (i.e. its organisation in units and lessons, and its activities), it also defines the learning objectives (LO) associated with each unit and lesson and the order in which the LO should be achieved, known as sequencing. This stage also defines the delivery methods and formats for each unit and lesson (i.e. selection of instructional, media, evaluation and delivery strategies).

8.4.1. Learning objectives

The content analysis (section 8.3.3 in this chapter) informed the LO of the course. LO described the expected outcome of each unit and lesson by combining the expected level of performance (with a verb) and the learning content (the type of knowledge or skills that must be learned) (Ghirardini 2011). The expected level of performance was formulated according to the revised Bloom's taxonomy (Krathwohl 2002). It defines six different cognitive processes, from the simplest to the most complex ones: to remember, to understand, to apply, to analyse, to evaluate, and to create. The aim of the set of LO listed was to achieve the general, high-level course objective: to understand how to assess a patient with NSLBP in a BPS manner and to understand the management options available. LO included a combination of LO on NSLBP (e.g. Unit 2 LO: to understand the variety of possible factors that may contribute to NSLBP and to appreciate ways of assessing them), the BPS model (e.g. Unit 5 LO: to analyse the available therapeutic options depending on patients' BPS factors in order to create management options tailored to each patient) and the e-learning itself (e.g. Lesson 1.1 LO: to understand the technical requirements needed for this course and the overall learning objectives of this course) (see Table 8.1 – E-learning learning objectives).

Table 8-1 - E-learning learning objectives

Lessons	Learning objectives
Unit 1	**To understand the technical requirements needed for this course and the different topics discussed during the course**
Lesson 1.1: introduction	To understand the study design and the technical requirements to take the course
Lesson 1.2: non-specific low back pain	To remember basic knowledge (including NSLBP) and the BPS model
Unit 2	**To understand the variety of possible factors that may contribute to NSLBP and to appreciate ways of assessing them**
Lesson 2.1: case history	To self-analyse their knowledge on the possible factors influencing NSLBP course and on their own clinical reasoning
Lesson 2.2: prognostic factors	To understand the variety of possible factors that may contribute to NSLBP and highlight BPS factors for NSLBP
Quiz after lesson 2.2	To evaluate knowledge acquired in Lesson 2.2 on prognostic factors for NSLBP
Lesson 2.3: case history	To apply theory on PS factors from lesson 2.2 in a practical exercise (case study from lesson 2.1)
Lesson 2.4: case history	To list the PS factors in case study presented in lesson 2.2
Unit 3	**To evaluate which assessment methods are the most appropriate and reliable for specific patients' presentations**
Lesson 3.1: clinical examination	To evaluate the limitations of the lumbar clinical examination
Quiz after lesson 3.1	To apply knowledge on lumbar spine examination from lesson 3.1 with a scenario-based approach
Unit 4	**To analyse how different factors that a patient presents with may interact with and influence the course of their NSLBP**
Lesson 4.1: case history transcript	To apply knowledge from previous lessons in a case-scenario with a mainly biological component. To analyse what possible mechanisms may be underlying the patient's

	presentation. To reflect on an example of bad practice
Quiz after lesson 4.1	To apply knowledge from previous lessons in a case-scenario with a mainly biological component. To analyse what possible mechanisms may be underlying the patient's presentation
Lesson 4.2: nociceptive pain	To remember the nature of nociceptive pain mechanism
Lesson 4.3: acute/chronic pain	To understand how psychosocial factors may influence the course of NSLBP. To understand the differences between acute and chronic pain
Quiz after lesson 4.3	To reflect in lesson 4.3 on the differences between acute/chronic pain
Lesson 4.4: case study	To evaluate a case-scenario with a main psychological component applying knowledge from previous units and lesson 4.3. To analyse what possible mechanisms may be underlying the patient's presentation
Quiz after lesson 4.4	To reflect on the case-scenario presented in Lesson 4.4: patient presenting with NSLBP with a main psychological component
Lesson 4.5: central sensitisation	To remember the nature of central sensitisation pain mechanism
Lesson 4.6: case study	To evaluate a case-scenario with a mainly social component and to analyse what possible mechanisms may be underlying the patient's presentation
Unit 5	**To understand the different management options available for patients with NSLBP**
Lesson 5.1	To remember the NICE guidelines LBP pathway and available management options recommended in guidelines
Lesson 5.2	To understand and evaluate how communication can affect the therapeutic alliance, how one can enhance their communication skills, and evaluate the two types of reassurance that are described in the literature and their effects on patient outcomes
Lesson 5.3	To evaluate the value and challenges of consent in a manual therapy context
Lesson 5.4	To evaluate the possible psychosocially informed management options in a manual therapy context

Lesson 5.5	To assess and summarise the e-learning programme content adding external validity to the content
Lesson 5.6	N/A (page prompting participants to contact the researcher to let him know they had finished the e-learning programme)
Extra Content Folder	To understand where extra material is available and evaluate the evidence provided in the e-learning programme

8.4.2. Design of a table informed by the Behaviour Change Wheel (BCW)

The BCW and the COM-B model of behaviour informed the e-learning programme content. A table was developed listing the conditions, both internal to the participants and in their social and physical environment, needed for the adoption of a BPS approach to NSLBP (see Appendix H – Behaviour Change Wheel e-learning pre-development). The first three columns of the table listed the different aspects of the COM-B model: Capability, Motivation and Opportunity. Comments were added in the cells to ensure a common understanding of these terms between the researcher and his supervisors. The next column listed conditions that were required for the e-learning programme to be effective in promoting a BPS approach when facing patients with NSLBP. This list was then sent to both supervisors and discussed during a meeting to ensure that major conditions had been included.

8.4.3. Sequencing

The sequencing of the units and learning was informed by using a prerequisite method (Ghirardini 2011), providing background information that was a prerequisite to progressing further in the course. This method mainly informed Unit 1 in which general information on NSLBP and the BPS model was offered before starting Unit 2 on the history taking of patients presenting with LBP. The content was also organised following a job-context principle (Ghirardini 2011) where content is organised according to the order of actions in a real job context. This method was applied mainly in Units 2 and 3: Unit 2 was designed around the first part of an osteopathic consultation (history-taking) and unit 3 around the following part of the consultation (examination). Unit 4 was organised following a spiral principle (Ghirardini 2011) where basic concepts are repeatedly built upon until the learner understands them fully. Unit 4 reinforced the learning from the previous units' content. It provided examples that were informed with content from units 2 and 3.

A course plan was developed. It listed the different LO and was informed by the sequencing to decide to which unit/lesson the LO were attributed. Lesson 2.2 course plan is shown as an example in Table 8.2 – Lesson 2.2 course plan (see Appendix I – Course plan, for the entire course plan).

Table 8-2 - Lesson 2.2 course plan

UNIT AND LESSON TITLE		Learning objectives	Description	Extra content		Test
Lesson 2.2.	PS factors/ theory	To understand the variety of possible factors that may contribute to NSLBP. To remember a variety of different BPS factors for NSLBP.	This lesson describes and lists the possible factors that can contribute to NSLBP. The psychosocial risk factors are explained and the flag system (yellow, blue and black) is detailed (Kendall 2009). This lecture describes the possible influences of HCP on patients' attitudes and beliefs (Darlow et al. 2012 and 2013). MUST KNOW: NSLBP is influenced by a variety of factors including PS factors. How to use the flag system as a tool to classify possible PS factors and look for PS evolution. DESIRABLE TO KNOW: The flag system does not provide a fixed PS state of patient but is a snapshot of that moment. Reassessment is necessary as patient's context changes constantly, hence their PS state changing regularly.	App 1	List of PS flag system	List possible factors and ask right or wrong

8.4.4. Instructional strategy

Two instructional methods were used when developing the e-learning programme: expositive methods and application methods.

Expositive methods were mainly used as they are ideal for teaching new information with the aim of changing participants' attitudes (Ghirardini 2011). They were used through the medium of case-studies and presentations. The delivery format included simple learning resources (including Word documents, e.g. *Lesson 4.1: case history transcript*) and webcasting (video lessons) (e.g. *Lesson 2.2: prognostic factors*).

Application methods were used when the LO was to develop job-specific cognitive skills. This was achieved by providing worksheets, as they are useful for providing just-in-time information and guidance (e.g. in the Extra Content Folder, a red flags list was provided), and mainly by using scenario-based exercises (e.g. see *Lesson 4.1.: case history transcript* and *Quiz after lesson 4.1*). Scenario-based exercises were used to develop cognitive skills in a specific domain where participants are asked to apply knowledge and principles in a concrete professional situation (Ghirardini 2011). A variety of formats to design scenario-based exercises was used. Linear lessons used texts (*Lesson 2.1: case history, Lesson 2.3: case history* and *Lesson 2.4: case history*) and specific feedback was given to participants after they made choices in response to electronic simulations (e.g. *Quiz after lesson 4.4*).

8.4.5. Delivery strategy

Participants' computers' capabilities and connectivity were considered before making any decisions about technology. As participants had trained more than 15 years ago, there was a possibility that they might not be computer-literate. For that reason, it was decided that the interface of the e-learning course would be very simple with few options, menus or buttons to minimise the risk of confusing participants when logging onto the website. The e-learning programme was developed in an online format only rather than delivered via CD-ROMs or other offline formats. In a 2014 survey from the Office for National Statistics (Office for National Office for National Statistics 2014) 38 million adults (76%) in Great Britain reported having accessed internet every day, 21 million more than in 2006. Participants had the email address and mobile phone number of the researcher in case they had difficulties with the e-learning programme.

8.4.6. Evaluation strategy

It is recommended that the evaluation strategy for the e-learning programme should be decided from the design stage (Molenda 2003, Ghirardini 2011). Two strategies were used: a formative evaluation and a confirmative evaluation. A formative evaluation was used to check the quality of the e-learning programme to improve it before it was implemented (described in section 8.6.2). A confirmative evaluation assessed the feasibility and acceptability of the e-learning programme immediately after the course had been implemented (described in paragraphs 9 to 11).

8.5. Development

This section details the different phases of the e-learning programme development: developing a storyboard and courseware. It details the list of software used for the development stage, and finally the construct and content of the lessons are detailed.

8.5.1. Storyboard development

A storyboard is a visual representation of the different screens the e-learning will have and the different learning experiences that will be included (Jantke and Knauf 2005, Ghirardini 2011). It is an intermediate product before developing the e-learning programme. Its development was based on the content analysis phase, drawing on the results of the scoping review.

The storyboard was created with PowerPoint (see Appendix J – Storyboard). At the beginning of each unit, the LO and description of that unit were given, informed by the course plan (see Appendix I – Course plan). Each lesson's LO and description were also given before describing the lesson content. The lesson description slide(s) had the lesson number as part of the title. The left hand side of the slide had a simple icon to describe the instructional methods used. Images were used to also give a sense of the final product. On the right hand side a short text explained the content of that e-learning page.

An e-learning lesson should ideally be not more than 30 minutes long (Ghirardini 2011). The storyboard development was informed by aiming for a 30-minute duration for each element in order to make decisions on content and instructional methods used. Only two lessons were longer than 30 minutes: *Lesson 5.2: Communication and reassurance* was 43 minutes long and *Lesson 5.4: psychosocial management* was 31 minutes long.

Diverse teaching methods and quizzes were included as this is good practice in medical education (Cutting and Saks 2012). These included a video of a clinical scenario during history taking and physical assessment, case studies, an interview with an expert in communication and lectures that included multiple choice tests to keep learners alert. The storyboard was informed with scenario-based approaches during which participants had to make decisions by choosing between different options (e.g. *Lecture 4.6: case study*). Feedback and information were provided when answers were incorrect and, when possible, where information on each specific topic could be found in the e-learning programme (e.g. feedback for question 5 in *Quiz after lesson 4.4*). This approach is useful for the development of interpersonal skills, (e.g. *Lesson 4.1: case history transcript*), and also to practise what was taught in previous theoretical lessons (Ghirardini 2011), e.g. *Lesson 4.3: acute/chronic pain* provided the theory on central sensitisation that could then be applied in the case study in *Lesson 4.4: case study*.

Adding examples in the storyboard is fundamental to helping participants to make sense of the theoretical concepts developed in the e-learning programme. An inductive sequence was used when participants were likely to be familiar with the topics presented. E.g. the case study in *Lesson 4.1: case history transcript* of a patient complaining of NSLBP of a mainly nociceptive nature was followed by *Lesson 4.2: nociceptive pain*. A deductive sequence was used when it was likely that the topic presented might not be known by the participants, e.g. *Lesson 4.3: acute/chronic pain* informed participants on the differences between acute and chronic pain before providing a case scenario of a patient presenting with NSLBP of a mainly central sensitisation nature in *Lesson 4.4: case study.* Using an example of an incorrect application of principles, known as a non-example, is a useful way to develop exemplars (Ghirardini 2011). A non-example was used to allow participants to reflect on possible examples of bad practice, based on theory developed in earlier lessons, e.g. *Lesson 4.1: case history transcript* used a case study of a practitioner with a mainly biomedical model of back pain who did not follow a patient's cues. It aimed to enable participants to reflect upon and identify unhelpful practice habits they may have.

The storyboard also listed where quizzes would happen. The main aim of the quizzes was to reinforce the achievement of LO. While quizzes may not influence the amount learners learn online, prompting learners' reflection enhances learning (Means, Toyama et al. 2009). Questions also play an important role in keeping participants involved and attentive (Ghirardini 2011). Extra content material was also listed in the storyboard. It consisted of various documents that could be downloaded or printed, or links to websites where extra information related to the e-learning programme content was accessible.

8.5.2. Courseware development

This stage consists of developing media, producing the course online and integrating the content elements into a learning platform that learners can access. Lessons were either theoretical, case-scenario based or quiz-based.

8.5.2.1. Graphics

In theoretical lessons, graphics (illustrations or pictures) were used. Pictures were either royalty-free or referenced when they were sourced from an article (e.g. Gifford's picture in *Lesson 2.2: prognostic factors*). Graphics had a decorative purpose to keep participants motivated and were also used for representational (e.g. *Lesson 2.2: prognostic factors* coloured flags were used to represent the classification of prognostic factors) and interpretative (e.g. *Lesson 1.2: non-specific low back pain* used a diagram to define the three different LBP categories: spinal pathology, neuropathic pain and NSLBP) functions.

8.5.2.2. Media

Audio tracks and videos were used for the theoretical lessons and the case scenarios. No extraneous audio was used, such as music background or sounds, to focus participants' attention on the narration. Audio was either used on its own, e.g. in *Lesson 2.1: case history*, or was added to presentations, e.g. in *Lesson 2.2: prognostic factors.* Video was used in a case scenario, e.g. *Lesson 4.4: case study*, as it is suitable for reproducing behaviour and processes as they happen in real life (Ghirardini 2011) and for interview-based lessons (e.g. *Lesson 5.3: consent*). Video requires more bandwidth than audio or text media but it was not foreseen as a problem.

Quizzes were written using a similar format for each item: first a question or statement was given, then a task was given, e.g. "choose", and finally a series of possible answers was given. Feedback differed, i.e. it was provided at the end of each quiz. A variety of question formats was used including multiple choice (e.g. question 6 in *Quiz after lesson 3.1*), multiple response (e.g. question 3 in *Quiz after lesson 2.2*), matching (e.g. question 8 in Quiz after lesson 3.1) and true/false (e.g. question 11 in *Quiz after lesson 2.2*) type of questions. Multiple choice and multiple answer questions offered different feedback for each option that could be selected. The questions in the quizzes were reviewed with both supervisors to analyse the questions' pertinence and unambiguity. Changes were made according to feedback received.

8.5.3. Software

A variety of software products was used to develop the e-learning programme. This section details which products were used, their purpose and the licence obtained for their use.

8.5.3.1. Prezi

Prezi was used for the development of the theoretical lessons, e.g. *Lesson 1.1: introduction*. Prezi is a cloud-based presentation tool that can be used as an alternative to PowerPoint. Instead of slides Prezi uses a large canvas that allows panning and zooming to different parts of the canvas. A Prezi Edu Pro licence was purchased to enable the researcher to develop presentations and use them in the e-learning programme. The researcher followed an online course on how to design courses on Prezi provided by Prezi in August 2015.

8.5.3.2. Camtasia

Camtasia was used to record Prezi presentations while adding an audio recording to it. Camtasia also allows editing and sharing course content online. Camtasia can upload videos to a YouTube account. Camtasia offers several editing options that help to improve the learners' experience. Zooming in was used to help participants to focus on specific points, e.g. in *Lesson 1.1: introduction* zooming was used to show how to log onto the e-learning programme website (see at 10 min 32 sec). Zooming out was then used to show the context of the whole recording and how what had just been described related to the rest of the screen, e.g. in *Lesson 2.2: prognostic factors* zooming out was used for the summary page at the end of the lesson (see at 29 min 55 sec). Another editing option that was used was panning, i.e. changing where the camera is pointing. It was a helpful tool to help participants to focus on something specific, e.g. in *Lesson 4.3: acute/chronic pain* when using the example of climbing a mountain (at 9 min 17 sec). Other options, such as cursor effects and annotations, were used less often but were useful when emphasis needed to be added to prevent participants from getting lost, e.g. in *Lesson 1.1: introduction* when showing participants how to use YouTube (see at 12 min 25 sec). A Camtasia for Mac Education Pricing licence was purchased to enable the researcher to edit and share presentations online.

8.5.3.3. YouTube

YouTube is a free video-sharing website that allows users to upload, view, and share videos. In order to upload videos, a Google account is required. The account needs to be activated (with a valid mobile number) in order to upload several videos of a long duration. Videos that were uploaded on YouTube were 'unlisted' to prevent people not taking the course finding these videos, including participants in the waiting list group. No licence is needed to use this service.

8.5.4. Lesson construction and content

The e-learning programme was divided into five units. UNIT 1 provided introductory information on the content of the e-learning programme and its structure, and on NSLBP and the BPS model. UNIT 2 used a scenario-based exercise to discuss history-taking. Results from the scoping review (Stage 1) were used in this section to list the different BPS factors described in the literature for NSLBP. UNIT 3 discussed clinical examination for NSLBP. As the evidence for the examination content is very limited and the scoping review extracted mainly tests that should not be used rather than tests that should be used, it was agreed that this unit should discuss what a usual osteopathic examination is, what the purpose of it is, and its evidence. As the e-learning programme is designed for experienced osteopaths, the idea is not to change their examination routine as such, but maybe to shift their objective in carrying out an examination. E.g. findings may not lead to a tissue causing symptom diagnosis but help build the therapeutic alliance. Osteopaths use less objective tools in their examination when assessing patients with NSLBP than other manual practitioners (Kent, Keating et al. 2009); therefore it was decided to include clinically relevant tools in the e-learning programme that would help the implementation of a BPS approach, e.g. 2 specific questions from the Primary Care Evaluation of Mental Disorders patient questionnaire for screening for depression (Delitto, George et al. 2012, Choi, Mayer et al. 2014), or the STaRT back tool for risk assessment (Beneciuk, Bishop et al. 2013). UNIT 4 integrated the content of the previous units on case history and examination around three different clinical scenarios. Current knowledge in pain neurophysiology was used to provide explanations around the clinical cases and to provide a framework to teach the BPS model (Nijs, Paul van Wilgen et al. 2011; Moseley and Flor 2012). Modern pain neurophysiology fits well with the mechanisms-based classification of musculoskeletal pain (Smart, Blake et al. 2011) that provides a clinically relevant system. It was also expected that this mechanisms-based classification of musculoskeletal pain would help participants to relate the new knowledge provided in the e-learning programme to their practice and envisage what impact the BPS model might have on their practice. UNIT 5 discussed management considerations for patients with NSLBP. It was explicitly explained in this unit that the content was drawn from emerging research. Treatment effects for NSLBP are similar across different types of interventions (Artus, van der Windt et al. 2010) therefore it was difficult to strongly recommend one intervention over another in the e-learning programme. First, informed consent was discussed, including the need to discuss alternative treatment options with patients. A review of the guidelines listed in the scoping review was conducted to summarise the treatments recommended for participants with NSLBP (see Appendix K – Review on alternative treatments, example of some categories). The results from the aforementioned review were similar to the results from a systematic review on the assessment and management of LBP (Dagenais, Tricco et al. 2010). Then communication and reassurance were discussed. This included the concept of shared decision making and how this may provide positive outcomes. Examples of poor outcomes in shared decision-making emphasise the need to conduct it properly (Patel, Ngunjiri et al. 2014). It also included reassurance, as a systematic review showed moderate- to high-quality evidence that patient education can provide long-term reassurance for patients with non-chronic LBP (Traeger, Hubscher et al. 2015). The unit also discussed the importance of using a plurimodal approach with patients with NSLBP as mono-interventions have shown little effect, e.g. education alone (Ainpradub, Sitthipornvorakul et al. 2016) or interventions focussing solely on psychosocial risk factors (Ramond-Roquin, Bouton et al. 2014) (see Table 8.3 – Lesson construct and content for details on lesson content and construct).

Table 8-3 - Lesson construct and content

Lesson	Aim	Summary	Informed by	Comment
Lesson 1.1	To explain the study design and the technical requirements to take the course	Part 1: Explained the researcher's experience with the BPS model. His initial training was very biomedical and biomechanical and learning about the BPS model transformed his way of practising. Part 2: The lesson continued with information on the study: randomisation process, questionnaires to be completed (reassuring participants that it was not an assessment of them but of the e-learning programme), and possible invitations for some participants for interviews. Part 3: A tutorial on how to log onto the website, how to navigate once logged, how to open the different files (mainly YouTube videos and PDFs), which devices can access the website and finally restriction on access to lessons (access to lessons was dependent on the participant having accessed the previous one)	N/A	This lesson was sent to the participants in an email with their access codes (username and password) to the e-learning programme website. The lesson was also accessible from the e-learning programme website in case participants wanted to verify some of the information contained in this video later on.

Lesson 1.2	To provide basic knowledge to participants on LBP, including NSLBP, and the BPS model	The points covered were made specific to osteopaths (e.g. frequency of patients going to osteopaths with LBP) practising in the UK (e.g. LBP direct and indirect costs in the UK, and NICE guideline recommendations). The lesson ended with introducing the content of the following units.	Airaksinen O. et al. 2006, Fawkes C. L. et al. 2010, NIJS J. et al. 2015, Orrock P. J. 2009, PINCUS T. et al. 2013, Savigny P. et al. 2009, Waddell G. 2005, Walker B. et al. 2004	Item available in the Extra Content Folder once participants completed this lesson: a list of red flags for LBP
Lesson 2.1	To allow participants to self-analyse their knowledge on the possible factors influencing NSLBP course and on their own clinical reasoning	This lesson used an inductive approach to outline the different factors that may contribute to NSLBP. An audio recording of a case-history of a patient presenting with NSLBP and several PS factors was used. The participants were asked, based on the recording, to consider their differential diagnoses and what factors in the history may need to be addressed. Participants were asked to keep their answers on their notebook.	Scoping review results (stage 1 of the research presented in this thesis)	The case-history included several possible obstacles to recovery including yellow flags (e.g. fear of activity, patient expectation of a 'techno-fix', extreme symptom report, passive coping strategies), blue flags (e.g. inflexible work), black flags (e.g. conflicting diagnoses) and green flags (e.g. age)

Lesson 2.2	To present the variety of possible factors that may contribute to NSLBP and highlight BPS factors for NSLBP	The importance and relevance of the psychosocial factors were explained using the flag system as an educational tool. It also emphasised the possible impact of the therapeutic relationship on patient outcomes.	Scoping review results (stage 1 of the research presented in this thesis) + Darlow B. et al. 2012, Darlow B. et al. 2013, Kendall NAS. et al. 2009.
Quiz after lesson 2.2	To reinforce knowledge acquired in Lesson 2.2 on prognostic factors for NSLBP	11 questions related to risk factors (including questions related to the flag system) were included.	Scoping review results (stage 1 of the research presented in this thesis)
Lesson 2.3	To apply theory on PS factors from lesson 2.2 in a practical exercise (case study from lesson 2.1)	This lesson offered the opportunity to participants to listen again to the case-study presented in lesson 2.1. The file included the sound and the transcript. Participants were asked not to read what was written in their notebook before answering the same questions again: considerations for differential diagnoses? What factors may need to be addressed?	Scoping review results (stage 1 of the research presented in this thesis)

Lesson 2.4	To list the PS factors in case-study presented in lesson 2.2	This lesson used the same audio file. The sound stopped when a possible flag was mentioned in the case-study and a comment box appeared to explain why this might be a prognostic factor and to reinforce what had been taught in lesson 2.2.	Scoping review results (stage 1 of the research presented in this thesis)
Lesson 3.1	To highlight the limitations of the lumbar clinical examination	This lesson highlighted the limited evidence that clinical examination has for the lumbar spine and which tests are the most reliable. It was emphasised that there are no gold-standard tests in the clinical examination of the lumbar spine. Combining findings from the case-history, the examination, the practitioner's experience and the patient's context, preferences and values was advised.	Scoping review results (stage 1 of the research presented in this thesis) + Cohen SP. and Raja SN. 2007, Delitto A. et al. 2012, Freeman M. D. et al. 2010, Haggman S. et al. 2004, NIJS J. et al. 2015.
Quiz after lesson 3.1	To apply knowledge on lumbar spine examination from lesson 3.1. with a scenario-based approach	This lesson used a scenario-based approach. Participants were expected to use the knowledge obtained in lesson 3.1. Response options were defined but responses were not obvious and each one generated detailed feedback.	Scoping review results (stage 1 of the research presented in this thesis)

Lesson 4.1	To apply knowledge from previous lessons in a case-scenario with a mainly biological component. To analyse what possible mechanisms may be underlying the patient's presentation. To reflect on an example of bad practice.	This lesson was a PDF document of a clinical transcript of a case history and clinical examination of a patient with NSLBP with a mainly biological component presenting to an osteopath. It was a non-example: the practitioner was behaving in a way that was increasing the risk of the patient developing chronic symptoms.	Scoping review results (stage 1 of the research presented in this thesis)
Quiz after lesson 4.1	To apply knowledge from previous lessons in a case-scenario with a mainly biological component. To analyse what possible mechanisms may be underlying the patient's presentation.	Participants were asked through Q&A to think about possible mechanisms that may underpin the patient's presentation. Participants were asked to draw from the history and examination possible red flags and psychosocial factors including factors related to the therapeutic alliance.	Scoping review results (stage 1 of the research presented in this thesis)

Lesson 4.2	To teach nociception pain mechanism.	This lesson provided information on nociception in a deductive manner based on the case-study in lesson 4.1 which was mainly nociceptive. This lesson described in simple terms what nociception is, how nociception differs from pain, and what influences nociception.	Bogduk N. 2005, Brinjikji W. et al. 2015, Nijs J. et al. 2015, Smart K. et al. 2011, Smart K. et al. 2012, Woolf C. et al. 1998.
Lesson 4.3	To explain how psychosocial factors may influence the course of NSLBP. To explain the differences between acute and chronic pain	This lesson described the differences between acute and chronic pain and possible risk factors of chronicity (PS factors). Participants were asked first to note in their notebook what pain is, what the differences are between acute and chronic pain, and how these differences influenced the way they approached and treated patients. The lecture was theoretical but very engaging: images of optical illusions and clinical examples were used in order to make it an enjoyable experience for the participants and clinically relevant to them. Pain being context-dependent was explained in order to deconstruct the belief participants may have that pain is a sign of tissue damage. Possible implications for treatment and advice were then discussed. Challenges of osteopathic treatment for chronic pain were introduced.	Baliki MN. et al. 2012, Hashmi J. A. et al. 2013, Moseley G. L. 2007, Smart K. et al. 2011, Wand B. M. et al. 2011.

Quiz after lesson 4.3	To allow participants to reflect on lesson 4.3 on the differences between acute/chronic	A 10-item quiz explored some possible misconceptions practitioners may have on pain to reinforce the content of lesson 4.3.	Lehman G. 2014.
Lesson 4.4	To allow participants to apply knowledge from previous units and lesson 4.3 in a case-scenario with mainly a psychological component. To allow participants to analyse what possible mechanisms may be underlying the patient's presentation.	This lesson provided a case-study where the case history and clinical examination of an actor patient were video-recorded. The patient was complaining of chronic NSLBP, presenting with a strong psychological component of her symptoms. The content of this lecture highlighted the differences between acute and chronic presentations and the possible implications for treatment.	Scoping review results (stage 1 of the research presented in this thesis)
Quiz after lesson 4.4	To reflect on the case-scenario presented in Lesson 4.4 of patient presenting with NSLBP with mainly a psychological component	The questions were related to the case-scenario presented in Lesson 4.4. They related to case-history findings, examination choices and management considerations including psychosocial management.	Scoping review results (stage 1 of the research presented in this thesis)

Lesson 4.5	To teach the central sensitisation pain mechanism	This lesson described in simple terms what central sensitisation is, what influences central sensitisation and what the most common signs of central sensitisation are.	Acerra N. and Moseley G.L. 2005, Gifford L. 1998, Moseley G. L. et al. 2012, Nijs J. et al. 2015, Nijs J. et al. 2014, Smart K. et al. 2011, Smart K. M. et al. 2012	Item available in the Extra Content Folder once participants completed this lesson: Central sensitisation Inventory
Lesson 4.6	To allow participants to apply knowledge from previous lessons in a case-scenario with a mainly social component and to analyse what possible mechanisms may be underlying the patient's presentation	This lesson was a written case-history informed by the vignette used by Bishop et al. 2008. This case-history was the last one of the course. Following the written case-history, a 4-item quiz was used. It was based on questions Bishop et al. used in their study.	Bishop A. et al. 2008.	

Lesson 5.1	To teach participants the NICE guidelines LBP pathway and available management options recommended in guidelines	First the NICE pathway was shown using the interactive pathways on the NICE website, then informed consent was explained, including the need to inform patients on alternative treatment options (including seeking no treatment), and then the recommended and not recommended treatments were listed based on a summary of clinical guidelines used in the scoping review.	Ashton J. et al. 2004, Burton A. K. et al. 2006, Chiodo A. et al. 2010, Chou R. et al. 2007, Clinical Guideline Subcommittee on LBP. 2010, Dagenais S. et al. 2012, Delitto A. et al. 2012, Goertz, M., et al. 2012, Hildebrandt J. et al. 2005, Koes B. W. et al. 2010, Oostendorp R. et al. 2004, Savigny P. et al. 2009, Toward Optimized Practice 2009, Van Tulder M. et al. 2004.	List of items available in the Extra Content Folder once participants completed this lesson: - an open-source neuroscience education workbook - a list of the alternative treatments recommendations - a link to the NICE pathway for LBP - a PDF of the NHS pathway for LBP

Lesson 5.2	To explain to participants how communication can affect the therapeutic alliance, how to enhance their communication skills, and to discuss the two types of reassurance that are described in the literature and their effects on patient outcomes	This lecture was a PowerPoint presentation designed and developed by Steven Vogel. The aims were to review the standards of practice relating to communication, to explore different types of communication skills, to provide an example of a structure, to discuss problems and information giving, to provide some practical examples and finally to review and discuss reassurance in practice.	Linton et al. 2008, Pincus et al. 2013, Silverman et al. 2005.
Lesson 5.3	To highlight the value and challenges of consent in a manual therapy context	This video was an interview of Steven Vogel by Jerry Draper-Rodi on consent.	N/A

Lesson 5.4	To discuss the possible psychosocially informed management options in a manual therapy context	This lecture discussed findings from trials that assessed manual therapy with a psychosocial component and found positive effects on patient outcomes. The lecture detailed the content of these interventions. The lecture continued with how work advice could be provided to patients (including the use of fit notes).	Asenlof P. et al. 2009, Brunner E. et al. 2013, Hill J. C. et al. 2011, Gifford L. 1998, Kamper S. et al. 2014, Kendall NAS. et al. 2009, Lehman G. 2014, Synnott A. et al. 2015, Vibe Fersum K. et al. 2013.	List of items available in the Extra Content Folder once participants completed this lesson: - STaRT Back screening tool - 'Advising patients about work' document - 'Psychosocial management': document prepared by Dr Serena McCluskey and Prof Kim Burton
Lesson 5.5	To summarise the e-learning programme content and to add external validity to the content	This video was an interview with Prof Peter O'Sullivan. It discussed common misunderstandings on back pain and what therapists can do about them.	N/A	Item available in the Extra Content Folder once lesson completed: - a booklet on 'Managing your back pain'
Lesson 5.6	To thank participants and ask them to inform the researcher of their course completion	This lesson consisted of a short section of text to thank participants for their participation and to ask them to email the researcher that they had completed the course. The process was explained once more: they were going to be asked to fill in some questionnaires, would receive a CPD certificate and might be invited for an interview that they could accept or decline.	N/A	

Extra Content Folder	To provide extra material to participants related to content discussed during the e-learning programme	Documents in the Extra Content Folder were available once the lesson that mentioned these documents was completed (conditional activity): - after Lesson 1.2: a red flag document, - after Lesson 4.5: the Central Sensitisation Inventory, - after Lesson 5.1: an open-source neuroscience education workbook, a list of the alternative treatments recommendations, a link to the NICE pathway - after Lesson 5.4: the STarT Back Screening Tool, a document named Advising patients about work and information on psychosocial management - after Lesson 5.5: a booklet on Managing your back pain	Red flag document: Downie A. et al. 2013. Alternative treatments recommendations was informed by the review carried out in the research presented in this thesis on treatment options recommended in guidelines. Information on psychosocial management provided by Dr McCluskey and Prof Burton.

8.6. Implementation

The implementation stage consisted of the installation and distribution of the e-learning programme, and managing of participants' activity.

8.6.1. Installation

The e-learning programme was installed on a Modular Object-Oriented Dynamic Learning Environment (Moodle), a free e-learning platform that runs without modification on Unix, Windows and MacOS. Moodle is widely used with more than one million users around the world (Ghirardini 2011). The British School of Osteopathy uses Moodle as its virtual learning environment. The researcher installed the e-learning programme with the support of the BSO Information Technology (IT) team. The IT team provided the participants' usernames and passwords to access the e-learning programme. The IT team trained the researcher on how to create units and lessons on Moodle and how to develop quizzes. Conditional activity was enabled: participants could access a lesson only when the previous one had been completed. This ensured that the sequencing would be respected (see section 8.4.3). It was also applied to the Extra Content Folder: a document became accessible only once the lesson that mentioned it had been seen. For quizzes participants were not asked for a 'pass' grade but to attempt the quiz at least once to access the subsequent lesson. The aim of the quizzes was to reinforce the LO. It was expected that participants would engage more actively with the content while answering quizzes, and LO would be reinforced with the different feedback. This reflection pre-feedback and then feedback at the end of each quiz offered an active learning activity during which participants could reflect on their understanding and go back to previous lessons (feedback mentioned where in previous lesson they could get more information if their answer was incorrect, e.g. feedback for question 5 in Quiz 4.4).

8.6.2. Formative evaluation

Formative evaluations are not common and most evaluations are conducted after interventions have been delivered (Hickey, Johnson et al. 2011, Asarbakhsh and Sandars 2013). The purpose of this early evaluation was to ensure that the set-up, login procedures and platform on which the learning was situated would be easily accessible to participants even with basic IT skills. A 70-year old person with basic skills in IT tested the e-learning programme. As participants were going to have a minimum of 15 years of practice, it was decided to test the e-learning programme on a person who did not use informatics during their education and had a limited use of it in their professional job. The e-learning programme was installed on Moodle by the researcher using mainly a PC. The tester used an iMac that the tester was used to, that helped to assess the e-learning programme compatibility. The tester received a username and password to access the e-learning programme. This person provided a very detailed feedback. After the changes following the tester's feedback, the programme was easy to open and to take to completion. This was verified by the researcher. The feedback received is divided below into topics. Each topic starts with the problem encountered by the tester, and then the solution provided to it is explained. Solutions were discussed with the tester to verify that they would solve the initial problem encountered.

8.6.2.1. Video size

- Problem: the tester had difficulty seeing the top and bottom of the video for lessons 2.1, 2.3 and 2.4. The tester estimated that there was less than 5% of the video screen missing.
- Solution: these videos could be watched from other iMacs with no trouble. The resolution of the tester's iMac was limiting the video size.

8.6.2.2. YouTube related videos

- Problem: once a video is finished on YouTube other videos are offered by YouTube. The tester was not sure if these videos were part of the course.

The videos were related to previous videos the tester had watched and were not related to the e-learning programme. The tester found this distracting.

- Solution: when a YouTube video is embedded on Moodle, there is an option to deactivate YouTube offering related videos at the ends of videos. All the embedded video links were changed so as to not have these related videos at the end of each video lectures.

8.6.2.3. *Lack of instructions*

- Problem: lessons 2.1 and 2.3 lacked instructions on what to do with the answers.
- Solution: text preceding the video made more explicit what was expected from the participants and when they would go back to their answers.

8.6.2.4. *Subtitles*

- Problem: three YouTube videos (lesson 1.2, lesson 5.2 and lesson 5.3) offered the possibility of adding subtitles to the video. These subtitles were automatically created by YouTube. While this could be a good tool to help participants who may have a hearing impairment, the quality of the subtitles was very poor and did not provide an accurate transcription of the lectures.
- Solution: on the YouTube website, under the video manager section, the subtitles for these three videos were deactivated with the command *subtitles and cc > action > unpublish.*

8.6.2.5. *Access to lessons*

- Problem: after taking *Quiz after lesson 2.2*, the tester could not access *Lesson 2.3*. The setting on Moodle correctly indicated though that *Quiz after lesson 2.2* had to be complete to access *Lesson 2.3*. The same problem occurred after taking *Quiz after lesson 4.3* and *Lesson 4.6 (quiz based).*

- Solution: the settings in *Quiz after lesson 2.2, Quiz after lesson 4.3* and *Lesson 4.6* (quiz-based) were different from the other quiz settings. Two options were ticked: “Student must receive a grade to complete this activity” and “Require passing grade”. The other quizzes only had the first option ticked. “Require passing grade” was unticked from these three quizzes.

8.6.3. Distribution of the e-learning programme

8.6.3.1. Course components

Course components are usually used for instructor-led courses. The e-learning developed for this research was a self-paced e-learning programme but some of instructor-led course components informed the implementation process of the e-learning programme, as this promotes participants’ motivation (Ghirardini 2011). A *kick-off event* was used: participants who were included in the study received an email where they were invited to fill in questionnaires. The email also mentioned the course goals and agenda but not in too much detail to prevent it affecting participants’ responses to the questionnaires. An *initial learning activity* was then sent to the intervention group participants. They received an email with their username and password to access the e-learning programme. The email also included a direct link to lesson 1.1 that introduced the course goals and agenda in greater detail than in the previous email. It included a short video of the researcher explaining why he decided to carry out this research and the effects of a BPS approach on his practice. The e-learning then differed from instructor-led courses as participants were free to complete the course at their own pace within a 6-week period. The course ended with a *conclusion,* and *feedback* was gathered from the participant. When the intervention group participants were asked to fill in the ABS-mp and PABS when the course was completed, a short satisfaction course survey was also sent. It consisted of 5 closed questions and 2 open questions, described in in section 9.5.9.4.

8.6.3.2. Communication tools

E-learning activities did not need to be led by the researcher, but communication was needed and most of it was done by email, including sending questionnaires and informing participants of their group allocation, username and password to access the e-learning programme. Phone calls were made when participants initiated them as they had the researcher’s phone number or when the researcher needed to get in contact rapidly with a participant or if a participant was not answering emails.

8.7. Evaluation

8.7.1. Content evaluation

The BCW table (described in section 8.4.2) was used to verify that the content of the e-learning matched the conditions the e-learning required to maximise effectiveness of the programme in changing practitioners’ behaviours, and hence attitudes to back pain.

A new column, named *Designed elements in the programme*, was added. Each condition resulted in a list of designed elements that covered topics related to the condition. Designed elements were described by the *name of the lesson*, the '*intervention function*' that had been included using Michie's terminology: Education, Persuasion, Incentivisation, Coercion, Training, Restriction, Environmental restructuring, Modelling, Enablement (the intervention function was printed in red to enhance the readability of the document), and finally a short description of which aspect of the lesson covered the condition. Another column was added to list the anticipated outcomes of these designed elements, based on the internal and external conditions necessary for the e-learning to be effective. Please see *Appendix L – Behaviour Change Wheel e-learning post-development* to access the full list of designed elements and anticipated outcomes for each internal and external conditions.

8.7.2. Quality evaluation

The ECBCheck tool was used to assess the quality of the e-learning programme. The assessment was done by the researcher using the online version of the tool (http://www.ecb-check.net/). Each criterion of the tool checklist required a description of the component of the e-learning programme that it was fulfilling and for documents to evidence it. The e-learning programme was also submitted for peer-review on the same website on 14/02/2016 but no feedback has been received so far. Based on the researcher's assessment using the online ECBCheck tool, the e-learning programme scored 93% of maximal score. The ECBCheck tool recommended that the content should be provided in a flexible manner, allowing for different learning pathways to improve the e-learning programme. See *Appendix M – ECBCheck Tool result* for more details on the score.

8.7.3. Confirmative evaluation

A mixed methods feasibility study was performed to evaluate the feasibility and acceptability of the e-learning programme on the participants' attitudes to back pain. The study is detailed in the next chapters (9 to 11).

8.8. Chapter conclusion

An e-learning programme was developed using the different phases of the ADDIE model. The BCW model was used to list the conditions required from the participants to implement a BPS approach when managing patients with NSLBP. This led to the design of a table that was used to evaluate the content of the e-learning programme. It demonstrated that there were designed elements for all important conditions listed. A formative evaluation was conducted with a user testing the e-learning programme and modifications were carried out. The quality of the e-learning was highly rated using the ECBCheck tool.

9. Evaluation of the e-learning programme: methods

9.1. Chapter summary

This chapter describes the methods used to evaluate the e-learning programme developed on NSLBP and the BPS model, detailed in chapter 8. The mixed methods sequential explanatory design consisted of both quantitative and qualitative strands. The quantitative strand was a feasibility RCT that evaluated the feasibility and acceptability of the e-learning programme with experienced osteopaths. The qualitative strand explored a sample of participants' views on the e-learning programme using semi-structured interviews. Philosophical assumptions and theoretical foundations are discussed in this chapter.

9.2. Research question

What is the acceptability, feasibility and likely impact of a biopsychosocially structured e-learning programme for non-specific LBP on experienced osteopathic practitioners' attitudes to back pain?

9.3. Aims

Following the research question the aims of the mixed methods evaluation were to assess the feasibility of a main trial (concerning data collection questionnaires, the randomisation procedure, the acceptability of the intervention, the recruitment and the consent processes), the feasibility and acceptability of the e-learning programme, and its impact. These were addressed using both quantitative (questionnaires and satisfaction survey) and qualitative (semi-structured interviews) methods designed to get a deeper understanding of participants' experience in taking the e-learning programme.

The methods are presented following the chronological order in which the study was performed (quantitative followed by qualitative strand).

9.4. Philosophical and theoretical assumptions

9.4.1. Philosophical assumptions

The way researchers envisage the nature of reality (ontology), the way knowledge is gained (epistemology), the role values play in research (axiology) and the process of research (methodology) influence the paradigm underlying a research design (Creswell and Clark 2011). The researcher's paradigm during this evaluation was pragmatic. Pragmatism is centred around the concept of human experience and rejects the distinction between realism and anti-realism; instead it recognises that our experiences are constrained by the nature and our understanding is limited to our interpretations of our experiences (Morgan 2014). This leads to a pragmatist position where the value of all research methods is acknowledged and where qualitative and quantitative approaches are seen as filling each other methodological gaps (Onwuegbuzie and Leech 2005, Morgan 2014). To assess the feasibility of running a main trial, the acceptability and the likely impact of the intervention, the emphasis of the mixed methods and analytic stance for the feasibility study presented in this thesis was on the quantitative analysis. The qualitative strand was used to analyse what the quantitative strand could not explore, including participants' views on the implementation of the BPS model. This quantitative emphasis followed the recommendations for explanatory mixed methods design (Creswell and Clark 2011). The epistemological stance was practical in the sense that the researcher collected data using tools that "worked" to answer the research question. In order to understand what could work, the methodology used was pluralistic in nature, combining multiple methods of data collection to answer the research question. Its ontological stance was both singular (believing that there might be a single theory that could explain a phenomenon) and multiple (believing that it is important to assess varied individual inputs to understand the nature of the phenomenon). It was singular when using the attitudinal questionnaires as the underlying assumption was that these tools could measure something that already existed. It was multiple in conducting the semi-structured interviews, as it was assumed that experiences from different individuals were needed to understand the experience of taking the e-learning programme. The axiology varied, as the researcher's perspectives were sometimes less prone to bias (e.g. when analysing the quantitative data) and sometimes more prone to bias (e.g. when analysing the qualitative data). Strategies were used to minimise the researcher's biases when assessing the data and to enhance the trustworthiness of the analysis (detailed in section 11.5.1.2 Mixed methods study quality).

9.4.2. Theoretical foundations

Theoretical foundations in mixed methods are a stance taken by the researcher that provides directions throughout the different stages of the research (Creswell and Clark 2011: 47). The study was informed by social science theories based on an attitudinal change model (Cacioppo, Petty et al. 1994) and a behavioural change model (Michie, Van Stralen et al. 2011).

9.5. Ethical considerations

The research was approved by the British School of Osteopathy Research Ethics Committee (see appendix CC – Letter of ethical approval). The ethical considerations for the mixed methods feasibility study are presented for each strand:

9.5.1. Quantitative strand ethical considerations

Autonomy: Recruitment material was only sent in a written format to not be coercive. The information sent detailed the purpose and content of the study. It allowed participants to make informed decisions about the study. Participants were allowed enough time to decide to take part or not in the study. Participants who decided to take part in the study signed a consent form before starting the study to evidence their informed decision to participate in this study.

Beneficence: The e-learning programme content was evidence-informed offering participants the most up-to-date knowledge on the topic, in accordance with the NICE guidelines (Savigny, Kuntze et al. 2009). LBP is the most common symptom encountered by osteopaths (Orrock 2009; Fawkes 2010) and BPS model is recommended in the NICE guidelines (Savigny, Kuntze et al. 2009) and in the osteopathic literature (Penney 2010; Penney 2013).

Non-Maleficence: No harm was expected to result from participating in the study. It was reminded to participants before starting the e-learning programme that they could decide to withdraw from the study without needing to provide any explanation. It was made clear to the participants that this study was not an assessment of their fitness to practise and that the researcher was looking at osteopaths' attitudes rather than at safety. If there was a conflict arising between the participants' experience and attitudes and the evidence-informed content of the e-learning package, participants were reminded that Evidence-Based Medicine approach does not only rely on best evidence but also on practitioners' experience and patient's values (Sackett, Rosenberg et al. 1996). It was also reminded to participants that all data were anonymised in order to avoid participants to feel anxious that their identity would be known.

Justice: The participants that were invited to take part in the study had not been selected on their class, socioeconomic status, or race. Participants needed to have 15 years of experience in order not to have had undergraduate training in the BPS model.

Confidentiality: Osteopaths were allocated codes and the data gathered from the questionnaires were analysed anonymously.

Integrity: The researcher had no conflicts of interest in this study. No financial gains or favours for family and friends were expected from this study.

9.5.2. Qualitative strand ethical considerations

Confidentiality: Participants were not called by their names during their interview and they were reminded before the interviews that they should not disclose information about patients that might be identifying, such as names. If this happened during interviews, transcripts were anonymised.

Autonomy: Recruitment material was only sent in a written format to not be coercive. The information sent detailed the purpose and content of the study. It allowed participants to make informed decisions about the study. Participants were allowed enough time to decide to take part or not in the study. Participants who decided to take part in the study signed a consent form before starting the study to evidence their informed decision to participate in this study.

Beneficence: Osteopaths were interviewed about their attitudes and beliefs regarding non-specific LBP. There was a minimal risk of harm as they talked about things they do every day in practice so the discussions had little risk of causing distress. Participants were reminded that they could withdraw from the study at any time (including after the introductory explanations) and without needing to give reasons and without penalty. If any distress was noted, the interviewer verified participant well-being by calling the participant 48 hours later. The BSO provided psychological support if participants needed it. This was covered by the BSO insurance, as stated in the BSO policy.

Non-Maleficence: No harm was expected to result from participating in the study. It was nevertheless reminded to participants before starting the individual interview that they could decide to withdraw from the study without needing to provide any explanation. It was made clear to the osteopaths that this study was not an assessment of their fitness to practise and that the researcher was looking at osteopaths' attitudes rather than at safety. The risk of needing to disclose details of participants' practice to the GOsC was insignificant. If there was a conflict arising between the participants' experience and attitudes and the evidence-informed content of the e-learning package, participants were reminded that Evidence-Based Medicine approach does not only rely on best evidence but also on practitioners' experience and patient's values (Sackett, Rosenberg et al. 1996).

Justice: The participants that were invited to take part in the study had not been selected on their class, socioeconomic status, or race. Participants needed to have 15 years of experience in order not to have had undergraduate training in the BPS model and to have taken part in the quantitative strand of the mixed methods feasibility study.

Integrity: The researcher had no conflicts of interest in this study. No financial gains or favours for family and friends were expected from this study.

9.6. Quantitative strand

This section describes the methods used to assess the study feasibility. The section follows the CONSORT guidelines (Moher, Hopewell et al. 2010) to describe the trial design, the recruitment methods used in the feasibility RCT, the inclusion criteria implemented, the interventions for each group, the outcome measures and the sample size (Moher, Hopewell et al. 2010). The section ends with the methods used for the effect size calculation to be used in a main study to estimate the sample size required.

9.6.1. Feasibility

Following Lancaster's recommendations for feasibility studies (Lancaster, Dodd et al. 2004, Lancaster 2015), the feasibility and acceptability of the study were evaluated. This included adherence to the study protocol, the recruitment strategies, the recruitment and retention rates, the eligibility criteria, the randomisation procedures, the data collection, the acceptability of the intervention and the acceptability of the outcome measures, and provided an initial estimate for sample size calculation for a future main RCT.

9.6.2. Trial design

The study was a feasibility RCT with a parallel design. The allocation ratio between the intervention group and the control group was 1:1. There were no important changes to the methods after the trial started.

9.6.3. Participants

9.6.3.1. Eligibility criteria

To be eligible for the study osteopaths had to:

- be an osteopath practising in the UK,
- have a minimum of 15 years' practice experience (although trained in subjects such as psychology or sociology within the context of holistic care, they would not have been introduced to the BPS model in their undergraduate professional education),
- agree to take part in the study and provide written consent,
- not have been involved in osteopathic education in the last ten years: as the BPS model is taught in Osteopathic Educational Institutions (OEIs), osteopaths could have encountered the BPS model while teaching.

9.6.3.2. Recruitment

Different media sent to different groups were used to invite osteopaths to take part in the study. A description of each is listed below. Each communication (see Appendix N – E-learning programme email, Appendix O – E-learning programme letter to regional groups, Appendix P – E-learning programme Email to the National Council for Osteopathic Research, Appendix Q – e-learning programme Email to magazine editors) was accompanied with information on the study (see Appendix R – Participant Information Sheet), a consent form (see Appendix S – Consent form) and a contact form (see Appendix T – Contact form).

Various media were used to recruit participants to try to minimise the limited amount of available time private practitioners may have.

- Emails to osteopaths

The GOsC database of osteopaths who agreed to be contacted for research purposes was used. 1000 osteopaths were contacted in September 2015. They each received an email personalised with their name using FirstClass Mass Mailer.

- Emails to regional groups

A list of osteopathic regional groups was accessed on the Institute of Osteopathy website (Osteopathy 2015). They were contacted by email on 31/08/2015.

- Email to NCOR and research hubs

The NCOR is a coalition of stakeholder organisations concerned with the quality of osteopathic patient care. It aims at providing leadership and unity in osteopathic research development (NCOR 2015). NCOR was contacted by email on 31/08/2015 using their website contact form. A copy of the introductory letter outlining the nature of the study was used (see Appendix P – e-learning programme letter to the National Council for Osteopathic Research) and an email address was requested to send the rest of the information pack. The aforementioned documents were then sent to the email address provided.

- Adverts in professional journals

The editors of *Osteopathy Today* (the iO journal) and *The Osteopath* (the GOsC journal) were contacted on 09/07/2015 to ask if they could publish an advert in the September edition of their journals to help with the recruitment of participants. An introductory letter outlining the nature of the study was used (see Appendix Q – E-learning programme letter to magazine editors) and a poster (see picture in Appendix O – E-learning programme letter to regional groups) was attached as an example of a possible way to advertise the study. The editors decided to also include some written information to increase the likelihood of their readers reading the piece, in an editorial for *Osteopathy Today* and in an article for *The Osteopath*. Information required by the editors was provided to support their needs.

- Extra information sent

Osteopaths who were not informed by email (e.g. heard about the study from reading about it in a magazine or during a talk given by NCOR or to a regional group) and who were interested in taking part in the study contacted the researcher. If the initial contact was by phone or text, an email address was requested. An email with the information pack was sent.

No financial incentives were offered to take part. Offering a free CPD may be perceived as an inducement but in this group of experienced professionals it was not anticipated that it would result in participants feeling coerced into participating.

Recruitment was done in writing. The wording chosen presented the material in a factual manner in order to avoid putting pressure on potential participants and to decrease the risk of a possible ceiling effect if only osteopaths with a special interest in the BPS model were recruited. To prevent this occurring, the advertising material for this study did not mention the BPS model but only NSLBP. Owing to the limited time available to osteopaths in private practice and the restrictive inclusion criteria (described above), it was expected that the recruitment rate of participants might be low.

9.6.3.3. Consent and contact forms

To be included, osteopaths had to complete a contact form and sign a consent form. The contact form provided administrative details of the participants (including their address, phone number and preferred day and time to be contacted) and was used to verify that participants fitted the inclusion criteria (15 years of practice and not teaching in the last 10 years).

9.6.3.4. Confidentiality

To ensure participants' confidentiality, they were allocated codes. The website www.random.org was used to generate a random string that was then used for participants' codes. These codes were the participants' usernames to access the e-learning programme website. Passwords were generated by the BSO IT team. Questionnaires sent to the participants used the same codes as identification to allow the analysis to be performed anonymously. Only the researcher and the research team had access to the file establishing the identity for each participant code.

9.6.3.5. Settings and locations where the data were collected

The questionnaire data were collected either electronically by email or in hard copy through the post.

9.6.4. Intervention

The e-learning programme developed for this study (detailed in chapter 8) was the intervention used in this feasibility RCT. The e-learning itself took 6 hours and 45 minutes to complete. It was expected that participants would require 75 minutes to access the extra content material and reflect on the content. All participants were informed that the course would require a total of 8 hours over 6 weeks. The intervention group was invited to take the e-learning programme and had access from 19/10/2015 for 6 weeks. The control group participants were put on a waiting period during which time the intervention group took the e-learning programme. The control group participants were invited to take the course on 06/12/2015 and had 6 weeks to complete the e-learning programme.

9.6.5. Outcomes

9.6.5.1. Questionnaire - baseline

All participants (intervention and control) were asked to complete the initial questionnaire (see Appendix U – Questionnaire pre-study). The questionnaire first recorded the characteristics of the participants: gender, age, years in practice and their professional special interests. Following the discussion on attitudes and behaviour in section 2.5, the questionnaire also included two validated attitudinal measures: the Attitudes to Back Pain Scale for musculoskeletal practitioners (ABS-mp) and the Pain Attitudes and Beliefs Scale

(PABS). The ABS and PABS were not named to minimise the possible impact it could have on participants' answers. It was decided not to use an online survey service (e.g. survey monkey) to enable the researcher to match each participant's answers before and after the intervention while securing participants' anonymity. The attitudinal questionnaires were sent in Word documents, each of which had been personalised by the researcher with the participant's ID number. Participants could print out the questionnaires and post a completed hard copy of the questionnaires or complete the questionnaires electronically and return them by email. The questionnaires were protected to restrict how much editing could be done without a password. This was to ensure that participants could not change the content of the questionnaires, which could have affected the usability of their responses, and to provide drop-down menus for each question with Likert scale items.

9.6.5.2. Questionnaire – follow-up

- Intervention group

The last lesson of the e-learning programme (lesson 5.6: Farewell my friends) prompted participants to inform the researcher on completion of the e-learning programme. The researcher verified the completion from the administration panel on the e-learning programme, and then sent the final questionnaire. The questionnaire post-study included the ABS-mp (unnamed) and the PABS (unnamed) and finished with a short satisfaction survey (see Appendix V – Short satisfaction survey). The satisfaction survey assessed participants' satisfaction with the e-learning programme and their acceptability of the intervention. Participants were asked to rate their satisfaction with the e-learning programme, the interest of the e-learning programme, and the clarity of the teacher, using 5-point satisfaction Likert scales (Vagias 2006). Their agreement that the e-learning programme provided a new perspective on NSLBP and the applicability of the e-learning programme in their practice were recorded using 7-point agreement Likert scales (Vagias 2006). The questionnaire also had two open questions: one to list the three most useful things they had learned in the e-learning programme and one for general feedback.

- Control group

The control group also received a follow-up questionnaire that included the ABS-mp (unnamed) and PABS (unnamed). It did not include the satisfaction survey as the control group had not taken the e-learning programme when completing the follow-up questionnaire.

9.6.6. Sample size

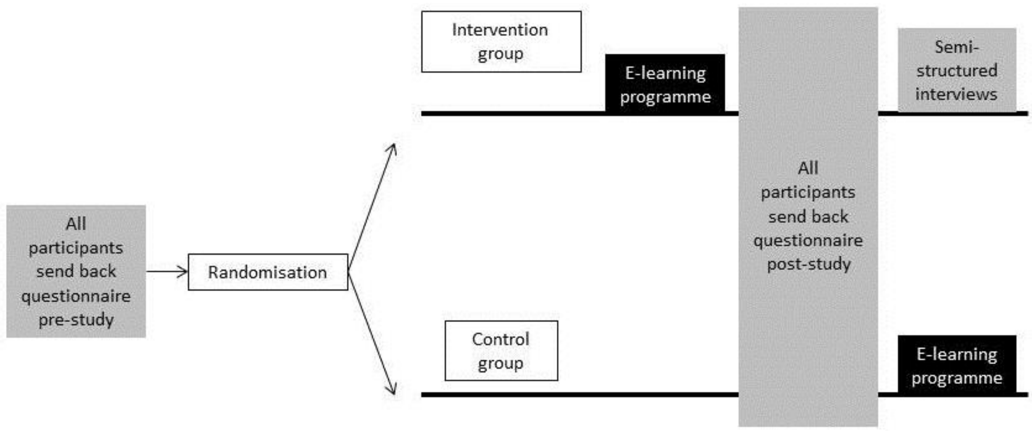
As this was a feasibility study, a formal sample size calculation was not done. While some authors argue that a feasibility study should have a formal sample size calculation to improve subsequent power calculations reliability (Cocks and Torgerson 2013), the data that would have been needed for the sample size calculation prior to running the pilot study were not available. It is currently unknown what change on the ABS-mp or PABS scores is meaningful. 70 participants is sometimes recommended to allow good precision in the estimate of the standard deviation (Teare, Dimairo et al. 2014), but this target is often a challenge for feasibility studies (Billingham, Whitehead et al. 2013). Following guidance on participant numbers for feasibility studies (Lancaster, Dodd et al. 2004, Cocks and Torgerson 2013) allowing for the testing of the practical feasibility, the statistical analysis plans, and the research risks (including the risks that the study aims will not be achieved) (Moore, Carter et al. 2011), a total sample of 50 participants was sought for inclusion in the feasibility RCT. This number also follows recommendations on how feasibility RCTs can provide reliable standard deviation estimates for a power calculation (Sim and Lewis 2012).

This study aimed to provide preliminary data on experienced osteopaths' attitudes to back pain after completing an e-learning programme for non-specific low-back pain. The data from this feasibility RCT could then be used to inform a main RCT in the future, including determining how many participants would be needed in order to get enough power to detect differences in attitudes.

9.6.7. Randomisation

The randomisation procedure was implemented by the researcher. Once all pre-study questionnaires were received, the RAND function in Excel was used to generate a sequence and randomise participants into two groups: the first half was allocated to the intervention group and the second half to the control group (see Figure 9.1 – Study design).

Figure 9-1 - Study design



9.6.7.1. Intervention group

Participants assigned to the intervention group received a personalised email (see Appendix W – Intervention group letter) informing them of their group allocation, the e-learning programme website address to use to access the e-learning programme, their username and password to log onto the website and the date the e-learning programme had to be completed by, and they were reminded they might be invited for an interview after the e-learning programme. The email also had a link directing them to the first video of the e-learning programme (Lesson 1.1: introduction) which explained the technicalities of the e-learning programme. Participants' progress was monitored once a week using the e-learning programme administration panel on the e-learning programme website. Participants who had not logged on for seven consecutive days were contacted by email. Technical support was offered and they were reminded of the completion deadline. When participants did not reply to the email and did not log onto the website the following week, they were contacted over the phone during their preferred day/time they had indicated on their contact form. If a phone contact was made but participants failed to log on the following week, a text message was sent to remind them of the deadline for completion. The different contacts made to monitor participants' progress were recorded: the list detailed how participants were contacted, summarised the content of the discussion and included a comment section for when participants provided information that needed to be recorded on their completion status.

9.6.7.2. Control group

Participants assigned to the control group received an email (see Appendix X – Control group letter) informing them of their group allocation and the date when they were going to be able to start the e-learning programme. Participants were also reminded that they would need to fill in questionnaires before taking the e-learning programme.

9.6.8. Blinding

Participants and the researcher who collected and analysed the data were not blinded in this feasibility RCT.

9.6.9. Statistical methods

All statistical analyses were performed using IBM SPSS version 22 (IBM Corp, Armonk, New York). Being a feasibility study, the analysis was descriptive and focused on point estimates and 95% confidence intervals (Lancaster, Dodd et al. 2004, Thabane, Ma et al. 2010, Moore, Carter et al. 2011). The primary aim was to assess if the outcome measures chosen were appropriate and could be used in a bigger study and the secondary aim was to describe differences between groups before and after the completion of the e-learning programme.

9.6.9.1. Demographics

Demographic data were summarised as follows: gender and specialism using frequencies and percentages; age group using median and interquartile range; and years in practice using means and standard deviations. Details on specialism were analysed using content analysis. The results were categorised and reported quantitatively.

9.6.9.2. ABS-mp

The 6 ABS-mp domains were used for the statistical analysis. As per the developers' instructions, items 2, 6, 11, 16, 18 were reversed to allow their inclusion in the analysis of the subscores. Domain LS (limitations on sessions) includes items 14, 9, 6 (reversed) and 18 (reversed). Domain PS (psychology) includes items 1, 3, 5 and 11 (reversed). Domain CHS (Connection to health care system) includes items 7, 16 (reversed) and 19. Domain CC (confidence and concern) includes items 2 (reversed) and 12. Domain RA (Reactivation) includes items 8, 10 and 15. Domain BM (Biomedical) includes items 4, 13 and 17.

- Within-group changes

The 6 ABS-mp domain changes before and after the intervention were independently presented for each group with means and confidence intervals. Confidence levels were set to 95%. The value of no effect was 0. If the confidence intervals included the value of no effect the observed effect was considered statistically not significant (Attia 2005).

- Between-group changes

The 6 ABS-mp domain between-group changes before and after the intervention were presented with means and confidence intervals. The value of no effect was 0.

9.6.9.3. PABS

The two PABS domains were used for the statistical analysis. Each item is scored between 1 (totally disagree) and 6 (totally agree). The biomedical domain is calculated by summing scores for items 3, 6, 8, 9, 10, 11, 12, 15, 16 and 19, the behavioural domain is calculated by summing scores for items 1, 2, 4, 5, 7, 13, 14, 17 and 18.

- Within-group changes

The 2 PABS domain changes before and after the intervention were independently presented for each group with means and confidence intervals. The value of no effect was 0.

- Between-group changes

The 2 PABS between-group domain changes before and after the intervention were presented with means and confidence intervals. The value of no effect was 0.

9.6.9.4. Short satisfaction survey

E-learning programme satisfaction, e-learning programme interest, NSLBP new perspective, teacher clarity and e-learning programme application in practice were described using medians, interquartile ranges and percentages. The 'Three most useful things learnt' and 'Other feedback' were analysed using content analysis. The results were categorised and reported quantitatively.

9.6.9.5. Baseline data

Random allocation in RCTs prevents selection bias but groups can still differ. Visual examination of the baseline data is recommended to assess differences in groups but statistically testing for baseline differences is not recommended even though it is often seen. The CONSORT guidelines recommend presenting baseline data in a table but not comparing between group baseline data (Moher, Hopewell et al. 2010). This recommendation was followed in this study.

9.7. Semi-structured interviews

Semi-structured interviewing was used to collect more in-depth views and opinions on the e-learning programme from a convenience sample drawn from the intervention group.

9.7.1. Semi-structured interviews

9.7.1.1. Participants

The Participant Information Sheet informed participants that they might be invited for interview after completion of the e-learning programme (see Appendix R – Participant Information Sheet). In *Lesson 1.1: Introduction of the e-learning programme*, participants were reminded that they might be invited for interview. Convenience sampling was used inviting all participants from the intervention group for interview. An introductory letter outlining the nature of the study and the time the interview was expected to last (see Appendix Y – Interview invitation) was sent with a consent form (see Appendix Z – Consent form interview). Participants who were interested in taking part in the study were asked to send back the consent form completed and signed. The interview was then arranged at a suitable time. Interviews were conducted either face-to-face (at the BSO or at the interviewee's practice) or using a voice-over-IP service (such as Skype®), at the time most convenient for them.

9.7.1.2. Semi-structured interview questions

An interview guide (see Appendix AA – Semi-structured interview questions) was used to collect participants' views on the intervention itself and to explore if and how the e-learning intervention had an impact on their practice. The first part of the interview was about their practical experiences of taking part in the course, the second part was on their views about the content of the course and the last part was on their views on the BPS model, asking them if they had any recent examples in their practice that could suggest how the e-learning intervention had had impacted on their practice.

9.7.1.3. Semi-structured interview process

The interview was expected to last between 20 and 40 minutes. Before starting the interview, the researcher asked the participant if they had any questions about the consent form. The participant was reminded that they could withdraw from the study at any time (including after the introductory explanations) without needing to give reasons and without penalty and was asked to keep the interview confidential, i.e. to not mention patients' or colleagues' names. If the interview was face-to-face, the researcher and participant sat alone in the same room and the recording device was placed between them, in view of both. If the interview was done online (using a voice-over-IP service, such as Skype®), the researcher and the participant were both alone in their own rooms. The researcher informed the participant that a recording device was placed near the researcher's computer. Participants' names were not used; their username identification numbers used in the feasibility RCT were used instead to secure their confidentiality. The interview guide led the structure of the interview. A procedure was put in place in case the participant seemed distressed during the interview: the researcher would pause the interview, would give the participant a break and would offer to stop the interview. If the participant wished, the interview would resume. If not, the researcher would verify the participant's well-being by calling the participant a few days later. At the end of the interview, the participant was thanked and offered the opportunity to review the transcript before it was used in the analysis. The researcher then left or stopped the online conversation.

9.7.1.4. Equipment

Computers or tablets connected on the internet were needed when the interviews were done online using a voice-over-IP service, such as Skype®. Participants were audiotaped with:

- Voice memos application® when semi-structured interviews were done face-to-face or on Facetime®. The audiotapes were saved on a password-protected IPhone®.
- the freeware MP3 Skype recorder® when semi-structured interviews were done on Skype®. The audiotapes were saved on a password-protected computer.

9.7.2. Data collection and data analysis

Transcription of interviews has evolved with technological advancements and current recommendations are to combine different transcription methods rather than replacing older methods by the most recent one (Tessier 2012). One method overcomes another method’s weakness, e.g. transcripts overcome field note-taking weakness and audiotape overcomes transcripts’ weakness (Tessier 2012). The interview was therefore transcribed using a six-step reflexive, iterative process of data management (Halcomb and Davidson 2006) that consisted of:

1/ Audiotaping interviews while taking field notes

Interviews were carried out by the researcher, allowing him to familiarise himself with the data (Braun and Clarke 2006). Note-taking included content of the interview as well as feelings and non-linguistic data following Tessier’s recommendations (2012).

2/ Reflective journaling immediately post-interview

Reflective journals were written just after each interview to allow the researcher to expand his comments and perceptions. Doing it himself allowed the researcher to familiarise himself with the data and prevented delaying the progression of the research (Tessier 2012).

3/ Listening to the audiotape and amending/revision of field notes and observations

The audiotapes were listened to while reviewing the field notes and reflective journals to ensure an accurate reflection of the interaction. A different notation system was used to make these editorial changes transparent.

4/ Conducting preliminary content analysis

Once the researcher was confident that the field notes and reflective journals represented an accurate account of the interaction, analysis of the data started. Content analysis requires little interpretation, resulting in greater reliability than other qualitative analysis methods (Namey, Guest et al. 2008). Frequencies reported the number of individual participants who mentioned a particular theme, rather than the number of times themes were mentioned, to prevent over representation of individual participants who could mention a theme several times (Namey, Guest et al. 2008). The process was first done manually and then transcribed in an Excel spreadsheet using structural coding, a question-based coding (Namey, Guest et al. 2008) that facilitated thematic review in step 6.

5/ Secondary content analysis

The preliminary analysis was then reviewed by the first supervisor who did not undertake the initial interviews. The first supervisor reviewed the audiotapes and reflective journals to test audit trails and to validate the themes developed from the data.

6/ Thematic review

The researcher then analysed the secondary content analysis with a theory-driven approach, as themes were conceptually organised in the semi-structured questions (see Appendix AA – Semi-structured interview questions). A theory-driven approach is a structured and reliable approach to data analysis (Namey, Guest et al. 2008). The data were coded identifying themes or patterns. Themes were then reviewed and refined (Braun and Clarke 2006) in order to identify key themes, areas of consensus and differences of opinion between participants. Themes were then defined and named (Braun and Clarke 2006). Thematic analysis offers a more nuanced perspective than content analysis, looking further than word or sentence count (Namey, Guest et al. 2008). Data triangulation was used to assess saturation (Creswell 2012, p. 251 & 433, Houghton, Casey et al. 2013) and it was concluded that data saturation had been reached when interview data were not providing new themes and were fitting into the themes developed from previous interview data. Audiotapes were used to identify illustrative quotes to illustrate themes.

Only the researcher and supervisory team involved in the study had access to the interview transcriptions. All material was stored securely in a locked drawer at the researcher’s practice.

10. Evaluation of the e-learning programme: results

10.1. Chapter summary

This chapter details the results of the mixed methods feasibility study. Results from the questionnaires (demographics, ABS-mp and PABS), the satisfaction survey and the semi-structured interviews are organised according to the aims. The first section describes the participants in the quantitative and qualitative strands. The second section describes the feasibility of running a main trial. The third section describes the feasibility and acceptability of the e-learning programme. The last section explores the impact of the e-learning programme on experienced osteopaths’ attitudes to back pain and reported behaviour.

10.2. Characteristics of participants

10.2.1. Quantitative strand

45 participants took part in the feasibility randomised controlled trial: 23 were randomly allocated to the intervention group and 22 to the control group. The demographics of the participants in both groups are described in Table 10.1 – RCT participants’ characteristics.

Table 10-1 - RCT participants' characteristics

	Intervention group (n=23)	Control group (n=22)
Gender n (%)		
Male	11 (48%)	5 (23%)
Female	12 (52%)	17 (77%)
Age group (number of participants)	30-39 (n=1) 40-49 (n=9) 50-59 (n=12) 60-69 (n=1)	30-39 (n=2) 40-49 (n=9) 50-59 (n=7) 60-69 (n=4)
Median (IQR)	4.00 (1.00) (50-59)	3.50 (1.00) (40-59)
Years in practice Mean (SD)	21.91 (5.74)	23.45 (5.26)
Special interest in LBP n (%)		
Yes	14 (61%)	6 (27%)
No	9 (39%)	16 (73%)
Other special interest n (%)		
Yes	13 (57%)	12 (55%)
No	10 (43%)	10 (45%)

All of the 25 participants (13 participants in the intervention group, 12 in the control group) who described having another special interest provided details in the open question asking them to detail their other interests. The number of other special interests ranged between 1 and 5, with a total of 41 interests reported with a median of 1 interest. Interests were classified in four categories: pain/location of pain (16 interests), types of management (9 interests), types of patients (7 interests), injuries (5 interests) and chronic pain (4 interests) (see Table 10.2 – List of special interests).

Table 10-2 - List of special interests

Pain/location of pain (16)	Neck/Neck pain (4) Knees (3) Neck pain with headaches (2) Musculoskeletal problems (2) Headaches (2) Feet (2) Frozen shoulder (1)
Types of management (9)	Dry needling (2) Pilates (1) Orthotics / foot healthcare (1) Orthopaedics (1) Structural techniques (1) Cranial osteopathy (1) Applied kinesiology (1) Nutrition (1)
Types of patients (7)	Babies and children (3) Elderly patients (2) Pregnancy (1) Patients with osteoarthritis (1)
Injuries (5)	Sports injuries/rehab (1) Sports (1) Motor vehicle accidents (1) Shoulder injuries (1) Sports/gymnastics (1)
Chronic pain (4)	Chronic pain (2) Chronic fatigue (1) Psychosomatic pain (1)

10.2.2. Qualitative strand

9 participants from the intervention group took part in the semi-structured interviews. The participants' demographics are shown in Table 10.3 - Semi-structured interview participants' characteristics.

Table 10-3 - Semi-structured interview participants' characteristics

ID	Gender	Age group	Years in practice	Special interest in LBP	Other special interests	Special interests details
107705	Female	50-59	26	Yes	No	N/A
117268	Male	40-49	25	Yes	Yes	Chronic fatigue
215827	Female	50-59	23	Yes	Yes	Elderly patients
375469	Male	50-59	29	No	No	N/A
410737	Female	40-49	17	Yes	Yes	Frozen shoulder
431276	Male	60-69	31	Yes	No	N/A
532034	Male	50-59	17	Yes	No	N/A
539532	Female	40-49	18	No	No	N/A
878115	Female	40-49	23	Yes	Yes	Neck, knees, headaches

10.3. Feasibility of a main trial

To assess the feasibility of a main trial this section describes the integrity of the study protocol; specifically the feasibility of the recruitment strategies, the recruitment and retention rates and the randomisation procedure, data collection, and outcome measures.

10.3.1. Integrity of the study protocol

The mixed methods study presented in this thesis followed the protocol that would be followed for a larger trial, including inclusion/exclusion criteria, and intervention preparation and testing.

10.3.2. Recruitment strategies feasibility

10.3.2.1. Quantitative strand

Different media were used to invite experienced osteopaths to take part in the study: by emails, through regional groups, through the National Council for Osteopathic Research (NCOR) and through adverts in professional journals. The results of each method are summarised below.

- Emails

FirstClass merger successfully delivered the 1000 emails according to the FirstClass Mass Mailer Results received by email: 500 were sent on 07/09/2015, and 500 on 16/09/2015. The email recruitment strategy worked well and would be suitable in a main trial.

- Regional groups

The regional groups responded positively to the researcher's emails and forwarded the information to their members. The recruitment strategy with the help of the regional groups worked well and would be suitable in a main trial.

- National Council for Osteopathic Research (NCOR)

NCOR provided information on the study during talks delivered across the UK. They distributed information and the researcher's contact details to people who were interested in the study. The recruitment strategy with the help from NCOR worked well and would be suitable in a main trial.

- Adverts in professional magazines

The two professional magazines agreed to publish advertising material and decided to write up short articles to enhance the promotion of the study rather than using the poster provided by the researcher. One journal did not include the inclusion criteria, leading many osteopaths to contact the researcher when they did not fulfil the criteria. The recruitment strategy with the help of the magazines was adequate but a main trial would necessitate the research team working more closely with editors to verify the content of any article.

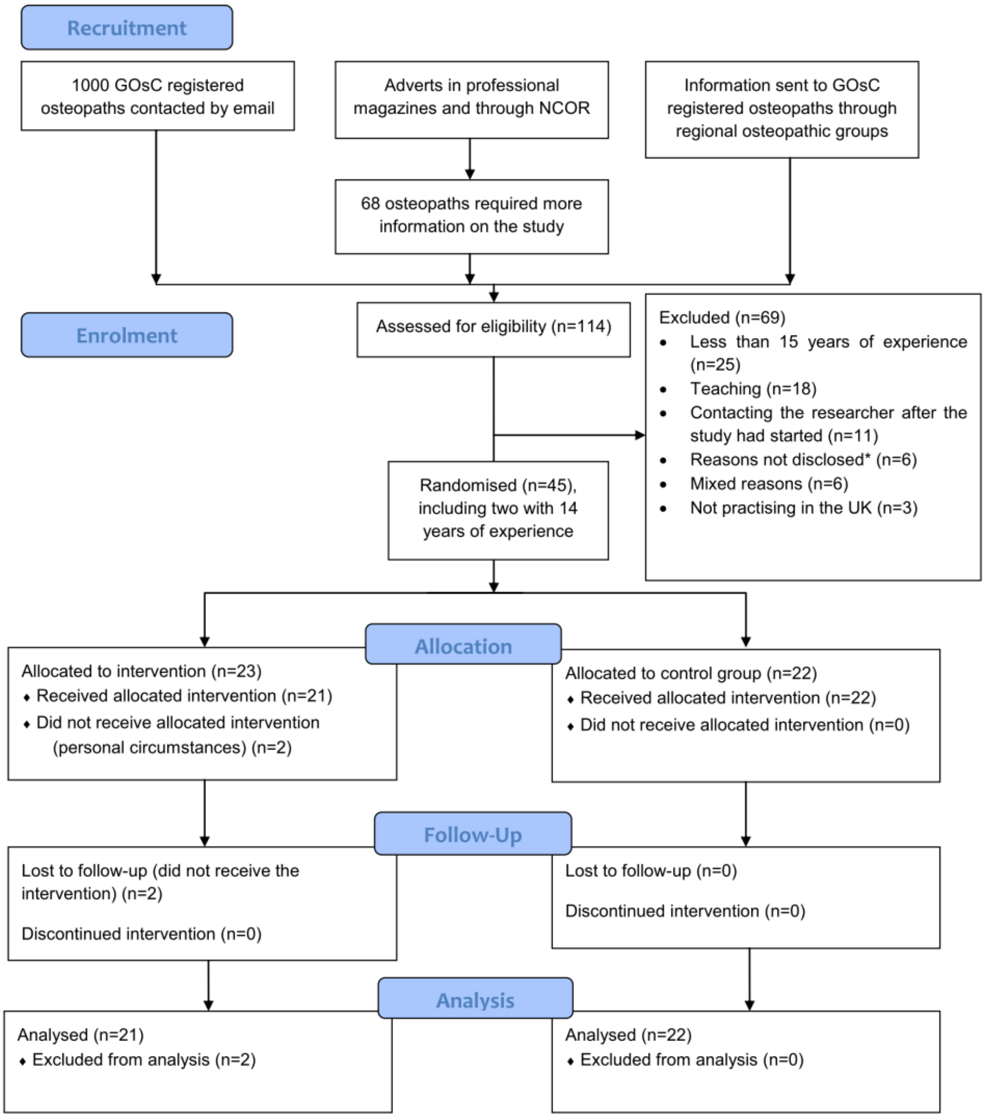
10.3.2.2. Qualitative strand

Intervention group participants had been reminded at several times in the Participant Information Sheet (see Appendix R – Participant Information Sheet) and in the content of the e-learning programme (see Lesson 1.1 – Introduction) that they would be invited for interview. The recruitment strategy worked well and would be suitable in a main trial.

10.3.3. Recruitment, randomisation and retention feasibility

Details of the flow of participants and the number of participants randomly assigned to the intervention group and the control group, and participants completing the study protocol and analysed are detailed in Figure 10.1 – Study flowchart.

Figure 10-1 - Study flowchart



* = Reasons not disclosed by osteopaths who self-excluded from study

- Recruitment

For the quantitative strand, 1000 osteopaths were contacted by email. From those informed by NCOR or from reading the advert in the professional magazines, 68 asked for more information on the study. A total of 114 osteopaths expressed interest in taking part in the study.

- Enrolment

69 participants were excluded from study, 43 were initially recruited. As this was under the 50 that were planned, it was decided to include 2 participants who had been in practice for 14 years. All consented to take part to the study and returned a signed consent form to the researcher. This process revealed no difficulties.

- Allocation

Random allocation of participants using the RAND function in Excel worked well. Once participants were allocated a random number, they were organised in increasing order. The first half of the group was allocated to the intervention group (23 participants) and the second half to the control group (22 participants). It is not possible to provide an accurate recruitment rate as some of the advertising media contacted osteopaths indirectly. Out of the 1068 osteopaths known to have been informed, 114 applied to the study (10.6%) and 45 were recruited (4.2%).

For the qualitative strand, all participants from the intervention group were eligible as long as they had completed the course (n=21). The retention rate was excellent: out of the 10 participants who agreed to take part, 9 were interviewed (90%). The last participant did not answer the email asking for suggested dates and times. As data saturation was reached, the researcher did not send a reminder email to the participant.

10.3.4. Data collection feasibility

For the quantitative strand, collection of the consent forms and contact forms revealed no difficulties. The use of protected Word documents for questionnaire data collection led to compatibility issues for 7 participants: the drop-down menus were not visible for participants reading the Word document on Mac computers or for participants using older Office versions than the researcher's version. As the document was protected, they could not enter their answers manually either. The researcher re-sent unprotected versions of the questionnaires to the 7 participants. This problem did not affect participant retention. For the post-intervention questionnaires, unprotected Word documents were used. For the completion of the questionnaires, the retention rate was 43/45 (96%): two participants in the intervention who did not complete the course (detailed below in section 10.4.1) were invited to fill in the post intervention questionnaires but did not send them back. All control group participants completed the questionnaires.

For the qualitative strand, collection of the consent forms revealed no difficulties. All participants agreed for the interviews to be recorded. The recording of one interview was faulty. Field notes from this interview were used to write up a transcript that was sent to the interviewee to check the content. There was less than three hours between the time the interview took place and the time the interviewee sent back feedback on the transcript. No excerpts were used from this interview as the audio recording was not available. No participants wanted to check the transcripts' accuracy; one asked for a copy of the transcript for their own records.

10.3.5. Acceptability and feasibility of the outcome measures

The questionnaires sent in a Word format during the quantitative strand were well accepted, apart from the compatibility issues initially faced (described above in section 10.3.4). Some participants noted their surprise on the similarities of the questions across the two questionnaires. If further testing or development were to be undertaken in the future, a further study might use only one questionnaire; to ease participants' experience, if both questionnaires were used, the study might need to make more explicit that both questionnaires measure similar attributes with different constructs.

All semi-structured interviews were done using a voice-over-IP service (either FaceTime® or Skype®). The use of the reflexive iterative process of data management during the qualitative strand was feasible and satisfactory and the intervention process was well accepted. No participants asked to pause or stop the interview.

In summary, conducting a main trial following this mixed methods feasibility study is feasible. The protocol followed in this feasibility study had the same integrity as the protocol that would have been followed in a main trial; the recruitment strategies, the randomisation procedure, the data collection and the outcome measures were shown to be feasible to use for a main trial. Minor amendments would need to be made to enhance participants' journey, and strategies would need to be developed to improve the recruitment rate.

10.4. Feasibility and acceptability of the e-learning programme

The feasibility and acceptability of the e-learning programme is presented using the completion rate, the satisfaction survey results, and the participants' views on the e-learning programme.

10.4.1. E-learning programme retention rate

The completion rate for the e-learning programme was excellent with 41/45 (91%) participants completing the programme: 2 participants in the intervention group and 2 participants in the control group did not complete the course. The researcher had a phone conversation with both participants in the intervention group who disclosed personal circumstances unrelated to the e-learning programme that did not allow them time to take the course. It was decided to analyse the data of the participants with full data as the study was a feasibility study not aimed at assessing effectiveness.

Up to seven reminders were sent to some participants of the intervention group over the 6 weeks of the intervention (see Table 10.4 – Details of reminders sent to intervention group participants).

Table 10-4 - Details of reminders sent to intervention group participants

Date	No. of participants contacted	Reasons to contact participants	Reminder content	Contact method	Outcome
After 1st week	9	Participants had not yet started the course	The email was sent to verify participants had received the initial email with their username and password to access the e-learning programme website and/or if they were having technical problems in accessing the website.	Email	One participant had not received the initial email and the others had not started the course because of time issues.
After 2nd week	7	Participants had either not started the course yet or not logged during previous week	The email was sent to ask if there was anything the researcher could do to help.	Email	The participants who replied said they were going to start very soon (n=4) and one participant disclosed he was moving house and practice and may not have time to complete the course.

After 3rd week	6	Participants had not logged onto the website during previous week	The email asked if anything could be done to help them with the course.	Email	4 participants replied that they had a busy week and would continue the course soon.
	1	Participant had not yet started the course	To verify participants had received the initial email with their username and password to access the e-learning programme website and/or if they were having technical problems to access the website.	Phone call	The participant disclosed having familial issues and would not be able to take the course.
After 4th week	2	Participants had not logged onto the website during previous week	To ask if anything could be done to help them with the course.	Email	Both participants replied that they had a busy week and would continue the course soon.
After 5th week	14	Participants who had not completed the course at that point.	To remind participants there was one week left to complete the course.	Email	2 participants answered they should complete on time.
	7	Participants who had not completed the course at that point.	To remind participants there were 4 days left to complete the course.	Email	

10.4.2. Satisfaction survey

21 out of 23 participants from the intervention group answered the survey at the end of the e-learning programme. The responses to the 5-point Likert scale items are summarised in Figure 10.2 – Answers to questions with 5-point Likert scales.

Figure 10-2 - Answers to questions with 5-point Likert scales
(NR = no response)

- Course satisfaction

61% of the intervention group participants were very satisfied with the e-learning programme, 30% were satisfied and 9% did not complete the course. The median was 5 (very satisfied) (IQR = 1).

- Course interest

48% of the intervention group participants rated the interest of the e-learning programme as excellent, 43% as very good and 9% did not complete the course. The median was 5 (excellent) (IQR = 1).

- Teacher clarity

61% of the intervention group participants rated the teacher’s clarity as very good and 30% as excellent. 9% did not complete the course. The median was 4 (very good) (IQR = 1).

- NSLBP new perspective

This question used a 7-point agreement Likert scale. 48% of the intervention group participants strongly agreed that the e-learning programme provided them with a new perspective on NSLBP, 30% agreed and 13% somewhat agreed. 9% did not complete the course. The median was 7 (strongly agree) (IQR = 1).

- Course application in practice

This question also used a 7-point agreement Likert scale. 61% of the intervention group participants totally agreed that they would apply the content of the e-learning programme in their practice, 21% largely agreed and 9% agreed to some extent. 9% did not complete the course. The median was 6 (totally agree) (IQR = 1).

- Three most useful things learnt

Out of the 21 participants who completed the e-learning programme 20 answered the question on the three most useful things learnt during the e-learning programme. Content analysis suggested 4 categories: answers related to pain theory (21), to management (18), to BPS influences and diagnosis (18), and other (1) (see Table 10-5 - items found the most useful in the e-learning programme).

Table 10-5 - Items found the most useful in the e-learning programme

Pain theory (21)	Differences between acute and chronic pain, nociception and central sensitisation	9
	Central sensitisation	5
	Pain does not mean tissue injury, causes of pain perception	3
	NSLBP = no specific tissue causing the symptoms	2
	Mechanism of non-traumatic pain	1
	Rates of MRI/x-ray findings on asymptomatic persons	1
Management (18)	Open questions in case-history / listening to the patient's whole story / listen more to patients and less to governments, institutions and PhD students / be aware of patients' perception of their condition	4
	PS management, how CBT can be used in conjunction of osteopathy, neuroscience	4
	Consent	3
	Importance of the initial consultation and advice given, effects of practitioners on patients' recovery (language, advice)	2
	Tools (CSI, Start Back screening tool), 2 questions to assess risk of depression	2
	Importance of activity for patients with back pain, importance of self-management	1
	Cluster diagnosis	1
	May be a need to work with others	1
BPS influence and diagnosis (18)	Flag system, consider PS factors more consistently, flags don't replace manual therapy but are an enhancement	13
	The influence of BPS factors on back pain	5
Other (1)	Last 100 years of osteopathy is a complete waste of time and end is nigh	1

- Other feedback

14 participants out of the 21 who completed the e-learning programme provided additional feedback. Content analysis suggested 4 categories: content of the course (33), e-learning (14), effects of the course (6), suggestions (4) (see Table 10.6 – Other feedback on the e-learning programme).

Table 10-6 - Other feedback on the e-learning programme

Content of the course (33)	Very helpful course, the most transformative course in the whole of participant's CPD	11
	Lots of food for thought	6
	Not taught when at college	5
	Need deeper insight on how to apply content in practice, on how to help patients in difficult work situations	3
	Challenged everyday practice	3
	Evidence-based	2
	Interesting to understand how the NHS approach NSLBP	1
	Consent and communication content was very helpful	1
	Extra Content Folder very helpful	1
E-learning (14)	E-learning worked well, enjoyed mixture of lesson types	7
	Want to do it again, did it twice	4
	Minor technical problems	3
Effects of the course (6)	Influence on treatment and management	5
	Enhanced participant's confidence	1
Suggestions (4)	Would have liked a handout	1
	Would have liked all papers mentioned in lectures to be in Extra Content Folder	1
	Would have liked to be able to ask questions	1
	Could be interesting to look into practitioners' ability to read/observe their patients (emotional intelligence)	1

10.4.3. Participants' views on the programme

Data from the semi-structured interviews were organised in three themes. The first two themes were related to the feasibility and acceptability of the e-learning programme: *practical experience of following the course* and *engagement with the content* and are presented in this section. The third *Perception of the BPS model and impact of learning* relates to the impact of the intervention and is presented in section 10.5.2.

10.4.3.1. Practical experience of following the course

- Time and setting

Participants used time outside their clinic time to take the course as they found it to be an easy way to take the course without disturbing their clinic schedule.

Weekday evenings were the most popular time and the course was mostly completed in chunks, at their own pace.

"It worked better for me doing it in chunks" Participant B

- Practical aspects of the course

The mode of delivery of the course was well accepted by the participants. They were happy that it was online.

"It was very good, very convenient in the sense that I could do it from home or in my clinic if I wanted to. I didn't have to travel to a venue." Participant G

Overall the e-learning programme was described as easy to access, including in areas with low broadband connection or on different operating systems (Windows© and Apple©). Some difficulties were reported including slight confusion the first time one participant accessed the website, one participant could not access the e-learning programme during a half day when the BSO server was down and one participant found it was not very clear how many lessons had been completed. The e-learning programme was described as well-presented and very easy to access from a laptop. One interviewee reported that the references font was too small to be read on tablets. The interactivity was thought to work well and the use of quizzes was particularly praised.

"Quizzes made me think and made me have to recall what I'd been looking at and listening to so I thought they were really good. They helped to reinforce the learning." Participant D

- Technical aspects

Participants found it very convenient to take the e-learning programme online for two main reasons: geographical for those in remote areas and organisational, allowing planning the course around their schedule rather than the other way round.

"I thought it was a very good idea [to take the course online]. I think it enabled me to do it at my own pace so I could sort of do it in the time that I had available to me but also I could slow it down or speed you know go through it quickly or slowly according to how easy I found it to understand. When there was a concept I couldn't quite get I should go over - back over it a few times just to make sure I was understanding properly so yeah from that point of view it was really good because I'm quite slow to take things on board sometimes, new ideas. So that was very helpful." Participant H

Some participants felt that the e-learning programme could have benefited from some form of interaction: either a simple email system to message the lecturer or perhaps a forum.

10.4.3.2. Engagement with the content

- Perception of the content

Overall participants found there was a lot of content, the e-learning programme was thorough while not being overwhelming and being accessible to the participants with little academic background.

"A lot of content and it was very relevant to clinical you know to practice of osteopathy and the type of patients one sees. And you explained the concepts very well which being an older practitioner, someone that qualified a long time ago I guess a lot of these concepts were not around then so it was good to have your programme there which introduced a lot of these concepts in a very clear manner" Participant G

Participants were satisfied with the content and the coverage of the e-learning programme and found the content clear.

"There were things within the content that I'd certainly come across like the flags etc. before on other courses but actually it was a much more interesting approach to the flags that I've come across before" Participant I

One participant mentioned that there was one quiz that could have been clearer but did not remember which one. Quizzes were found helpful to engage with the content, and made participants study. They helped the absorption of the information delivered. Seeing results was found gratifying and the process could be improved by providing a record of previous attempts when participants take quizzes multiple times. Other possible quiz improvements include distributing them more across the e-learning programme (e.g. *Unit 5: management considerations* had no quizzes) and using more learners' experience in the questions.

> *"The last quarter [of the e-learning programme] I thought "Gosh there's a lot there" in the last chunk which I felt was clinically very relevant" Participant G*

- Extra work done

Nearly half of participants interviewed spent more than the estimated 6 hours taking the course (range from 8h to 12h).

> *"I did go back to a couple of the modules just to understand them again. I did a couple of modules further on and I thought "oh I think I need to go back to the basics" so I went back to the earlier modules a couple of times" Participant E*

The extra work also included the 'Extra content' folder, accessed by all but one of the participants. It also included taking notes and reading them back or taking screen pictures as memos and looking at them later. One participant mentioned that a handout would have been useful.

> *"I estimate eleven hours [of online work]: I went back over bits; I made notes when I went along as well" Participant B*

- Specific items liked or would have liked in the content

Participants often reported that nothing was missing from the content or nothing was unhelpful in it. Details on aspects that were particularly liked were given including information on discs, differences between NSLBP/neuropathic pain/central sensitisation and consent. Some aspects that could be further developed were mentioned and they were particularly related to clinical management.

In summary, the e-learning programme was found to be feasible and acceptable as an intervention. The retention rate was excellent; participants' satisfaction with the e-learning programme was high; their practical experience of following the course was positive and their engagement with the e-learning programme was strong. Possible amendments could be considered in a further use of the e-learning programme such as including an interactive tool to enhance participants' communication with the researcher and with each other.

10.5. Impact of the e-learning programme

The outcome changes below are not presented to address the effectiveness of the e-learning programme but to explore if the outcome measures chosen were appropriate and could be used in a bigger study. The impact of the e-learning programme is presented with results from the ABS-mp and PABS questionnaires and with participants' views on the e-learning programme.

10.5.1. Attitudinal change

10.5.1.1. ABS-mp baseline comparison

There was little difference in the means and standard deviations on the six ABS-mp domains for the intervention and control groups at baseline. Details in Table 10-7 - ABS-mp baseline measures.

Table 10-7 - ABS-mp baseline measures

	Intervention group (n=23) Mean (SD)	Control group (n=22) Mean (SD)
Limitations on sessions (LS)	17.74 (4.33)	18.36 (4.26)
Psychology (PS)	20.70 (1.99)	20.68 (3.43)
Connection to health care system (CHS)	10.48 (2.94)	11.64 (3.32)
Confidence and concern (CC)	8.48 (2.47)	9.36 (1.59)
Reactivation (RA)	15.04 (2.71)	14.23 (3.65)
Biomedical (BM)	13.57 (2.92)	13.59 (2.84)

10.5.1.2. ABS-mp within-group change

The within group differences following the intervention are shown in Table 10-8 - ABS-mp within-group change – intervention group.

Table 10-8 - ABS-mp within-group change – intervention group

	Baseline	After intervention	Mean difference	95% Confidence interval of the difference	
				Lower	Upper
LS	17.38	13.76	3.619	1.83	5.408
PS	20.52	22.62	-2.095	-3.132	-1.058
CHS	10.00	9.62	0.381	-0.958	1.72
CC	8.33	8.67	-0.333	-1.404	0.737
RA	14.76	16.33	-1.571	-2.806	-0.337
BM	13.52	9.29	4.238	3.106	5.371

In the intervention group, 4 domains had mean differences before and after the intervention with confidence interval ranges that did not include the value of no effect: LS (3.619, 95% CI, 1.83-5.408), PS (-2.095, 95% CI, -3.132- -1.058), RA (-1.571, 95% CI, -2.806- -0.337) and BM (4.238, 95% CI, 3.106-5.371). In the control group one domain had a mean difference with a confidence interval range that did not include the value of no effect: LS (1.409, 95% CI, 0.135-2.683) (see Table 10-9 - ABS-mp within-group change – control group).

Table 10-9 - ABS-mp within-group change – control group

	Baseline	After intervention	Mean difference	95% Confidence Interval of the difference	
				Lower	Upper
LS	18.36	16.95	1.409	0.135	2.683
PS	20.68	20.59	0.91	-0.718	0.899
CHS	11.64	11.64	0	-0.968	0.968
CC	9.36	8.86	0.5	-0.153	1.153
RA	14.23	15.05	-0.818	-0.1.960	0.324
BM	13.59	13.41	0.182	-0.55	0.914

10.5.1.3. ABS-mp between-group changes

Examination of between-group changes shows that 3 domains had mean differences with confidence interval ranges that did not include the value of no effect: LS (2.21, 95% CI, 0.097-4.323), PS (-2.186, 95% CI,-3.454- -0.918) and BM (4.056, 95% CI, 2.761-5.351) (see Table 10-10 - Mean differences between groups).

Table 10-10 - Mean differences between groups

	Mean difference between groups	95% Confidence interval of the difference	
		Lower	Upper
LS	2.21	0.097	4.323
PS	-2.186	-3.454	-0.918
CHS	0.381	-1.209	1.971
CC	-0.833	-2.057	0.39
RA	-0.753	-2.382	0.875
BM	4.056	2.761	5.351

10.5.1.4. PABS baseline comparison

The means and standard deviations on the two PABS domains were similar for the intervention and control groups at baseline. Details in Table 10-11 - PABS baseline measures.

Table 10-11 - PABS baseline measures

	Intervention group (n=23) Mean (SD)	Control group (n=22) Mean (SD)
PABS Biomedical	35.30 (6.069)	34.77 (6.697)
PABS Behavioural	29.86 (5.023)	29.55 (3.925)

10.5.1.5. PABS within-group change

In the intervention group, both domains had mean differences before and after the intervention with confidence interval ranges that did not include the value of no effect: PABS biomedical (9.619, 95% CI, 7.551-11.687) and PABS behavioural (-5.143, 95% CI, -7.434- -2.852). In the control group, both domains had mean differences before and after the intervention with confidence interval ranges that included the value of no effect: PABS biomedical (-1.409, 95% CI, -3.442-0.623) and PABS behavioural (-1.682, 95% CI, -3.52-0.156). These are shown in Table 10-12 - PABS within-group changes.

Table 10-12 - PABS within-group changes

		Baseline	After intervention	Mean Differenc e	95% Confidence Interval of the Difference	
					Lower	Upper
Intervention group	PABS biomedical	35.33	25.71	9.619	7.551	11.687
	PABS behavioural	29.86	35	-5.143	-7.434	-2.852
Control group	PABS biomedical	34.77	36.18	-1.409	-3.442	0.623
	PABS behavioural	29.55	31.23	-1.682	-3.52	0.156

10.5.1.6. PABS between-group changes

Concerning between-group changes, both domains had mean differences with confidence interval ranges that did not include the value of no effect: PABS biomedical (11.028, 95% CI, 8.216-13.841) and PABS behavioural (-3.461, 95% CI, -6.2948- -0.6272) (see Table 10-13 - Mean between-group differences).

Table 10-13 - Mean between-group differences

	Mean between-group difference	95% Confidence interval of the difference	
		Lower	Upper
PABS Biomedical difference	11.028	8.216	13.841
PABS Behavioural difference	-3.461	-6.2948	-0.6272

10.5.2. Participants' perceptions of the BPS model

Data from the semi-structured interviews were organised in three themes. The first two themes were presented in section 10.4.3. The third theme (Perception of the BPS model and impact of learning), relating more to the impact of the e-learning programme on participants' practice, is presented below. It is divided into three subthemes that represent the three types of perception of the BPS model amongst the participants (see Figure 10-3 - Perceptions of the BPS model).

Figure 10-3 - Perceptions of the BPS model

- BPS model is not structural enough

One view of the BPS model was that it was not structural enough. It was perceived as a model where musculoskeletal problems were either systemic (red flags) or psychosocial (yellow, blue and black flags) with no space for simple mechanical etiology.

> *"There is a psychological element to it, there's a social element to it but there's also possibilities of physical problems which are not pathological but are not psychological or social." Participant A*

This dualism between systemic and psychosocial issues was found unhelpful in the management of patients as it highlighted mainly aspects that practitioners have no influence on.

> *"What [the BPS model] doesn't necessarily do is provide you with the answers. How can I sort that out?" Participant H*

This lack of a structural aspect led to difficulties in communicating with osteopathic colleagues with a strong biomechanical model of back pain, and a feeling of worry that what had been practised in the last decade was being challenged,

> *"There's a point in the course when you just feel like everything you've been doing for the last ten years or fifteen years are being strongly challenged and you're thinking am I doing any good with these patients with low back pain?" Participant I*

and a sense that osteopathy was devalued in the content of the e-learning programme.

> *"There was a general tone of - I would quite often - you know this thing about I'm going to go and shoot myself now then - what am I doing as an osteopath? You know? There was a general tone of devaluing what osteopaths do." Participant A*

It was also felt that this model was not specific enough and was challenging to adopt for practitioners using a Tissue Causing Symptom model for LBP management.

> *"A new student if they haven't been taught the other methods they could accept that NSLBP method or mode a lot easier but I think once you've been used to being a little bit more specific it is hard to be broad in a way" Participant E*

- BPS model is part of existing practice

The BPS model was viewed as a model of practice that was already used by osteopaths.

> *"I think intuitively a lot of osteopaths do follow some of the concepts [of the BPS model]" Participant G*

While there were no disagreements with the content, there was a feeling that the content was not bringing a new perspective to osteopaths on back pain.

> *"Some of the psychological and psychosocial stuff I think a lot of older people that are reasonably experienced, I think we do it anyway" Participant A*

It was also perceived as a model of back care that used to be implemented by GPs.

- Transformative

The last category saw the BPS model as a better model than the biomedical, and one that was suitable to a lot of patients in clinic situation.

> *"That [BPS] model works better for me than the biomedical one which actually has always been a bit of a struggle to know 'is it facet?' 'is it disc?' " Participant I*

The BPS model was seen as offering a novel approach to back pain. It had not been taught during undergraduate education that included courses in psychology or diet but was very mechanistic in nature and not integrated in clinical practice.

> *"That's something I wasn't taught a great deal at undergraduate when I was a student although I've heard about it postgradually. The Flags were new to me so I found that very helpful." Participant B*

“[The content] was very good, very thorough. It was an aspect of diagnosis I hadn’t learned in college so it did make me think. It challenged the way I had been taught” Participant E

It also had the merit of being evidence-based rather than experience-based.

“I found [the content of the course] very helpful. It was very helpful it was drawing on research because so much we’re told, or what I was told in my training was basically experiential” Participant H

The BPS model offered a structure to assess and manage patients with e.g. the flag system and a system to integrate the different aspects of a patient’s life. It also helped patients’ management.

“It has made me think a bit more about the various factors which do come to play in a person’s problems which would stop them getting better. Since doing the course I have identified people who had put perhaps psychological barriers up to their progress or to advice on exercises. They say ‘oh yes yes I’ll have to do that after Christmas’ or ‘I don’t have a swimming costume so I won’t be able to go swimming’ you know. Challenging them on it actually did seem to make them realise what they were doing, that they were putting up hurdles. I find it helped. In the past I would have left it.” Participant E

Participants became more aware of the risks of increasing patients’ negative attitudes to back pain. To prevent this participants changed their communication with patients.

“[The course] has changed in some of the language maybe that I would use with patients and just re-emphasizing thought positives and maybe not using quite so much medicalised language.” Participant I

“A patient recently that had sort of coming with acute low back pain to the point that you couldn’t even touch with a feather at the back. He was shouting and screaming. He was about 6 foot 7 the guy, a huge guy. And

quite often when someone is that acute there's not a lot you want to do. I just sat and chatted with him for about ten minutes when he was lying on the couch and started explaining a few things - just explaining central sensitisation and the way the body processes pain - and he actually said to me "I've never had it explained to me like that before". He had probably seen three four practitioners within the last month. He keeps having these flare ups and literally within 5 min talking to him, I could treat him normally with the same pressure I'd put on any other patients." Participant F

The BPS model also offered a common language with other professionals.

"It seems to be absolutely everywhere at the moment. It seems to be the way the NHS is going in this country, the way physios are going in this country so I think it's something we need to embrace - that we need to be very aware of." Participant I

"It's something that in my practice seems to be gaining a lot of credent indeed. I had some literature come through from a company called [name of the company ananymised] who have something to do with medical insurance company and they've put the flag system that you mentioned." Participant D

10.6. Chapter conclusion

In summary, whilst a main trial would be needed to provide a definitive assessment of effectiveness, the results suggest that the intervention had a positive impact on the participants' attitudes to back pain. The results of the mixed methods evaluation suggest it would be appropriate to use the same outcome measures in a main trial. Participants' perceptions of the BPS model after taking the e-learning programme were represented in three categories: *not structural enough, part of existing practice* and *transformative*.

11. Evaluation of the e-learning programme: discussion

11.1. Chapter summary

The feasibility study used mixed methods research to assess the feasibility of running a full-scale study and the acceptability of the intervention. This section follows recommendations on what should be discussed in a feasibility study discussion (Thabane, Ma et al. 2010): the first section interprets the feasibility and acceptability of the study, the second section contextualises the findings, the third section discusses the research implications of the study and the last section analyses the limitations and strengths of this mixed methods feasibility study.

11.2. Feasibility and acceptability overview

Whilst feasibility study guidelines recommend the interpretation to focus on the feasibility of a main trial (Thabane, Ma et al. 2010), this section also includes interpretation of the acceptability of the intervention, as the study included the development of a new intervention (detailed in chapter 8).

11.2.1. Feasibility interpretation

In order to assess the feasibility of running a main trial, the mixed methods feasibility study followed the same protocol as a main trial would follow. This section discusses the feasibility of the recruitment procedure, of the randomisation method and data collection, of the outcome measures and of the statistical analysis. This section also discusses inferential analysis a further trial would include and provides an effect size calculation for a future trial.

11.2.1.1. *Recruitment*

The recruitment strategy included several media to assess if this could provide enough participants in a main trial. It was found that all media were satisfactory but more collaborative work with magazine editors was recommended. Using phone calls or sending SMS could complement the recruitment strategies used as they are effective ways to increase recruitment rates (Treweek, Lockhart et al. 2013). Being a feasibility study, 50 participants were sought for the mixed methods feasibility study. Only 45 were recruited and this was largely due to the strict exclusion criteria. One exclusion criterion was to have taught in the previous ten years. This was based on a supposition that educators could have been exposed to the BPS model during their teaching. A recent qualitative study conducted in New Zealand (Roots, Niven et al. 2016) analysed with video-recording the clinical management of patients with acute NSLBP by 3 osteopaths who graduated in the UK and were teaching in New Zealand. The model used by these participants includes clear signs of BPS management supporting the exclusion criterion choice. Another possible reason for the low recruitment rate might have been related to the recruitment period: 12 participants contacted the researcher after the study had started, up to four months later. For a further study, it would be recommended to extend the 2-month recruitment period and to carefully consider the exclusion criteria for recruiting more participants while weighing the risk of having a population that would not respond to the intervention. Another way to improve recruitment would be to enhance the description of the e-learning programme by including the possible effects of the e-learning programme on clinical practice and the individual benefits for participants (Fletcher, Gheorghe et al. 2012). Low recruitment rates in trials is a common problem with less than a third achieving the recruitment of the number of participants initially planned (Teare, Dimairo et al. 2014). A possible way forward for a further study would be to include practitioners from different manual therapy professions.

11.2.1.2. Randomisation and data collection

The randomisation process, using the RAND function in Excel, worked well and could be employed in a main trial. The retention rate was high but the effects of a highly selective sample on the retention rate would need to be considered when estimating the sample size required in a main trial (effect size calculation in section 11.2.1.5 below). Using digital versions of the questionnaires to collect participants’ answers was found adequate as long as word documents were not protected and were saved as .doc rather than .docx, minimising compatibility risk. Few participants decided to send hard copies and those who did decided to do it because of the compatibility issues aforementioned.

11.2.1.3. Outcome measures

The outcome measures were well accepted but more information should be provided to the participants on the fact that both questionnaires measure similar constructs as some mentioned being surprised by the similarity of questions in the questionnaires. While it would be appropriate to conduct a main trial using the same attitudinal measurement questionnaires, it would be acceptable to use only the PABS as both questionnaires showed similar changes and the PABS permits comparing findings with other studies. Careful consideration would need to be taken on the cost of conducting such a trial and the clinical and research impact the findings would have: including tools that would measure practitioner behaviour and/or patient outcomes might provide results which have potential for a stronger impact. This is further discussed below in section 11.4.

11.2.1.4. Statistical analysis

Being a feasibility study, the statistical analysis presented in this study was descriptive following feasibility study recommendations (Lancaster, Dodd et al. 2004, Leon, Davis et al. 2011, Moore, Carter et al. 2011, Lancaster 2015). It was found appropriate and feasible to use descriptive analysis to provide recommendations on the feasibility of running a main trial. However, in a main trial, inferential testing would be required. To explore what the statistical analysis in a main trial would consist of, inferential testing was conducted using the quantitative strand results as an example. It was not conducted to discuss effectiveness as this would need to be assessed in a main study (Teare, Dimairo et al. 2014) and there would be a high risk of overestimating the intervention effects, a common problem for studies with small samples (Dechartres, Trinquart et al. 2013). Tests of normality, T-tests to assess differences in groups and paired sample t-tests to assess differences before/after the intervention were used (see Appendix BB – Inferential analysis). The findings from this inferential testing confirmed the risk of running inferential tests on small samples: the groups' demographics were found comparable apart from the item 'Special interest in LBP' but the gender distribution was very different in both groups (48% male in the intervention group vs. 23% male in the control group). If the sample size was doubled, the difference would become statistically significant (p=0.013), confirming the caution required when interpreting the results presented in this mixed methods feasibility study apart from the feasibility of the study and acceptability of the intervention.

11.2.1.5. Effect size calculation for a future trial

It is suggested that sample sizes are too small in feasibility studies to provide precise between treatment group effect size estimates (Arain, Campbell et al. 2010, Leon, Davis et al. 2011) resulting in an incorrect estimate of the sample size needed in the main trial (Kraemer, Mintz et al. 2006, Cocks and Torgerson 2013). Sample size estimates for a main trial should instead be based on a clinically meaningful effect (Leon, Davis et al. 2011) which is currently not available for PABS or ABS-mp measures. This is a general problem for all attitudinal measurement questionnaires, as there is currently no consensus on what constitutes a clinical meaningful change in practitioners' LBP beliefs using any validated questionnaire (O'Sullivan, O'Sullivan et al. 2013). Based on the available data, a Cohen's d test was used, but caution would be required if these findings were used in a main trial due to the limitations described above (see Table 11-1 - Cohen's d test).

Table 11-1 - Cohen's d test

	Intervention group		Control group		
	Mean	Standard deviation	Mean	Standard deviation	Cohen's d test
PABS biomedical	9.619	4.544	-1.409	4.584	2.42
PABS behaviour	-5.143	5.033	-1.682	4.145	0.75

Based on the Cohen's d test, the effect of the intervention was large on both domains, particularly on the biomedical one. When deciding on the sample size required in a main trial, the results of the Cohen's d test should be balanced with the fact that practitioners commonly show poor adherence to guidelines (Bishop 2007), and change in attitudes and behaviour need a large sample of subjects in order to show differences before and after an intervention. To compensate for the possible risk of miscalculation of effect size Thabane, Ma et al. (2010) recommend providing qualitative data from practitioners to enrich the data. The semi-structured interviews highlighted that participants valued the e-learning programme and when asked what they thought about the BPS model and how they viewed its practical implementation (in section 10.5.2), their views ranged between "Not structural enough" to "Already done" to "Transformative", with most participants being in the latter category suggesting that the intervention provided new information and maybe had an impact on their attitudes and beliefs. A risk of recruitment bias is not negligible as out of the 1068 osteopaths known to have been informed, 114 applied to the study (10.6%) and 45 were recruited (4.2%) and this should be considered if this effect size estimate was used in a main trial.

11.2.2. Intervention acceptability

The acceptability of both the content and the instructional method used was assessed with the retention rate, the satisfaction survey and the participants' views.

11.2.2.1. Instructional acceptability

The e-learning programme had strong elements of cognitive-behaviourism in its design: a sequence of linear stages was set, with predefined learning outcomes, and periodic learning reinforcements (Papadopoulos and Sapsed 2012). The design and development of the course contained some elements of social constructivism in that participants' professional experience and context were taken in consideration (Papadopoulos and Sapsed 2012). This was mainly to enhance transferability of the content learnt into practice, even though behaviour changes were not objectively monitored. The satisfaction survey and the semi-structured interviews' content highlighted the participants' satisfaction with the Extra Content Folder. The fact that the content was evidence-based rather than experiential and references were listed was also valued by the participants. These elements reflect a sense of connectivism, offering participants the capacity to know where to find knowledge when they need to (Papadopoulos and Sapsed 2012). More aspects of social constructivism should probably be included in the next version of the e-learning programme. One participant mentioned in their semi-structured interview a need for an easier system to contact the lecturer than email. An embedded messaging service could be a way to address this need. Another would be to include a forum that would allow participants and the lecturer to be in contact, raise questions and foster debates. Participants valued the autonomy they had while taking the course over the 6-week period with no constraints on time, place, or from other participants. Asynchronous collaboration and communication tools (e.g. emails and forums) would therefore probably be easier and more appropriate to implement than synchronous tools (e.g. live instant messages and live broadcasts) in an improved version of the e-learning programme. E-learning programmes for postgraduate studies using asynchronous format promote self-reflection (Sinclair, Kable et al. 2016) leading to deeper learning than e-learning programmes using a synchronous format (Means, Toyama et al. 2009).

11.2.2.2. Content acceptability

The content satisfaction was high and this could be related to several reasons: the content was designed for experienced practitioners taking into consideration their probable current biomechanical understanding of back pain. A recent study assessed physiotherapists' and patients' views on triggers for NSLBP and found that they are very similar and are strongly biomechanical. Psychosocial factors are infrequently mentioned by the physiotherapists (Stevens, Steffens et al. 2016). The likelihood of participants' biomechanical understanding of back pain was the baseline used to develop the e-learning programme. Whilst the aim had been to provide tools for participants to implement in their practice and to give them a way forward, some participants were left in the middle of the programme with a sensation that everything they had practised in the last few decades had been a waste of time; a sensation that faded away on completing the programme. Another possible reason for the content satisfaction may be that it was evidence-based rather than experience-based. Some participants mentioned that the evidence used provided them with tools to discuss management options with patients (e.g. the possible innocuousness of some MRI findings). This was also reported in another study that assessed what participants found helpful to change their attitudes to back pain (O'Sullivan, O'Sullivan et al. 2013). Another content satisfaction reason mentioned by the participants was the use of clinical scenarios associated with quizzes. Participants enjoyed knowing when they were right or wrong as they saw this as a landmark of their progress. They also found it useful to know where more information could be found for a quiz item wrongly answered. Finally, they valued the content because it answered a need they had had and did not know how to learn about it.

While participants generally reported that nothing was missing from the e-learning content, there was overall agreement that more information on how to implement a BPS management of patients with NSLBP was required (developed in Unit 5 of the e-learning programme). Participants suggested that this information should be developed in a different e-learning programme, as the one developed in this thesis already contained a lot of content.

11.3. Contextualisation

This was a feasibility study, therefore the results of this thesis did not test the effectiveness of the intervention and could not be directly transferable to the profession: the participants included did not represent the characteristics of the average practitioner in the profession because of the inclusion criteria applied, including the fifteen years' experience. There is currently no definition of what constitutes a high or low score on the ABS-mp or PABS domains, making it difficult to quantify a clinically relevant attitudinal change (Mutsaers, Peters et al. 2012). In this section, the findings of this thesis are contextualised with results from other studies that assessed practitioners' attitudes to back pain using PABS as an attitudinal measurement questionnaire.

11.3.1. Baseline comparison

Results from the mixed methods feasibility study presented in this thesis were consistent with scores found in previous studies that also used the PABS (see Table 11-2 - PABS scores from the study presented in this thesis and published studies). Participants in this study had slightly higher biomedical scores and lower behavioural scores than Houben et al's participants (2005, 2005). Participants included in the study were experienced osteopaths whereas Houben et al's participants were either physiotherapy students or physiotherapists with an average of 12 years of work experience. This is consistent with results in a study that found that the more experienced GPs are, the more likely they are to have high biomedical levels (Fullen, Baxter et al. 2011).

Table 11-2 - PABS scores from the study presented in this thesis (highlighted in blue) and published studies

	Number of items in the version of PABS used		PABS Biomedical Mean (SD)	PABS Behavioural Mean (SD)
Baseline results from the research presented in this thesis	19	Intervention group	35.33 (6.1)	29.86 (5.0)
		Control group	34.77 (6.7)	29.55 (3.9)
Houben, Gisjsen et al. 2005	19	Physiotherapy students	29.8 (6.5)	37.5 (5.3)
Houben, Ostelo et al. 2005	19	Physiotherapists	29.5 (7.9)	35.6 (5.6)
Bishop, Foster et al. 2008	19	GPs	30.9 (5.3)	33.7 (4.2)
		Physiotherapists	31.1 (7.2)	32.5 (4.8)
Overmeer, Boersma et al. 2009	36	Physiotherapists	41.4 (4.8)	25.9 (7.6)
Fullen, Baxter et al. 2011	17	GPs	38.8 (7.7)	16.3 (3.1)
Hendrick, Mani et al. 2013	19	Physiotherapists	31.12 (6.7)	31.76 (4.30)
Innes, Werth et al. 2015	19	Chiropractors	34.5 (6.3)	31.4 (4.1)

11.3.2. Attitudinal changes post intervention

The intervention group in the study presented in this thesis showed changes in scores on the PABS domains after an 8-hour e-learning programme: the biomedical score decreased and the behavioural score increased. *Table 11-3 - PABS changes with BPS interventions* provides details of attitudinal changes in the participants in this thesis study and in two studies that also used PABS as their outcome measurement questionnaire. While these results may imply that a longer course may not provide bigger attitudinal changes, Overmeer et al.'s study results (2009) may be skewed due to a ceiling effect from the recruitment material they used: participants applied voluntarily to the 8-day course that was clearly advertised as being on the BPS model and had high scores on the behavioural domain prior to taking the course.

Table 11-3 - PABS changes with BPS interventions

				PABS Biomedical Mean	PABS Behavioural Mean
Changes in study presented in this thesis	Osteopaths > 15 years' experience	8-hour course	E-learning	- 9.6	+ 5.1
Beneciuk and George 2015	Physiotherapy students	8-hour course	Face-to-face	- 4.5	+ 5.5
Overmeer, Boersma et al. 2009	Physiotherapists	8-day course	Face-to-face	- 8.1	+ 2.1

11.4. Research implications

The research presented in this thesis concerned the development and assessment of an e-learning programme on the BPS model for NSLBP in a manual therapy context. In order to conduct a main trial, a feasibility study is required to assess feasibility but also to understand the context in which interventions take place (Craig, Dieppe et al. 2008). The methods used were found to be practical and appropriate. Using a RCT design with a waiting period for the control group was well accepted and permitted control group data collection while offering the e-learning programme to all participants. The attitudinal measurement questionnaires used showed similar change trends, providing some evidence of responsiveness of these questionnaires.

Two further key research questions are discussed below:

- <u>What is the effectiveness of an e-learning programme on experienced osteopaths' attitudes to back pain?</u>

This research question is a logical continuation to the feasibility study presented in this study. Similar methods could be used as they were found appropriate for a main trial. The mixed methods study had a mainly quantitative emphasis. The qualitative strand analysis therefore focussed on getting a sense of participants' views and challenges faced when taking the e-learning programme rather than exploring the meaning of their experience when taking the e-learning programme. The six-step reflexive, iterative process of data management (Halcomb and Davidson 2006) used for the transcription of the semi-structured interviews was found appropriate for this research and could be used in a main trial. As most steps are conducted by the main researcher, it offered a cost-effective data management tool immersing the researcher in the data while conducting and analysing the interviews.

In the preparation of the study care would need to be taken with regard to the measurement tools used. Attitudinal measurement provides a low-cost tool with acceptable validity and reliability but limited interpretation of the clinical impact an intervention may have. In their systematic review on the effectiveness of e-learning programmes on practitioner behaviour and patient outcomes, Sinclair, Kable et al. (2016) recommend developing psychometrically tested tools to assess behavioural change. While it is challenging to perceive how behaviour can be measured with self-reported tools, it clearly supports the results of the mixed methods feasibility study that highlighted the need to develop tools to measure behaviour.

- <u>How can practitioners' behaviour be measured and compared?</u>

Following on the point raised in the previous research question, there is a distinction between attitudinal measurement and behavioural measurement. There is also a distinction between reported behaviour measurement and behaviour measurement. Reported behaviour is usually assessed by asking participants to report what they would do if they were facing a situation, often with the use of vignettes to prompt participants' answers. This can easily be done on a large scale and is the source of most of the evidence supporting the relationship of attitudes and behaviour (Rainville, Carlson et al. 2000, Houben, Ostelo et al. 2005, Bishop, Foster et al. 2008, Fullen, Baxter et al. 2011). Behaviour is less often assessed, maybe because of the resource and ethical implications. The tools currently available include video recording and assessing patient notes but it would require large resources to assess a large sample and even greater resources if it needed to be repeated after an intervention. A possible alternative way would be to conduct focus group interviews with practitioners to gather their views on what a BPS approach is and how it is implemented in practice. In parallel, another focus group with patients could be interviewed, as practitioners' and patients' perceptions of the BPS model can differ (Overmeer and Boersma 2016). These focus groups would be used to extract items for the development of a questionnaire for patients or observation schedule for use in direct observation of consultations. These could then be tested in "real" osteopathic consultations: observing practitioners' behaviour or using patients' reports of behaviour as a measure of behavioural change in response to biopsychosocial training; the rationale being to test the impact on behaviour in addition to the evaluating attitudinal change. Developing instruments along these lines would be helpful in informing further work, but would also need some careful psychometric evaluation in order to test validity and reliability of the instruments.

11.5. Strengths and limitations

11.5.1. Strengths

The feasibility study presented in this thesis was the first study assessing osteopaths' views on using e-learning as a form of CPD and their views on the BPS model. The design followed best practice: the Medical Research Council (MRC)'s recommendations for the development and evaluation of complex interventions were followed. Before the conducting of any main trial, a feasibility study tested the RCT design to assess its acceptability, to estimate recruitment and retention rates, and to determine the sample size required in a main trial (Craig, Dieppe et al. 2008). Guidance on good practice for conducting feasibility studies (Lancaster, Dodd et al. 2004, Arain, Campbell et al. 2010, Thabane, Ma et al. 2010, Leon, Davis et al. 2011, Moore, Carter et al. 2011, Teare, Dimairo et al.

2014, Lancaster 2015, Eldridge, Lancaster et al. 2016) and for conducting explanatory mixed methods (Bryman 2006, Creswell and Clark 2011, van Griensven, Moore et al. 2014, Green, Duan et al. 2015) were also followed. Several methods were employed to assess and ensure the study quality. It also provided new insights on methods to assess practitioners' views.

11.5.1.1. Mixed methods design

The design used for the mixed methods feasibility study followed recommendations for explanatory studies (Creswell and Clark 2011). Methods were implemented sequentially, starting with a quantitative collection and analysis phase, followed by a qualitative one aiming at explaining the quantitative results. The participants invited to take part in the qualitative strand were not selected on any criteria apart from having completed the e-learning programme prior to taking part in the interview.

11.5.1.2. Mixed methods study quality

Mixed methods study quality is difficult to assess. Several models for quality assessments were proposed, highlighting the lack of agreement on the quality assessment. Following the criteria used in Ivankova's study (2013) to assess the quality of a mixed methods study that analysed student engagement with an e-learning programme, this section first describes the reliability and validity of the quantitative data and results, then the credibility and trustworthiness of qualitative data and findings are discussed, and finally the validation strategies specific to a sequential quantitative to qualitative mixed methods design are explored.

- Reliability and validity of the quantitative data and results

Information on reliability and validity enables the appraisal of research quality: reliability provides information on the reproducibility of the results whilst validity provides information on the ability of an instrument to measure what it is intended to measure (Roberts, Priest et al. 2006). The mixed methods feasibility study described in this thesis used two published attitudinal measurement questionnaires used in other studies: the Pain Attitudes and Beliefs Scale (PABS) and the Attitudes to Back Pain Scale (ABS-mp). The PABS has been widely used to assess practitioners' attitudes to back pain (Houben, Ostelo et al. 2005, Bishop, Foster et al. 2008, Watson, Bowey et al. 2008, Overmeer, Boersma et al. 2009, Bishop 2010, Overmeer, Boersma et al. 2011, Mutsaers, Peters et al. 2012, Hendrick, Mani et al. 2013, Beneciuk and George 2015, Innes, Werth et al. 2015). It has an overall good validity and reliability although there have been some issues reported with the behaviour domain (Houben, Gijsen et al. 2005). The ABS-mp has been less used in published studies (Pincus, Foster et al. 2007, Valjakka, Salanterä et al. 2013) but presents two advantages: it was developed on musculoskeletal practitioners including osteopaths and is the only questionnaire identified in a systematic search and critical review of attitude measurement questionnaires as being developed and used in a UK population of healthcare professionals (Bishop 2007). It has a good face validity but its reliability is not known (Bishop 2007), apart from the psychology domain, and that is fair (Valjakka, Salanterä et al. 2013).

To strengthen the results both attitudinal measurement questionnaires were used as they both have limitations either due to missing information (ABS-mp reliability) or less than satisfactory measurement properties (PABS behavioural domain reliability). Both questionnaires provided similar findings on the groups investigated (control and intervention) and both times measures were taken (before and after the intervention) supporting the validity of these questionnaires.

- Credibility and trustworthiness of qualitative data and findings

Criteria to assess qualitative research quality differ from those used for quantitative research (Golafshani 2003, Shenton 2004). Halcomb and Davidson's recommendations (2006) were followed using their six-step reflexive, iterative process of data management. This process ensured triangulation of the data:

field notes and reflective journal content were revised while listening to the audiotapes to secure the credibility of the data. The analysis was also reviewed by the first supervisor, who did not undertake the interviews, to maximise the trustworthiness of the findings.

Qualitative data trustworthiness can be assessed following Guba's trustworthiness four characteristics (Shenton 2004): credibility (corresponding to internal validity in quantitative research terms), transferability (corresponding to external validity), dependability (corresponding to reliability) and confirmability (corresponding to objectivity). It is argued that authors cannot make transferability inferences (Shenton 2004) and should provide enough data to allow readers to make their own decisions.

Credibility: In the qualitative strand several attempts were made to ensure the credibility of the data. First the research methods used (semi-structured interviews and reflexive iterative process of data management) had already been employed in the literature. The use of field notes and audio recordings of the interviews also increased the credibility of the data. The researcher was familiar with the subject prior to the data collection, having conducted the scoping review and developed the e-learning programme, and with the participants, having been in contact with them prior to the semi-structured interviews. This assisted the researcher in an understanding of the context and also in building trust with the participants. The random sampling of the participants and tactics to ensure honesty in participants (e.g. participant's own choice to take part, and participants reminded that the comments they made during the semi-structured interviews were understood as being on the e-learning programme rather than on the researcher) also assisted in enhancing data credibility. Frequent supervisory meetings were also used to test the credibility of the data: the first supervisor assessed credibility of the reflexive iterative process of data management by listening to the interview recordings while reading the field notes. His comments were integrated in the data. Following this, both supervisors received the raw data with the content and thematic analyses prior to a meeting where these analyses were debriefed. The data analysis was also peer-scrutinised in conferences[1,2]. While no participants decided to check the content of the interview transcripts, the one who agreed to do so it following the recording fault (mentioned in section 10.3.4) found only one minor change to recommend. ***Transferability:*** details of participants who took part in the study were provided to allow readers to relate the findings to their own situations. Transferability was also partly assessed by presenting the findings to different manual therapy professions: in a conference with the continental European osteopathic community[1] and in a conference with physiotherapists[2]. ***Dependability:*** To allow the reproducibility of the study, the research design, its implementation and the data gathering were detailed in the methods chapter (see chapter 9).

Confirmability: To minimise the effect of researcher bias, regular supervisory meetings were held to confirm that the results reflect the participants' views and experiences rather than the researcher's beliefs.

In summary, trustworthiness of the qualitative data was ensured following four characteristics: credibility, transferability, dependability and confirmability.

- Validation strategies specific to a sequential quantitative to qualitative mixed methods design

The mixed methods feasibility study followed explanatory design guidance starting with a quantitative strand followed by a qualitative strand. A systematic procedure was applied for inviting participants for the semi-structured interviews: all participants in the intervention group were invited regardless of

[1] Draper-Rodi J, Vogel S, Bishop A. Impact of an e-learning programme on the biopsychosocial model for non-specific low-back pain on experienced osteopaths' attitudes to back pain: a pilot randomised-controlled trial. Osteopathic European Academic Network (OsEAN) Open Forum, Vienna, Austria, 22/04/2016

[2] Draper-Rodi J, Vogel S, Bishop A. Impact of an e-learning programme on the biopsychosocial model for non-specific low back pain on experienced osteopaths' attitudes to back pain: a mixed methods study. International Federation of Orthopaedic Manipulative Physical Therapists (IFOMPT) conference, Glasgow, UK, 08/07/2016

their responsiveness to the intervention or their rating of course satisfaction. The quantitative results showed an unexpectedly high level of satisfaction with the course and the content leading to the inclusion of specific questions in the semi-structured interviews to explore more deeply participants' views on the biopsychosocial model in practice. The qualitative analysis did not reveal a need for additional statistical examination of the quantitative part of the study.

11.5.2. Limitations

11.5.2.1. Intervention limitations

While the intervention validity was carefully considered and its content informed by the scoping review results, the validity of the scenarios would need to be considered: they were written by the researcher based on his clinical experience, and on theoretical aspects important for understanding pain mechanisms. Using an expert panel to assess their validity would be appropriate and exchanging the ones used for real case scenarios that would be used to film professional actors or real patients, while considering ethical implications, could enhance their validity.

The intervention quality scored high with the ECBCheck tool (93%) but only a self-assessment score was obtained. A request for peer-review assessment of the e-learning programme using the ECBCheck tool was made but no results had been received by the time this thesis was submitted. Although the researcher tried to be objective during the evaluation, the results should be interpreted with caution as the assessor was the developer of the programme.

11.5.2.2. RCT limitations

As there is not a clear-cut point when the integration of the BPS model started in Osteopathic Educational Institutions' curricula, the inclusion criteria might have limited the recruitment rate. The recruitment rate was lower than expected (45 instead of 50): while this may not have a large impact on the findings on the feasibility of running a main trial, it is suggestive of a highly selective sample that was possibly keen on taking a course online. This may have had an impact on the e-learning programme acceptability findings and the effect size estimate calculation.

The external validity of the findings on using e-learning as a form of CPD might be limited, as participants in the study did not pay to take the e-learning programme. Their satisfaction rating or acceptability of the intervention could have been different if a fee had been paid.

11.5.2.3. Limitations of the semi-structured interviews

The collection of the semi-structured interview data used a system that relies on audio-recording and field notes as a foundation for the analysis (Halcomb and Davidson 2006). For one interview, the recording was faulty. In order to use the interview while not requiring re-conducting the interview, the field notes were used to write up a transcript sent to the participant to check the content. While it was appropriate to check and use the content, it was not possible to conduct the recommended third step of the six-step reflexive, iterative process of data management: *listening to the audiotape and amending/revision of field notes and observations.*

11.6. Chapter conclusion

Based on these results of the mixed methods feasibility study, a RCT would be feasible: the recruitment procedure, randomisation process and data collection were found feasible to use in a main trial. Further considerations would be required concerning the outcome measures that would be used: if the same questionnaires (ABS-mp and PABS) were used, it would be appropriate to provide more information to the participants on the similarity of the questionnaires. Other outcomes may be appropriate including measures of practice behaviour (as long as psychometrically robust measures are used), consultation observations, or patient reports of consultation characteristics. The effect size estimate provided in this chapter needs to be used with caution

due to the limited reliability of using feasibility studies for estimating effect size, and to the highly selective sample. The sample was composed of experienced practitioners suggesting a higher chance for them to report higher initial biomedical belief levels, therefore making them more likely to respond to the intervention and shift their attitudes towards a more BPS view. The intervention was overall very well accepted. Using real scenarios or discussing the clinical scenarios with experts should be considered to improve the e-learning programme validity. The study followed recommendations on the conducting of mixed methods explanatory design and there were clear strategies implemented to ensure the quantitative and qualitative data quality.

12. Thesis professional implications

12.1. Chapter summary

This chapter discusses the professional implications of this work. The first section is about the BPS approach: first the biomedical heritage of the profession is examined, then the possible heritage impact on the participants' perceptions of the BPS model; it then discusses which practitioners might be more suitable for managing patients with NSLBP, and finally the need for BPS training. The second section focuses on e-learning, looking first from the point of view of the participants and then from the CPD providers' point of view. The last section discusses the implications of the mixed methods study particularly, including evidence and osteopathy, and explores CPD that would need to be developed to support the profession's development.

12.2. Chapter introduction

The research conducted in this thesis had a direct clinical application as it was centred on developing a CPD. First, a scoping review on the BPS prognostic factors and assessment methods for NSLBP was conducted; then an e-learning programme was developed informed by the scoping review results, a developmental model (ADDIE) and a behavioural change model (BCW); the intervention was tested on two levels: its quality (see Appendix M - ECBCheck tool result) and its content (see Appendix L – Behaviour Change Wheel e-learning post-development). A mixed methods feasibility study assessed the acceptability of the intervention and the feasibility of running a main trial. There is currently no data available on osteopaths' preferences and views on CPD. This chapter describes the participants' views on the e-learning programme and how this new information may inform CPD providers on their current offerings. The e-learning programme was developed for experienced osteopaths on NSLBP management. The chapter also explores challenges faced when implementing a BPS approach in osteopathic practice, and finally the CPD that could be developed to support the profession.

12.3. Biopsychosocial approach

12.3.1. Profession with a strong biomedical heritage

"Find it, fix it and leave it alone" is one of many examples of the strong biomechanical heritage the osteopathic profession has. This motto demonstrates a biomedical view of health: the cause (find it), can be resolved (fix it), curing the patient (leave it alone). A lot of osteopathic models support this concept of management where the issue is in the body and therefore a skilful practitioner needs to fix that body to help the patient recover from their symptoms. Training in osteopathy was informed with these theories and beliefs at least until the early twenty-first century. While it was expected that osteopaths who trained during this time would find implementing a BPS approach challenging, there was a lack of data on their experience. The next section discusses the participants' views on the challenges some of them faced.

12.3.2. Implementation challenges

After taking the e-learning programme some participants were left with a sensation that the BPS model was not giving enough space to the physical part of the symptoms. While an effort had been made to blend all factors, including physical/biological ones, into the e-learning programme content, this might have not been done clearly enough. This is a problem encountered previously with BPS training (e.g. Overmeer, Boersma et al. 2009). Some participants felt that the approach offered in the e-learning programme was already practised by osteopaths despite the evidence of the lack of integration of psychosocial assessment and management by osteopaths presented in the e-learning (Kent, Keating et al. 2009). There might be a misunderstanding on the part of osteopaths on what BPS (or holism) is, for example the idea of treating away from the painful area (e.g. applying a technique to increase knee mobility for a patient complaining of NSLBP) might be seen as a holistic approach. Arguably this is merely refined biomechanics, relying on the fact that pain would only be related to sensory stimuli and stimulus intensity, known as bottom up mechanisms (Legrain, Damme et al. 2009, Puentedura and Flynn 2016). Cognitive, emotional, psychological and social influences, known as top down influences (Legrain, Damme et al. 2009, Puentedura and Flynn 2016), are therefore neglected: the interaction of different events in the patient's life, and how these may have an impact on their symptom experience and the prognosis, are more complex and broader than the impact of knee mobility on lumbar function.

The next section discusses a difficulty expressed by some participants at communicating with their peers who held a strong biomedical view of back pain.

12.3.3. Professional communication issues

Some participants found it difficult to communicate with other osteopaths after the course particularly if the latter had a strong biomechanical approach to back pain. Others found ways to communicate with colleagues. Offering support to participants after the completion of the CPD may promote maintaining a BPS approach and responding to difficulties they may encounter in practice or with colleagues.

12.3.4. Psychologists vs. osteopaths

There is a general agreement that manual practitioners need more training in the BPS management of patients, and they express little confidence in managing patients within a BPS context (Singla, Jones et al. 2015). A possible reason for this lack of confidence could be that they do not have the required skills. It is suggested that non-psychologists may not be able to deliver effective psychological interventions to patients with LBP, and especially patients with a high risk of developing chronic symptoms (Pincus, Anwar et al. 2015). This confirms the recent findings from a RCT using osteopathy to manage patients with chronic LBP (Licciardone, Gatchel et al. 2016): patients with depression are less likely to recover from chronic LBP with osteopathy. There is a need to remain mindful of previous pitfalls where there had been few positive patient outcomes, e.g. having a dichotomic approach: patients with acute NSLBP being managed with manual interventions and those with chronic low back pain being managed with psychological interventions (Harding, Campbell et al. 2010). There is a need for a clear BPS framework for the management of patients with NSLBP. The work presented in this study did not assess effectiveness or behaviour change, but tools were provided to the participants to promote the introduction of a structured BPS approach for patients with NSLBP, e.g. StarT Back tool (Hill, Whitehurst et al. 2011) or the flag system described in section 6.5.

12.3.5. BPS training

Whilst recognising the importance of psychosocial (PS) factors, manual therapists tend to focus more on clinical findings (including pain levels and range of motion) rather than on PS factors to inform their prognosis and treatment plan (Kent, Keating et al. 2009). The problem is that PS factors are stronger predictors than physical examination findings (Chou, Qaseem et al. 2007) and when manual practitioners assess PS function this is based on non-accurate methods (Singla, Jones et al. 2015). The results of the scoping review support the idea that NSLBP is multifactorial in nature. Undergraduate curricula have integrated BPS principles in the last few years but experienced osteopaths would not have been trained on this model during their undergraduate training. Some participants acknowledged that they received lectures in topics that could be assimilated to the BPS model but felt they had never been brought together in the training clinic. Manual therapists express a need for training in this field (Singla, Jones et al. 2015), and this has been confirmed in the study presented in this thesis: most participants felt that the content filled a gap in their knowledge and perceived a transformation of their practice. They either reported having encountered many clinical situations where they felt there was something more than physical findings related to the patients' presentations, or they felt they had never been comfortable with the simplistic understanding of back pain being either 'a facet' or 'a disc'. For participants who had been aware of this lack of information and training, they did not know where to obtain these skills.

In summary, LBP is the most common symptom encountered by osteopaths (Fawkes 2010) who treat approximately 10,000 patients with LBP every working day in the UK (GOsC 2016). Implementing the BPS model is challenging, especially for experienced osteopaths. There is an urgent need to provide training on a large scale to osteopaths to promote the implementation of the BPS model in the diagnosis, prognosis and management of patients with NSLBP, and to provide support post-training to answer some of the challenges faced in everyday situations.

12.4. E-learning

12.4.1. Participants' views

The recruitment material used for the feasibility RCT clearly stated that the CPD was online so participants who decided to take part were likely to be comfortable with the idea of taking a course online. This was confirmed by the results from the satisfaction survey where 11 out of 14 participants mentioned spontaneously that they enjoyed the fact that the course was online, and the qualitative data showed that being online was well accepted and was found to be very convenient. The offer of online CPD to osteopaths is currently very limited. Due to the nature of the profession, not all aspects of manual therapy can be taught online and not all professionals may wish to use e-learning as a form of CPD, but this study suggested that there was a gap in the market for CPD for osteopaths. Participants valued the time efficiency e-learning offered: they did not have to travel to a CPD venue and could set up their own time, thus disturbing their clinic schedule as little as possible.

12.4.2. Access to CPD providers

This study defined a multi-stage development process to develop e-learning programmes for experienced osteopaths. Whilst the type of manual profession for which the course was designed had little impact on the e-learning programme itself, the fact that it was designed for experienced osteopaths rather than undergraduate students had more influence, supported by the fact that the guide used for developing the course is specifically written for postgraduate e-learning programmes (Ghirardini 2011). The analysis prior to the development stage was key: defining for whom the course would be designed and what content would be appropriate. The following stages, each with specific requirements, offer an organised system to enhance the usability and possible effectiveness of e-learning programmes. Trying to decrease the time needed to develop e-learning programmes by skipping key stages would risk negatively influencing the end result. The Behaviour Change Wheel (BCW) model was found very useful and was an excellent tool to expand views on what the learning outcomes should include: rather than only considering the knowledge acquisition as an outcome, the BCW helped in the consideration of what the participants would need in order to be able to use the information, and how the course could support these needs. The use of the ECBCheck tool is a good way for e-learning designers to consider the quality aspects of e-learning.

Developing e-learning programmes is accessible to most Osteopathic Educational institutions (OEIs). Most work can be done by lecturers with some technical support from IT departments for implementing the e-learning programme on the OEIs virtual learning environment, and providing learners with access to the course.

12.5. Implications of the mixed methods feasibility study

12.5.1. Evidence in osteopathy

The study sought to recruit 50 participants but only 45 were included. Being a feasibility study, the recruitment rate was one of the aspects assessed and was not problematic as such but highlights the difficulty in involving the profession in research. Other current projects that require the support of the profession also suffer from limited engagement from osteopaths (e.g. the PROM project by the National Council for Osteopathic Research). This may be related to the lack of translation of evidence in practice (Rushton, Fawkes et al. 2014). Interestingly, the fact that the e-learning programme developed in this thesis was evidence-based was valued by the participants. Participants expressed a need for CPD to integrate evidence as their training and most of their CPD had been experience-based. Most osteopathic CPD and conferences are indeed more experience-based than evidence-based (e.g. iO convention 2015) due to a strong belief that osteopaths prefer experience than evidence and would not register for evidence-based CPD. This was the first study assessing osteopaths' satisfaction with CPD and further research would need to be conducted that could further inform CPD providers.

12.5.2. Other CPD needed

The last unit of the e-learning programme was on BPS management considerations for NSLBP. It was challenging to include evidence-based content because of the paucity of information but it was necessary as the limitation of the effectiveness of previous BPS training programmes was partly due to not providing management information (Overmeer, Boersma et al. 2011). Evidence for NSLBP management in a BPS context is emerging: to prevent providing anecdotal information, the content was drawn from a review of LBP guidelines and from 3 RCT that compared BPS approaches to usual care (Asenlof, Denison et al. 2009, Hill, Whitehurst et al. 2011, Vibe Fersum, O'Sullivan et al. 2013). Despite this attempt to provide information on management, participants mentioned that they would have liked more on how to manage PS factors. Participants felt they acquired a good understanding of the diagnosing aspect of PS factors but were left with a sense of uncertainty on how to deal with these factors. They suggested that another CPD should be developed rather than adding content to the current one as this already included a lot of information. This could be a follow-up CPD during which key concepts could be re-explored and then applied to case-studies. This could either be online, using a video-chat service, or face-to-face; with the online option offering easier geographical and organisational advantages.

12.6. Conclusion

The osteopathic profession has a strong biomedical heritage that may challenge the implementation of the BPS model and communication with peers on the BPS model. The implementation challenges need to be supported by appropriate training and follow-up support. Participants found that the e-learning programme filled a gap in their knowledge. E-learning is a suitable form of CPD for some topics and the feedback gathered during the study presented in this thesis suggests that there is a gap in the market. Whilst manual practitioners express a need for training on the BPS model, it is challenging to provide suitable content due to the paucity of evidence available. The integration of evidence in the e-learning programme was highly valued by the participants in this study. Further CPD could use case-studies to explore and put into practice some of the key concepts.

13. Conclusion

13.1. Chapter summary

The work presented in this research investigated the feasibility of running a main trial to assess the effectiveness of an e-learning programme for non-specific low back pain (NSLBP) informed by the biopsychosocial (BPS) model in a manual therapy context. After summarising the problem and the gap in the knowledge, this chapter provides a summary of the key findings.

13.2. Problem and gap in the knowledge

NSLBP affects a third of the UK population each year (Savigny, Kuntze et al. 2009), is the main cause of years lived with disability (Vos, Barber et al. 2015), and costs associated with it are extremely high (March, Smith et al. 2014). Treatments show similar small to moderate effectiveness (Artus, van der Windt et al. 2010). Practitioners' influence seems to be a factor with an important impact on patient outcomes (Hall, Ferreira et al. 2010) and is related to their attitudes to and beliefs about back pain. Guidelines recommend having a BPS management for patients with NSLBP, but manual professions, especially osteopaths, have a strong biomechanical heritage and tend to have difficulties in implementing a BPS approach (Kent, Keating et al. 2009). Manual practitioners feel they lack training in this field and would like CPD to improve their understanding and assessment of psychosocial factors (Singla, Jones et al. 2015). Previous attempts to change practitioners' attitudes to back pain have had varied effects (e.g. Stevenson, Lewis et al. 2006, Overmeer, Boersma et al. 2009).

As there was a lack of information on which instructional method was the most effective to teach the BPS model to manual therapists and whether e-learning was a suitable form of CPD for experienced osteopaths, the work presented in this thesis was designed to answer the following research question:

What is the acceptability, feasibility and likely impact of a biopsychosocially structured e-learning programme for non-specific LBP on experienced osteopathic practitioners' attitudes to back pain?

13.3. Key findings

Previous attempts to train manual practitioners in the BPS model support the need to include two pre-developmental stages: content analysis and needs analysis, to ensure that the intervention designed is appropriate for the participants and provides them with new knowledge (Stevenson, Lewis et al. 2006). In order to include evidence-based and accurate content in the intervention, a scoping review (chapters 3 to 6) was conducted to identify BPS prognostic factors and assessment methods for NSLBP from the existing literature. 55 BPS prognostic factors and 10 assessment methods were extracted; out of the 55 prognostic factors of risk of developing chronic pain or chronic disability, 19 were of the biological domain, 13 of the psychological domain and 23 of the social domain which supports guideline recommendations to use BPS management for patients with NSLBP. The results of the scoping review also highlighted the need to ensure that biological factors are not neglected as prognostic factors for NSLBP. To support this idea, a green flag is suggested as an addition to the existing psychosocial flag system to add the biological factors to the list of possible risk factors of chronicity. Another key finding was the lack of validity of most clinical assessment methods used in manual therapy, including palpation and range of motion testing. This was used in the intervention to engage participants in reflecting on what informs diagnosis.

During the subsequent stage of this research, an e-learning programme on the BPS model applied to NSLBP in a manual therapy context was designed and developed (chapter 8). The ADDIE model was found to be appropriate to design an e-learning programme in an organised manner. It included both the needs and content analyses discussed above. The Behaviour Change Wheel was found to be a valuable addition in developing the intervention and assessing the final content in light of the conditions listed (see Appendix L – Behaviour Change Wheel e-learning post-development). Finally the ECBCheck tool was found suitable to assess the quality of the e-learning programme. The ECBCheck feedback recommended the offering of different learning pathways to participants, but this would have compromised the sequencing, which was informed by a job-context principle for organising the content (see section 8.4.3).

The last stage of the work presented in this thesis was a mixed methods feasibility study that assessed the feasibility of running a main trial, and the acceptability of the e-learning programme as an intervention (chapters 7 to 11). The study showed that it was feasible to conduct a main trial and that the e-learning programme was acceptable as an intervention; and it explored how it might have an impact on experienced osteopaths' attitudes to back pain and reported behaviour. Whilst indicating signs of effectiveness, the feasibility design was not suitable for testing the effectiveness of the intervention, reinforcing the need for the main trial whose feasibility was confirmed. The recruitment methods were found adequate, but more communication with magazine editors is recommended; the recruitment rate was lower than the number sought and strategies to overcome this in a main study were discussed, including integrating participants from different manual therapies; the randomisation procedure was adequate; the data collection and outcome measures were appropriate, but further consideration would need to be taken on which outcome measure to use for a further trial.

13.4. Conclusion

The intervention designed (the e-learning programme) was evidence-based following a scoping review on BPS prognostic factors and assessment methods. It was found feasible to run a main trial and the intervention was well accepted by the participants. A main trial is required to assess the effectiveness of the e-learning programme. This work provided data on aspects so far unreported: osteopaths' views on CPD, osteopaths' views on e-learning as a mode of CPD,

and osteopaths' views and challenges in implementing the BPS model in practice. An effect size calculation was conducted to inform a main trial sample size decision.

14. Learning journey

This chapter summarises my journey during my professional doctorate and key learning points while conducting my research. I was the youngest member in my cohort which was challenging whilst being extremely valuable. The taught units at the beginning of the professional doctorate included a lot of experience sharing for which I had to learn how to construct arguments more effectively and express them coherently. In this context I realised more clearly that my colleagues had distinct views which were different to mine and that others' experience was useful in making me reflect on my own position. It was partly this which helped me to develop my critical thinking. One of the taught units was on reflective practice: it made me realise that I had some major misconceptions and led me to make substantial changes to my practice. It also made me decide to conduct my research on the biopsychosocial model. This unit made me aware of the inappropriate pain management strategies I was using: I realised I was approaching patients with acute and chronic symptoms quite similarly, while I thought I was offering person-centred care to my patients. I thought I was aware of the differences between acute and chronic pain in terms of mechanism and management implications, but to my dismay it transpired that in practice I was not. After this unit, I read, discussed, attended various CPD courses and finally changed my practice. Seeing how much effort this required, I could see that there was a need to combine some of my experience and existing evidence into a CPD that could be easily accessible to experienced osteopaths.

14.1. Methods

14.1.1. Scoping review

I learned how to systematically acquire knowledge and which methods were available to understand a substantial body of knowledge. I did not know about scoping review methods before starting the professional doctorate. I considered doing a systematic review at first, and then, because of the heterogeneity of the articles that were going to be included, I thought about doing a narrative review. Whilst I was aware that the review was only a first step in my research I felt a narrative review would weaken the foundations of my research and make it less likely to be publishable. It became apparent that a scoping review was the ideal method for the type of evidence synthesis that was required for the first stage of my work. This process has given me a good grasp of a range of methods available to synthesise and appraise information.

Conducting this review helped me to develop a systematic way of approaching the literature and extracting content. This taught me how to manage large amounts of data, the prognostic factors and assessment methods extracted, and how to inform choices on the inclusion or exclusion of the papers and then the prognostic factors and assessment methods.

14.1.2. E-learning development

When looking for tools to support my decision-making on the course content, I found the Behavioural Change Wheel (Michie, Van Stralen et al. 2011). Prior to the doctorate, I was not familiar with behavioural change models and using theoretical models has taught me an evidence-based approach to conceptualise, design and implement e-learning programmes that aim to change practitioner behaviour. Thinking about this approach more generally, I now feel that I have a clearer idea about how to implement interventions that aim to change behaviour.

The ADDIE model helped me understand how to organise e-learning programme development. This helped me to avoid problems encountered with previous biopsychosocial training programme developments: e.g. it made me aware of the key stages necessary before developing the content of the e-learning programme including the content analysis and needs analysis. It reinforced the need to have a clear structure and plan in delivering e-learning.

I expected to have a native English speaker to record the e-learning lectures but I quickly realised that a lot of metacognition happens when giving a lecture, e.g. exactly when to say something, when to change slides, what intonation to use or when to pause. Because of time constraints I decided to record the lectures myself knowing that this could have an impact on the participants' learning experience. To monitor this, I decided to include a question on the teacher's clarity in the short satisfaction survey at the end of the e-learning programme. The high levels of acceptance of my delivery and accent have increased my confidence when presenting to audiences.

14.1.3. Mixed methods study

Conducting the mixed methods feasibility study provided me with knowledge on trial methodology, on the recruitment, consent and randomisation processes, and on how to report trials following the CONSORT guidelines. I also learned what the different stages in the conduct of an RCT are, including conducting a feasibility study following the MRC guidelines (Craig, Dieppe et al. 2008) to establish the feasibility of running a main trial and the acceptability of the intervention. It became clear that feasibility studies do not assess effectiveness and have an impact on statistical choices. I developed a better understanding of the differences between descriptive and statistical analyses and how to interpret them. I decided to run inferential testing as the professional doctorate was the perfect platform to experiment and learn research methods. The aim was not to assess effectiveness but to explore what a main trial statistical analysis could look like. I have been surprised since then by the number of articles published with very small samples, using inferential testing and making effectiveness claims without providing power calculations. I am even more surprised by the fact that these articles are often published in well-regarded peer-reviewed journals. In some ways this has helped me see that there is flexibility and varied academic rigour in the research world.

I had little knowledge on qualitative methodology before starting the professional doctorate: preparing the research project, preparing the interviews, conducting the interviews, reporting the data and then analysing it were extremely valuable steps to learn about qualitative research.

In summary, I now have a foundation in review, trial and qualitative methods, which has given me confidence that I can continue research using a range of methodological approaches.

14.2. Peer-review

During the professional doctorate, we had biannual meetings with the other professional doctorate students, and sometimes PhD students undertaking different programmes, to present our progress, share our difficulties and discuss possible solutions. My first supervisor was at most meetings and provided detailed feedback to help me to enhance my presentation skills. This helped me to develop my communication skills in academic settings.

I submitted several abstracts to peer-reviewed conferences (for details on these conferences, see p. iv). Writing abstracts taught me how to describe my findings concisely and in an academic manner. I presented my study design at CAMstrand, a conference on complementary and alternative medicine in which most presenters were PhD students. I presented my scoping review findings to the Society for Back Pain Research conference (Draper-Rodi, Vogel et al. 2016), which was to an academic audience with few osteopaths in the room. It was an excellent exercise for me to learn about using language common with other professions rather than osteopathic colloquialism.

I also presented my findings to osteopathic groups (regional groups, osteopathic conferences and CPD). The audience was less academic and was strongly influenced by osteopathic heritage. The presentations to regional groups were the most challenging. These taught me how to explain coherently that the BPS model and the supposed holism in osteopathy were not completely similar. One particular event that helped me was receiving an email from one attendee after a presentation. This person used to teach Osteopathy Philosophy & Principles in an osteopathic education institution and used the concept of Total Lesion developed by Fryette (detailed in Parsons and Marcer 2005) to provide evidence that the BPS model had been implemented in osteopathy long before Engel published his first article (Engel 1977). Reading on this concept helped me to develop the argument that what osteopathy called holism was only related to a causal mechanism, i.e. a "lesion" that could be caused by a variety of factors. It made me realise that a major dimension in the BPS model that is absent from osteopathic models is that it offers alternative management options with better outcomes (Asenlof, Denison et al. 2009, Hill, Whitehurst et al. 2011, Vibe Fersum, O'Sullivan et al. 2013). Holistic approaches in osteopathy always end with similar management considerations (e.g. spinal manipulations) with possibly some different specificity. Fryette's concept also made me realise and developed my ability to express complex ideas including the different framework for understanding symptoms that the BPS model offers: rather than being "in the body", they are understood as the expression of an experience.

I developed my academic writing during the professional doctorate journey: writing the thesis partly enhanced my skills but it was also achieved by writing up manuscripts for peer-reviewing. One was submitted a few months before submitting the thesis (Draper-Rodi, Vogel et al. 2016) and another one is being finalised on the intervention development. This developed my familiarity with peer-reviewed journal requirements. In addition, the regular review involved in supervision has developed my ability to use criticism and feedback effectively and positively.

14.2.1. Industry e-learning example

I visited a company that designs e-learning programmes for health education, mainly in dentistry. Beside the fact that their output was very slick, it was very interesting to see how they manage to track participants' activity and prevent people simulating course completion by skipping forward over lectures. My assessment of adherence was suitable for a study with 45 participants but due to the nature of their business they need a more systematic and automatic way of checking adherence. The method used in the feasibility study would not be sustainable in a large trial. This company's techniques are advanced and much more so than those the British School of Osteopathy (BSO) IT department currently has. These issues would need to be considered in a main trial or if the BSO decided to develop e-learning programmes as CPD.

Their resources, in terms of time and finances, are more substantial than the ones I had when I developed the e-learning programme (on average, developing one hour of e-learning requires 3 months with an approximate cost of £25,000) but the stages followed to design and develop e-learning programmes in this company are very similar to the ones followed for the intervention developed in this thesis: defining the length of each section, creating templates and prototypes, adding clients' graphics, designing interactive prototypes, reviewing with clients, and then producing the media including auditioning actors and filming.

In summary, experiencing a real world industry setting for e-learning helped me to value my work, but also to appreciate the scope and quality of a wider and better-resourced environment.

14.3. Changes to my practice

As a clinician, the reflective practice unit at the beginning of the professional doctorate was the first step for me to change both my attitudes and my behaviour in practice with patients with NSLBP and more generally with patients with non-specific musculoskeletal symptoms. The realisation of the misconceptions I had and the knowledge gathered from conducting the scoping review gave me tools to use in practice with patients. The skills I developed with the experience of communicating with osteopathic regional groups that could sometimes be resistant to the content of my presentations helped me to learn how to mediate rather than confront, which also helped me communicate with patients when discussing possible challenges they may be facing. My stance dramatically changed and I went from a moderate biomedical to a strongly biopsychosocial practice. I still encounter challenges with the implementation of the BPS model: my communication skills have greatly improved but I sometimes find myself explaining basic biomechanics to patients rather than using reassuring messages, e.g. with the use of pain neuroscience education. This work-in-progress is a good insight into the challenges practitioners may be facing when implementing a BPS approach with their patients after decades of managing patients with NSLBP with a biomedical model of care.

The professional doctorate also influenced me as an educator. The knowledge I gathered during my research helped me to better support students in their understanding and implementation of the BPS model. I have become clearer at explaining how the BPS model may be put into practice and where students can look for additional resources. I have also developed a more systematic method for developing my lectures with the inclusion of high level of evidence content. This, along with the appreciation of how to appraise the literature, and how to plan research projects, has also helped me as a dissertation supervisor and assessor.

Finally, the professional doctorate has widened my perspective of being an academic clinician. With the scoping review, I learned how to systematically acquire and interpret a substantial body of knowledge. This has had an impact on how I interpret systematic reviews and guidelines as I better understand their strengths and limitations. I have learned how to conceptualise and design an intervention using an e-learning developmental model and a behavioural change model and then to implement and use it in an RCT. I have also acquired skills in qualitative research with the conducting of semi-structured interviews and thematic analysis. This understanding of both qualitative and quantitative methodologies has become the foundation for my knowledge on mixed methods research that has then been refined by learning on the different mixed methods designs available and specifically the explanatory one. Finally, writing and submitting abstracts and manuscripts has helped me to develop my academic writing; and presenting to specialist and non-specialist audiences has enhanced my communication skills. The skills I have developed during the professional doctorate have prepared me to undertake further research in various fields including on NSLBP, the BPS model, attitudinal changes and on the exploration of the development of a behavioural change tool and given me experience in a variety of methodologies.

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Pubmed	((((((((((((((((((((((musculoskeletal manipulations[MeSH Terms]) OR manipulation, osteopathic[MeSH Terms]) OR osteopathic physician[MeSH Terms]) OR osteopathic physicians[MeSH Terms]) OR osteopathic medicine[MeSH Terms]) OR specialty, physiotherapy[MeSH Terms]) OR physiotherapies techniques[MeSH Terms]) OR physiotherapist[MeSH Terms]) OR physiotherapists[MeSH Terms]) OR physiotherapy specialty[MeSH Terms]) OR chiropractic manipulation[MeSH Terms]) OR manipulation therapies[MeSH Terms]) OR lumbar manipulation[MeSH Terms]) OR manipulation, spinal[MeSH Terms]) OR manual therapies[MeSH Terms]) OR manual therapy[MeSH Terms]) OR therapies, manual[MeSH Terms]) OR therapy, manual[MeSH Terms])))) OR ((((((((((((((((((((modalities, physical therapy[MeSH Terms]) OR modality, physical therapy[MeSH Terms]) OR physical therapist[MeSH Terms]) OR physical therapists[MeSH Terms]) OR physical therapy modalities[MeSH Terms]) OR physical therapy modality[MeSH Terms]) OR physical therapy specialty[MeSH Terms]) OR physical therapy technique[MeSH Terms]) OR physical therapy techniques[MeSH Terms]) OR specialty, physical therapy[MeSH Terms]) OR techniques, physical therapy[MeSH Terms]) OR adjustment, chiropractic[MeSH Terms]) OR adjustment, chiropractic spinal[MeSH Terms]) OR adjustments, chiropractic spinal[MeSH Terms]) OR chiropractic[MeSH Terms]) OR chiropractic manipulation[MeSH Terms]) OR chiropractic spinal adjustment[MeSH Terms]) OR chiropractic spinal adjustments[MeSH Terms]) OR manipulation, chiropractic[MeSH Terms]) OR spinal adjustment, chiropractic[MeSH Terms]) OR spinal adjustments, chiropractic[MeSH Terms]) OR risk factors [MeSH Terms]) OR Disabled Persons/psychology[MeSH Terms])))) AND ((((((((((((((((((((((((((((((((((ache, low back[MeSH Terms]) OR aches, low back[MeSH Terms]) OR low back ache[MeSH Terms]) OR low back aches[MeSH Terms]) OR low back pain[MeSH Terms]) OR low back pain, mechanical[MeSH Terms]) OR low back pain, postural[MeSH Terms]) OR low back pain, recurrent[MeSH Terms]) OR low back pains[MeSH Terms]) OR low backache[MeSH Terms]) OR low backaches[MeSH Terms]) OR ache, back[MeSH Terms]) OR back[MeSH Terms]) OR back ache[MeSH Terms]) OR back ache, low[MeSH Terms]) OR back aches[MeSH Terms]) OR back aches, low[MeSH Terms]) OR back pain[MeSH Terms]) OR back pain without radiation[MeSH Terms]) OR back pain, low[MeSH Terms]) OR back pain, lower[MeSH Terms]) OR back pains, lower[MeSH Terms]) OR back pain, lower[MeSH Terms]) OR back pains[MeSH Terms]) OR back pains, low[MeSH Terms]) OR backache[MeSH Terms]) OR mechanical low back pain[MeSH Terms]) OR nonspecific low back pain) OR non-specific low back

	pain) OR idiopathic low back pain) OR LBP)))))) AND ((systematic[sb] OR Guideline[ptyp] OR Review[ptyp]) AND "last 10 years"[PDat] AND (English[lang] OR French[lang])))) OR Low Back Pain/psychology[MeSH Terms]))) NOT lipopolysaccharide binding protein Filters: Guideline, Review, Systematic Reviews, Practice Guideline, 10 years, English, French
	(("lumbar spine") AND "examination") AND ("2004"[Date - Completion] : "3000"[Date - Completion]) Filters: Guideline; Systematic Reviews. Filters: Guideline; Systematic Reviews
	(((("lumbar spine") AND "reliability") AND "sensitivity") AND "validity") AND ("2004"[Date - Completion] : "3000"[Date - Completion])) Filters: Guideline; Systematic Reviews
Cochrane	#1 MeSH descriptor: [Low Back Pain] explode all trees #2 MeSH descriptor: [Musculoskeletal Manipulations] explode all trees #3 MeSH descriptor: [Central Nervous System Sensitization] explode all trees #4 MeSH descriptor: [Nociceptive Pain] explode all trees #5 MeSH descriptor: [Neuralgia] explode all trees #6 MeSH descriptor: [Psychology] explode all trees #7: #1 and (#2 or #3 or #4 or #5 or #6) #8 MeSH descriptor: [General Surgery] explode all trees #9 MeSH descriptor: [Injections] explode all trees #10: #1 and (#2 or #3 or #4 or #5 or #6) not (#8 or #9) (Word variations have been searched)
PsycINFO	LBP OR Any Field: low back pain OR Any Field: low back aches OR Any Field: back pain AND Year: 2000 TO 2014
OstMed	"Low back pain"
PEDro	"Abstract & Title: low back pain" AND "Therapy: stretching, mobilisation, manipulation, massage" AND "Published since 2000"
	Abstract & Title: low back pain AND "Therapy: behaviour modification" AND "Published since 2000"
	Abstract & Title: low back pain AND "Therapy: electrotherapies, heat and cold" AND "Published since 2000"
	Abstract & Title: low back pain AND "Therapy: education" AND "Published since 2000"
	Abstract & Title: lumbar spine AND "Published since 2004"
AMED	"Low back pain" AND "Manual Therapy" AND "Published date: 2000-2014" with no specific field selected
	"Low back pain" AND "Osteopathy" AND "Published date: 2000-2014" with no specific field selected
	"Low back pain" AND "Physiotherapy" AND "Published date: 2000-2014" with no specific field selected
	Low back pain AND "Physical Therapy"AND "Published date: 2004-2014" with no specific field selected
	"Low back pain" AND "Chiropractic"AND "Published date: 2000-2014" with no specific field selected

	"Low back pain" AND "Psycholog*" AND "Published date: 2000-2014" with no specific field selected
	"Low back pain" AND "biopsychosocial" AND "Published date: 2000-2014" with no specific field selected
	Boolean/Phrase: lumbar spine AND examination AND assessment
	Boolean/Phrase: lumbar spine AND examination AND assessment AND reliability AND validity AND specificity
CINAHL	"Low back pain" AND "Manual Therapy" AND "Published date: 2000-2014" with no specific field selected
	"Low back pain" AND "biopsychosocial" AND "Published date: 2000-2014" with no specific field selected
	"Low back pain" AND "osteopathy" AND "ublished date: 2000-2014" with no specific field selected
	"Low back pain" AND "Physiotherapy" AND "Published date: 2000-2014" AND "Systematic reviews" with no specific field selected
	"Low back pain" AND "Physiotherapy" AND "Published date: 2000-2014" AND "reviews" with no specific field selected
	"Low back pain" AND "chiropractic" AND "Published date: 2000-2014" AND "Systematic reviews" with no specific field selected
	"Low back pain" AND "chiropractic" AND "Published date: 2000-2014" AND "reviews" with no specific field selected
	"Low back pain" AND "psychol*" AND "Published date: 2000-2014" AND "systematic reviews" with no specific field selected
	Low back pain AND "physical therapy" AND "Published date: 2004-2014" AND "systematic reviews" OR "meta-analysis" OR "practice guidelines" OR "review"
	"Low back pain" AND "psychol*" AND "Published date: 2000-2014" AND "reviews" with no specific field selected
	lumbar spine AND examination AND assessment Limiters Published Date: 20040101- Publication Type: Systematic Review

STUDY ELIGIBILITY FORM

Article ID	40
Date	22/04/2015
Reviewer	JDR
Checked by	

TYPE OF STUDY			
1. Is the paper a systematic review?	Yes	Unclear	No
CONTENT			
2. Is the paper about non-specific low-back pain?	**Yes:** - Defined by authors and meet definition - meets definition	**Unclear:** - mixed population NS LBP and back/leg pain	**No**
3. Does the paper focus on manual therapy or knowledge and skills of interest in manual therapy consultation (incl. psychology, rehabilitation, exercises)?	Yes	Unclear	No
4. Is the article published in English or French?	Yes	Unclear	No
5. Has the article been published In 2004 or after?	Yes	Unclear	No

FINAL DECISION	INCLUDE	UNCLEAR	EXCLUDE

If 1 'no' => exclude // If 2 unclear => unclear // Otherwise => include

EVIDENCE TABLE

SYSTEMATIC REVIEW DESCRIPTION				
Author, Organisation	SEFFINGER, M. N., WI. MISHRA, SI. ADAMS, A. DICKERSON, VM. MURPHY, LS. REINSCH, S.			
Title	Reliability of spinal palpation for diagnosis of back and neck pain: a systematic review of the literature.			
Year	2004			
Journal/Source	Spine J, 29, E413-25.			
Country	USA			
Design (type of sources included)	RCTs only (grade 1a)	Cohort studies (grade 2a)	Case-control (grade 3a)	Mixed sources
Date of inclusion of sources	From 1966		to 2001	

INCLUSION / EXCLUSION CRITERIA

INCLUSION CRITERIA	articles in any language that pertained to manual spinal palpation procedures to any and all regions of the human spine (excluding the sacral region); included measurement for the intra- and/or interexaminer reliability of manual spinal palpation; published between January 1, 1966 and October 1, 2001 in a peer-reviewed journal article, monograph, or dissertation.			
EXCLUSION CRITERIA	articles inconsistent with the inclusion criteria; anecdotal, speculative or editorial in nature; included a whole regimen of tests or methods, without separate data for each test and/or the data for spinal palpatory procedures could not be ascertained.			
POPULATION				
PATIENTS				
age	Not stated			
sex	Not stated			
Type of NS-LBP	Mixed population: asymptomatic (74% of studies) and NSLBP (26% of studies)			
Specific characteristics (incl comorbidities)	N/A			
PROFESSION	Osteopathy	Chiropractic	Physiotherapy	Other
If other, detail:				
POTENTIAL ITEM FOR INCLUSION IN REVIEW				
Type of item	Diagnostic			
Item description	The majority of spinal palpatory diagnostic tests demonstrated low reliability.			
Use in practice	Yes			
Strength of evidence	Not reported			
Type of item	Diagnostic			
Item description	Acceptable reliability for intraexaminer lumbar segmental vertebral motion tests			
Use in practice	Yes			
Strength of evidence	Data from the higher quality studies (quality score 67.5 of 100 or greater)			
Type of item	Diagnostic			
Item description	Acceptable reliability for interexaminer pain provocation at L4–L5 and L5–S1			
Use in practice	Yes			
Strength of evidence	Data from the higher quality studies (quality score 67.5 of 100 or greater)			
Type of item	Diagnostic			
Item description	Acceptable reliability for interexaminer pain provocation at lumbar paraspinal myofascial trigger points (between trained examiners only)			
Use in practice	Yes			

Strength of evidence	Data from the higher quality studies (quality score 67.5 of 100 or greater)
Type of item	Diagnostic
Item description	Acceptable reliability for identification of a nominated lumbar vertebral spinous process.
Use in practice	Yes
Strength of evidence	Data from the higher quality studies (quality score 67.5 of 100 or greater)
Type of item	Diagnostic
Item description	Mixed reliability results for interexaminer lumbar segmental vertebral motion tests.
Use in practice	Yes
Strength of evidence	Data from the higher quality studies (quality score 67.5 of 100 or greater)
Type of item	Diagnostic
Item description	Pain provocation, regional motion, and landmark location tests have acceptable reliability (kappa 0.40 or greater), but they were not always reproducible by other examiners under similar conditions. Intraexaminer reliability is better than interexaminer reliability.
Use in practice	Yes
Strength of evidence	From the higher quality quartile studies that used the same statistical analysis, kappa statistics.
Type of item	Diagnostic
Item description	Soft tissue paraspinal palpatory diagnostic tests are the least reliable amongst the tests reviewed.
Use in practice	Yes
Strength of evidence	High

(continue on a separate sheet if needed)

PF or MF = predisposing factor or maintaining factor

References to hand search	
Notes	

Appendix D. Summary table for biological category

Summary table risk factor assessment

List of articles		Biological																			
Article ID	Type of study: 1=syst rev 2=guid 3=narr rev	Age	Sex	Obesity	LBP intensity	LBP function	Hxx of LBP	Multiple previous MSK complaints	LSp changes (AO, disc, scoliosis, etc)	Previous back surgery	Trunk muscle endurance	Trunk muscle strength	LSp mobility	Comorbidities	Excessive mobility in other joints	Presence of symptoms below the knee	Leisure-time sport or Exx or professional level	Sitting	Sleeping	Prolonged standing / walking	Genetics
1	2																		x		
2	2	x			x																
3	2																				
4	2				x	x	x														
6	2																				
8	2					x															
9	2																				
10	2			x			x		x	x											
11	2																				
13	2	x	x		x							x	x	x	x	x					
14	2						x							x							x
15	2																				
16	1																				
17	1																				
18	1																				
19	1							x													
20	1	x	x		x									x							
21	1																x	x	x	x	
22	1																	x			
23	1																				
24	1												x								
25	1	x	x	x	x	x								x							
26	1			x																	
27	1																				
28	1																		x		
29	1													x							
30	1						x							x							
31	1																				
32	1	x	x		x																
33	1																				
35	1			x										x							x
36	1																				
42	1										x	x	x								
43	1																x				
44	1																				
45	1						x														
46	1																				
47	1	x			x	x	x														

Summary of the evidence for each item

		Hxx of LBP
Syst review	30	Predictor of onset of LBP (strong evidence)
	45	The only risk factor that was notably different in those who were pain free at baseline versus having never experienced LBP was a history of LBP
	47	Strong evidence that previous history of LBP: risk factor for chronicity and recurrence
Guidelines	4	History of LBP predictive of chronicity (level B)
	10	History of LBP predictive of disability and future back ache
	14	History of LBP predictive of chronicity

Conclusion	History of LBP is a strong predictor of recurrent episodes and chronic pain

Inclusion for e-learning programme	**Yes**	**Unclear**	**No**

Category	BIO	PSYCHO	SOCIAL

Appendix F. List of items included and excluded

Items included in the e-learning programme

	To include	Unsure	To exclude	Comments
NSLBP onset prognostic factors				
Inconclusive evidence that poor trunk muscle strength can predict LBP				
No relation between trunk muscle endurance and the risk of future low back pain.				
Obesity increases risk of LBP but is not a strong predictor. Association mainly with chronic LBP (but not a chronic risk factor).				
LBP is not associated with leisure-time sport or exercises (strong evidence) or professional level exercises				
There is strong evidence that LBP is not associated with sitting. There is no evidence that sitting during leisure time or at work (independently or combined) is a risk factor for LBP and there is no dose-related response to sitting with LBP.				
LBP is not associated with prolonged standing or walking (strong evidence)				
Depression is not a predictive factor for the onset of NSLBP.				Item split with general outcomes
Conflicting evidence that higher physical work demands is a risk factor for LBP onset				Split with gnl outcomes. AB: This is a risk factor so exploring a patient's work situation is important so long as the e-learning makes it clear that the answer is not to routinely limit activities and work SV: It's a tough one, the way I think you could discuss this is with the few specific high level exampels that suggest there may be a risk but present some of the uncertainty with this?
There is high evidence that low job satisfaction is a risk factor for the development of LBP.				Split with general outcomes
Sedentary work and desk/chair set up are not risk factors for the onset of LBP.				Split with general outcomes

	To include	Unsure	To exclude	Comments
Chronic pain prognostic factors				
Presence of symptoms below the knee is a prognostic factor for the development of chronic pain				
Many structural changes (including OA, mild to moderate scoliosis, SIJ asymmetry, disc bulges) occuring on the LSp are asymptomatic.				
The more functional impairement the more likely chronic pain development.				
Previous back surgery predicts possible future pain				
Preexisting sleep disturbances are strong predictors of higher reported pain intensities (substantial evidence) and once patients have developed CLBP it is associated with sleep problems (substantial evidence), including sleep disturbance, reduced sleep duration, decreased sleep quality, increased time to fall asleep and diminished day-time functioning as a consequence of poor sleep				
There is currently insufficient evidence for a positive association between stress at work and LBP but lower psychological demands at work is a prognostic factor for return to work.				
Fear of work activities is a risk factor for pain intensity, delayed return to work. Belief that work is harmful is suggested to be a risk factor for pain chronicity and disability.				

	To include	Unsure	To exclude	Comments
Disability prognostic factors				
Younger age favourable prognostic factor, mainly for disability				
Mutliple previous MSK complaints predict disability				
The effects of genetics are higher from more complex and disabling LBP than acute and less disabling, and their effects range from 0% (age 11) to 67% (age 30).				AB: I'm not sure what you mean here. An individual's genetic make-up is non-modifiable so I do not think this should be included DECISION: keep as has a utility for explaining to patients, deconstruct misbeliefs

Patients' pain misbeliefs may increase risk of long term disability and work loss. There is confliting evidence on catastrophising and fear-avoidance behaviour effect on LBP outcomes. Possible effects of catastrophising on long-term self-reported disability.				
Extreme symptom report is a predictor of chronicity, perhaps more for disability than pain.				AB: I'm not sure what you mean here. Severity of pain is associated with risk of poor outcome, but do you mean over-reporting of symptoms? We have no way of quantifying symptoms such as pain and stiffness so how can this be established?
Compensation issues, previous sick leave on LBP, financial problems and delay to access income support are possible factors predictive of increased risk of disability and word loss.				
Guidelines suggest that poor relationships with peers at work is a risk factor for chronic disability.				
Low socioeconomic status is a risk factor for chronic disability				
Experience of conflicting diagnoses or explanations for back pain, resulting in confusion may increase the risk of long-term disability and work loss				Mentioned in only one guideline but it reflects things in the literature out of the scope of this review so I would be inclined to keep it.
Diagnostic language leading to catastrophising and fear (eg, fear of ending up in a wheelchair) may increase the risk of long-term disability and work loss. A careful initial examination may help in reassuring the patient.				
Patient expectation of a 'techno-fix', eg, requests to treat as if body were a machine may increase the risk of long-term disability and work loss				Mentioned in only one guideline butI find it very suitable for osteopathy that can easily become technique-obessed.
Lack of satisfaction with previous treatment for back pain may increase the risk of long-term disability and work loss.				I understand the rationale but I haven't come across that in the literature apart in one guideline so I would be to discard that one. AB: I think this is an important aspect of care to assess previous experiences of treatment and outcomes of that treatment SV: Need to figure out evidence under this one DECISION: Included (need to dig in more the literature)
Advice from healthcare professional to withdraw from work may increase the risk of long-term disability and work loss.				Mentioned in only one guideline but it reflects things in the literature out of the scope of this review so I would be inclined to keep it even though there is conflicting evidence of the effects of sick leave and work status on LBP outcome (box 58) AB: Although the link between patient outcomes and practitioner factors has not been clearly established, this highlights the 'power' practitioners have in their advice to patients. I'm happy to remove this if these aspects are covered elsewher, but it is important somewhere to acknowledge practitioner factors on outcomes DECISION: included

Unspecific poor outcomes prognostic factors				
General health is not predictive of LBP and comorbidities may not impact LBP clinical course. LBP associated with various other diseases, including osteoporosis, asthma, diabetes and chronic headaches. Patients' poor self-perceived health is correlated with poorer LBP outcomes.				
Low intensity of LBP at baseline is a favourable prognostic factor. High intensity predicts worse outcomes at 3-6 months but not at 1 year.				
Passive coping strategies, including extended rest and excessive reliance on use of aids or appliances are unfavourable prognostic factor for LBP (LBP outcomes and disability)				
Reduced activity level is an unfavourable prognostic factor				
Patient's healthcare beliefs that do not fit best practice increase the risk of chronicity				
Poor patients' expectations of recovery are a risk factor of chonicity. Positive patients' expectations of recovery is a favourable prognostic factor for LBP.				
Fear of activity is an unfavourable prognostic factor, mainly for patients with subacute LBP for work-related outcomes.				SV: Yes but small groups who have this fear and need to not over play it
There is a strong consensus and evidence that depression is a predictive factor for NSLBP poor outcomes.				Item split with Onset
There is a general consensus that anxiety is a strong risk factor of poor outcome but there is conflicting evidence.				

Suggestion that high level of self-efficacy (coping skills) with regards to LBP or internal locus of control would be favourable prognostic factors for LBP				Even though only one guideline mentions these factors, they start to appear more in the literature. It is also interesting to have some favorable prognostic factors
Current psychiatric comorbidity is a strong predictor of poor outcomes at 3 to 6 months.				Split with disability DECISION: include
General consensus that spouse and family may increase risk of developing chronicity by their behaviour (being over-protective, expressing frustration) or from spouse/family's negative expectations of recovery.				
Evidence that higher work demands predicts worse outcomes at 1 year. Lower physical demands at work is a prognostic factor for return to work. There is suggestion that history of specific manual works (including farming, nursing, truck driving) may be risk factors of chronicity but there is conflicting evidence that they are associated with LBP.				I would like to have your feedback on that one. I think it makes sense but I may be wrong. AB: included SV: These items are kinda in above
There is conflicting evidence that low job satisfaction predicts of worse outcomes; it can predict worst outcomes at 1 year but probably not earlier. More job satisfaction is a prognostic factor for return to work.				Split with onset
There is conflicting evidence on the effect of social support at work on LBP but the evidence is mainly against an association.				
General consensus that inflexible work schedule or unsociable hours are risk factors for chronicity.				
Lack of job accomodations and graduated return to work pathways are risk factors of chronicity.				
Recovery expectations have the strongest prediction of people at risk of poor outcome when done within the first 3 weeks of NSLBP.				
Limited evidence that sedentary work is a risk factor for LBP. No evidence that sedentary behaviour at work and leisure time together is a risk factor of LBP. No dose-related response between sitting and LBP.				Split with onset
Strong evidence that worker having difficulty returning to normal occupational duties at 4-12 weeks, the lower the chances of ever retruring to work.				
To avoid pejorative labelling of patients with Yellow Flags and sanctioning disability as this will have a negative impact on management.				Mentioned in only one guideline but it reflects things in the literature out of the scope of this review so I would be inclined to keep it.
If the clinician has fear-avoidance beliefs, he or she may transmit them to the patient and may increase the likelihood of delayed recovery.				Mentioned in only one guideline but this is a crucial point and it sort of underpins the whole idea of my research, i.e. effects of what practitioners say/do to patients and the possible effects of training practitioners to minimise possible these negative effects.

Recurrence prognostic factors				
Excessive mobility in other joints is a prognostic factor for development of recurrent low back pain				AB: How strong is this evidence? If moderate + then include, if weaker do not
Hxx of LBP is a strong predictor of recurrent episodes and chronic pain				
No evidence that decreased LSp mobility can predict LBP but there is high evidence that excessive spine mobility is a prognostic factor for recurrent LBP.				

Assessment				
Imaging should not be recommended for the management of NSLBP.				
The history taking should be thorough and should investigate pain characteristics, sensory changes, strength changes, job and activity associations, psychosocial factors that may delay recovery. Psychosocial factors and emotional distress should be assessed because they are stronger predictors of low back pain outcomes than either physical examination findings or severity and duration of painThe healthcare practitioner should ask the patient if he or she has any specific questions or expectations from this visit.				

Clinical impressions are not sensitive enough to detect depression in patients with low back pain but there are several questionnaires easy to use in practice that are available for practitioners to assess depression or disability (details in summary table - questionnaires)			It could either be fully included in the e-learning content or as an optional course for those who want to learn about possible tools available. AB: There are very short screening questions available such as those that have been included (recently scrapped I believe) for patients with diabetes & heart disease in primary care. But could be useful as a screening check SV: Not sure about this one - are there not a couple of screening questions? DECISION: included with 2-question screening tool and extra questionnaires as appendix and explanation to refer to GP
There is moderate to strong evidence of low reliability of the observation during the examination.			SV: Not really sure what is in here
Palpation is not a reliable independent tool in the evaluation of NSLBP.			
Straight leg raising tests (Lasegue) in the diagnosis of non-specific CLBP are not recommended.			It seems a bit too obvious to put it in the learning package. AB: I would include it unless osteopaths are much more clued up than a lot of practitioners I have been involved with!! SV: interesting to talk diff between referred pain and sciatica DECISION: included
Pain provocation tests are the most reliable of the palpatory tests, e.g. spring tests.			
Palpation of asymmetrical anatomic landmarks is part of the diagnosis of somatic dysfunction but palpation-based assessment has a low reliability.			
There is a general consensus that active range of motion should be assessed. Observation of aberrant movements has demonstrated moderate to good reliability. Double-inclinometer is a valid method for assessing the total range of motion of the lumbar spine.			
General consensus in manual therapy that passive assessment of the lumbar spine is an integral part of the examination of patients with NS LBP. Passive range of motion (ROM) tests of the lumbar spine have a low reliability, regional ROM is more reliable than segmental ROM.			AB: Include if clearly put into context that palpation is not reliable for assessment of movement only as a pain provocation test

Items excluded from the e-learning programme

	To include	Unsure	To exclude	Comments
Chronic pain prognostic factors				
Female may be at higher risk to develop LBP, and at long term may have higher intensity pain but no differences at short term.				AB: Females are more likely to report/consult with a ramge of MSK pain. It is not a modifiable risk factor so I do not thing it should be included SV: I think we could include this as part of the epidemiology of pain and thinking about prognosis?
Deconditioning may contribute to persistent pain when associated to other factors.				Suggested in one guideline that it "may" be associated with other factors to persistent pain
Disability prognostic factors				
Anecdotal mention of troubled childhood as being a risk factor for chronic disability				Only one guideline mentions it with no evidence to back it up
Somatization is a predictor failure to return to work at 3 months and predictor of disability at one year but no longer at 4 years				Description of somatisation not precise enough to use in e-learning programme.
A psychiatric history may be a risk factor for chronic disability.				Split with general outcomes AB: I don't think is well supported and a psychiatric history 20 years ago would probably noy impact on my risks and outcomes now
Lack of vocational directions is suggested to be a risk factor for chronic pain and disability.				Mentioned in only 1 guideline
Near to retirement is a risk for chronic disability				Only 1 guideline mentioning it
Number of times visited health professional in last year (excluding the present episode of back pain) may increase the risk of long-term disability and work loss.				I understand the rationale but I haven't come across that in the literature apart in one guideline so I would be to discard that one.
Unspecific poor outcomes prognostic factors				
Alcool consumption and drug use (possibly as self-medication) are risk factors for chronicity and are associated with chronic and complex LBP.				AB: I would include this and the one below as healthy 'lifestyle factors' which should be included but is the evidence of a direct link between these individual factors and LBP clearly established? SV: see evidence DECISION: excluded as mixed evidence
Smoking may be associated with chronic LBP lasting more than a month in the last year but is not a risk factor of chronicity (consistent evidence)				AB: I would include this and the one below as healthy 'lifestyle factors' which should be included but is the evidence of a direct link between these individual factors and LBP clearly established? SV: I think this one is hard evidence rather mixed? DECISION: excluded as mixed evidence
Some consensus that lack of support or person to talk to about problems may be a risk factor of chronicity				From 2 guidelines, not very strong statements or evidence. DECISION: exclude
There is moderate evidence that shorter job tenure is a predictor of chronicity.				AB: exclude SV: look at evidence DECISION: Excluded (evidence not strong)
At the best, weak evidence of effects of educational level on LBP outcome.				AB: excluded SV: excluded DECISION: excluded (Conflicting evidence and no strong evidence of association: 2 guidelines mention it as being a blue flag but 1 SR recommends to remove educational background from the flag system and the other one found weak evidence of its effects on LBP outcome.)

Being a male, younger age, having less pain, lower physical demands, lower psychological demands, higher decision latitude at work, being a breadwinner, better general health, more job satisfaction, surgery in the first year of sick-listing, no treatment before being sick-listing are positive prognostic factors for return to work. Fear or work activities, higher somatiszation are negative prognostic factors for return to work.				This is not directly related to LBP outcome but return to work. Conflicting evidence of effects of sick leave on LBP outcome (item just above) but I find it still interesting in a BPS perspective. AB: Most of these factors are covered separately SV: excluded DECISION: exclusion (most already covered)
Strong evidence of an association between healthcare professional's judgement at baseline of poor recovery and LBP recovery				AB: Was this strong? I thought the StartBack studies suggested that clinican intuition isn't great at predicting outcome SV: Not sure how this would be put in? Pt who we think are going to struggle with multiple risk factors etc do struggle - isn't this just a form of triangulation with other data? DECISION: Excluded, low evidence (mentioned only in 1 guideline) and does not match rest of literature
Assessment				
Electromyography is not recommended for the NSLBP management				Not applicable in osteopathy AB: Otherwise osteopthss may refer for this SV: not applicable DECISION: excluded as osteopaths cannot refer patients for these tests and programme will explain clearly that the topic is about NSLBP, therefore these tests would not be necessary
No lab tests for NSLBP management				Not applicable in osteopathy AB: Otherwise osteopthss may refer for this SV: not applicable DECISION: excluded as osteopaths cannot refer patients for these tests and programme will explain clearly that the topic is about NSLBP, therefore these tests would not be necessary
High reliability of timed muscle endurance				Not applicable in an osteopathic context

Appendix G. Papers categorised per methods

	Guidelines		Systematic reviews
1	ASHTON, J., BUTLER, M., BRIDGE, M., GRIFFITHS, R., HAWTIN, J., KENDALL, N., MCGRATH, C., MCNAUGHTON, H., MERCER, S., NICHOLLS, D., NICHOLSON, R., SCOTT, D., WATT, J. P. Y. F. K. N., LINTON, S. & MAIN, C. N. Z. A. C. C. 2004. New Zealand acute low back pain guide, incorporating the guide to assessing psychosocial yellow flags in acute low back pain, October 2004 edition.	16	HARTVIGSEN, J., LINGS, S., LEBOEUF-YDE, C. & BAKKETEIG, L. 2004. Psychosocial factors at work in relation to low back pain and consequences of low back pain; a systematic, critical review of prospective cohort studies. Occupational and Environmental Medicine, 61, 10p.
2	OOSTENDORP, R. A. B., SCHOLTEN-PEETERS, G. G. M., SWINKELS, R. A. H., BEKKERING, G. E., HEIJMANS, M. W. F., HUIJBREGTS, P. A. & HENDRIKS, E. J. M. 2004. Evidence-based practice in physical and manual therapy: development and content of Dutch National Practice Guidelines for patients with non-specific low back pain. Journal of Manual & Manipulative Therapy (Journal of Manual & Manipulative Therapy), 12, 21-31.	17	MAY, S., LITTLEWOOD, C. & BISHOP, A. 2006. Reliability of procedures used in the physical examination of non-specific low back pain: A systematic review. Australian Journal of Physiotherapy, 52, 91-102.
3	VAN TULDER, M., BECKER, A., BEKKERING, T., BREEN, A., CARTER, T., GIL DEL REAL, M. T., HUTCHINSON, A., KOES, B., KRYGER-BAGGESEN, P., LAERUM, E., MALMIVAARA, A., NACHEMSON, A., NIEHUS, W., ROUX, E. & ROZENBERG S EUROPEAN COMMISSION RESEARCH DIRECTORATE GENERAL, C. B. W. G. O. G. F. T. M. O. A. L. B. P. I. P. C. 2004. European guidelines for the management of acute nonspecific low back pain in primary care [with consumer summary].	18	PINCUS, T., VOGEL, S., BURTON, A. K., SANTOS, R. & FIELD, A. P. 2006. Fear avoidance and prognosis in back pain: A systematic review and synthesis of current evidence. Arthritis and Rheumatism, 54, 3999-4010.
4	HILDEBRANDT, J., URSIN, H., MANNION, A., ARIKSAINEN, O., BROX, J. I., CEDRASCHI, C., KLABER-MOFFETT, J., KOVACS, F., REIS, S., STAAL, B., ZANOLI G EUROPEAN COMMISSION, R. D.-G. D. O. P. C.-O. & STRATEGY 2005. European guidelines for the management of chronic non-specific low back pain [with consumer summary].	19	LITTLEWOOD, C. & MAY, S. 2007. Measurement of range of movement in the lumbar spine - what methods are valid? A systematic review. PHYSIOTHERAPY (LONDON), 93, 201.
5	BURTON, A. K., BALAGUE, F., CARDON, G., ERIKSEN, H. R., HENROTIN, Y., LAHAD, A., LECLERC, A., MULLER, G., VAN DER BEEK, A. J. & ON BEHALF OF THE COST B13 WORKING GROUP ON GUIDELINES FOR PREVENTION IN LOW BACK PAIN EUROPEAN COMMISSION RESEARCH DIRECTORATE GENERAL, C. B. W. G. O. G. F. T. P. O. 2006. Chapter 2 European guidelines for prevention in low back pain, November 2004 [with consumer summary]. European Spine Journal 2006 Mar;15(Suppl 2):S136-S168.	20	SLEBUS, F. G., KUIJER, P. P. F., WILLEMS, J. H. B., SLUITER, J. K. & FRINGS-DRESEN, M. H. W. 2007. Prognostic factors for work ability in sicklisted employees with chronic diseases. Occupational and Environmental Medicine, 64, 814-819.
6	CHOU, R., QASEEM, A., SNOW, V., CASEY, D., CROSS, J. T., JR., SHEKELLE, P., OWENS, D. K., FOR THE CLINICAL EFFICACY ASSESSMENT SUBCOMMITTEE OF THE AMERICAN COLLEGE OF, P. & THE AMERICAN COLLEGE OF PHYSICIANS/AMERICAN PAIN SOCIETY LOW BACK PAIN GUIDELINES PANEL AMERICAN COLLEGE OF PHYSICIANS, A. P. S. 2007. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society [with consumer summary]. Annals of Internal Medicine 2007 Oct 2;147(7):478-491.	21	BAKKER, E. W., VERHAGEN, A. P., VAN TRIJFFEL, E., LUCAS, C. & KOES, B. W. 2009. Spinal mechanical load as a risk factor for low back pain: a systematic review of prospective cohort studies. Spine (Phila Pa 1976), 34, E281-93.
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8	SAVIGNY, P., KUNTZE, S., WATSON, P., UNDERWOOD, M., RITCHIE, G., COTTERELL, M., HILL, D., BROWNE, N., BUCHANAN, E., COFFEY, P., DIXON, P., DRUMMOND, C., FLANAGAN, M., GREENOUGH, C., GRIFFITHS, M., HALLIDAY-BELL, J., HETTINGA, D., VOGEL, S. & WALSH D NATIONAL COLLABORATING CENTRE FOR PRIMARY CARE, R. C. O. G. P. 2009. Low back pain: early management of persistent non-specific low back pain: full guideline.	23	ILES, R. A., DAVIDSON, M., TAYLOR, N. F. & O'HALLORAN, P. 2009. Systematic review of the ability of recovery expectations to predict outcomes in non-chronic non-specific low back pain. JOURNAL OF OCCUPATIONAL REHABILITATION, 19, 25-40.
9	TOWARD OPTIMIZED, P. 2009. Guideline for the evidence-informed primary care management of low back pain.	24	LAKKE, S. E., SOER, R., TAKKEN, T. & RENEMAN, M. F. 2009. Risk and prognostic factors for non-specific musculoskeletal pain: a synthesis of evidence from systematic reviews classified into ICF dimensions. Pain, 147, 153-64.
10	CHIODO, A. E., ALVAREZ, D. J., GRAZIANO, G. P., HAIG, A. J., HARRISON, R. V., PARK, P., STANDIFORD, C. J. & WASSERMAN, R. A. U. O. M. H. S. 2010. Acute low back pain: guidelines for clinical care [with consumer summary].	25	CHOU, R. & SHEKELLE, P. 2010. Will this patient develop persistent disabling low back pain? JAMA, 303, 1295-302.
11	Clinical Guideline Subcommittee on Low Back Pain. 2010. American Osteopathic Association Guidelines for Osteopathic Manipulative Treatment (OMT) for Patients With Low Back Pain. J Am Osteopath Assoc, 110, 653-666.	26	SHIRI, R., KARPPINEN, J., LEINO-ARJAS, P., SOLOVIEVA, S. & VIIKARI-JUNTURA, E. 2010. The association between obesity and low back pain: a meta-analysis. American Journal of Epidemiology, 171, 135-54.
12	GUEVARA-LOPEZ, U., COVARRUBIAS-GOMEZ, A., ELIAS-DIB, J., REYES-SANCHEZ, A. & RODRIGUEZ-REYNA, T. S. 2011. Practice guidelines for the management of low back pain. Consensus Group of Practice Parameters to Manage Low Back Pain. Cirugia y Cirujanos, 79, 264-79, 286-302.	27	WAI, E. K., ROFFEY, D. M., BISHOP, P., KWON, B. K. & DAGENAIS, S. 2010. Causal assessment of occupational carrying and low back pain: results of a systematic review. Spine J, 10, 628-38.
13	DELITTO, A., GEORGE, S. Z., DILLEN, L. V., WHITMAN, J. M., SOWA, G., SHEKELLE, P., DENNINGER, T. R. & GODGES, J. J. O. S. O. T. A. P. T. A. 2012. Low back pain clinical practice guidelines linked to the International Classification of Functioning, Disability, and Health from the Orthopaedic Section of the American Physical Therapy Association [with consumer summary]. The Journal of Orthopaedic and Sports Physical Therapy 2012 Apr;42(4):A1-A57.	28	KELLY, G. A., BLAKE, C., POWER, C. K., O'KEEFFE, D. & FULLEN, B. M. 2011. The association between chronic low back pain and sleep: a systematic review. Clinical Journal of Pain, 27, 169-81.

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39 VAN TRIJFFEL, E., ANDEREGG, Q., BOSSUYT, P. M. M. & LUCAS, C. 2005. Inter-examiner reliability of passive assessment of intervertebral motion in the cervical and lumbar spine: a systematic review. Manual therapy, 10, 256-269.

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44 WERTLI, M. M., RASMUSSEN-BARR, E., WEISER, S., BACHMANN, L. M. & BRUNNER, F. 2014. The role of fear avoidance beliefs as a prognostic factor for outcome in patients with nonspecific low back pain: a systematic review. The spine journal : official journal of the North American Spine Society, 14, 816-36 e4.

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COM-B model			What conditions internal to individuals and in their social and physical environment need to be in place for a specified behavioural target to be achieved?
Behaviour	Capability	Physical	Willingness to adapt their way of communicating with patients Interest in having a system to record factors other than biological ones Willingness to look beyond biomechanical/structural causes to back pain
		Psychological	Willingness to develop interpersonal skills to engage with a patient's emotions and beliefs Interest in updating their knowledge on assessment and flexibility with the model of back pain they use Interest in updating their knowledge on pain Interest in updating their knowledge of advice and exercises to give to patients Cognitive flexibility to look beyond biomechanical/structural causes leading to chronicity
	Motivation	Automatic	NO ITEMS IN LEARNING PACKAGE
		Reflective	Osteopaths are primary healthcare practitioners whose role includes maintaining up-to-date knowledge of risk factors [social role/identity] Willingness to adapt the therapeutic relationship to enhance patient outcomes Willingness to reflect on their treatment orientation Osteopaths will have experience to have treated repeatidly patients with NSLBP
	Opportunity	Social	Profession moving towards an evidence-informed practice Guidelines for NSLBP recommend biopsychosocial approaches to manage patients Osteopathic Practice Standards promote working in partnership with patients New graduates trained with a BPS approach
		Physical	Resources available to the profession (research journals, profession journals) recommending a BPS approach to NSLBP Consultation time - mainly private practitioners.

Appendix I. Course plan

COURSE PLAN

UNIT AND LESSON TITLE		Learning objectives	Description	Extra content		Test
UNIT 1	**INTRO**	**To understand the technical requirements needed for this course and the different topics discussed during the course.**	**This unit introduces the main concepts that will be taught during this course. This unit also explains which IT requirements will be needed, which types of media will be used and general learning outcomes are presented.**			
Lesson 1.1.	Intro	To understand the technical requirements needed for this course and the overall learning objectives of this course.	This lesson describes the technical requirements for this course (which type of devices and internet connection are possible to use for this e-learning programme, optional but recommended to have a specific notebook to write up their answers and thoughts) and the learning objectives of this course.			
Lesson 1.2.	Basic concepts	To understand the classification of LBP and how NSLBP fits in it. To start being familiarised with the idea that the 'tissue causing symptom' model is flawed. To start appreciating differences between acute and chronic symptoms and their impact on prognosis and treatment options.	This lesson outlines the basic concepts that are pre-requisites for the other units of the course. NSLBP is defined and the challenges NSLBP brings are discussed, including its recurrence. This lesson reviews the main previous model of LBP taught in OEIs, 'tissue causing symptom' (TCS), and discusses how current evidence challenges its reliability and therefore use in practice. Concepts that will be detailed later in the course are named, including the BPS model and pain mechanisms. Current challenges in therapy, such as chronic pain, are also introduced. This lecture provides extra material for participants who want an update on the red flags system. <u>MUST KNOW</u>: participants must know at the end of this lesson what NSLBP means, that TCS is a model with limited reliability, chronic pain is a challenging symptom to treat that is not in the TCS model. <u>NICE TO KNOW</u>: Pain is currently classified in mechanisms, providing information on risk factors, prognosis and possible treatment options.	Suppl. 1	List of red flags	
UNIT 2	**CASE HISTORY**	**To understand the variety of possible factors that may contribute to NSLBP and to appreciate ways of assessing them.**	**This unit outlines the possible factors that are associated with NSLBP, discusses the possible impact of therapeutic relationship on patients symptoms outcomes and provides information on how to try to capture as many possible factors as possible**			
Lesson 2.1.	PS factors/ case-study	To self-analyse learner's knowledge of possible factors influencing NSLBP course and on own clinical reasoning	This lesson uses an inductive approach to outline the different factors that may contribute to NSLBP. An audio recording of a case-history of patient presenting with NSLBP and several PS factors is used. The participants are asked, based on the recording, what their considerations for differential diagnoses are and what the risks of not seeking treatment are. Participants are asked to keep their answers on their notebook.			Questions about case-study answered in notebook
Lesson 2.2.	PS factors/ theory	To understand the variety of possible factors that may contribute to NSLBP. To remember a variety of different BPS factors for NSLBP.	This lesson describes and lists the possible factors that can contribute to NSLBP. The psychosocial risk factors are explained and the flag system (yellow, blue and black) are detailed (Kendall 2009). This lecture describes the possible influences of HCP on patients' attitudes and beliefs (Darlow et al. 2012 and 2013) MUST KNOW: NSLBP is influenced by a variety of factors including PS factors. How to use the flag system as a tool to classify possible PS factors and look for PS evolution. NICE TO KNOW: The flag system does not provide a fixed PS state of patient but is a snapshot on that moment. Reassessment is necessary as patient's context changes constantly, hence their PS state changing regularly.	App. 1	List of PS flag system	List possible factors and ask right or wrong
Lesson 2.3.	PS factors/ case-study (cont.)	To apply theory about PS factors (from lesson 2.2.) in a practical exercise (case study from lesson 2.1.)	This lesson offers the possibility to learners to listen again to the case-study presented in lesson 2.1. Participants are asked not to read what was written in their notebook before answering to the same questions again (what are your considerations for differential diagnoses? What are the risks of not seeking treatment?). This lesson provides an example (case study from lesson 2.1.) where participants can apply theory learnt in lesson 2.2.			Questions about case-study answered in notebook
UNIT 3	**Examination**	**To evaluate which assessment methods are the most appropriate and reliable for specific patient's presentations**	**This unit describes the low reliability of assessment methods available to osteopaths and introduces concepts of clinical uncertainty and clinimetrics. An evidence-based choice of assessment methods will be detailed, with application methods to help participants to understand the application of these assessment methods**			

Lesson 3.1	Examination / introduction	To understand the limitations of the lumbar clinical examination. To remember the most reliable tests of the lumbar examination.	This lesson highlights the limited evidence that clinical examination for the lumbar spine has and which tests are the most reliable. A powerpoint presentation, informed by stage 1 scoping review, with pictures and when necessary videos details the most reliable tests, their indications and interpretations. MUST KNOW: There are no gold-standards part of the examination of the lumbar spine in manual therapy. A clustered approach is the most reliable way of assessing the lumbar spine. Indications and interpretations of evidence-based tests. NICE TO KNOW: Names of the evidence-based tests, i.e. with currently the highest reliability.	Suppl. 2	Papers on lumbar examination used for scoping review	Quizz at the end, naming the tests or showing a picture and asking indication or interpretation
Lesson 3.2	Examination / scenario	To apply knowledge on lumbar spine examination with a scenario-based approach	This lesson uses a scenario-based approach. Participants can put in use the knowledge obtained in lesson 3.1. Learners are only provided with the information required to make decisions. Possible choice options are defined (choices are not be obvious) and each choice generates a detailed feedback by showing its consequences.			Participants have to answer to possible choices generated from the scenario
UNIT 4	**Integration**	**To analyse how different factors that a patient presents with may interact and influence the course of their NSLBP**	**This unit reviews how the different factors mentioned in earlier units may interact with each other. Three case-studies This unit introduces some elements on treatment options and choices, that will be further discussed in unit 5.**			
Lesson 4.1	Case study 1 / practical	To apply knowledge from previous units in a case-scenario with a main biological component. To analyse what possible mechanisms may be underlying the patient's presentation.	This lesson provides a NSLBP case-study with a main biological component. Participants are asked with Q&A to think about possible mechanisms that may underpin the patient's presentation. First a short summary of a case-history is presented in a Word format (e.g. young, IT job, keen runner, no history of trauma, past medical history unremarkable, rest of case history normal, etc) followed by the presentation of the findings from the examination of this patient's acute NSLBP of severe intensity. Participants are asked to draw from the CH and examination possible PS factors that may contribute to the patient's presentation and consider what the possible risks are. TO KNOW: Participants have to understand what the different facets of NSLBP presentation are. Best-evidence advice must be understood and applied to this case-study. NICE TO KNOW: Severity of pain is not a sign of gravity.			Q&A, including which tests would be appropriate to do based on CH, which advice should be given concerning RTW/bed-rest/Exercises, what could be causing the pain (poor muscle strength? Increased weight? Leisure activity? Etc)
Lesson 4.2	Case study 1 / theory	To understand pain mechanism of nociception.	This lesson provides explanation on nociception in a deductive manner based on the case-study in lesson 4.1. which was mainly nociceptive. This lesson describes in simple terms what nociception is, how different nociception is from pain, and what influences nociception. This lecture discusses what possible treatment options could be integrated for treatment of NSLBP with a main nociceptive component.	App. 2	Cluster of seven clinical criteria predictive of nociception pain (from Smart et al. 2012)	
Lesson 4.3	Case study 2 / theory - PS factors and acute/chronic pain	To understand how psychosocial factors may influence the course of NSLBP. To remember the differences between acute and chronic pain. To evaluate participants' own practice for treating of chronic and acute patients.	This lesson describes the differences between acute and chronic pain and details possible risk factors of chronicity (PS factors). Participants are asked first to note in their notebook what differences there are between acute and chronic pain and if acuteness/chronicity influences the way they approach and treat patients. The lecture then is theoretical but very engaging: images of optical illusions and clinical examples are used in order to make it an enjoyable experience for the learner and clinically relevant to them. Pain being context-dependant is explained in order to deconstruct the belief participants may have that pain is sign of tissue damage. Possible implications for treatment and advice are then discussed. Challenges of osteopathic treatment for chronic pain are introduced. At the end of the lesson, participants are asked to review how this knowledge may influence the way they would assess and treat acute/chronic patients. MUST KNOW: chronic and acute pain are different mechanisms and may require different treatment options.	Suppl. 2	Papers on differences between acute and chronic pain with strong clinical relevance	Participants are asked to use their notebooks to note their reasoning according to acute/chronic pain before and after this lecture.

Lesson 4.4	Case study 2 / practice	To apply knowledge from previous units and lesson 4.3 in a case-scenario with a main psychological component. To analyse what possible mechanisms may be underlying the patient's presentation.	This lesson provides a case-study where the case history and clinical examination of an actor patient are video-recorded. They are based on a patient complaining of a chronic NSLBP, presenting with a strong psychological component of his/her symptoms. MUST KNOW: Participants must be able to differentiate acute/chronic presentations and possible implications for treatment.			Q&A, including which tests would be appropriate to do after the CH video (reinforcing content from lesson 3.1.), which advice should be given concerning RTW/bed-rest/Exercises, what could be causing the pain, what possible differentials there are, what possible underlying mechanism there is.
Lesson 4.5	Case study 2 / theory - central sensitisation	To understand the central sensitisation pain mechanism.	This lesson describes central sensitisation. This lesson describes in simple terms what central sensitisation is, what influences central sensitisation and what the most common signs of central sensitisation are (Smart et al. 2012 + Nijs et al. 2014. Applying Modern Pain Neuroscience in Clinical Practice: Criteria for the Classification of Central Sensitization Pain. Pain Physician, 17, 447-457). MUST KNOW: Participants must understand that central sensitisation pain is not a peripheral local process. Participants must be able to understand the implications of central sensitisation pain, including the absence of relationship betwen pain and tissue damage. Participants must understand that central sensitisation pain is highly corrolated to PS factors.	App. 3	List of 4 predictive symptom s and signs of central sensitisati on pain (from Smart 2012)	
Lesson 4.6.	Case-study 3 / practice	To apply knowledge from previous units and current unit's lessons in a case-scenario with a main social component. To analyse what possible mechanisms may be underlying the patient's presentation.	This lesson is based on a Word case-history informed by the vignette used in Bishop et al. 2008 (How does the self-reported clinical management of patients with low back pain relate to the attitudes and beliefs of health care practitioners? A survey of UK general practitioners and physiotherapists). This case-history is the last one of the course. It highligyhts even more than previous case studies how biological, psychological and social components can be			
UNIT 5	**Treatment consideration s**	**To analyse what possible therapeutic options depending on the BPS factors patients present with, in order to create management options tailored to each patient.**	**This unit introduces concepts of treatment options that are currently used and discusses what the literature currently suggests for treatment options. This unit aims at providing answers that the training may have given rise to as in previous studies it has been described as a possible reason why trainings have not changed practitioners' attitudes or behaviors.**			
Lesson 5.1.	Treatment - general information	To understand that treatment options have a great uncertainty and there is limited evidence for most of them. To evaluate what approaches may suit more a nociceptive or a central sensitisation type of pain.	This lecture outlines the different treatment options and advice for patients with NSLBP based on the guidelines and systematic reviews used in the scoping review (stage 1). The aim of this lecture is to provide guidance on how participants may want to integrate these options in their practi+D6ce rather than changing dramatically their practice.			
Lecture 5.2	Treatment - evidence for PS management	To understand the challenges of managing PS factors and what the evidence is currently suggesting	This lecture provides information on what current options are described in the literature. (Video from experts?). Discuss treatment goals (not only looking at improving mobility but also taking patients choices and preferences into account / not only guided by stopping the pain but restoring a normal functioning)		Explain pain booklet?	

Lecture 5.3	Final discussion	To analyse the overall content of the course and to understand where additional material is available from	This lectures ends up the programme. A summary of the key findings is provided and links to additional material are listed.	Suppl. 3	Detail of a cluster of two symptoms and one sign predictive of peripheral neuropathic pain	

Storyboard

Stage 2

UNIT 1
INTRODUCTION

UNIT AND LESSON TITLE		Learning objectives	Description
UNIT 1	INTRO	To understand the technical requirements needed for this course and the different topics discussed during the course.	This unit introduces the main concepts that will be taught during this course. This unit also explains which IT requirements will be needed, which types of media will be used and general learning outcomes are presented.

Lesson 1.1

UNIT AND LESSON TITLE		Learning objectives	Description
Lesson 1.1.	Intro	To understand the technical requirements needed for this course and the overall learning objectives of this course.	This lesson describes the technical requirements for this course (which type of devices and internet connection are possible to use for this e-learning programme, optional but recommended to have a specific notebook to write up their answers and thoughts) and the learning objectives of this course.

1.1 – Video: part 1

Welcome video.
Me talking?

Short video to welcome and thank the participants for taking part in the study.

Explanations about the content, NSLBP and the BPS model, and this work is part of my doctoral work:

Talk about my experience (biomechanical/biomedical approach to LBP and learnt about other possible factors that can influence LBP)

Before starting the course and at the end of the course, you will be asked to fill in 2 questionnaires online. It will be anonymised: it is not an assessment of your performance but an assessment of the e-learning programme. It is very important for me that you complete these questionnaires before and after as the collection of these answers is a very important part of my research.

Until now I have completed a scop rev (that has been submitted to a journal?) and the results from this review is what informed for developing the content of this e-learning programme.

Content is at the hedge of knowledge. That may bring uncertainty but when that occurs, the programme allows time to reflect on these issues.

1.1. – Video: part 2

Short screen video of a PowerPoint, listing the learning objectives per unit

Learning objectives

List the learning objectives for each unit

Organisation of your time

Lectures last no more than 30 minutes each. There are **5 units** with a total of **16 lessons**. You can decide to do one lesson at a time or several, that would depend what works best for you and the time available you have each time. The **16 lessons** will need to be completed on **XXX**. After that you will be asked to complete the same questionnaires as filled in before the programme and for those who completed the programme and questionnaires, a CPD certificate of **8 hours** will be delivered.

Demonstrate how to navigate between different lessons

Explain how quizzes work

The programme has been designed so that you can access it whenever you want and you can do it at your own pace. You can retake a whole lesson or only parts of it if you wish to. For videos, you can start from the beginning or only go a bit backward if you have missed something. For PowerPoint presentations, the same applies.

1.1 – Video: part 3

Same video, change of screen

Explanations about technical requirements:

This e-learning programme can be accessed on different devices (computers, including laptops, and tablets) that have access on the internet.

Different media (text documents, presentation documents such as PowerPoint, and audio files and video files) are used in this programme. If you can open PDFs on your computer/tablet and see YouTube videos you should be able to read all the media included in this programme. Otherwise you can download plug-ins or contact us if you have any troubles. When you open a lesson, you will see a video: click on the right hand corner symbol to enlarge the video to a full screen size.

We advise use to be on the Wifi/home internet when doing the e-learning otherwise if you are on a tablet or mobile you may use a lot of your internet data allowance.

At the end of some lessons, you will be offered to download PDF documents summarizing what was said in the lesson and extra material will be available for those of you who are interested in the content. Once downloaded, the documents will go in the download folder of your computer, unless you have changed the settings of your computer.

Preferable to have a notebook and a pen with them every time they take the course as they will be asked to write down their thoughts at some stages and they might need to go back to what was written in early lessons so having one notebook allows to retrieve previous thoughts.

Contact: If you have any trouble or questions, please don't hesitate to contact me on j.rodi@bso.ac.uk

Lesson 1.2

UNIT AND LESSON TITLE		Learning objectives	Description
Lesson 1.2.	Basic concepts	To understand the classification of LBP and how NSLBP fits in it. To start being familiarised with the idea that the 'tissue causing symptom' model is flawed. To start appreciating differences between acute and chronic symptoms and their impact on prognosis and treatment options.	This lesson outlines the basic concepts that are pre-requisites for the other units of the course. NSLBP is defined and the challenges NSLBP brings are discussed, including its recurrence. This lesson reviews the main previous model of LBP taught in OEIs, 'tissue causing symptom' (TCS), and discusses how current evidence challenges its reliability and therefore use in practice. Concepts that will be detailed later in the course are named, including the BPS model and pain mechanisms. Current challenges in therapy, such as chronic pain, are also introduced. This lecture provides extra material for participants who want an update on the red flags system. MUST KNOW: participants must know at the end of this lesson what NSLBP means, that TCS is a model with limited reliability, chronic pain is a challenging symptom to treat that is not in the TCS model. NICE TO KNOW: Pain is currently classified in mechanisms, providing information on risk factors, prognosis and possible treatment options.

Lesson 1.2 – part 1: Prezi video with audio

Video of a Prezi with images and bullet points

Prezi

Some figures:

- Up to 80% of the adult population (Walker 2004)
- NS-LBP ~85% of LBP patients in primary care (Deyo and Phillips, 1996)
- 1/3 of UK population each year
- 20% consult GP (Savigny, Kuntze et al. 2009)

Incidence of LBP: highest in the third decade. Overall prevalence increases with age up to the 60-65 year age group, and then gradually declines.

Most common symptom encountered by osteopaths:

- in the UK (36%) (Fawkes 2010)
- in Australia (27.3%) (Orrock 2009)

Guidelines on LBP care have increasingly included more manual therapy, including osteopathy, in LBP management.

- European guidelines for the management of chronic non-specific LBP (2006)
- NICE Guidelines (2009)

Lesson 1.2 – part 2: PowerPoint with audio

LBP classification

LBP (Waddell, 2004):

- specific spinal pathology
  - Red flags
- nerve root pain
- simple or NS-LBP

Red flags

Text doc to download listing red flags

EXTRA CONTENT

Neuropathic pain

(Smart et al.)

Lesson 1.2 – part 3: Prezi video with audio

Intro to the BPS model

Biomedical paradigm

- Cause => Consequence
- Cause → Symptom
  - Treatment

Prezi

What existed before the BPS model: biomedical, incl TCS

Linear model where a cause as a consequence and influencing the cause would solve the problem. Osteopathic clinical reasoning is thought to rely a lot on this model (find it, fix it and leave it alone) but we probably include much more than one cause in our reasoning even though it is not a conscious choice (this will be further discussed in lesson XXX)

The biomedical model is a seductive model as it is easy to apply and explain to patients but when studies looked at NSLBP, no single causes could be pinned as being responsible for NSLBP. This research brought other interesting insights: the TCS model that had been taught in osteopathic colleges for decades was also being strongly challenged. The main reasons are shared innervation between different structures making tissue specific diagnosis barely impossible as pain provoked during tests could be from different structures (will be further discussed in lesson XXX), and also the fact that inter-rater and intra-rater reliability of the tests used in our assessment is very low.

A model has a limited lifespan and is the seed for the next one. The biomedical, and TCS one, offered a limited understanding of patients' presentations and experience of LBP and has led to the BPS model.

Lesson 1.2 – part 4: Prezi video with audio (cont.)

Intro to the BPS model

Prezi

BPS model

"It is difficult to identify the precise biological basis for most LBP but there is good evidence to suggest that psychological constructs such as pre-existing somatization, depression, anxiety, fear avoidance beliefs, poor coping strategies and poor-self efficacy are significant predictors of outcomes such as more severe pain, greater functional disability, and work loss. Similar constructs play a role in the transition from acute to persistent pain and disability."

(PINCUS, T., KENT, P., BRONFORT, G., LOISEL, P., PRANSKY, G. & HARTVIGSEN, J. 2013. Twenty-five years with the biopsychosocial model of low back pain-is it time to celebrate? A report from the twelfth international forum for primary care research on low back pain. Spine, 38, 2118-23.)

Lesson 1.2 – part 5: Prezi video with audio (cont.)

NSLBP classification

Prezi

NSLBP classification based on pain mechanisms

(NIJS, J., APELDOORN, A., HALLEGRAEFF, H., CLARK, J., SMEETS, R., MALFLIET, A., GIRBES, E., DE KOONING, M. & ICKMANS, K. 2015. Low back pain: guidelines for the clinical classification of predominant neuropathic, nociceptive, or central sensitization pain. *Pain Physician,* 18, E333-46.)

UNIT 2
CASE HISTORY

UNIT AND LESSON TITLE		Learning objectives	Description
UNIT 2	CASE HISTORY	To understand the variety of possible factors that may contribute to NSLBP and to appreciate ways of assessing them.	This unit outlines the possible factors that are associated with NSLBP, discusses the possible impact of therapeutic relationship on patients symptoms outcomes and provides information on how to try to capture as many possible factors as possible

Lesson 2.1

UNIT AND LESSON TITLE		Learning objectives	Description
Lesson 2.1.	PS factors/ case-study	To self-analyse learner's knowledge of possible factors influencing NSLBP course and on own clinical reasoning	This lesson uses an inductive approach to outline the different factors that may contribute to NSLBP. An audio recording of a case-history of patient presenting with NSLBP and several PS factors is used. The participants are asked, based on the recording, what their considerations for differential diagnoses are and what the risks of not seeking treatment are. Participants are asked to keep their answers on their notebook.

Lesson 2.1 – Case-history, audio file

This lesson uses an inductive approach to outline the different factors that may contribute to NSLBP.

An audio recording of a case-history of patient presenting with NSLBP and several PS factors is used.

The participants are asked, based on the recording, what their considerations for differential diagnoses are and what the risks of not seeking treatment are. Participants are asked to keep their answers on their notebook.

Lesson 2.2

UNIT AND LESSON TITLE		Learning objectives	Description
Lesson 2.2.	PS factors/ theory	To understand the variety of possible factors that may contribute to NSLBP. To remember a variety of different BPS factors for NSLBP.	This lesson describes and lists the possible factors that can contribute to NSLBP. The psychosocial risk factors are explained and the flag system (yellow, blue and black) are detailed (Kendall 2009). This lecture describes the possible influences of HCP on patients' attitudes and beliefs (Darlow et al. 2012 and 2013). MUST KNOW: NSLBP is influenced by a variety of factors including PS factors. How to use the flag system as a tool to classify possible PS factors and look for PS evolution. NICE TO KNOW: The flag system does not provide a fixed PS state of patient but is a snapshot on that moment. Reassessment is necessary as patient's context changes constantly, hence their PS state changing regularly.

Lesson 2.2 – part 1: Video with a PowerPoint presentation and voice

Flag system

The psychosocial risk factors are explained and the flag system (yellow, blue and black) are detailed (Kendall 2009 + results from Stage 1).

Appendix 1

Word document: list of BPS factors + flag system

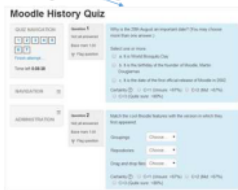
Therapeutic alliance

This lecture describes the possible influences of HCP on patients' attitudes and beliefs (Darlow et al. 2012 and 2013 + Kirsty's framework).

Lesson 2.2 – part 2: Quiz

In Moodle, include a quiz. E.g.

Theme for the quiz: List of possible factors and right or wrong



Lesson 2.3

UNIT AND LESSON TITLE		Learning objectives	Description
Lesson 2.3.	PS factors/ case-study (cont.)	To apply theory about PS factors (from lesson 2.2.) in a practical exercise (case study from lesson 2.1.)	This lesson offers the possibility to learners to listen again to the case-study presented in lesson 2.1. Participants are asked not to read what was written in their notebook before answering to the same questions again (what are your considerations for differential diagnoses? What are the risks of not seeking treatment?). This lesson provides an example (case study from lesson 2.1.) where participants can apply theory learnt in lesson 2.2.

Lesson 2.3 – Case-history, audio file with transcript

Same audio file as one in lesson 2.1, with transcript.

Use of participants' notebook, without reading what was previously written, and series of questions to answer to:

- what are your considerations for differential diagnoses?
- What are the risks of not seeking treatment?
- This lesson provides an example (case study from lesson 2.1.) where participants can apply theory learnt in lesson 2.2.

Lesson 2.4 – Case-history, audio file with transcript and comments

Same audio file as one in lesson 2.1

Participants will be provided with some comments on possible barriers to recovery in the case-history.

UNIT 3 EXAMINATION

UNIT AND LESSON TITLE		Learning objectives	Description
UNIT 3	Examination	To evaluate which assessment methods are the most appropriate and reliable for specific patient's presentations	This unit describes the low reliability of assessment methods available to osteopaths and introduces concepts of clinical uncertainty and clinimetrics. An evidence-based choice of assessment methods will be detailed, with application methods to help participants to understand the application of these assessment methods

Lesson 3.1

UNIT AND LESSON TITLE		Learning objectives	Description
Lesson 3.1	Examination / introduction	To understand the limitations of the lumbar clinical examination. To remember the most reliable tests of the lumbar examination.	This lesson highlights the limited evidence that clinical examination for the lumbar spine has and which tests are the most reliable. A powerpoint presentation, informed by stage 1 narrative review, with pictures and when necessary videos details the most reliable tests, their indications and interpretations. MUST KNOW: There are no gold-standards part of the examination of the lumbar spine in manual therapy. A clustered approach is the most reliable way of assessing the lumbar spine. Indications and interpretations of evidence-based tests. NICE TO KNOW: Names of the evidence-based tests, i.e. with currently the highest reliability.

Lesson 3.1 – part 1: nociceptive sources and clinical tests

Introduction: discuss the array of various nociceptive sources that have been described in the LSp, followed on discussion on the limited validity of clinical tests. (e.g. (NIJS, J., APELDOORN, A., HALLEGRAEFF, H., CLARK, J., SMEETS, R., MALFLIET, A., GIRBES, E., DE KOONING, M. & ICKMANS, K. 2015. Low back pain: guidelines for the clinical classification of predominant neuropathic, nociceptive, or central sensitization pain. *Pain Physician*, 18, E333-46.)

Discuss the lack of gold standards for the examination of the LSp in manual therapy and importance of having a clustered-approach.

Lesson 3.1 – part 2: nociceptive sources and clinical tests

List the assessment methods that were found to be reliable in the scoping review and discuss that other tests that exist (and that practitioners may use) have limited evidence (maybe not evidence against) and therefore requires criticality.

For each test, an explanation of the indication and interpretation of tests will be given either with a text alone or a text associated with a picture or a video depending on the need for explanation.

Lesson 3.2

UNIT AND LESSON TITLE		Learning objectives	Description
Lesson 3.2	Examination / scenario	To apply knowledge on lumbar spine examination with a scenario-based approach	This lesson uses a scenario-based approach. Participants can put in use the knowledge obtained in lesson 3.1. Learners are only provided with the information required to make decisions. Possible choice options are defined (choices are not be obvious) and each choice generates a detailed feedback by showing its consequences.

Lesson 3.2: clinical examination scenario

Scenario-based approach to put in use the knowledge obtained in lesson 3.1.

A case-scenario with limited information is presented in a text fo[illegible]at:

"A 42-year-old patient presents to you with a sub-acute focal [illegible] pain of moderate intensity that came up gradually over a two-week period. You excluded any pote[illegible]ags (i.e. it is unlikely that the patient has an underlying disease to the current presentation) and [illegible]s in good health in general."

Possible choice options are defined (choices are [illegible]bvious) and each choice generates a detailed feedback by showing its consequences:

- Would you refer the patient for an [illegible]?
- Would you start your examin[illegible]n with observation?
  - If yes: what for?
- Would you perfo[illegible]ological examination?
- Would you perfor[illegible]SLR?
- How would you assess the local area (one choice possible)?
  - Active tests
  - Passive tests
  - Pain provocation tests
  - Palpation

QUIZ FORMAT?

UNIT 4
INTEGRATION

UNIT AND LESSON TITLE		Learning objectives	Description
UNIT 4	Integration	To analyse how different factors that a patient presents with may interact and influence the course of their NSLBP	This unit reviews how the different factors mentioned in earlier units may interact with each other. Three case-studies This unit introduces some elements on treatment options and choices, that will be further discussed in unit 5.

Lesson 4.1

UNIT AND LESSON	TITLE	Learning objectives	Description
Lesson 4.1	Case study 1 / practical	To apply knowledge from previous units in a case-scenario with a main biological component. To analyse what possible mechanisms may be underlying the patient's presentation.	This lesson provides a NSLBP case-study with a main biological component. Participants are asked with Q&A to think about possible mechanisms that may underpin the patient's presentation. First a short summary of a case-history is presented in a Word format (e.g. young, IT job, keen runner, no history of trauma, past medical history unremarkable, rest of case history normal, etc) followed by the presentation of the findings from the examination of this patient's acute NSLBP of severe intensity. Participants are asked to draw from the CH and examination possible PS factors that may contribute to the patient's presentation and consider what the possible risks are. TO KNOW: Participants have to understand what the different facets of NSLBP presentation are. Best-evidence advice must be understood and applied to this case-study. NICE TO KNOW: Severity of pain is not a sign of gravity.

Lesson 4.1 – part 1: description of the case-history and examination

a short summary of a case-history is presented in a Word format:

A 23-year-old male patient, with an IT job, who runs 20 minutes every other week, presents with a severe and acute LBP. This is the first LBP episode for the patient. There is no history of trauma, his past medical history is unremarkable apart from multiple previous MSK complaints (neck, shoulder and heel pain), and the rest of case history normal.

The patient will show some psychosocial risk factors, including:

- Green flags (Multiple previous MSK complaints + Pre-existing sleep disturbances)
- Blue flags (misbelief on sitting at work + job dissatisfaction + poor relationships at work)
- Yellow flags (poor expectations of recovery)
- Pink flag: young age
- Black flags (Osteopath using technical/diagnostic language, Osteopath's communication potentially increasing patient's fear and catastrophisation, Osteopath using a highly biomedical explanation for back pain, Osteopath suggesting that it would be better for the patient to be off work for some time)

Use of a NON-EXAMPLE

Lesson 4.1 – part 2: questions based on the case-scenario

Questions:

- What is the severity of the pain a sign of?
- Advice to give about RTW?
- Advice to give about bed-rest?
- Advice to give about exercises?

Scenario reasoning:

- If the patient was not doing any physical activity and had a poor muscle strength, could that be a risk factor for the onset of LBP? (Answer: No evidence that poor muscle strength can predict LBP)
- If the patient was overweight, could this patient's pain be related to it? (answer: Obesity increases risk of LBP but is not a strong predictor. Association mainly with chronic LBP (but not a chronic risk factor)).
- If the patient was older, would that affect the prognosis? (answer: "Younger age favourable prognostic factor, mainly for disability")
- If the patient was a professional cyclist, could that be the cause of the onset of this non-specific low back pain episode? (answer: LBP is not associated with leisure-time sport or exercises (strong evidence) or professional level exercises)

Each answer will give appropriate feedback.

Lesson 4.2

UNIT AND LESSON	TITLE	Learning objectives	Description
Less on 4.2	Case study 1 / theory	To understand pain mechanism of nociception.	This lesson provides explanation on nociception in a deductive manner based on the case-study in lesson 4.1. which was mainly nociceptive. This lesson describes in simple terms what nociception is, how different nociception is from pain, and what influences nociception. This lecture discusses what possible treatment options could be integrated for treatment of NSLBP with a main nociceptive component.

Lesson 4.2 – lecture on nociceptive pain

A lecture based on the Prezi "Douleur mecanismes" (only the nociception part) based mainly on Smart et al.'s publications, will be updated with (NIJS et al. 2015)

- Description in simple terms of what nociception is
- how different nociception is from pain
- what influences nociception

This lecture discusses what possible treatment options could be integrated for treatment of NSLBP with a main nociceptive component.

Nijs et al. 2015. Low back pain: guidelines for the clinical classification of predominant neuropathic, nociceptive, or central sensitization pain. *Pain Physician*, 18, E333-46

Lesson 4.3

UNIT AND LESSON TITLE		Learning objectives	Description
Lesson 4.3	Case study 2 / theory - PS factors and acute/chronic pain	To understand how psychosocial factors may influence the course of NSLBP. To remember the differences between acute and chronic pain. To evaluate participants' own practice for treating of chronic and acute patients.	This lesson describes the differences between acute and chronic pain and details possible risk factors of chronicity (PS factors). Participants are asked first to note in their notebook what differences there are between acute and chronic pain and if acuteness/chronicity influences the way they approach and treat patients. The lecture then is theoretical but very engaging: images of optical illusions and clinical examples are used in order to make it an enjoyable experience for the learner and clinically relevant to them. Pain being context-dependant is explained in order to deconstruct the belief participants may have that pain is sign of tissue damage. Possible implications for treatment and advice are then discussed. Challenges of osteopathic treatment for chronic pain are introduced. At the end of the lesson, participants are asked to review how this knowledge may influence the way they would assess and treat acute/chronic patients. MUST KNOW: chronic and acute pain are different mechanisms and may require different treatment options. NICE TO KNOW: central changes occur in chronic pain

Lesson 4.3 – acute and chronic pain

Participants are asked first to note in their notebook what differences there are between acute and chronic pain and if acuteness/chronicity influences the way they approach and treat patients.

Based on the Prezi named "Douleur aiguë/chronique":

The lecture then is theoretical but very engaging: images of optical illusions and clinical examples are used in order to make it an enjoyable experience for the learner and clinically relevant to them. Pain being context-dependant is explained in order to deconstruct the belief participants may have that pain is sign of tissue damage. Possible implications for treatment and advice are then discussed. Challenges of osteopathic treatment for chronic pain are introduced.

At the end of the lesson, participants are asked to review how this knowledge may influence the way they would assess and treat acute/chronic patients.

Lesson 4.4

UNIT AND LESSON TITLE		Learning objectives	Description
Lesson 4.3	Case study 2 / Practice	To apply knowledge from previous units and lesson 4.3 in a case-scenario with a main psychological component. To analyse what possible mechanisms may be underlying the patient's presentation.	This lesson provides a case-study where the case history and clinical examination of an actor patient are video-recorded. They are based on a patient complaining of a chronic NSLBP, presenting with a strong psychological component of his/her symptoms. MUST KNOW: Participants must be able to differentiate acute/chronic presentations and possible implications for treatment.

Lesson 4.4 – part 1

Case-study (video): case history + clinical examination

Patient complaining of a chronic NSLBP, presenting with a strong psychological component of his/her symptoms.

Lesson 4.4 – part 2

Q&A:
- which tests would be appropriate to do after the CH video (reinforcing content from lesson 3.1.),
- which advice should be given concerning RTW/bed-rest/Exercises,
- what could be causing the pain,
- what possible differentials there are,
- what possible underlying mechanism there is.

Lesson 4.5

UNIT AND LESSON TITLE	Learning objectives	Description
Lesson 4.5 Case study 2 / theory - central sensitisation	To understand the central sensitisation pain mechanism.	This lesson describes central sensitisation. This lesson describes in simple terms what central sensitisation is, what influences central sensitisation and what the most common signs of central sensitisation are (Smart et al. 2012 + Nijs et al. 2014. Applying Modern Pain Neuroscience in Clinical Practice: Criteria for the Classification of Central Sensitization Pain. Pain Physician, 17, 447-457). MUST KNOW: Participants must understand that central sensitisation pain is not a peripheral local process. Participants must be able to understand the implications of central sensitisation pain, including the absence of relationship between pain and tissue damage. Participants must understand that central sensitisation pain is highly correlated to PS factors.

Lesson 4.5

Prezi

This lesson describes in simple terms:
- what central sensitisation is,
- what influences central sensitisation,
- what the most common signs of central sensitisation are

Ref:
- Smart et al. 2012
- Nijs et al. 2014. Applying Modern Pain Neuroscience in Clinical Practice: Criteria for the Classification of Central Sensitization Pain. Pain Physician, 17, 447-457).

Lesson 4.6

UNIT AND LESSON TITLE		Learning objectives	Description
Lesson 4.6.	Case-study 3 / practice	To apply knowledge from previous units and current unit's lessons in a case-scenario with a main social component. To analyse what possible mechanisms may be underlying the patient's presentation.	This lesson is based on a Word case-history informed by the vignette used in Bishop et al. 2008 (How does the self-reported clinical management of patients with low back pain relate to the attitudes and beliefs of health care practitioners? A survey of UK general practitioners and physiotherapists). This case-history is the last one of the course. It highlights even more than previous case studies how biological, psychological and social components can be mixed and participants are asked to reflect on these issues.

Lesson 4.6

"A 50-year-old office worker presents with a four-week history of low back pain with referral to the right buttock. The pain initially came on gradually over 24 h. Since the onset of the pain she has been unable to work and has been taking Diclofenac regularly. She also has had moderate to high levels of disability and particularly has difficulty bending and rising from a chair and can stand and walk only for short periods. There is no history of trauma. Her work consists mainly of computer work with some standing. She feels she has to move slowly and needs to lie down to rest more often than usual. She demonstrates some anxiety and has felt tired and worn out most of the time since the pain started. Her average pain over the last two weeks has been 4 out of a maximum of 10. Her general health is good. On physical examination, there is marked limitation of forward flexion and right paraspinal tenderness. Neurological examination is normal. All other case history, past medical history and physical examination findings are unremarkable, except that she has had two previous episodes of LBP."

(from: BISHOP, A., FOSTER, N. E., THOMAS, E. & HAY, E. M. 2008. How does the self-reported clinical management of patients with low back pain relate to the attitudes and beliefs of health care practitioners? A survey of UK general practitioners and physiotherapists. *Pain*, 135, 187-95.)

UNIT 5

Include podcast from O'Sullivan (see rights etc)?

http://www.pain-ed.com/blog/2012/01/01/threaded-comments/#t=10:53.041

For ttt options:

- KAMPER, S., APELDOORN, A., CHIAROTTO, A., SMEETS, R., OSTELO, R., GUZMAN, J. & VAN TULDER, M. 2014. Multidisciplinary biopsychosocial rehabilitation for chronic low back pain (Review). *Cochrane Database of Systematic Reviews*, 9.
- NIJS, J., MEEUS, M., CAGNIE, B., ROUSSEL, N., DOLPHENS, M., VAN OOSTERWIJCK, J. & DANNEELS, L. 2014. A Modern Neuroscience Approach to Chronic Spinal Pain: Combining Pain Neuroscience Education With Cognition-Targeted Motor Control Training. *Physical Therapy*, 94, 730-738.
- Talk about neuroscience education? (see in notes box from Puentedura's article)
- See from slide 25 of "Adriaan_Louw_Powerpoint_D7F27D4725FC4.pdf" in Stage 2 folder in dropbox
- Pain toolkit? https://www.youtube.com/watch?v=pbqrM8W7D48&feature=youtu.be
- Put Explain Pain booklet (from Greg Lehman)? In folder stage 2
- Read "Psycho interventions for chronic LBP" paper in stage 2 folder
- Advising about work (in appendix folder)?

5.1 – LBP pathway

See NICE guidelines: http://pathways.nice.org.uk/pathways/low-back-pain-early-management#content=view-node%3Anodes-person-presenting-with-non-specific-low-back-pain-that-has-lasted-for-more-than-6-weeks-but-for-less-than-12-months&path=view%3A/pathways/low-back-pain-early-management/low-back-pain-early-management-overview.xml

Which exercises? What advice to give?

NICE guidelines
- Physical activity and exercise
- Advise people with low back pain that staying physically active is likely to be beneficial.
- Advise people with low back pain to exercise.
- Consider offering a structured exercise programme tailored to the person:
- This should comprise up to a maximum of eight sessions over a period of up to 12 weeks.
- Offer a group supervised exercise programme, in a group of up to 10 people.
- A one-to-one supervised exercise programme may be offered if a group programme is not suitable for a particular person.
- Exercise programmes may include the following elements:
  - aerobic activity
  - movement instruction
  - muscle strengthening
  - postural control
  - stretching.

+ Aleksiev, A. R. Ten-Year Follow-up of Strengthening Versus Flexibility Exercises With or Without Abdominal Bracing in Recurrent Low Back Pain. SPINE 2014;39(13):997 – 1003 **(on my website)**

Divide unit 5, in categories?

How to deal with social issues? Where to refer when problem with work?

How to deal with psychological issues? Problem of not being in the NHS… long waiting list but tackling MSK problems is sort of urgent because of risk of chronicity…. What to do?

Look at Psychologically-informed physiotherapy?

How to deal with … ? Where to refer when problem with?

Discuss the fact that GOsC require osteopaths to talk about alternative ttt approaches available to the patient (consent talk for HVT – and ttts?): show other possible ttt recommended (see pics in folder alternative ttt, in stage 2

Dagenais S1, Brady O, Haldeman S. Shared decision making through informed consent in chiropractic management of low back pain. J Manipulative Physiol Ther. 2012 Mar-Apr;35(3):216-26. doi: 10.1016/j.jmpt.2012.01.004. Epub 2012 Mar 8. http://www.ncbi.nlm.nih.gov/pubmed/22405500

Appendix K. Review on alternative treatments, example of some categories

The ID articles are those used in Appendix G - Papers categorised per methods

	Information and reassurance	Education	Stay active and normal activities	Specific exercises	Interferential current therapy, Touch therapies, Yoga therapy	Medication	Manipulations	Physical therapies (heat/cold, traction, laser, ultrasound, short wave, interferential, massage, corsets)	CBT
Acute NSLBP	Yes (1, 3, 9, 10, 15) Evidence-based information (6)	Back schools: don't know (9) Information and education based on BPS principles but not on biomedical or biomechanical model (5) Do not provide in-depth, pathoanatomical explanations for the specific cause of the patient's low back pain but should emphasize (1) the promotion of the understanding of the anatomical/structural strength inherent in the human spine, (2) the neuroscience	Yes (1, 3, 6, 9, 10, 14)	No (2, 3) Don't know (9) Aerobic and core strengthening exercise programs which minimally stress the back) can be started during the first 2 weeks for most patients with acute LBP. Recommend aerobic activities such as walking, biking, swimming and core strengthening exercises to rehabilitate and prevent recurrent low back pain (10) Exercise but no specific ones (14, 15) - Exercise but don't know about	Don't know (9)	Regular doses of simple analgesics (1) Paracetamol, second choice NSAIDs at regular intervals. Add short course of muscle relaxant if paracteamol or NSAIDs failed to reduce pain. (3, 9, 14, 15). Careful use of opioids (14) Paracetamol and NSAIDs (6) No oral steroids (9) Topical NSAIDs: don't know (9) NSAIDs, muscle relaxants (10)	Yes for patients who are not improving (6, 9) Yes (2, 13, 14)	Superficial heat (application of heating pads or heated blankets) is recommended for the short term relief of acute low back pain. Clinical experience supports a role for superficial cold packs and alternating heat and cold as per patient preference (9). Massage: don't know (9) Heat: yes (10, 14) Cold: no (14)	
Subacute NSLBP	Yes (8, 9, 15) Evidence-based information (6)	Back schools: don't know (9) Information and education based on BPS principles but not on biomedical or biomechanical model (5) Do not provide in-depth, pathoanatomical explanations for the specific cause of the patient's low back pain but should emphasize (1) the promotion of the understanding of the anatomical/structural strength inherent in the human spine, (2) the neuroscience	Yes (6, 8, 9, 14)	Yes (structured exercise programme tailored to the person / group supervised exercise programme / one-to-one if group not suitable) (8) Don't know (9) Consider utilizing trunk coordination, strengthening, and endurance exercises (13) Exercise but no specific ones (14, 15) - Exercise but don't know about specific ones (5) No (2)	Don't know (9)	Regular paracetamol as first medication option; if needed add NSAIDs (with a PPI for age>45) and/or weak opioids; tricyclic antidepressants if other medication insufficient pain pain relief. Consider strong opioids for short-term use to people in severe pain (8). Regular doses of simple analgesics (1) Paracetamol, second choice NSAIDs at regular intervals. Add short course of muscle	Yes: massage+manipulations (max 9 sessions over 12 weeks) (8) Yes referral within 2-6 weeks (9) Yes for patients who are not improving (9) Articulations and HVT: yes (13) Yes (2)	Superficial heat (application of heating pads or heated blankets) is recommended for the short term relief of acute low back pain. Clinical experience supports a role for superficial cold packs and alternating heat and cold as per patient preference (9). Massage: don't know (9) Cold: no (14) Heat: yes (14)	Yes (14) Yes for patients with psychosocial indicators for agreater chance for developing chronic pain (2)
Chronic LBP	Yes (15) Evidence-based information (6)	Brief educational interventions (4); Information and education based on BPS principles but not on biomedical or biomechanical model (5) back schools (for short-term improvements) (4) Do not provide in-depth, pathoanatomical explanations for the specific cause of the patient's low back pain but should emphasize (1) the promotion of the understanding of the anatomical/struct	Yes (6) Patients should be encouraged to initiate gentle exercise and gradually increase their exercise level within their pain tolerance (9).	Supervised exercise therapy (4, 15) Sophisticated equipment is not necessary. Low cost alternatives include unsupervised walking and group exercise programs such as those offered though chronic disease management programs (9). A client-specific, graded, active therapeutic exercise program is recommended (9). Therapeutic aquatic exercise is recommended for chronic low back pain (9).	There is some evidence that Viniyoga and Iyengar types of yoga can be helpful in the treatment of chronic low back pain (9).	The short term use of NSAIDs and weak opioids, Noradrenergic or noradrenergic-serotoninergic antidepressants, muscle relaxants and capsicum plasters can be considered for pain relief. We cannot recommend the use of Gabapentin (4). Regular paracetamol as first medication option; if needed add NSAIDs (with a PPI for age>45); some muscle relaxants may be appropriate; tricyclic	yes: (manipulations/mobilisations) (4) Don't know (9) Articulations and HVT: yes (13) Short-term use of manipulations (15) Yes (2)	No (4) Massage therapy is recommended as an adjunct to an overall active treatment program (9). Touch therapy: don't know (9) Cold: no (14) Heat: yes (14)	Yes - the most promising approaches seem to be CBT encouraging activity/exercise. (4) CBT/PMR: yes (9) Yes (2, 15)

COM-B model			What conditions internal to individuals and in their social and physical environment need to be in place for a specified behavioural target to be achieved?	Designed elements in the programme	Anticipated outcomes
Behaviour	Capability	Physical	Willingness to adapt their way of communicating with patients	Lesson 4.1 (Training on how a main biological presentation can also present PS factors) Lesson 4.4 (Modelling of communication with a patient with NSLBP with a major psychological component) Lesson 5.3 (Persuasion + Education + Enablement: Knowledge on communication and reassurance, and effects of how we communicate on patients) Lesson 5.4 (Training: interview on consent)	To understand the role of communication within a BPS consultation To understand the structure of reassurance and have knowledge of common reassuring content for people with NSLBP
			Interest in having a system to record factors other than biological ones	Lesson 2.2 (Enablement + Training: lecture on flag system and how to record them) Lectures 2.1 / 2.3 / 2.4 / 4.1 / 4.4 / 4.6 (Training: implementation of recording PS factors on a case study)	To reflect on their current methods of recording and note-taking To identify opportunities to enhance the recording of PS factors
			Willingness to look beyond biomechanical/structural causes to back pain	Lesson 2.1. (Training - self-analysis of knowledge of possible factors affecting NSLBP using a case-study as a media) followed by lesson 2.2 (Education - lecture on the different possible factors; not directly applied to case in lesson 2.1 & Training: techniques to use to get information on patients' PS status) followed by lesson 2.3 (Enablement - using knowledge acquired in lesson 2.2 and do a new self-analysis based on case from lesson 2.1, with new knowledge acquired in lesson 2.2) and followed by lesson 2.4 (Modelling - prompting the factors during the case-scenario that could influence NSLBP) Lesson 4.1 (Modelling - main biological presentation but with other PS factors to integrate in the understanding of the presentation) Lesson 4.5 (Education - lecture on central sensitisation; Modelling - providing examples of central sensitisation) Lesson 4.6 (Modelling - main social case-scenario with some biological and psychological components)	To understand that NSLBP is not due to only biomechanical/structural problems To understand the variety of the factors influencing pain experience/processing To appreciate outcomes beyond restoration of functional movement To understand the role of open questions in establishing the patient's psychosocial context
		Psychological	Willingness to develop interpersonal skills to engage with a patient's emotions and beliefs	Lesson 3.1 (Training - key questions to triage risk of depression for patients with NSLBP) Lesson 4.4 (Modelling - communication with a patient with NSLBP with a major psychological component)	To understand the value of communication skills to engage with a patient's psychosocial context To understand how to triage the risk of clinical depression
			Interest in updating their knowledge on assessment and flexibility with the model of back pain they use	Lesson 1.2. (Training: definition of NSLBP) Lesson 3.1 (Persuasion: evidence against TCS model & Education: lecture on limited reliability of clinical examination) Lesson 3.2 (Enablement: application of LSp examination in a case study) Lesson 4.3 (Education - lecture on pain processing vs. nociception) Lesson 4.5 (Education - lecture on possible stimuli than can lead to pain (other than nociceptive ones))	To reflect on their own model of working with patients with back pain To ensure that participants identify opportunities to enhance and broaden their model of back pain To understandthe role of LBP categorisation To understand the limitations of the lumbar clinical examination To appraise the limitations of the 'tissue causing symptom' model To understand differences between acute and chronic pain

COM-B model			What conditions internal to individuals and in their social and physical environment need to be in place for a specified behavioural target to be achieved?	Designed elements in the programme	Anticipated outcomes
Behaviour	Capability (cont.)	Psychological (cont.)	Interest in updating their knowledge on pain	Lesson 4.2 (Education: lecture on nociception - deductive approach post lesson 4.1) Lesson 4.3 (Training: self-reflection of their understanding of chronic pain + Education: lecture on differences between acute and chronic pain) Lesson 4.5 (Education: lecture on central sensitisation; Modelling: providing examples of central sensitisation)	To understand the role of nociception in the pain experience To understand differences between acute and chronic pain and the possible implications for NSLBP management To remember the different pain mechanisms that can be present in NSLBP
			Interest in updating their knowledge of advice and exercises to give to patients	Lesson 4.5 (Education - lecture on central sensitisation and what may trigger pain, importance for patients to be as active as possible) Lesson 5.2 (Persuasion: results from review of 13 guidelines on NSLBP from different healthcare professions & Education: knowledge on recommendations for advice and exercises to give to patients with NSLBP)	To understand importance for patients to remain active even when in pain To understand that best practice for all healthcare professionals would advise NSLBP patients to remain active
			Cognitive flexibility to look beyond biomechanical/structural causes leading to chronicity	Lesson 4.1 (Modelling: main biological presentation but with other PS factors to integrate in the understanding of the presentation) lesson 2.2 (Education - lecture on the different possible factors; not directly applied to case in lesson 2.1 & Training: techniques to use to get information on patients' PS status)	To understand that risk factors for chronicity are mainly PS-related
	Motivation	Automatic	NO ITEMS IN LEARNING PACKAGE	NO ITEMS IN LEARNING PACKAGE	NO ITEMS IN LEARNING PACKAGE
		Reflective	Osteopaths are primary healthcare practitioners whose role includes maintaining up-to-date knowledge of risk factors [social role/identity]	Lesson 2.2 (Education - lecture on the different possible factors; not directly applied to case in lesson 2.1 & Training: techniques to use to get information on patients' PS status)	To remember the different prognostic factors for NSLBP
			Willingness to adapt the therapeutic relationship to enhance patient outcomes	Lesson 3.1 (Education + Persuasion: lecture on possible positive and negative effects of therapeutic relationship on patient outcomes) Lesson 5.1 (Modelling: bad example where the practitioner advise to stop working / stop activity)	To understand how to best use therapeutic relationship to improve patient outcomes. To remember the factors having a positive impact and those having a negative impact on patient outcomes.

COM-B model			What conditions internal to individuals and in their social and physical environment need to be in place for a specified behavioural target to be achieved?	Designed elements in the programme	Anticipated outcomes
Behaviour	Motivation (cont.)	Reflective (cont.)	Willingness to reflect on their treatment orientation	Lesson 1.2 (Education: lecture on NSLBP and BPS model, introduction on communication changes the BPS model may require) Lesson 2.2 (Education: explanation that patient preferences need to be included in the treatment plan + Persuasion: explanation on possible negative impact of not communicating and sharing decisions with patients) Lesson 3.1 (Education: lecture on what informs a working diagnosis, i.e. not only items from the practitioner's perspective but also factors from the patient's perspective) Lesson 4.4 (Modelling: case-scenario using open questions in order to get the patient's perspective on the current presentation) Lesson 5.3 (Training: information on communication, shared decision-making and reassurance).	To reflect and appraise the practitioner's current treatment orientation To understand the role of sharing decision-making with patient and the potential positive impact on patient outcomes it can have.
			Osteopaths will have experience to have treated repeatidly patients with NSLBP	Lesson 1.2. (Training: definition of NSLBP with figures on frequency of NSLBP in osteopathic setting) Lesson 2.2 (Persuasion: lecture on prognostic factors including history of back pain, i.e. recurrent nature of NSLBP)	To integrate their own clinical experience with NSLBP and its recurrent episodic condition. To recognise the role of sharing the epidemiological information with patient to enhance reassurance
	Opportunity	Social	Profession moving towards an evidence-informed practice	Lesson 1.1 (Persuasion: explanation on where the content of the e-learning comes from, i.e. a scoping review) Lesson 1.2 (Environment restructuring: lecture on LBP mentions the NICE guidelines) Lesson 5.2 (Environment restructuring: results from review of 13 guidelines on NSLBP from different healthcare professions)	To understand the extent of the BPS use across different healthcare professions. To understand the international use of the BPS model.
			Guidelines for NSLBP recommend biopsychosocial approaches to manage patients	Lesson 1.2 (Environment restructuring: lecture on LBP mentions the NICE guidelines) Lesson 5.2 (Environment restructuring: results from review of 13 guidelines on NSLBP from different healthcare professions)	To understand the extent of the BPS use across different healthcare professions To remember a language suitable for communicating with GPs and other manual therapists
			Osteopathic Practice Standards promote working in partnership with patients	Lesson 3.1 (Education + Persuasion: lecture on possible positive and negative effects of therapeutic relationship on patient outcomes) Lesson 5.1 (Modelling: bad example where the practitioner advise to stop working / stop activity) Lesson 5.2 (Persuasion: lecture on the requirements from the professional body on osteopaths to get consent before treatment) Lesson 5.4 (Education: interview on consent)	To reflect on the role of consent as a core element of working in partnership with patients To understand how to enhance a partnership with patients through communication
			New graduates trained with a BPS approach	NOT IN LEARNING PACKAGE	NOT IN LEARNING PACKAGE
		Physical	Resources available to the profession (research journals, profession journals) recommending a BPS approach to NSLBP	Extra content folder (Education + Enablement + Environmental restructuring - examples of resources available to osteopaths online)	To appreciate the available resources available to osteopaths and where they can be found.
			Consultation time - mainly private practitioners.	NOT IN LEARNING PACKAGE	To understand how much time with patients may be needed to have a BPS approach

Appendix M. ECBCheck tool result

I. Scoreboard

Areas	Your score	Possible max. score	% of max. score
B. Information about and organization of the programme			
1. General description, objectives and programme organisation	44	44	100%
2. Technical and organizational requirements	11	11	100%
Sum	**55**	**55**	**100%**
C. Target Audience Orientation			
1. Target group's learning needs are taken into account and considered in the design of the programme/course (curriculum, methodology)	11	11	100%
Sum	**11**	**11**	**100%**
D. Quality of Content			
1. The content of the course/ programme is coherently presented and subdivided in logical sequences of modules and/or lessons/sections, organized in such a way that enables comprehension and retention	11	11	100%
2. The contents are provided in a flexible manner, allowing for different learning paths	11	16	69%
3. Content is gender sensitive. It takes into account cultural diversity	11	11	100%
4. Media rich content is utilized exclusively with a fixed and definite purpose	11	11	100%
Sum	**44**	**49**	**90%**
E. Programme / Course Design			
1. Learning Design and Methodology	60	60	100%
2. Learning Materials	44	54	81%
3. Assignments & Learning Progress	28	38	74%
Sum	**132**	**152**	**87%**

F. Media Design			
1. Accessibility standards have been applied	11	11	100%
2. Usability standards are met	11	11	100%
3. The navigation (through the mandatory learning materials) allows learners to know about their progress and position in relation to the overall content	11	11	100%
4. Screens, table of content, and learning materials, including additional resources are printable	11	11	100%
Sum	**44**	**44**	**100%**
G. Technology			
1. The downloadable learning materials have common formats and acceptable size	11	11	100%
2. The virtual learning environment runs on an adequate server, which guarantees its stability	11	11	100%
3. The virtual learning environment is accessible through different browsers and operating systems	11	11	100%
Sum	**33**	**33**	**100%**
H. Evaluation & Review			
1. A comprehensive evaluation process is foreseen at the end of the course/ programme to evaluate its quality and overall coherence, and contribute to its further improvement for subsequent deliveries.	11	11	100%
2. Learners' feedback on the programme/ course delivery are collected through a questionnaire or other means.	11	11	100%
3. A process for integrating the recommendations for improvement is foreseen and is part of programme/ course design activities, in order to ensure continuous programme/ course improvement.	11	11	100%
Sum	**33**	**33**	**100%**
Total			

Areas	**Your score**	**Possible max. score**	**% of max. score**
Sum	**352**	**377**	**93%**

Appendix N. E-learning programme email

Dear Colleague,

My name is Jerry Draper-Rodi and I am an osteopath practising in the UK. I am doing a Professional Doctorate in Osteopathy with the University of Bedfordshire and the British School of Osteopathy. My supervisors are Mr Steven Vogel, Vice-Principal (Research and Quality) at the British School of Osteopathy and Dr Annette Bishop, Research Fellow (Institute of Primary Care and Health Sciences) at Keele University.

Low-back pain (LBP) affects up to 80% of the adult population overall and affects a third of the UK population every year. It is the most common symptom encountered by osteopaths in the UK. The NICE guidelines on LBP care recommend multimodal approaches for the early management of persistent non-specific LBP, including osteopathic care.

We have created an e-learning course on non-specific low-back pain and we are carrying out a study on the effects of this course on experienced osteopaths' attitudes to back pain.

You are invited to take part in this free e-learning course which is informed by the most up-to-date evidence. To be eligible you must have graduated at least 15 years ago.

This course will provide you with XX hours of free Continuous Professional Development (CPD) that you may use towards the 30 hours of CPD required to renew your GOsC registration.

The course will be over XX weeks, comprising XX hours of learning online per week and XX hours of homework offline per week. To claim the CPD hours, completion of the course will be required.

Participants will be randomised into two groups: both groups will be invited to complete the same e-learning course but not at the same time. Participants' names will not be recorded during the study. Participants will be allocated separate codes in order to enable the researcher to follow them up. Data will be collected and stored safely and only the researcher and his supervisors will have access to it.

If you are interested in taking part please read the attached information sheet then complete the attached contact and consent forms and email it to j.rodi@bso.ac.uk or post to Jerry Draper-Rodi, The British School of Osteopathy, 275 Borough High Street, London, SE1 1JE.

Joining the study is voluntary and will not affect your professional standing. If you agree to take part you will be free to withdraw at any time without giving any explanation and you will be able to ask questions at any point.

Please do not hesitate to contact me about any concern.

Hoping you find the research interesting I send you my best regards,

Jerry Draper-Rodi

The British School of Osteopathy, 275 Borough High Street, London, SE1 1JE

j.rodi@bso.ac.uk

Appendix O. E-learning programme letter to regional groups

Dear Colleague,

My name is Jerry Draper-Rodi and I am an osteopath practising in the UK.

I am doing a Professional Doctorate in Osteopathy with the University of Bedfordshire and the British School of Osteopathy. My supervisors are Mr Steven Vogel, Vice-Principal (Research and Quality) at the British School of Osteopathy and Dr Annette Bishop Grad Dip, Phys, MSc, PhD, NIHR Research Fellow, Institute of Primary Care and Health Sciences, Keele University.

Low-back pain (LBP) affects up to 80% of the adult population and affects a third of the UK population each year. It is the most common symptom encountered by osteopaths in the UK. The NICE guidelines on LBP care suggest multimodal approaches for early management of persistent non-specific LBP, including osteopathic care.

Our research aims at studying the effects of an e-learning course for non-specific low-back pain on experienced osteopaths' attitudes to back pain.

We would like to invite the members of your regional group to take part. Could you please forward this email with the attachments to your members? This email contains the Participant information sheet (PIS) and the consent form.

They are invited to take part in a free e-learning course for non-specific low-back pain, informed by the most up-to-date evidence. One of the inclusion criteria is to have graduated at least 15 years ago. The e-learning course will provide participants XX hours of CPD and they will get a certificate after completion indicating that they have taken part and they may wish to use this as part of their CPD return to the GOsC. Their participation will also contribute to generating research related to the practice of osteopathy. The outcomes of this research may contribute to education for osteopaths and others in the future.

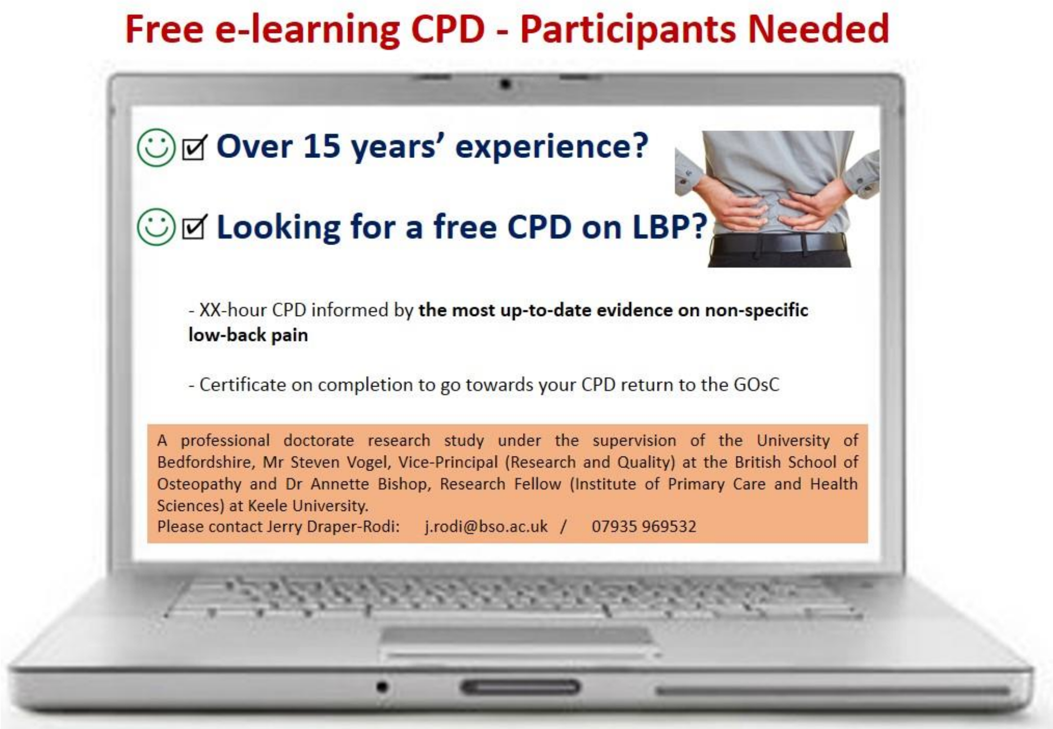
Please do not hesitate to contact me about any concern.

Hoping you find the research interesting I send you my best regards,

Jerry Draper-Rodi

The British School of Osteopathy, 275 Borough High Street, London. SE1 1JE

j.rodi@bso.ac.uk


Free e-learning CPD - Participants Needed
☑ Over 15 years' experience?
☑ Looking for a free CPD on LBP?
- XX-hour CPD informed by the most up-to-date evidence on non-specific low-back pain
- Certificate on completion to go towards your CPD return to the GOsC
A professional doctorate research study under the supervision of the University of Bedfordshire, Mr Steven Vogel, Vice-Principal (Research and Quality) at the British School of Osteopathy and Dr Annette Bishop, Research Fellow (Institute of Primary Care and Health Sciences) at Keele University.
Please contact Jerry Draper-Rodi: j.rodi@bso.ac.uk / 07935 969532

Appendix P. E-learning programme letter to the National Council for Osteopathic Research

Dear Colleague,

My name is Jerry Draper-Rodi and I am an osteopath practising in the UK.

I am doing a Professional Doctorate in Osteopathy with the University of Bedfordshire and the British School of Osteopathy. My supervisors are Mr Steven Vogel, Vice-Principal (Research and Quality) at the British School of Osteopathy and Dr Annette Bishop Grad Dip, Phys, MSc, PhD, NIHR Research Fellow, Institute of Primary Care and Health Sciences, Keele University.

Our research aims at studying the effects of an e-learning course for non-specific low-back pain on experienced osteopaths' attitudes to back pain.

We would like to ask you if you could post on your website an advert concerning our research and participants recruitment and we would also like to invite the members of the research hubs to take part. Could you please post the poster attached below and forward this email with the attachments to the research hubs? This email contains the Participant information sheet (PIS) and the consent form.

Osteopaths are invited to take part in a free e-learning course for non-specific low-back pain, informed by the most up-to-date evidence. One of the inclusion criteria is to have graduated at least 15 years ago. The e-learning course will provide participants XX hours of CPD and they will get a certificate after completion indicating that they have taken part and they may wish to use this as part of their CPD return to the GOsC. Their participation will also contribute to generating research related to the practice of osteopathy. The outcomes of this research may contribute to education for osteopaths and others in the future.

Please do not hesitate to contact me about any concern.

Hoping you find the research interesting I send you my best regards,

Jerry Draper-Rodi

The British School of Osteopathy, 275 Borough High Street, London, SE1 1JE

j.rodi@bso.ac.uk

Appendix Q. E-learning programme letter to magazine editors

Dear Editor of the XXX Magazine,

My name is Jerry Draper-Rodi and I am an osteopath practising in the UK.

I am doing a Professional Doctorate in Osteopathy with the University of Bedfordshire and the British School of Osteopathy. My supervisors are Mr Steven Vogel, Vice-Principal (Research and Quality) at the British School of Osteopathy and Dr Annette Bishop Grad Dip, Phys, MSc, PhD, NIHR Research Fellow at the Institute of Primary Care and Health Sciences, Keele University.

Our research aims at studying the effects of an e-learning course for non-specific low-back pain on experienced osteopaths' attitudes to back pain.

We would like to ask you if you could publish in your magazine and possibly on your website an advert concerning our research and participants recruitment. We are inviting osteopaths who graduated 15 years ago or more to take part in the study.

Would you be able to publish the advert below in your magazine and your website please?

Osteopaths are invited to take part in a free e-learning course for non-specific low-back pain, informed by the most up-to-date evidence. One of the inclusion criteria is to have graduated at least 15 years ago. The e-learning course will provide participants XX hours of CPD and they will get a certificate after completion indicating that they have taken part and they may wish to use this as part of their CPD return to the GOsC. Their participation will also contribute to generating research related to the practice of osteopathy. The outcomes of this research may contribute to education for osteopaths and others in the future.

Please do not hesitate to contact me about any concern.

Hoping you find the research interesting I send you my best regards,

Jerry Draper-Rodi, The British School of Osteopathy, 275 Borough High Street, London, SE1 1JE

j.rodi@bso.ac.uk

Participant Information Sheet

1. Study title

The effects of an e-learning programme for non-specific low-back pain on experienced osteopaths' attitudes to back pain: a mixed-method study.

2. Invitation

We would like to invite you to take part in our research study. Before you decide, we would like you to understand why the research is being done and what it would involve for you. Please feel free to talk to others about the study if you wish and ask us if anything is unclear or if you have any questions about the study.

3. What is the purpose of the study?

Low-back pain (LBP) is the most common symptom encountered by osteopaths in the UK (36%) and the NICE guidelines recommend a multimodal approach for LBP treatment, including osteopathy.

We have developed an e-learning programme for non-specific low-back pain that is informed by the most up-to-date evidence. The aim of the research is to test the effects of this programme on experienced osteopaths' attitudes to back pain and to evaluate their experience after completion with a semi-structured interview. To take part in the research you must have graduated at least 15 years ago.

The research will be used as part of Jerry Draper-Rodi's Professional Doctorate studies.

4. Why have I been invited?

You have been invited as you are a GOsC registered osteopath practising in the UK who has indicated to the GOsC their willingness to be contacted for research purposes.

5. Do I have to take part?

No; it is up to you to decide to join the study or not. A decision not to participate requires no reason and deciding to participate or not will have no effect on your professional standing. We will describe the study and go through this information sheet again with you if you agree to take part and we will then ask you to sign a consent form. You are free to withdraw at any time, without giving a reason or detriment. This would not affect your professional standing.

6. What will happen to me if I take part?

You will be invited to take an e-learning course on non-specific low-back pain. The e-learning content will be informed by the most up-to-date evidence from the literature. You will be asked to fill in two questionnaires before taking the e-learning course and after completion of the course. The questionnaires usually take less than 15 minutes to fill in. Anonymity and confidentiality will be respected.

After completion of the e-learning programme you will be invited to an interview. If you agree to be interviewed you will be contacted by the researcher, Jerry Draper-Rodi, to arrange an appointment at a convenient date and place for you. It is expected that this interview will last between 20 and 40 minutes. The interview will be audio recorded but anonymity and confidentiality will be respected. Your name will be replaced by a code and will not appear in any transcripts or published paper. You will be invited to talk about your experience of the e-learning intervention.

After the interview the researcher will transcribe the interview and will send the transcript to you to check for accuracy. Any changes you would like to make will be made to the transcript.

7. What do I have to do?

If you want to take part in the study or would like further information, please reply to this email to let the researcher know that you are interested.

8. What are the possible disadvantages and risks of taking part?

There are no significant risks to taking part in the study. For the e-learning course, it will entail giving up an hour of your time per week for XX weeks. The general aim is to test an e-learning programme for non-specific low-back pain on experienced osteopaths. The study tests the e-learning programme rather than your fitness to practice, therefore there are no right or wrong answers to questionnaire questions and it is not anticipated that the questions will be distressing. For the interviews it will entail giving up 20 to 40 minutes of your time. The general aim is to analyse if and how the e-learning intervention has changed your practice and to collect views on the intervention itself; therefore there are no right or wrong answers to the questions asked during the interview and it is not anticipated that the questions will be distressing.

9. What are the possible benefits of taking part?

The e-learning course will provide XX hours of CPD and you will get a certificate after completion indicating that you have taken part and you may wish to use this as part of your CPD return to the GOsC. Your participation will also contribute to generating research related to the practice of osteopathy. The outcomes of this research may contribute to education for osteopaths and others in the future.

Concerning the interviews, you may find reflecting on your clinical practice to be a useful experience, whilst your participation will also contribute to the evidence-base for the osteopathic profession. The outcomes of this research may contribute to education.

10. What if there is a problem?

If you wish to stop your participation at any time you are free to do so without penalty and do not need to give a reason. If you have concerns about the nature or conduct of the research, in the first instance you can discuss this with the researcher. Alternatively you may contact the supervisor directly.

Concerning the interviews, if you wish to stop your participation at any time you are free to do so without penalty and do not need to give a reason. If the researcher feels that you are under any distress or worried during the interview, he will pause the process. He will explain that all data gathered are anonymous and will offer you the chance to leave the interview. If any distress is noted, the interviewer will verify your well-being by calling you 48 hours later. The BSO will provide psychological support if participants need it. This is covered by the BSO insurance, as stated in the BSO policy.

11. Will my taking part in the study remain confidential?

The study has been approved by the BSO Ethics Committee. All information collected about you will be kept strictly confidential. The researcher and his supervisors will be the only people with access to the data.

Anonymity will be assured by removing names and allocating codes instead to questionnaires and interview transcripts and extracts. This will ensure that no names appear in the final paper.

Data will be stored securely and destroyed 6 years after completion of the study.

12. What will happen to the results from the study?

The results of the research will be used as part of a Professional Doctorate in Osteopathy thesis. The researcher will work towards presenting the findings of this research to relevant osteopathic professional conferences and towards publication of the findings in academic journals.

Participants will receive results of the study, unless they do not wish to. The thesis will be available in the BSO library after final approval.

13. Who is organising the research?

The researcher is Mr Jerry Draper-Rodi, a technique lecturer and clinic tutor at the British School of Osteopathy, and a research student at the University of Bedfordshire. This research goes towards the completion of a Professional Doctorate at the University of Bedfordshire.

The supervisors of this research are Mr Steven Vogel, Vice-Principal (Research and Quality) at the British School of Osteopathy and Dr Annette Bishop, Research Fellow (Institute of Primary Care and Health Sciences) at Keele University.

Thank you for taking the time to read this information sheet. Our contact details are given below should you have any questions or want further information.

Researcher's name and contact details

Mr Jerry Draper-Rodi
British School of Osteopathy
275 Borough High Street
City of London
SE1 1JE
07935 969532
j.rodi@bso.ac.uk

Supervisors' names and contact details

Mr Steven Vogel
Vice Principal (Research)
British School of Osteopathy
275 Borough High Street
City of London
SE1 1JE
020 7089 5331
s.vogel@bso.ac.uk

Dr Annette Bishop
Arthritis Research UK Primary Care Centre
Institute of Primary Care and Health Sciences
Keele University
Keele
ST5 5BG
01782 734838

CONFIDENTIAL

Participant Identification Number:

CONSENT FORM

Title of Project: The effects of an e-learning programme for non-specific low-back pain on experienced osteopaths' attitudes to back pain: a mixed-method study.

Name of researcher: Jerry Draper-Rodi

Name of supervisors: Steven Vogel and Annette Bishop

Please tick where appropriate

1. I confirm that I have read the information sheet for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason. ☐
3. I agree to take part in the above study. ☐
7. I do not want to receive a summary of the results. ☐

<u>Participant's name</u> <u>Date</u> <u>Signature</u>

<u>Researcher's name</u> <u>Date</u> <u>Signature</u>

Jerry Draper-Rodi

1 copy for the researcher. 1 copy for the participant.

CONTACT FORM

Title of Project: The effects of an e-learning programme for non-specific low-back pain on experienced osteopaths' attitudes to back pain: a mixed-method study.

Name of researcher: Jerry Draper-Rodi

Name of supervisors: Steven Vogel and Dr Annette Bishop

If you would like to have more information about the study, please fill in the contact box below and send this document back to the researcher. Thank you.

If you would like to take part in the study, please fill the contact box below and send this document and the consent form back to the researcher. Thank you.

Your name	
Your address	
Number of years since graduation (15 years minimum required)	
Have you been in an osteopathic educational role in the last ten years?	Yes No
Telephone	
Preferred time/day to be called	
Email	

Thank you very much for completing the form.

You can either send it by:

- Email: at j.rodi@bso.ac.uk
- Post to:

  Jerry Draper-Rodi, The British School of Osteopathy, 275 Borough High Street, London, SE1 1JE

Appendix U. Questionnaire pre-study

Participant no. Group: ABS-mp: Pre-study

Osteopath characteristics questionnaire

Select your gender	Choose an item.
Select your age bracket	Choose an item.
Number of years of osteopathic practice	Click here to enter text.
Do you have a special interest in low back pain?	Click here to enter text.
If you have any specialisations, which is the primary one?	Click here to enter text.

Participant no. Group: ABS-mp: Pre-study

Questionnaire 1

To what extent do you agree or disagree with the following statements? Please read each statement and choose the value that best represents your view.		1 = Strongly disagree 2 = Disagree 3 = Somewhat disagree 4 = Neither agree or disagree 5 = Somewhat agree 6 = Agree 7 = Strongl agree
1	I explore the psychological problems that my patient is facing.	Choose a value
2	I am concerned about the quality of treatment my referred patients receive.	Choose a value
3	I often find myself providing psychological support to patients.	Choose a value
4	If you look hard enough you can find a structural reason for most patients' back pain.	Choose a value
5	It is essential that I know about my patients' psychological difficulties.	Choose a value
6	Regular treatment by a physical therapist does not help prevent back pain.	Choose a value
7	When I refer my patients I know they will be seen within a suitable time frame.	Choose a value
8	The most important goal of treatment is to increase mobility.	Choose a value
9	I believe in continuing to treat the patient after the back pain has been resolved, to prevent its return.	Choose a value
10	Return to normal daily activities is the most important consequence of treatment.	Choose a value
11	I try to avoid probing into my patients' personal problems.	Choose a value
12	I don't believe that there is anyone out there who could help my back pain patients more than I do.	Choose a value
13	I advise back pain patients to restrict their life-style.	Choose a value
14	If I keep seeing patients on and off I can prevent relapse.	Choose a value
15	My objective is to get my patients back to work quickly.	Choose a value
16	I don't see myself as connected to a health system of resources that I can access.	Choose a value
17	I often find I have to teach patients to be vigilant about their backs.	Choose a value
18	If I keep seeing patients on and off, they might never learn to manage their back problem themselves.	Choose a value
19	When referring patients I am confident they will receive good treatment.	Choose a value

Participant no. Group: ABS-mp: Pre-study

Questionnaire 2

We would like you to indicate the level to which you agree or disagree with each of the following statements. *(Please choose one answer on each line)*	Totally Disagree Largely disagree Disagree to some extent Agree to some extent Largely agree Totally agree
Mental stress can cause back pain even in the absence of tissue damage	Choose an item.
The cause of back pain is unknown	Choose an item.
Pain is a nociceptive stimulus, indicating tissue damage	Choose an item.
A patient suffering from severe pain will benefit from physical exercise	Choose an item.
Functional limitations associated with back pain are the result of psychosocial factors	Choose an item.
Patients with back pain should preferably practice only pain free movements	Choose an item.
Therapy may have been successful even if pain remains	Choose an item.
Back pain indicates the presence of organic injury	Choose an item.
If back pain increases in severity, I immediately adjust the intensity of treatment accordingly	Choose an item.
If therapy does not result in a reduction in back pain, there is a high risk of severe restrictions in the long term	Choose an item.
Pain reduction is a precondition for the restoration of normal functioning	Choose an item.
Increased pain indicates new tissue damage or the spread of existing damage	Choose an item.
There is no effective treatment to eliminate back pain	Choose an item.
Even if the pain has worsened, the intensity of the next treatment can be increased	Choose an item.
If patients complain of pain during exercise, I worry that damage is being caused	Choose an item.
The severity of tissue damage determines the level of pain	Choose an item.
Learning to cope with stress promotes recovery from back pain	Choose an item.
Exercises that may be back straining should not be avoided during the treatment	Choose an item.
In the long run, patients with back pain have a higher risk of developing spinal impairments	Choose an item.

Appendix V. Short satisfaction survey

Participant no. Group: ABS-mp: Post study

<u>Quick satisfaction course survey</u>

Overall, how would you rate your satisfaction with this course?	Choose an item.
How would you rate the interest of this course?	Choose an item.
This course provided me with a new perspective on non-specific low back pain:	Choose a value
How would you rate the clarity of the teacher?	Choose an item.
What are the three most useful things you learned in this course?	Click here to enter text.
I will apply the content of this course in your practice:	Choose an item.

Any other feedback would be greatly appreciated in the space below:

Click here to enter text.

Appendix W. Intervention group letter

Dear Colleague,

Thank you very much for taking part in the study “The effects of an e-learning programme for non-specific low-back pain on experienced osteopaths’ attitudes to back pain: a mixed-method study.”

Participants have been randomly allocated to two groups: one starting on the XXX and the other group starting after the first group completes the e-learning programme.

You have been allocated to the group doing the e-learning programme first. You are going to be invited by email to start the course on the XXX. Before starting the course, you will be asked to fill in two questionnaires that should take less than 15 minutes.

You will then start the course that will require XX hour(s) per week of work over XX weeks.

At the end of the course, you will be asked to fill in the questionnaires again. You will get a certificate after completion indicating that you have taken part in this course and you may wish to use this as part of your CPD return to the GOsC. You will also be invited to be interviewed (either face-to-face or Skype) at a convenient date and place for you to get your views on the e-learning programme.

Joining the study is voluntary and will not affect your professional standing. You will be free to withdraw at any time without giving any explanation and you will be able to ask questions at any point.

Please do not hesitate to contact me about any concern.

Hoping you find the course interesting I send you my best regards,

Jerry

Jerry Draper-Rodi

The British School of Osteopathy

275 Borough High Street

London

SE1 1JE

j.rodi@bso.ac.uk

Appendix X. Control group letter

Dear Colleague,

Thank you very much for taking part in the study "The effects of an e-learning programme for non-specific low-back pain on experienced osteopaths' attitudes to back pain: a mixed-method study."

Participants have been randomly allocated to two groups: one starting on the XXX and the other group starting after the first group has completed the e-learning programme.

You have been allocated to the waiting list group. You are going to be invited by email to complete two questionnaires on the XXX (that should take less than 15 minutes). You will then start the course on the XXX and before starting the course, you will be asked to fill in again the questionnaires.

After that, you will start the course that will require XX hour(s) per week over XX weeks.

You will get a certificate after completion indicating that you have taken part in this course and you may wish to use this as part of your CPD return to the GOsC.

Joining the study is voluntary and will not affect your professional standing. You will be free to withdraw at any time without giving any explanation and you will be able to ask questions at any point.

Please do not hesitate to contact me about any concern.

Hoping you find the course interesting I send you my best regards,

Jerry

Jerry Draper-Rodi

The British School of Osteopathy

275 Borough High Street

London

SE1 1JE

j.rodi@bso.ac.uk

Appendix Y. Interview invitation

Dear Colleague,

My name is Jerry Draper-Rodi and I am an osteopath practising in the UK.

I am doing a Professional Doctorate in Osteopathy with the University of Bedfordshire and the British School of Osteopathy. My supervisors are Mr Steven Vogel, Vice-Principal (Research and Quality) at the British School of Osteopathy and Dr Annette Bishop, Research Fellow (Institute of Primary Care and Health Sciences) at Keele University.

You took part in the first stage of our study, following an e-learning course for non-specific low-back pain. We would like to thank you very much for doing it. We have collected data before and after the intervention in order to test the effects of the course on the osteopaths' attitudes and now we would like to collect the participants' views on the e-learning programme and discuss with the participants if the e-learning course has or has not changed their practice, and if so discuss how it has changed it. To do that, we would like to invite you for an interview where you could express your opinion on these matters.

The interview is expected to last between 20 and 40 minutes and would be done at a time of your convenience. It could wither be done at your practice, at the BSO or over the phone (or Skype).

Find attached the original Participant Information Sheet. Please fill in the contact form attached if you are interested in taking part or would like more information about the study. We would then arrange a time and date for the interview.

Joining the study is voluntary and will not affect your professional standing. You will be free to withdraw at any time without giving any explanation and you will be able to ask questions at any point. Participants' names will not be recorded during the interview and codes will be allocated in order to enable the researcher to analyse the data.

Please do not hesitate to contact me about any concern.

Hoping you find the research interesting I send you my best regards,

Jerry

Jerry Draper-Rodi

The British School of Osteopathy

275 Borough High Street

London

SE1 1JE

j.rodi@bso.ac.uk

CONFIDENTIAL

Participant Identification Number:

CONSENT FORM

Title of Project: The effects of an e-learning programme for non-specific low-back pain on experienced osteopaths' attitudes to back pain: a mixed-method study.

Name of researcher: Jerry Draper-Rodi

Name of supervisors: Steven Vogel and Annette Bishop

Please tick where appropriate

1. I confirm that I have read the information sheet for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason. ☐
3. I agree to take part in the above study. ☐
4. I agree not to disclose any identifying information about my patients during the interview. ☐
5. I understand that the interview will be recorded and typed out in full. ☐
6. I understand that brief, anonymous, extracts from the interview may be reproduced in academic presentations, and academic and non-academic publications. ☐
7. I do not want to receive a summary of the results. ☐

<u>Participant's name</u> <u>Date</u> <u>Signature</u>

<u>Researcher's name</u> <u>Date</u> <u>Signature</u>

Jerry Draper-Rodi

1 copy for the researcher. 1 copy for the participant.

Appendix AA. Semi-structured interview questions

Participant number ID:

Gender: M / F

Year of graduation (Osteopathy):

First of all I would like to thank you for taking part into this study.

Either:

- I've received the consent form that you've signed. I assume you're happy with it. Do you have any questions?
- I haven't received your consent form. If you're happy to do it this way, I can read the consent form to you and if you agree with the study you can give me a verbal consent and send me the form back after the interview. How does that sound?

We can now start the interview if you are OK. You can decide to pause or stop the interview at any time, without needing to give justifications and without detriment. If you see me looking away from the camera is just that I'm checking I'm asking all the questions I need to ask not that I'm bored!

We are going to start the interview with talking about some of your practical experiences of taking part in the course, then in the second part of the interview I'll ask your views about the content of the course. There are no right or wrong answers; I'm really interested in your experiences and views. I would like to ask you to not mention names please (patients, colleagues, etc.). If it happens, the names would be changed during the transcription to keep the interview confidential.

N.B. (If interview done using a using a voice-over-IP service, such as Skype, the researcher will tell the participant that a recording device has been placed near the computer to record the interview).

TIME

How have you organised your working week to fit the course?

How long did you spend online on the e-learning course per week? How did you organise accessing the course over the 6 weeks?

What types of things and how much time if at all did you devote to off line work related to the course?

MODE OF DELIVERY

Could you tell me what you thought about taking the course online?

OK, and tell me about your experience of accessing the course online.

Prompts:

Have you encountered any problems?

Difficulties for logging in?

Difficulties to access videos?

Difficulties to fill in quizzes?

Poor video quality?

Help me understand your practical experience of taking part – for example tell me about from where you accessed the course.

CONTENT

What did you think of the content of the course? Good vs bad

Tell me what you thought about the coverage of the course (the topics covered)? What was covered particularly well? Was there stuff missing?

Now we've talked about the content, what about the level/accessible/detail of it: How accessible was it – in terms of the level of information?

What about the extent of interactivity in the course? Can you give me an example of interactivity that worked well and example that didn't work so well?

CONTENT - BPS

To wrap up, a lot of the course was about the biopsychosocial model. What are your views of the BPS model in practice? (Any experience of early cases that changed since the course??)

Could you confirm me you want to check the content? If yes I would really appreciate end it back – if not heard after 2/52 I'll assume you're happy with content

Table a: Demographic data

	Intervention group (n=23)	Control group (n=22)	
Gender n (%)			χ^2 = 3.09; p=0.08
Male	11 (48%)	5 (23%)	
Female	12 (52%)	17 (77%)	
Age group median (IQR)	4.00 (1.00) (50-59)	3.50 (1.00) (40-59)	U=252.50 p=0.99
Years in practice Mean (SD)	21.91 (5.74)	23.45 (5.26)	t= -0.94 p=0.35
Special interest in LBP n (%)			χ^2 = 5.14; p=0.02*
Yes	14 (61%)	6 (27%)	
No	9 (39%)	16 (73%)	
Other special interest n (%)			χ^2 = 0.12; p=0.89
Yes	13 (57%)	12 (55%)	
No	10 (43%)	10 (45%)	

ABS-mp

ABS-mp test of normality

- **At baseline**

A series of Shapiro-Wilk tests showed that 10 out of the 12 variables (6 domains per group) were of normal distribution: in the intervention group LS, PS, CC and RA were of normal distribution. In the control group the 6 domains were of normal distribution. CHS and BM in intervention group did not have a normal distribution.

- **After the intervention**

A series of Shapiro-Wilk tests showed that 10 out of the 12 variables (6 domains per group) were of normal distribution after the intervention: in the intervention group the 6 domains were of normal distribution. In the control group LS, CHS, CC and BM were of normal distribution. PS and RA in the control group did not have a normal distribution.

Differences between group

A series of Shapiro-Wilk tests showed that 8 out of the 12 variables (6 domains per group) were of normal distribution after the intervention: in the intervention group LS, CHS, CC, RA and BM were of normal distribution. In the control group LS, PS and CHS were of normal distribution. PS in the intervention group and CC, RA and BM in the control group did not have a normal distribution.

- **ABS-mp baseline comparison**

There was little difference in measures of central tendency and spread of the six ABS-mp domains for the intervention and control groups at baseline.

Table b: Baseline measure ABS-mp

Mean (CI) Median (IQR)*	Intervention group (n=23)	Control group (n=22)	
LS1	17.74 (15.87-19.61)	18.36 (16.47-20.25)	t=-0.49, p= 0.628
PS1	20.70 (19.84-21.55)	20.68 (19.16-22.20)	t=0.016, p=0.987
CHS1	10.00 (3)*	11.64 (10.17-13.11)	U= 204.00; p=0.263
CC1	8.48 (7.41-9.54)	9.36 (8.66-10.07)	t=-1.424, p=0.162
RA1	15.04 (13.87-16.21)	14.23 (12.61-15.85)	t=0.855, p=0.397
BM1	14.00 (4)*	13.59 (12.33-14.85)	U=240.00; p=0.765

* = median and IQR, others are based on assessment of normality (mean and SD)

A series of independent t tests showed that there were no significant differences in the LS, PS, CC and RA subscales of the ABS-mp between the 2 groups at baseline (ps>0.05). Independent Mann-Whitney tests showed that there were no significant differences in the CHS and BM subscales of the ABS-mp between the 2 groups at baseline (ps>0.05) (see Table b for details)

- **ABS-mp within group change**

Table c - ABS-mp within group change – intervention group

Baseline	After intervention	Mean difference	95% Confidence Interval of the difference		t/Z*	df / sample size*	p
			Lower	Upper			
LS1 17.38	LS2 13.76	3.619	1.830	5.408	4.22	20	<0.0005*
PS1 20.52	PS2 22.62	-2.095	-3.132	-1.058	-4.21	20	<0.0005*
CHS1 10.00	CHS2 9.62	0.381	-0.958	1.720	-0.546*	21*	0.585
CC1 8.33	CC2 8.67	-0.333	-1.404	0.737	-0.65	20	0.52
RA1 14.76	RA2 16.33	-1.571	-2.806	-0.337	-2.66	20	0.02*
BM1 13.52	BM2 9.29	4.238	3.106	5.371	-3.887*	21*	<0.0005*

Paired samples t tests showed there were 3 significant changes after the intervention in the intervention group: LS decreased ($p<0.0005$), PS increased ($p<0.0005$) and RA increased ($p=0.02$). Wilcoxon tests showed there was one significant change after the intervention in the intervention group: BM decreased ($p<0.0005$). See Table c for details.

Table d - ABS-mp within group change – control group

Baseline	After intervention	Mean difference	95% Confidence Interval of the difference		t/Z*	df / sample size*	p
			Lower	Upper			
LS1 18.36	LS2 16.95	1.409	0.135	2.683	2.30	21	0.03*
PS1 20.68	PS2 20.59	0.91	-0.718	0.899	-0.291*	22*	0.771
CHS1 11.64	CHS2 11.64	0.000	-0.968	0.968	0.00	21	1
CC1 9.36	CC2 8.86	0.500	-0.153	1.153	1.59	21	0.13
RA1 14.23	RA2 15.05	-0.818	-0.1.960	0.324	-1.245*	22*	0.213
BM1 13.59	BM2 13.41	0.182	-0.550	0.914	0.52	21	0.61

Paired sample t tests showed one significant difference after the intervention in the control group: LS decreased (p=0.03). See Table d for details

- **ABS-mp between group changes**

Table e – ABS-mp between group changes

		Mean Difference	95% Confidence Interval of the Difference		t/U*	df / sample size*	p
			Lower	Upper			
LSDiff	Equal variances assumed	2.21	0.097	4.323	2.112	41	0.041*
PSDiff	Equal variances assumed	-2.186	-3.454	-0.918	90.50*	43*	0.001*
CHSDiff	Equal variances assumed	0.381	-1.209	1.971	0.484	41	0.631
CCDiff	Equal variances not assumed	-0.833	-2.057	0.39	-1.385	33.313	0.175
RADiff	Equal variances assumed	-0.753	-2.382	0.875	174.00*	41	0.161
BMDiff	Equal variances assumed	4.056	2.761	5.351	6.327	41	<0.0005*

Equal variances assumed when Lavene's test p> 0.05. Equal variances not assumed when Lavene’s test p<0.05.

Independent samples t tests showed there were 2 significant between group differences in LS (p = 0.04) and BM (p<0.0005). Mann-Whitney test showed there was one significant between group differences in PS (p = 0.001). See Table e for details.

PABS

PABS test of normality

- **At baseline**

A series of Shapiro-Wilk tests showed that the 4 variables (2 domains per group) were of normal distribution at baseline.

- **After the intervention**

A series of Shapiro-Wilk tests showed that 3 out of the 4 variables (2 domains per group) were of normal distribution after the intervention: in the intervention group both domains were of normal distribution. In the control group the Biomedical domain was of normal distribution and the Behavioural domain did not have a normal distribution.

Differences between group

A series of Shapiro-Wilk tests showed that the 4 variables (2 domains per group) were of normal distribution.

- **PABS baseline comparison**

The means and standard deviations on the two PABS domains were quite close for the intervention and control groups at baseline. Details in table f.

Table f: Baseline measure PABS

Mean (CI)	Intervention group (n=23)	Control group (n=22)	
PABS Biomedical 1	35.30 (32.75-37.86)	34.77 (31.80-37.74)	t= 0.283; p=0.779
PABS Behavioural 1	29.86 (27.57 – 32.14)	29.55 (27.81-31.29)	t= 0.314; p=0.775

Two independent T-tests showed that there were no significant differences in the 2 PABS subscales between the 2 groups at baseline (ps > 0.05).

- **PABS within group change**

Table g - PABS within group change – intervention group

Baseline	After intervention	Mean Difference	95% Confidence Interval of the Difference		t	df	p
			Lower	Upper			
PABS Biomedical 1 35.33	PABS Biomedical 2 25.71	9.619	7.551	11.687	9.70	23	<0.0005 *
PABS Behavioural 1 29.86	PABS Behavioural 2 35	-5.143	-7.434	-2.852	-4.683	23	<0.0005 *

Both PABS domains were significantly different for the intervention group before and after the intervention: the Biomedical one went down (p<0.0005) and the Behavioural one domain went up (p<0.0005). See Table g for details.

Table h - PABS within group change – control group

Baseline	After intervention	Mean Difference	95% Confidence Interval of the Difference		t/Z*	df / sample size*	p
			Lower	Upper			

PABS Biomedical 1 34.77	PABS Biomedical 2 36.18	-1.409	-3.442	0.623	-1.44	22	0.16
PABS Behavioural 1 29.55	PABS Behavioural 2 31.23	-1.682	-3.520	0.156	-1.667*	22*	0.096

There were no significant changes on both PABS domains for the control group before and after the intervention (ps > 0.05). See Table h for details.

- **PABS between group changes**

Table i – PABS between group changes

		Mean Difference	95% Confidence Interval of the Difference		t	df	p
			Lower	Upper			
PABS Biomedical Difference	Equal variances assumed	11.028	8.216	13.841	7.919	41	<0.0005
PABS Behavioural Difference	Equal variances assumed	-3.461	-6.2948	-0.6272	-2.467	41	0.018

Equal variances assumed when Lavene's test p> 0.05. If p<0.05, equal variances not assumed.

Independent samples t test showed significant between group differences on both PABS measures: the Biomedical domain (p<0.0005) and the Behavioural domain (p = 0.02). See Table i for details.

Confounding analysis

No statistically significant correlations were found between the 6 ABS-mp and the 2 PABS domains with Age Group and Years In Practice (ps>0.05). No statistically significant differences were found in the 6 ABS-mp and the 2 PABS domains between male and female participants; osteopaths who reported a special interest in LBP and those who did not; and participants who reported another special interest and those who did not (ps>0.05).

Appendix CC. Letter of ethical approval

THE BRITISH SCHOOL OF OSTEOPATHY

Name: Jerry Draper-Rodi
Title: The effects of a biopsychosocially structured e-learning programme for non-specific low-back pain on experienced osteopaths' attitudes to back pain: a mixed-method pilot randomised-controlled trial and qualitative study.

Wednesday, 10 September 2014

Dear Jerry

Outcome: Approved

Thank you for your application to the BSO Research Ethics Committee. Your submission has been approved without further changes. You are free to begin your dissertation.

If you have any questions or queries regarding please do not hesitate to contact REC Secretary Mike Ford on either m.ford@bso.ac.uk or 0207 089 5330.

Yours sincerely,

Mike Ford

p.p. Dr. Alan Ruben
BSO Research Ethics Committee Chair.

The British School of Osteopathy Research Ethics Committee
Research Centre, Room 2.02, 275 Borough High St, London SE1 1JE. **Tel:** 0207 089 5330
Please direct all queries to BSO REC secretary **Mike Ford** (m.ford@bso.ac.uk).
www.bso.ac.uk