

**The role of breathing techniques and self-reported anxiety
in Osteopathy:
A descriptive case study.**

Luis Thomsen

Declaration**Name of candidate: Luis Thomsen**

This Thesis/Dissertation/Research Project entitled: The role of breathing techniques in osteopathic management of self-reported anxiety: A descriptive case study

is submitted in partial fulfillment for the requirements for the degree of Masters of Osteopathy (MOST) - *Unitec, Te Pūkenga*
New Zealand Institute of Skills and Technology

Principal Supervisor: **Helen Anderson**

Associate Supervisor/s: **Tim Friedlander**

Candidate's declaration

I confirm that:

- This Thesis/Dissertation/Research Project represents my own work;
- The contribution of supervisors and others to this work was consistent with the Unitec Regulations and Policies.
- Research for this work has been conducted in accordance with the Unitec Research Ethics Committee Policy and Procedures, and has fulfilled any requirements set for this project by the Unitec Research Ethics Committee.

Research Ethics Committee Approval Number: 2022-1026



Candidate Signature:

Date: 21/06/2023

Student number: 1499477

Acknowledgements

First I would like to thank my supervisors. Thank you Tim for your feedback and amazing diagram creation skills. Thank you Helen for all your suggestions, support and help. You have been so generous with your time and wisdom and have made this thesis much more enjoyable to write so thank you.

To all my amazing friends James, Smeed and Ben thanks for just being you and keeping me sane. Thank you Serena for being my wise thesis mentor I appreciate you lots. A big thank you to all my osteopathy friends I have made at Unitech, you are all amazing and will make great osteopaths. Special thanks to Patrick and Tim for being my older osteo bros I love you guys.

To Eden my beautiful girlfriend. Your unconditional love and support means the world to me. I am so lucky to have you in my life.

To my family, Jed and Ngaio thank you for your endless support you show to me in your own ways. I feel so proud watching you both shine with your studies and throughout life. You guys are the best and I love you so much.

Mum and Dad without your support I would not be where I am today, I really mean that. You are the most kindest compassionate loving parents who I look up to so much. You both work so hard and inspire me to be the best version of myself I can be. Thank you for everything you have done for me I am so very grateful for your love.

To everyone else who has been a part of my journey thank you all so much.

Table of Contents

Declaration	2
Acknowledgements	3
List of Tables	6
List of Figures	6
Abstract	6
Literature Review	6
Defining anxiety	7
Prevalence	8
Categories of anxiety	10
The impact of musculoskeletal pain on anxiety	10
Anxiety's influence on musculoskeletal issues	11
Diagnosis	11
Self-reported anxiety	12
Treatments	13
Breathing	15
Osteopathy	15
Methodology	18
Qualitative and quantitative research	18
Mixed methods approach	19
Case study methodologies	20
Rigour in research	21
Reflexivity and reflection	22
Reporting quality	23
Techniques	30
Interviews	23
Archival research	24
Observations	24
Field notes	25
Data analysis	26
Types of case studies	28
Single case design	30
RESEARCH METHODS	31
Research Aim, Research Question and Objectives	31
Key definitions	31
Self-Reported anxiety	31
Breathwork	32
Recruitment and participants	32

Inclusion criteria.....	33
Exclusion criteria.....	33
Participants.....	34
Procedure.....	34
Interview development.....	34
Data collection schedule.....	35
Data collection and management of rigor.....	35
Patient notes (archival).....	36
Researcher field notes.....	36
Transcription of interviews.....	36
Data analysis.....	36
Ethical considerations.....	37
Informed consent.....	37
Privacy and confidentiality.....	38
Risks.....	38
Findings.....	40
Themes.....	40
Main themes.....	40
Anxiety.....	40
Breathing.....	47
Osteopathy.....	51
Discussion.....	56
Case study.....	57
Anxiety, pain and injury.....	59
The role of breathing.....	60
Strengths and limitations.....	62
Future recommendations.....	64
Recommendations for research.....	64
Recommendations for practice.....	64
References.....	66
Appendix A Standards for Reporting Qualitative Research.....	79
Appendix B Ethics Approval Letter.....	83
Appendix C Information For Osteopath.....	84
Appendix D Information For Patient.....	86
Appendix E Consent Form For Osteopath.....	88
Appendix F Consent Form For Patient.....	90
Appendix G Interview Schedule For Osteopath.....	92
Appendix H Interview Schedule For Patient.....	93
Appendix I Observation Form.....	94
Appendix J Initial Development Of Themes.....	96

List of Tables

Table 1	35
Table 2	40

List of Figures

Figure 1	62
----------------	----

Abstract

This thesis explored the role of breathing techniques and self-reported anxiety in Osteopathy. The research question of the study was: What is the role of breathing techniques in the osteopathic management of musculoskeletal pain, discomfort and self-reported anxiety that can be observed in an authentic case study?

This thesis used a descriptive case study methodology and utilised qualitative methods such as interviews, observations and field notes. The findings highlighted the limited role breathing techniques played and also the importance of other factors such as exercise, osteopathic manipulative therapy, utilising other therapeutic practitioners, good sleep, mindfulness, and patient and osteopath rapport in this context.

Literature Review

This thesis focuses on the role of breathing techniques in self-reported anxiety by patients in the context of Osteopathic treatment. There is significant literature on the key topics of anxiety and breathing, these topics have been explored in many contexts such as yogic breathing in the treatment of anxiety, effects of abdominal breathing on anxiety in woman in preterm labour and even breathing therapy as a primary treatment for anxiety (Sharma et al., 2022; Cicek & Basar, 2017). There has been some work on refining definitions of self-reported and self-identified anxiety (Fellmeth, et al., 2022). However, much less has been researched regarding anxiety and the effects of breathing techniques in the context of Osteopathy. This literature review gives a summary of current research on breathing and anxiety. This review will then consider the literature in relation to Osteopathy to provide the reader with a view of the context of this research. This thesis focuses on self-reported anxiety in conjunction with manual therapy in the Osteopathic space. Osteopaths are associated with pain management and disorders of the neuromusculoskeletal system. Osteopaths aim to empower patients by teaching them about lifestyle options that lead to better health outcomes

in order to avoid disease and enhance health (*Scopes Of Practice, 2023*) Osteopaths work holistically focusing on all facets of health (Kovanur Sampath & Roy, 2015). Osteopaths are interested in psychosocial domains especially if it reflects on a patient's presenting complaint. It is noted that it is outside of the New Zealand Osteopathic scope of practice to treat anxiety as a standalone disorder, or any other type of mental health disorders for that matter (*Scopes Of Practice, 2023*). However, as Osteopaths work primarily with the musculoskeletal system they are able to manipulate aspects of that system to help manage some of the effects of anxiety, when they occur as an adjunct to musculoskeletal issues given pain and anxiety are frequently interrelated (Poleshuck et al., 2009). It is appropriate for Osteopaths and for this research to be aware of current knowledge that is adjunct to their specific practices for the purposes of defining the boundaries of their scope, working to support patients into other scopes of practice with understanding where appropriate, and identifying the whole patient effects of musculoskeletal pain and injury, included psychosocial matters.

Defining anxiety

Anxiety is a common and natural part of daily life challenges, the Osteopath must be aware of its parameters, how it will affect treatment of musculoskeletal pain and injury, what supports they can provide within treatment and when to engage their patients with other specialists. Thus, defining anxiety is highly relevant.

Anxiety is a normal part of everyday life; it is common for people to feel anxious about certain situations (Ströhle et al., 2018). It is a natural biological response to perceived threats and challenges as it can motivate individuals to take action to avoid negative situations. The psychological and physiological reactions to anxiety such as increased heart rate, sweating and worry are even deemed necessary for survival in certain situations (Ströhle et al., 2018). It is normal to experience low levels of anxiety through day-to-day life. However when the anxiety becomes persistent, excessive and impacts an individual's ability to function and enjoy life it becomes of clinical concern (Bandelow & Michaelis, 2015). The line where normal everyday anxiety transitions into clinical anxiety is not always clear cut and there are some areas of uncertainty in the literature regarding this distinction. Although there are definitive symptoms that indicate clinical anxiety such as severe anxiety or panic attacks and avoidance behaviours, other symptoms may not be as definitive (Bystritsky et al., 2013). This shows that it can be difficult to identify if a certain level of anxiety is in excess or

not. To add further challenge there could even be cultural or individual differences in how the individual experiences anxiety (Ströhle et al., 2018).

Anxiety, as a health problem, refers to multiple physiological and mental responses to unusual, intense fear and worries about specific situations such as work, relationships and social situations, both past and present (Baxter et al., 2012). These symptoms can take the form of cold chills, hot flushes, palpitations, light-headedness and a sense of losing control (Bystritsky et al., 2013). Anxiety is a wide-ranging disorder, resulting in many subgroups of anxiety disorders. All of these conditions are marked by avoidance behaviours and heightened fear responses even in the absence of immediate danger (Otte, 2011). There are five main categories of anxiety, namely, generalised anxiety disorder (GAD), obsessive-compulsive disorder (OCD), panic disorder (PD), post-traumatic stress disorder (PTSD) and; social anxiety disorder (SAD) (Gale & Davidson, 2007). Each mentioned disorder is associated with their respective comorbidities which can lead to other health issues, both mentally and physically.

Prevalence

Anxiety disorders are extremely prevalent and are associated with a substantial economic burden (Revicki et al., 2012). Anxiety disorders are one of the leading contributors to disease burden worldwide, with over 275 million individuals currently affected (Konnopka & König, 2020). This corresponds to 27 million years lived with anxiety, the seventh-highest value for high-income countries. A systematic study investigating the cost of illness from anxiety disorders found that direct costs for anxiety disorders are 2.08% of health care costs and 0.22% of gross domestic product (GDP), and indirect expenses correspond to 0.23% worldwide (Konnopka & König, 2020). This is because anxiety patients have higher median healthcare costs of \$2,375.00 USD than non-anxiety patients of \$1,448.00 USD. In addition, anxiety disorder patients are higher utilizers of health care, which leads to a further burden on the global economy (Revicki et al., 2012)

Anxiety is one of the most prevalent mental health disorders globally (Leray et al., 2011). A recent systematic review reported that 1 out of 14 people at any given time meet diagnostic criteria for anxiety disorders globally (Baxter et al., 2012). This study also notes a prevalence of 7.3% for any diagnosed anxiety disorder (Baxter et al., 2012). In New Zealand, 1 in 4 people are affected by anxiety disorders throughout their lives, with 15% of the population

currently experiencing anxiety (*Annual Update of Key Results, 2020*). However, most anxiety disorders are underdiagnosed and under-identified (Konnopka & König, 2020). Studies illustrate that 17% of diagnosed anxiety patients have bipolar disorder and 67% have lifetime unipolar depression disorder, illustrating the extremely high prevalence of comorbidities seen in people with anxiety (Baxter et al., 2012). Anxiety is not only linked with other psychotic disorders but it is also associated with suicide, heart issues, alcoholism and other substance abuse (Simon, 2009). A high prevalence of anxiety within society adds further strain on the economy. Anxiety disorders are projected to cost patients up to \$7,451.00 USD annually and globally cost countries such as the United States more than \$63.1 billion (Zhu et al., 2009). In New Zealand, \$12 billion is spent annually to treat and manage mental disorders such as anxiety (Paterson et al., 2018.)

Anxiety and fear are intertwined and display themselves as a future mood state consisting of complex cognitive, behavioural, physiologic and affective response systems (Chand & Marwaha, 2021). These systems are associated with getting ready for anticipated events thought of as dangerous or threatening (Chand & Marwaha, 2021). Clinical anxiety is activated when there is an amplified estimation of a perceived threat or response to an event that leads to inappropriate and excessive responses (Gale & Davidson, 2007). In anxiety, serotonin, dopamine, and norepinephrine are the primary mediators in the central nervous system, whereas, in the autonomic system, the sympathetic system is responsible for mediating the symptoms (Bystritsky et al., 2013). Structures in the brain such as the amygdala have essential roles in mediating anxiety and fear. Patients with anxiety have shown heightened amygdala responses to anxiety cues (Chand & Marwaha, 2021). Prefrontal cortex areas are connected to the limbic system and amygdala. When activated together, the prefrontal limbic activation results in an anxiety response; however, these responses have shown to be reversed via pharmacological or psychological interventions (Bystritsky et al., 2013). Cognitive symptoms of anxiety include fear of death or physical injury, negative thoughts by others, losing control, poor memory and difficulty speaking. These can make normal situations very debilitating for sufferers (Chand & Marwaha, 2021). Behavioural responses to anxiety include escaping situations, agitation, and pursuit of safety (Otte, 2011). Physiological symptoms include dyspnoea, chest pain, raised heart rate and nausea (Chand & Marwaha, 2021). Affective symptoms make people seem jumpy, nervous, impatient and frustrated (Chand & Marwaha, 2021). Patients with these disorders usually underperform educationally and have a lowered

economic status and a high probability of losing their job, making them frequent users of the health system (Nardi, 2003).

Categories of anxiety

GAD is made up of symptoms of chronic anxiety not associated with certain situations or events (Bystritsky et al., 2013). OCD is characterised by excessive thoughts that result in repetitive behaviours (Chand & Marwaha, 2021). PD is characterised by intense panic attacks lasting minutes to hours, usually correlated with physical symptoms such as difficulty breathing and confusion (Otte, 2011). PTSD is characterised by a failure to recover following traumatic events. SAD is distinguished by a fear of social interactions or embarrassment in public (Bystritsky et al., 2013). A recurrent finding is that anxiety is more prevalent in the female sex than in the male sex, as females are twice as likely to experience anxiety (Bandelow & Michaelis, 2015). These are due to neurobiological, psychosocial and genetic factors (Bandelow & Michaelis, 2015). As an average timeline, anxiety disorder usually starts in early childhood, peaking around middle age and slowly decreases with time (Leray et al., 2011).

The impact of musculoskeletal pain on anxiety

Chronic musculoskeletal pain can have a significant impact on an individual's mental health and well-being (Burston et al., 2019). Persistent pain and disability associated with musculoskeletal conditions can lead to feelings of frustration and helplessness. Additionally the constant presence of pain can disrupt normal sleep patterns and interfere with daily activities, leading to increased stress and anxiety (Burston et al., 2019). Over time, this can contribute to the development of anxiety disorders such as generalized anxiety disorder (GAD) or panic disorder. Musculoskeletal pain is acute or chronic pain that affects ligaments, bones, muscles, nerves and tendons (El-Tallawy et al., 2021). Pain related to musculoskeletal disorders is a common medical and socioeconomic issue worldwide (El-Tallawy et al., 2021). Musculoskeletal disorders encompasses a vast range of conditions, such as low back pain, fibromyalgia, osteoarthritis, rheumatoid arthritis, osteoporosis, and primary or secondary headaches (Poleshuck et al., 2009). They can affect the entire body, primarily the neck, lower back, shoulders, elbows, knees, and fingers, and can be widespread or localised. according to studies its prevalence in the population ranges from 14%-57% (Poleshuck et al., 2009). The World Health Organisation reports that over 1.78 billion people have musculoskeletal conditions throughout the world, they also report that it is the leading contributor to disability

worldwide (Musculoskeletal Health, 2022). Musculoskeletal pain appears to have a substantial impact on both physical and mental health issues, which may have a big impact on quality of life. Individuals with anxiety disorders may have decreased pain thresholds (Burston et al., 2019). In addition to having lower pain thresholds than those without anxiety disorders, subjects with anxiety disorders may worry more about their health and worry more about the potential adverse effects of their medications, thus showing a relationship within subjects between anxiety and pain (Burston et al., 2019). Thus, the Osteopath must tread a delicate path when responding to anxiety in musculoskeletal treatment and remaining within their allowable scope. A close examination of interactions between Osteopath and patient in case study format offers illumination.

Anxiety's influence on musculoskeletal issues

Anxiety plays a role in the experience of musculoskeletal issues. Anxiety can cause muscle tension and stiffness, which can exacerbate existing musculoskeletal conditions or even lead to new ones (Poleshuck et al., 2009). Additionally, anxiety can interfere with sleep quality and disrupt the body's natural healing processes, slowing down recovery from musculoskeletal injuries or surgeries (Poleshuck et al., 2009). Finally, anxiety can lead to hypervigilance or heightened awareness of bodily sensations, causing individuals to interpret normal aches and pains as symptoms of a more serious musculoskeletal condition (Burston et al., 2019). Understanding anxiety in patients with pain requires understanding the context of the patients' life. When faced with stressful and traumatic life experiences, pain may be linked to increased stress as well as decreased resilience and coping skills (Poleshuck et al., 2009). Living with pain can result in social isolation, impaired performance of responsibilities like food shopping and child care, and increasing reliance on others for support (Poleshuck et al., 2009).

Diagnosis

While Diagnosis is outside of the osteopathic scope, an understanding of its issues is helpful in building an overview of anxiety and defining the boundaries between anxiety as a mental health issue (where referral to other specialists is warranted) and self-reported everyday anxiety routinely associated with health treatment.

Given the complexity of the human brain's structure, research into it is extremely difficult. Improvements in the diagnosis of mental illnesses and the development of more potent treatments for mental disorders have been made through research in the departments of

neuroscience, psychology, and psychiatry (Ströhle et al., 2018). The diagnostic criteria of GAD is still up for debate, and some academics believe that additional research into GAD and its diagnostic criteria is necessary, despite the fact that the diagnostic criteria for GAD have undergone multiple alterations in the previous DSM releases (Ströhle et al., 2018). Following a review of the scientific literature, (Coutinho et al., 2010) recommended modifications to the diagnostic criteria for GAD are advocated, including situations that cause anxiety, the length and frequency of symptoms, how anxiety is related to other symptoms, and particular behaviours. These changes have been suggested for several reasons. One being that the current diagnostic process is too restrictive and overly reliant on the symptom of excessive worry. This has led to an underdiagnosis of GAD for people that experience immense anxiety but do not meet the criteria for excessive worry (Andrews et al., 2010). Another reason for the proposed changes is to improve the validity of the diagnosis. Research has shown that the current diagnostic criteria has poor inter-clinician reliability as different clinicians may diagnose GAD differently (Andrews et al., 2010).

The conduct of clinical interviews is another important aspect in the diagnostic process. They allow thorough investigation of the person's past, symptoms, and anxiety-related functional impairment (Bystritsky et al., 2013). The Diagnostic and Statistical Manual of Mental Disorders' diagnostic criteria are frequently used in structured interviews, such as the Structured Clinical Interview for DSM-5 (SCID-5), to detect specific anxiety disorders (DSM-5) (Coutinho et al., 2010). Clinical interviews also give the doctor a chance to consider additional diseases, drugs, or environmental stresses that may be contributing to the patient's anxiety or acting as additional causes.

Observation of behavioural and physiological symptoms can help in the diagnosis of anxiety, in addition to self-report measures and clinical interviews. The degree of anguish experienced by the person, avoidance actions, and diminished functioning in varied contexts are examples of behavioural observations. The diagnosis method may also involve evaluating physiological signs including elevated heart rate, perspiration, and muscle tension (Coutinho et al., 2010).

Self-reported anxiety

Self-report questionnaires, professional interviews, and close observation of behavioural and physiological symptoms are frequently used to make the diagnosis of anxiety. In the initial assessment, self-report measures are frequently employed to learn more about the person's

subjective experiences with anxiety (Davies et al., 2022). These measurements that gauge frequency, severity, and persistence of anxiety symptoms, take the form of questionnaires, surveys, and self rating scales. The Beck Anxiety Inventory (BAI), the Generalized Anxiety Disorder 7-item scale (GAD-7), and the Hamilton Anxiety Rating Scale are a few examples of frequently used self-report measures for anxiety (HAM-A) (Davies et al., 2022). There are differences in how a patient may informally self report anxiety compared to those who have received a clinical anxiety disorder diagnosis (Davies et al., 2022). Those who have received an anxiety diagnosis may disclose that they have received a diagnosis or use words around their anxiety that are more specific and intense. Compared to those who have informally self-reported their anxiety and may talk about how their anxiety is low level or how they are slightly worried about some event happening in the future (Davies et al., 2022).

In an Osteopathic setting there is no formal anxiety diagnosis given as it is outside of their scope. However, through conversations in the case history and during treatment there is potential for the Osteopath to consider the patient's anxiety. This may be the case for Osteopaths as during a case history the patient may display psychological symptoms of their anxiety. This could take the form of irritability, excessive worry and difficulty concentrating (Sinnema et al., 2018). Osteopaths may even be able to note anxiety from the case history by identifying physical symptoms such as tremors, sweating and palpitations (Sinnema et al., 2018).

It is important that Osteopaths take a patient's anxiety levels into account when developing their treatment plans. The Osteopath may incorporate relaxation techniques into treatment plans to address any underlying psychological factors that may be contributing to the patient's anxiety that is in response to their injury or other factors in their life.

Treatments

While treating anxiety as a mental health issue is outside of the osteopathic scope, an understanding of its treatments is beneficial in constructing a comprehensive overview of anxiety and being aware of other assistance their patient could engage with.

Anxiety is a multifactorial disorder requiring a multimodal treatment approach (Bystritsky et al., 2013). Pharmacotherapy is currently a frequently used treatment option for anxiety disorders. Although pharmacotherapy interventions are practical, they come with

physiological and physical side effects such as weight gain and sexual dysfunction. Cognitive behavioural therapy (CBT) is a favoured method to treat anxiety (Otte, 2011). This is due to its effectiveness and lack of side effects (Otte, 2011). Cognitive Behavioural Therapy is a management option that falls underneath the scope of Psychotherapy (Otte, 2011). The research that investigated psychoeducational interventions in managing anxiety found that brief group psychoeducational interventions are more effective than longer individual CBT sessions and require fewer resources and expenses, showing great promise for future use (Parikh et al., 2012). Studies show that psychoeducational interventions effectively reduce both depression and anxiety and result in a lowered probability of having anxiety after one year (Dunbar et al., 2009). The benefits, as mentioned earlier, explain the increased use of this treatment technique in anxiety management.

Another emerging trend in the management of anxiety disorders is breathing techniques. In cognitive behavioural therapy, it has been found that breathing techniques have yielded successful outcomes reporting a reduction in anxiety episodes and symptoms (Chien et al., 2015). Types of breathing techniques such as abdominal and diaphragmatic breathing have been shown to reduce self-perceived anxiety via self-perceived anxiety rating tests called “The Profile of Mood Test” and “State-trait Anxiety Inventory” (Dunbar et al., 2009). There are emerging trends in using these techniques for managing anxiety and they highlight promising results (Zaccaro et al., 2018).

An interesting development in the treatment of anxiety is the acknowledgement of the value of rapport and a strong therapeutic alliance. Therapeutic alliance refers to a collaborative relationship between practitioner and patient characterized by mutual goals and agreements on treatment tasks (McParlin et al., 2022). Similarly, rapport is the interpersonal connection and harmony between the patient and practitioner and is characterized by trust, communication and respect (Dang et al., 2017). A strong therapeutic alliance is associated with improved treatment outcomes and an increased likelihood of patient adherence to treatment plans (McParlin et al., 2022). Within the context of anxiety management, a strong therapeutic alliance can create a space where patients feel comfortable expressing their fears and concerns which can aid in the development of personalised treatment plans and increase the effectiveness of interventions (Buchholz & Abramowitz, 2020). Factors such as empathy, active listening and cultural sensitivity all have significant roles in fostering a strong therapeutic alliance and rapport (Buchholz & Abramowitz, 2020).

Breathing

Breathing is a vital function of the body. It allows the uptake of oxygen needed for metabolism and the elimination of carbon dioxide. Breathing also has significant roles in postural stability, motor control, and psychological and physiological regulation (Ma et al., 2017). Breathing turns dysfunctional when the subject cannot breathe effectively or when the breath struggles or is unable to adapt to environmental stressors (Ma et al., 2017). From an anatomical perspective, breathing dysfunction can be due to diaphragm-related issues, asynchronous motion between the rib cage and abdomen, and upper body muscle dysfunction and mouth breathing (Courtney, 2009). The neurological control of breathing shows a large amount of neuroplasticity, illustrating how the breath can quickly adapt to a vast range of conditions. The prevalence of breathing dysfunction is estimated to be around 11% in the general population, 30% in asthmatics and 83% in subjects that suffer from anxiety (Zaccaro et al., 2018). Many breathing therapies are available, often seen in practices such as cognitive behavioural therapy and physiotherapy. The majority of them aim to do one of three things: address dysfunctional breathing, support the functions of breathing, and aid the regulation emotional states (Courtney, 2009). Studies support breathing protocols for heart disease, asthma, depression, and anxiety (Jerath et al., 2015). One study revealed physiological changes that go along with emotions. For instance, it has been demonstrated that the autonomic nervous system (ANS) and respiratory activity are intimately related to the perception of emotions (Kreibig et al., 2010). There is clear sympathetic/parasympathetic activity and breathing patterns that are linked to specific emotional states, including anxiety and happiness (Kop et al. 2011; Jerath et al., 2015). This is seen when people feel anxious and stressed and tend to breath shallowly, this activates the sympathetic nervous system which can further lead to the feelings of anxiety and panic (Jerath et al., 2015)

Osteopathy

Osteopathy is a form of alternative medicine that has been around since 1874. Osteopathy is distinguished for its hands-on, holistic approach that acknowledges the body systems as an interconnected functional unit primarily focusing on the musculoskeletal system (Seffinger et al., n.d.). Osteopathy emphasises the interdependence of the body's systems and places a strong emphasis on the body's natural capacity to repair itself (Roberts et al., 2022). Since its founding by Andrew Taylor Still in the late 19th century, it has developed into a reputable

profession with a demanding academic curriculum and international licencing criteria (Roberts et al., 2022).

In Osteopathy the musculoskeletal system is seen as crucial to overall health, and that hands-on manual procedures are used to identify and treat a variety of problems is among the fundamental tenets of Osteopathy (Esterov et al., 2021). An Osteopath will work to increase joint mobility, lessen discomfort, and improve general function, Osteopathic treatments may employ methods such joint mobilization, soft tissue massage, and manipulation (Esterov et al., 2021).

Musculoskeletal conditions can impact mental health through mechanisms such as pain, sleep disruption, reduced physical activity, impact on self-esteem and side effects of medication (Burston et al., 2019). The hands-on aspect of Osteopathy has been shown to release oxytocin via B and C tactile receptors throughout the body resulting in decreased blood pressure, heart rate and reduced pain sensitivity, overall yielding good outcomes for musculoskeletal complaints (Courtney, 2009). Osteopathy is thought to have improved subjects psychological factors who present with pain (Dixon et al., 2020). This has been supported by a systematic review that found that Osteopathic treatment produced a reduction in patients' anxiety levels and fear avoidance behaviour (Saracutu et al., 2018).

There are multiple mechanisms that have been shown that Osteopathic management can reduce anxiety. Osteopathic management has been linked to the activation of the parasympathetic nervous system which can result in a decrease of heart rate, blood pressure, muscle (Dixon et al., 2020). As persistent pain is a frequent anxiety trigger, Osteopathy may also assist to lessen anxiety symptoms by reducing pain (Esterov et al., 2021). Since poor sleep is a typical symptom of anxiety and Osteopathy has been found to enhance sleep quality in some people, improved sleep quality is another potential mechanism by which Osteopathy may reduce anxiety (Esterov et al., 2021). As well as this the focus on body awareness and mindfulness that is often a part of Osteopathic treatment may help individuals to become more aware of their physical and emotional sensations, allowing them to identify and manage anxiety symptoms more effectively (Dixon et al., 2020). This also implies that integrating psychological approaches into manual therapy could potentially lead to better outcomes such as improvement in the musculoskeletal complaint through recognition of psychological components or a secondary improvement in a patient's mental health as a side effect of

treatment. While Osteopathy is not a psychosocial intervention in and of itself, it may be worthwhile to combine it with brief psychological packages. Osteopathic care may be more successful and the effects of comorbidities may be moderated by using ideas and principles from third wave therapies like Acceptance and Commitment Therapy (ACT) (Saracutu et al., 2018). Comparing this kind of pairing to standard treatment alone may result in a positive synergistic impact on outcomes (Saracutu et al., 2018).

Those who frequently experience high levels of stress and struggle with self-management are more vulnerable to the negative effects of pain on their psychological and social wellness. It is commonly recognised that people's activity levels, social contacts, and ultimately their wellbeing are affected by pain (Burston et al., 2019). Also, there is a high probability of co-occurrence between pain and mental health. Research shows that between 50% and 75% of individuals with persistent pain also exhibit signs of anxiety and depression (Zhu et al., 2009). This highlights the connection between pain and anxiety, and thus the potential value of Osteopathy as a treatment option, given that many people seek out Osteopathic care precisely because they are experiencing pain (Penney, 2010).

Osteopathy places particular emphasis on the importance of proper breathing function, as breathing dysfunction can lead to significant structural and functional impairments throughout the body (Courtney, 2009). It has been noted in Osteopathic literature that poor breathing mechanics can cause musculoskeletal issues throughout the body such as scapular dyskinesis, temporomandibular joint (TMJ) pain and lower back pain (Lewit, 1980). Evidence within manual therapy modalities show the similarities between sub-optimal control of motor tasks and breathing dysfunction noted by O'Sullivan et al. (2002). In addition Roussel et al. (2007) recognised a positive correlation across dysfunctional breathing and sacroiliac joint pain. Breathing therapy is another facet of Osteopathy that is currently used in a clinical setting. It is commonly adjunct with Osteopathic manual therapy to treat and assess breathing-related dysfunction (Dixon et al., 2020). Although breathing therapy has a position within Osteopathy, the literature on clinically applicable protocols lacks generalizability and is sparse and is primarily textbooks and practice descriptions (Courtney, 2009; Benjamin et al., 2016). It is clear that breathwork is a commonly used by Osteopaths to treat many dysfunctions throughout the body so further research will be of value.

There is a lack of controlled clinical studies within the Osteopathic field to support Osteopathy and breathing technique's effectiveness in the management of health conditions in combination with each other. Therefore, an exploration of evidence across a range of modes exploring and understanding the perspectives of breathing management's role in managing anxiety disorders is needed. The subsequent area that needs more exploration is if there is a consistency in the management methods for anxiety in regard to breathing and Osteopathy. Only once these areas are explored, gaps in literature can be highlighted, and clinical questions can be formulated for future studies. For these reasons, it is a useful start in understanding the relationships among informally, self-reported anxiety, musculoskeletal issues and the use of breathing techniques in the context of Osteopathy, thus, the objective of this study is to explore in detail an Osteopath's and patient's perspectives on breathing in managing self-reported anxiety. Therefore, the research question for this study is: What is the role of breathing techniques in the osteopathic management of musculoskeletal pain, discomfort and self-reported anxiety that can be observed in an authentic case study?

Methodology

To obtain the most appropriate results in relation to the research question, every research project must employ an explicit, systematic methodology (Mohajan, 2018). An explicit and systematic methodology helps promote transparency and enhances validity and reliability (Timans et al., 2019). In addition to this it enables critical evaluation and establishes a common framework for conducting and evaluating the research (Baškarada, 2014a). The choice of research method is dependent on the specific research question being addressed. It is important that methods align with research inquiry and are independent of the subject matter. (Mohajan, 2018).

Qualitative and quantitative research

Two significant approaches to research that may be considered include the use of qualitative or quantitative methodologies. The approaches differ in their philosophies, the way in which data is collected and purposes (Timans et al., 2019). Inductive in nature, qualitative research typically involves the researcher exploring meanings and insights in a particular context (Baškarada, 2014). Qualitative research explores insights into other people's perspectives and experiences about specific topics. It explores how people have persevered through their lived experiences and by doing so can enable researchers to understand why people may have

experienced things the way they did (Noyes et al., 2019). Quantitative research is different to qualitative research as it embodies a range of methods concerned with systematic investigation to find patterns, test relationships and generalize results using numerical data (Noyes et al., 2019). Quantitative research in simplest terms is deductive, measurements are taken, data is analysed and conclusions are drawn (Noyes et al., 2019).

Mixed methods approach

Methodologies have developed beyond strict binary approaches and while mixed methods is somewhat contested, it does provide a framework for considering approaches that draw on techniques from both quantitative and qualitative thinking.

A mixed methods strategy combines quantitative and qualitative research methodologies (Wasti et al., 2022). It enables researchers to provide a more thorough grasp of the research subject by combining the strengths of both methodologies (Timans et al., 2019).

A mixed methods approach can be effective in case study technique as it allows researchers to collect qualitative as well as quantitative information from a mix of sources. A mixed methods approach can help case studies, which frequently entail in-depth examination of a single case or a small number of examples to gain a more complete knowledge in practise of the topic being examined (Onwuegbuzie & Leech, 2010). In contrast to qualitative data which can provide rich, comprehensive insights into individual experiences and perspectives, quantitative data, such as survey responses or statistical studies, can help provide generalizability and discover patterns and trends (Halcomb & Hickman, 2015).

Researchers can better understand the cases they are studying by triangulating data from various sources by employing a mixed methods technique. There are several crucial steps in the mixed methods technique. The researcher must first specify the research issue and choose the best data collection strategies to address it (Halcomb & Hickman, 2015). This might entail conducting surveys, interviews, and observations as well as gathering quantitative and qualitative data (Halcomb & Hickman, 2015). Second, the researcher may use both statistical and non-statistical techniques to analyse the data, such as content or thematic analysis. Finally in order to come to a conclusion on the research question, the researcher may combine the findings from the qualitative and quantitative studies (Halcomb & Hickman, 2015).

However, in considering these three approaches the researcher decided to employ a qualitative methodology as its inherent strengths and compatibility aligned with the research objectives. This approach was suitable for the research aim of exploring subjective experiences and perspectives in a topic that is in its very initial stages of exploration. This qualitative research approach provides in-depth exploration and the development of rich data by using methods including interviews, observations and document analysis in an authentic context following treatment sessions between an Osteopath and a single patient where the researcher observes and interviews both parties, thus generating direct insights.

Case study methodologies

Case study research is a constructive methodology to understand and investigate issues that are complex in nature and found in real world settings and may involve various iterations of qualitative and quantitative approaches (Mills et al., 2010). Case study research has undergone large changes and development in the past 40 years due to the application of various methodological approaches as noted above. Case study history is said to have its origins stemming from qualitative approaches to research in sociology, anthropology and psychology (Baškarada, 2014). When human behaviour and social interactions are crucial to comprehending topics of interest, the case study has become more sophisticated and is recognised as a legitimate method of investigation (Harrison et al., 2017). As a result, case studies give the researcher a chance to develop an in-depth understanding of the study problem and may make it easier to describe and explain a research problem or circumstance (Mohajan, 2018).

Gerring asserted that arguably the case study was the first method of social science. Its historical significance can be traced back through myths and historical events, and it can be understood to go all the way back to the earliest historical chronicles (Gerring, 2007). In addition to discussing the history of the case study, the section cited above also indicates that these investigations have an instinctual and organic element to them which is a significant strength in understanding real life situations. As discussed, the case study has an enduring and reputable history with the first scholar to be credited with the birth of case study methodology being Fredric LePlay (Sclafani, 2017). The earliest use of this type of research has been traced back to France in the 1800s with LePlay using this methodology to investigate in the financial realm (Gerring, 2007).

Qualitative case study method is popular with practitioners as a tool for evaluation and organisational learning in addition to being widely used in academia particularly in the field of health (Houghton et al., 2013). Nevertheless, despite its widespread use the qualitative case study method is poorly understood. Any misunderstandings regarding the goal and application of the approach as well as the validity of the findings might have serious negative effects given the large time and resource needs involved in conducting such research (Baškarada, 2014). Attention to rigour is essential to the credibility of case study findings (Cypress, 2017).

Rigour in research

Rigour refers to the use of strict, systematic, and rigorous methods in research to ensure that the findings are reliable, and trustworthy (Cypress, 2017). Houghton refers to the principles of confirmability, credibility, dependability, and transferability. These are used to uphold rigour in qualitative research (Houghton et al., 2013).

Rigour in case study methodology refers to the use of suitable data gathering and analysis methodologies, guaranteeing that data is gathered from different sources to triangulate conclusions and conducting research in a unbiased manner (Houghton et al., 2013). In order to ensure that the data is analysed methodically and that conclusions are supported by the data, rigour also ensures the use of effective analytical procedures. Overall, research must be rigorous to ensure that the conclusions are supported by valid data and are reliable (Maher et al., 2018).

Rigor can be included into case study technique in a number of different ways. For example, researchers can triangulate their conclusions by using many data sources, such as interviews, observations and documents (Houghton et al., 2013). This makes it possible to prevent the findings from relying solely on single sources of information. A variety of analytical methods including content analysis, theme analysis, and grounded theory, can be used by researchers to examine the data (Maher et al., 2018). These methods aid in ensuring that the data is analysed methodically and objectively and that the conclusions are supported by the data.

Although case study methodology's rigour may be viewed as strong there can be issues. One potential problem with a focus on rigour in any research, is that it can sometimes lead to a narrow and rigid approach to data collection and analysis (Cypress, 2017). Researchers may

become so focused on using specific methods and techniques that they overlook other important aspects of the research process, such as the context in which the study is being conducted or the subjective experiences of the participants (Cypress, 2017).

Rigour also occasionally results in a lack of flexibility in the research process which is a problem. Researchers may grow so devoted to a specific method or strategy that they are unwilling to change it in response to new information or unexpected results (Johnson et al., 2020). The emphasis on rigour can also occasionally result in a gap between the research method and the real-world applications of the area being investigated. The rigour of studies can cause researchers to lose sight of the practical consequences of their findings or considering the practical applications of how their research may be used (Johnson et al., 2020). This can be countered by using strong processes of reflexivity and reflection.

Reflexivity and reflection

Reflexivity refers to the process of acknowledging and routinely examining the role and biases of the researcher in relation to the data (Olmos-Vega et al., 2022). It involves self-awareness and active engagement with one's beliefs that may influence the research process and outcomes (Olmos-Vega et al., 2022). Reflexivity encompasses constantly reflecting on the researcher's assumptions, biases and values. Reflexivity is essential for producing meaningful and rigorous research (Olmos-Vega et al., 2022). Reflection involves contemplation and analysis of personal experiences, methodology and research findings (Braun & Clarke, 2019). Reflection allows researchers to gain a deeper understanding of the complexities of the research and, enhances the rigour and quality of the study (Olmos-Vega et al., 2022)

In considering the personal context of the primary researcher, the researcher has spent the past five years studying Osteopathy, he has completed a three year Bachelor of Applied Science Human Biology and has spent the past two years in clinical practice studying his Master of Osteopathy. The researcher had his own biases towards this research as he wanted to convincingly display the relationship of Osteopathic management to self-reported anxiety using breathing techniques. The researcher used the above techniques talked about in the rigour section to ensure that the biases were transparent and managed (see Methods below). The end result of the research was not the original answer that the researcher had predicted and, in addition to this, the researcher utilized reflexivity with his supervisors which additionally emphasizes the control of biases.

Case study methodology facilitates reflexivity by including and carefully examining one or more cases throughout time in order to comprehend the phenomenon being studied (Ridder, 2012). In qualitative research, descriptive case studies are frequently used to produce in-depth, rich data that can offer insights on challenging social or medical phenomena (Baškarada, 2014). The process calls for rigorous case selection, then data gathering using a range of techniques such as interviews, observation, document analysis, or archival research.

Reporting quality

To ensure excellent reporting quality in this qualitative research the Standards for Reporting Qualitative Research (SRQR) checklist was implemented (see appendix A) (O'Brien et al., 2014).

Interviews

A key component of case study technique is interviewing. Interviews are one of the main techniques utilised in case study research to gather data. There are many different ways to conduct interviews, including in-person, over the phone, and online. The nature or type of research, participant availability, and the researcher's preferences are variables that influence the technique selection (Bazeley, 2018). Interviews with key informants or participants who have first-hand knowledge of the topic being examined are frequently done in case study research. These people could be specialists, participants or those who have experienced the phenomenon first hand (Noyes et al., 2019). Information that is harder to collect through other approaches such as surveys or observations can be found with interviews. They can also aid in the researcher's ability to gain a deeper knowledge of the topic under investigation and to spot themes that different data collection techniques might miss (Bazeley, 2018). Semi structured interviews give research advantages that add to the depth and quality of research findings, flexibility being one of these (Magaldi & Berler, 2020). Flexibility allows for a dynamic interaction between the interviewer and interviewee. Compared to a structured interview that strictly follows a predetermined set of questions, semi structured interviewing provides a frame work while allowing the exploration of new avenues and welcoming unexpected insight and opportunities for reflexivity from one session to the next (Magaldi & Berler, 2020). The researcher is able to add and change questions and prompts in a dynamic manner based of previous findings.

Archival research

In case study methodology, archival sources can be utilised to investigate a wide range of research topics including those pertaining to historical events, social behaviours, cultural norms, and institutional regulations (Ridder, 2012). A wide range of resources including official records, private papers, images, newspapers, and artefacts, can be found in archival sources. Archival materials can be used in case study research to triangulate data gathered through other techniques such as interviews or observations (Baškarada, 2014). Archival sources, for example, can offer crucial context and background data that might support the information found via interviews or other primary sources when a researcher is researching an historical event (Baškarada, 2014). The data gathered via other approaches may have gaps that need to be filled and archival research may be able to assist. For instance archive materials may give significant records and papers that are not accessible through interviews or observations if a researcher is researching a certain organisation or institution or event (Mills et al., 2010). In this research archival notes referred to the Osteopath sharing patient notes with the researcher with the consent of the patient. These notes were then analysed using a systematic coding procedure used to identify and categorise data. Initially there was a set of predetermined themes and codes established based on the research objectives and questions. These themes were discussed and refined with the supervisors to ensure consistency and accuracy when extracting the participants' true experiences and beliefs from the data.

Observations

In case study research observations are crucial. Observations are the methodical recording of actions or circumstances in the context of the case being examined (Baškarada, 2014a). Observations can offer comprehensive and in-depth information about the surroundings, behaviours, and interactions of the individuals under study.

Participant and non-participant observations make up the two primary categories of case study research observations (Noyes et al., 2019). In contrast to non-participant observation, which includes the researcher as a passive spectator, participant observation involves the researcher as an active participant in the environment being researched (Noyes et al., 2019). There are numerous methods for doing observations, including naturalistic and controlled observation, direct and indirect observation, and structured and unstructured observation (Ridder, 2012). Controlled observation involves observing individuals inside a controlled

environment where variables are manipulated and regulated (Mulhall, 2003). This reduces confounding factors and helps establish cause and effect relationships. This method is commonly found in an experimental research setting such as a laboratory (Noyes et al., 2019). In contrast, naturalistic observation is frequently preferred in case study research because it enables the collecting of data in the setting of real-life circumstances without any interference (Ciesielska et al., 2018). Direct observation involves researchers witnessing first hand events giving real time data on observable phenomena, this is mainly used for studying non-verbal cues or social interactions (Mulhall, 2003). Indirect observation solely relies on secondary sources of information such as documents which gives insight into long term trends and historical events (Ciesielska et al., 2018). Structured observations follows predetermined categories to document behaviours and events, It makes it possible to collect data in a standardised manner, and streamlines quantitative analysis and comparisons (Ciesielska et al., 2018). Unstructured observation has flexibility giving the researchers ability to capture a diverse range of behaviours and details without rigid categories. It provides descriptive data for exploring and revealing new insights (Ciesielska et al., 2018).

In case study research, observations can offer a variety of data such as knowledge of the surrounding environment, social interactions and communication (Ridder, 2012). Observations can also be used to spot patterns and trends in behaviour as well as to gain understanding of the interpretations and meanings that people assign to their experiences and behaviours.

Field notes

Field notes play an essential role in case study methodology by providing a detailed and comprehensive record of the observations and experiences of the researcher in the study context (Deggs & Hernandez, 2018). Field notes are the written records that a researcher keeps when conducting fieldwork or research in a natural environment (Deggs & Hernandez, 2018). They act as the main means of gathering data for qualitative studies regarding detailed accounts of the places, people and things that were seen throughout the investigation. The researcher may utilise field notes to record their observations, interactions, and experiences with the participants and the location during the data collection stage of a case study (Phillippi & Lauderdale, 2018). The physical surroundings, participant behaviour, dialogue, and other valuable information may all be described in these notes.

These field notes can then be used by the researcher to gain a deeper understanding of the situation, spot trends and themes, and make judgements based on their data analysis (Deggs & Hernandez, 2018). Field notes may also be used by the researcher to give proof for their conclusions.

The ability to provide additional and contextualized data that may be utilized to support or deepen other types of data, such as interviews, is one of the primary benefits of field notes in qualitative research (Deggs & Hernandez, 2018). Field notes can offer a more thorough picture of the research context and participant experiences than standard data collection techniques. For example, field notes can give a more in-depth description of what that environment actually looks like, such as the lighting, temperature, and room layout, as well as the behaviour and interactions of participants within that environment, whereas interviews may provide information on the significance of creating a relaxing environment (Mulhall, 2003). This supplementary triangulation of data may enhance data analysis and interpretation and contribute to a more thorough grasp of the research issue (Timans et al., 2019).

Field notes are a valuable resource for researchers in qualitative research as they provide a detailed and comprehensive record of observations, interactions, and experiences during the research process (Phillippi & Lauderdale, 2018). The processes of obtaining field notes in qualitative research is similar to that of case study research. Data is initially collected by researchers these notes may include detailed descriptions of the research setting, people and events as observed by the researcher (Mulhall, 2003). Once the notes have been obtained then the analysis takes place. Here these are identified and categorized. Once analysed the data is then interpreted to develop a deeper understanding of the research topic and the experience of the participants. From here researchers integrates the field notes with other data sources to develop a comprehensive understanding of the research (Mulhall, 2003). This process is called data triangulation and aids to increase the validity and reliability of the research findings.

Data analysis

A crucial component of case study methodology and all research is data analysis. It entails the methodical inspection of information gathered from diverse sources to find trends, themes, and connections pertinent to the research subject under consideration (Harrison et al., 2017). Data analysis is critical to case study methodology because it helps make sense of the

information gathered from diverse sources, such as interviews, papers and observations (Harrison et al., 2017). The researcher can better comprehend the phenomenon being investigated by using the analysis to recognise and evaluate patterns and themes that appear in the data.

Data reduction, data display, and conclusion drafting are common processes in the data analysis process used in case study methodology. Data reduction is the process of gathering data from many sources, organising it, and compressing it into a form that can be easily analysed. It is important to present data in a way that makes it simple to spot trends and connections. Finally, formulating conclusions entails combining the facts to provide a thorough understanding of the topic under study (Houghton et al., 2013).

The data is then rigorously analysed utilising qualitative techniques to find trends, themes, and linkages between the case's many components (Baškarada, 2014). Descriptive case studies can be used to fully comprehend a case or to create theoretical frameworks that can be put to the test in other investigations. The descriptive case study's key advantage is its ability to offer in-depth, specific data that can help practice or theory in a given subject (Harrison et al., 2017). The process can be time and resource consuming and the generalisability of the results may be constrained. The method of analysis is described below, taken from the work of Braun and Clarke on thematic analysis.

Thematic analysis is used to analyse and identify themes within qualitative data (Braun & Clarke, 2019). Braun and Clarke have developed a commonly recognised and accepted six stage framework for thematic analysis. The first stage is familiarisation with the data. This involves the researcher immersing themselves in the data allowing the researcher to get a deeper understanding of the data set. The second stage is generating initial codes. Researchers must identify and generate initial codes which are labels assigned to specific segments of the data that highlight themes or ideas. These codes serve as a means of organising information whilst capturing the true substance of the material. Stage three is searching for themes. The researcher looks for reoccurring ideas within the codes then group similar codes together to form potential themes. After this step it is time for stage four being reviewing and refining themes. This is done by examining the themes coherence and considering how it relates to the data set as a whole whilst making modifications as needed. Stage five is defining and naming themes. This requires giving the themes clear definitions

and describing it in detail. The themes are given names that reflect their content. The final stage is producing the final report. Researchers will present their findings giving a narrative that incorporates the previously identified themes with supporting examples from the data and an interpretation of the results (Braun & Clarke, 2021). The final report will emphasise the themes and their implications for the research question.

Types of case studies

At the very start of research, a case study has the potential to explore a multi-faceted understanding of an issue that is not fully understood in a real-life context and in research (Mills et al., 2010). There are many different kinds of case studies, the most common being exploratory, explanatory and descriptive case studies (Yin, 2012; Bullough, 2015).

In addition to the more common exploratory, explanatory and descriptive case study, two further types are collective and critical instance. In collective case studies a set of connected instances is examined to find recurring themes or patterns. They are useful for developing theories or generalizations about a phenomenon (Orland-Barak & Hasin, 2010). A critical instance case study is another variety of case study. Critical instance case study examine one or multiple sites for the purpose of focusing on a single occurrence instead of making a generalization about a situation (Baškarada, 2014).

Exploratory case studies are used to gain initial insights into topics that are not well understood (Mills et al., 2010). Case study methodology is used to develop hypothesis that can aid in guiding future research on the topic. With exploratory case study methodology the research usually beginning with open ended research questions then collects data using a number of methods like interviews observations, field notes and document analysis (Mills et al., 2010). The focus is not on testing a pre-existing theory but rather exploring multiple facets of the of the research problem. With this type of case study the data collected is usually qualitative however quantitative data can be collected if it is relevant to the research problem (Baškarada, 2014). Exploratory case studies can also be used to generate new insights into a topic, identify new areas of research that needs to be conducted or give a preliminary understanding of an emerging field or research (Mills et al., 2010).

Explanatory case studies explains something or tests a theoretical explanation for a phenomenon (Priya, 2021). Explanatory case studies are used to test or improve theories by looking at how well they apply in actual situations. The researcher begins with a theory then

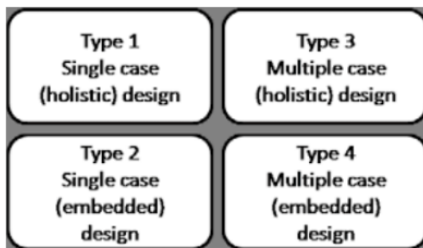
collects data to test said theory (Priya, 2021). Most commonly the data collected for explanatory case studies is a combination of qualitative and quantitative. Similarly to exploratory case studies data may be gathered through a range of techniques, including surveys, document analysis, observation and interviews (Baškarada, 2014). Testing a theoretical explanation or hypothesis regarding a phenomena or behaviour is the main goal of an explanatory case study. The gathered data is examined in light of the theoretical hypothesis and the conclusions are then used to either confirm or deny the theory (Priya, 2021). Explanatory case studies are particularly useful when there is already a pre-existing theory or hypothesis and there is a need to further refine the theory. Explanatory case studies do not provide a definitive answer for a research question, they are intended to test or improve a theoretical hypothesis and to offer knowledge that can be applied to aid future research (Priya, 2021).

A descriptive case study is a type of case study research that is used to describe a particular phenomenon, situation or individual in detail (Baškarada, 2014). The main objective of descriptive case studies is to give a detailed and comprehensive narrative of a specific case. Unlike experiments designed to test hypotheses or theories, the objective is on presenting a nuanced account with aim to capture the intricacies of the case under examination (Harrison et al., 2017). Typically, the researcher gathers information from a variety of sources, such as observations, document analysis, and interviews. The information gathered is often qualitative in nature and is used to give a thorough account of the case under investigation (Ridder, 2012). The data collected is typically analysed through a process of thematic analysis, where the researcher identifies key themes and patterns in the data. Not only are descriptive case studies useful to gain a deeper understanding of a particular situation they are also useful when the case being studied is unique in nature and therefore a detailed description of said case is required (Baškarada, 2014). The most appropriate case study for this context is a descriptive case study. Descriptive case study is a detailed method in which questions about a phenomenon are carefully examined and articulated at the outset (Baškarada, 2014). The main goal of the descriptive case study is to describe a situation that is not already well documented in detail and in-depth based on an articulation of a descriptive theory. This theory must respect the depth and scope of the case under study which is conveyed through robust propositions and questions seen in this study as how Osteopathy may contribute to the relief of anxiety through breath training.

Single case design

There are four types of case studies, type one and two focus on single cases whilst type three and four involve multiple cases (Yin, 2012). Type one was opted for by the researcher due to the case's nature, representing a distinctive circumstance with minimal existing research

Figure 1 Case Study Types



(Yin, 2012)

Breathing therapy is another facet of Osteopathy that is currently used in a clinical setting. It is commonly adjunct with Osteopathic manual therapy to treat and assess breathing-related dysfunction. Although breathing therapy is commonly used in Osteopathic management, the literature on clinically applicable protocols lacks generalizability and is sparse and is primarily textbooks and practice descriptions (Courtney, 2009). Therefore, a descriptive Type 1 case study utilising observations in the clinical setting, interviews with the participants and patient notes will open up further spaces for exploration by future researchers, such as the scope for practice and research in Osteopathy treatments and their relationship with anxiety (Mills et al., 2010).

Techniques

There are many techniques available to use for case study researchers. Some of these are discussed below, all of which were used in this study. All data collection was tracked and managed through the use of detailed audit trails where every engagement was recorded.

RESEARCH METHODS

Research Aim, Research Question and Objectives

Aim - to better understand how breathing techniques are used in the management of self-reported anxiety symptoms within an osteopathic context.

Research question - What is the role of breathing techniques in the osteopathic management of musculoskeletal pain, discomfort and self-reported anxiety that can be observed in an authentic case study?

Objectives

1. To carry out a case study of Osteopath's and patient's perspectives on breathing techniques in managing the patient's self-reported anxiety
2. To analyse transcriptions from interviews with patient and Osteopath, observations and field notes.
3. To identify the elements of a context where self-reported anxiety is a factor in Osteopathic treatment of musculoskeletal pain and injury for practitioners to consider in their treatment plans

Key definitions

This research aimed to better understand how breathing techniques are used in the management of self-reported anxiety. Definitions of breathing techniques and self-reported anxiety are contested in the literature as identified above. The following definitions are used to guide this study.

Self-Reported anxiety

This thesis uses the following definition of self-reported anxiety. While anxiety as a clinical condition is identified by a specific diagnostic criteria, self-reported anxiety relates to individuals own subjective accounts of their experiences with symptoms of anxiety that are dissimilar to diagnosed clinical anxiety disorders that may call for hospitalisation or medication. Self-reported anxiety presents as a more persistent and nuanced emotional state, regularly falling below the clinical threshold. This underscores that individuals may express

varying specificities and intensities of anxiety symptoms showing the complexity of self-reported anxiety. This may present in the Osteopathic context in conjunction with more specific injuries or pain, for example, in this thesis the patient presents with tightness in their chest as well as tension in their midback and neck.

Breathwork

This thesis defines breathwork or sometimes called breathing techniques as a mixed approach that includes both the intrinsic physiological processes of breathing essential to life and a set of established techniques frequently used within osteopathy and other domains for the purpose of influencing/improving breathing patterns and building control of those patterns.

Breathwork is firstly understood as a biological process of life connected to physiological processes such as diaphragm and rib movement. Secondly breathwork includes a series of deliberate and established techniques used within the osteopathic field. These techniques are specifically used to have a therapeutic effect on breathing patterns. Techniques found in Osteopathy include box breathing, diaphragmatic breathing and 4:6 breathing. Box breathing also known as square breathing involves a rhythmic pattern of inhalation, holding the breath and then exhaling and holding again usually in counts of four (Balban et al., 2023). Diaphragmatic breathing, also known as abdominal breathing, involves engaging the diaphragm for full expansion of the lungs during inhalation and full contraction during exhalation (Yang et al., 2022). 4:6 breathing is otherwise known as the relaxation response breathing and involves inhalation for four seconds and exhaling for six seconds (Ma et al., 2017). All of these techniques aim to promote relaxation, focus and reduce stress (Yang et al., 2022).

Recruitment and participants

Participants were recruited via the researcher's contacts within the health professional network, mainly other Osteopathic tutors inside the Unitec Masters of Osteopathy course. Recruitment took place inside the Auckland region. For this case study, one Osteopath and one patient were needed. Emails were sent out to Osteopaths that met the inclusion criteria (listed below). Osteopaths were assessed against the inclusion criteria using publicly available information from their professional websites and the researcher's prior knowledge of the Osteopath due to the researcher's contacts within the Osteopathic health profession. From here, screening was

done in relation to the inclusion criteria and an Osteopath that responded and fit the criteria was contacted with a zoom link by the researcher to discuss the proposed clinical case study. This conversation was attended by a supervisor to ensure the Osteopath understood the types of cases that were suitable. Once agreed to, then, the Osteopath had a conversation with their patient regarding the study. Once the patient was willing to proceed, then information files were sent via email, and a further phone call with the Osteopath happened. On this phone call, the researcher clarified the interview process, and an email was sent to the patient regarding their questions. The provision of information and consent was implemented to ensure the correct ethical processes.

Inclusion criteria

Patient:

- 18 years of age and above
- Ability to communicate in English.
- Has self-reported anxiety
- Able to provide informed consent.
- Must be able to use zoom.
- A musculoskeletal presentation for which breath work could be a reasonable part of the management.

Osteopath:

- Been in practice for more than five years.
- Has had experience using breathwork with patients.
- Understands basic concepts around self-reported anxiety.
- Willingness to engage in a case study with one of their patients.
- Must be able to use zoom.

Exclusion criteria

Patient

- Does not meet the above inclusion criteria,
- Patient that has multiple systemic issues
- Patient has more severe primary pathology that is being addressed.
- Exclude patients with COPD or other respiratory pathologies.
- Exclude patients with diagnosed mental health disorders.

Osteopath

- Does not meet the above inclusion criteria.

Participants

The chosen Osteopath had been practising for 10 years in a multi-disciplinary practice with other practitioners within an urban setting.

The patient had a history of self-reported anxiety and has been seeing the Osteopath for musculoskeletal pain over the course of four years.

Procedure

The Osteopath participated in an initial zoom discussion with the researcher and one of the research supervisors (an experienced Osteopath) to discuss the protocols of the case study. The Osteopath identified a patient that fit the criteria and then discussed the patient's willingness to partake in the study (Initial zoom discussion). In the first appointment, the researcher was present in the room as an observer, taking notes on his laptop (see Appendices G and H). These notes consisted of treatment techniques the Osteopath chose and some dialogue between Osteopath and patient and also observational notes on the environment. The researcher was present for treatment the following three times resulting in them being present in the treatment room four times. After each appointment, the researcher contacted via Zoom the patient and Osteopath separately to ask what their experiences were (See Appendix I). However, due to the Osteopath's availability it ended up being two zoom sessions total, one after treatment two and one after treatment four, with the second session being extended and lasting forty-five minutes. The interviews were recorded and involved the researcher asking them about their experiences throughout the appointment. This process was repeated several times, resulting in the researcher collecting 14 sets of data from both the appointment and the Osteopath and patient at the end of the process. See Table 1 below.

Interview development

The researcher drafted interview questions related to the research question and the literature review. The researcher practiced the interviews with colleagues on three occasions and further developed and refined the interview schedule and its prompts. Throughout the interview process new information arose and this was reflected upon with the supervisor, and it was integrated into the schedules that followed based on previous insights that arose from

interviews. For the purpose of this kind of flexibility needed for this research, the researcher employed a semi-structured approach to the interviews that could be responsive to new learning during the interviews and be adjusted from one interview to the next. This demonstrates the value of the semi structured interview as a data collection method in this context.

Table 1

Data collection schedule

Session/date	Participants	Data
Initial zoom discussion	Student researcher Supervisor Osteopath	Field notes 1
Treatment 1	Student researcher Osteopath Patient	Field notes 2 Osteopath's notes 1
Follow up Interview	Patient	Transcript 1
Treatment 2	Student researcher Osteopath Patient	Field notes 3 Osteopath's notes 2
Follow up Interview	Patient	Transcript 2
Follow up Interview	Osteopath	Transcript 3
Treatment 3	Student researcher Osteopath Patient	Field notes 4
Follow up Interview	Patient	Transcript 4
Treatment 4	Student researcher Osteopath Patient	Field notes 5 Osteopath's notes 3
Follow up Interview	Patient	Transcript 4
Follow up Interview	Osteopath	Transcript 5

Data collection and management of rigor

Data collection and rigor were managed by a number of strategies as discussed above to ensure the value of this case study. To ensure that the thesis remained credible the strategy of

prolonged engagement and persistent observation was employed. This took form of four treatment sessions observed and both patient and Osteopath being interviewed afterwards (Houghton et al., 2013). Triangulation, peer debriefing and member checking were also utilised to ensure that the case stayed credible. For both dependability and confirmability to remain to a high standard, audit trails and reflexivity were strategies used to ensure that rigour remained strong (Houghton et al., 2013). Transferability is the last approach that was used throughout this case study. The main method to ensure that this was being upheld is thick descriptions. This is determined by the original context of research being appropriately described so that judgements could be made (Houghton et al., 2013). Ongoing and regular discussion with the supervisors supported the rigour of the researcher's process.

Patient notes (archival)

Patient clinical notes were accessed by asking the patient if they give permission for the Osteopath to send their patient notes to the researcher. The patient felt comfortable with this then the Osteopath sent the notes to the researcher with the personal details of the patient blurred out. The notes collected were only those that related to the researched sessions. These were stored on a password protected folder. It is noted that the notes were very brief and less useful than other forms of data.

Researcher field notes

The researcher was making field notes during the session between the Osteopath and the patient. These were typed on a computer and identifying details were not recorded.

Transcription of interviews

During the zoom interviews the setting that transcribes the interview was used. After the Zoom interviews the student researcher listened through the interviews and manually transcribed them using the audio and transcription from the zoom

Data analysis

Interviews were transcribed and the voices of the participants were maintained without correction as they were found in the interviews to ensure the authenticity and accuracy of the data without transcriber alteration.

- Transcriptions were analysed and coded for persistent themes
- Data from patient and Osteopath interviews were triangulated against each other and with field notes and patient notes. This was done to identify key steps and stages in

the treatment process, Osteopath and patient perceptions, descriptions of their experiences and to compare and contrast participant perceptions.

- Thematic analysis was utilized. Thematic analysis was used to gain familiarity and generate initial codes, search, review, defining and name themes and produce the report. All sources of data were utilised: interviews, transcripts, observations, patient notes and field notes (Braun & Clarke, 2021).

Ethical considerations

An ethics application was completed and submitted to the Unitec Research Ethics Committee. The student researcher applied for ethical considerations from the Unitec Research Ethics Committee (UREC). The participants were informed of all the details about the study in writing and verbally so it was sure they understood the whole process and that there was informed consent. The participant was able to withdraw from the study at any point if they wanted to.

As per guidelines for Māori and Community Social and Cultural Responsiveness (UNITEC Guidelines for Researchers Regarding Māori and Community Social and Cultural Responsiveness, 2020), the proposed research may or may not have involved or impacted on Māori and was deemed of potentially low impact. The research was not directly targeted at the Māori population, but the research did take place in New Zealand, therefore, participants may be of Māori descent. Because of this, the appropriate steps to seek advice through Unitec's Māori Kaihautū was taken. Key ethical issues considered in the proposed research project were as follows: The student researchers research was not aimed at Māori and was not expected to have a Māori participant. The student researcher was however committed to undertaking this study in a culturally sensitive manner so should there be a Māori participant would have arranged a Hui with the Unitec Dean of Learning and Teaching Māori to have made sure that this study reached the criteria for research regarding Māori and community social and cultural responsiveness.

Informed consent

- Participants were given a 'Participant Information Sheet (See Appendix B) which outlines and explains the process of the study. Informed consent from the participants was sought by asking each participant to sign a 'Participant Consent Form' (See Appendix A). Participants were notified that their participation is voluntary and they have

the right to withdraw from the study at any time. In addition, they could withdraw their data within the first two weeks following data collection.

Privacy and confidentiality

- To conceal participants' identity, a pseudonym was assigned to each participant to employ it in the entire data collection, analysis and dissemination. All identifying information was removed from the data.
- All information gathered from each participant was kept in a locked cabinet and/or on a password-protected computer at Unitec Institute of Technology, Building 60. Data storage following the discontinuation of Master of Osteopathy Programme will be the responsibility of the sitting Secretary of the Unitec Research Ethics Committee.
- All hard copies gathered from participants and all recordings will be shredded and deleted respectively after 10 years.

Risks

- Having patient files being leaked was a very small possibility. There was very little likelihood of this happening because when the Osteopath sent over the patient notes they blurred out the name so there was no mention of them.
- Another risk factor was Covid-19. Covid was still out in the community, so it was possible for either the student researcher, the Osteopath or patient to catch it off one another or others in the waiting room. There were countermeasures by following proper Covid guidelines. This included wearing a mask and keeping a two-metre distance at all times.
- A risk that was possible was the patient refusing to be part of the study. In this case the student researcher would have recruited another patient and Osteopath.
- An identified risk was as only one patient and Osteopath were included in the study, it meant that if either one of them chose to withdraw from the research between data collection points it would leave the study with insufficient data to analysis. The study would then have been repeated with new participants.
- A risk that was possible was if one of the participants misses a data collection point it could lead to a risk being that there is not enough data collected. In this case it was considered that 14 elements of data including lengthy interview transcripts and

researcher observations from all sessions provided appropriate data to analyse against the research question.

- The last risk that faced this study was that the patient became overwhelmed with anxiety. If this did happen the student researcher would have ended the session on request of the patient. From there they would have provided the patient with the anxiety helplines such as the Anxiety NZ trust helpline and the Youthline helpline and /or refer back to the Osteopath.

Findings

Following the completion of four clinic sessions and six interviews the collected data was carefully coded and organised, allowing for a systematic analysis that yielded the findings seen below.

Table 2

Themes

(Main themes are in top row and subthemes follow directly underneath)

<u>Anxiety</u>	<u>Breathing</u>	<u>Osteopathy</u>
Anxiety and its ties with musculoskeletal presentations	Breathing dysfunction	Osteopathic treatment
Management of anxiety	Breathing techniques	Osteopathy fitting in with other modalities to manage patient
Anxiety related to diagnosis of a physical condition		Rapport
Anxiety and how it affects sleep		Environment Covid

Main themes

Anxiety

Anxiety refers to multiple physiological, mental and physical responses to excessive, intense fear and worries about specific situations such as work, relationships and social situations, both past and present (Baxter et al., 2012). Anxiety is frequently accompanied with musculoskeletal pain and therefore is frequently present when patients seek treatment. Studies have shown that individuals with pre-existing anxiety are at an increased risk of musculoskeletal pain and vice versa with subjects experiencing anxiety are at a heightened risk of developing pain (Poleshuck et al., 2009). Anxiety has been identified as an important theme within the transcripts and is in line with the research aims as anxiety was a subject of interest. Within the theme of anxiety there have been five additional sub themes identified.

These are anxiety and its ties with musculoskeletal presentations, management of anxiety. Anxiety related to diagnosis of a physical condition how anxiety affects sleep.

Anxiety and its ties with musculoskeletal presentations:

This sub theme encapsulates the physical manifestations of anxiety. This was identified in the transcripts by both the patient and Osteopath. The main points that were gathered from the patients transcripts were that she can feel her body holding onto her anxiety in the form of muscle tension and at times difficulty breathing. The main points of this sub theme identified from the Osteopaths transcript was that she definitely notices the physiological manifestation of anxiety in patients. She sees this in accessory breathing muscles that are hypertonic, ribs that are abnormally raised and a hypertonic diaphragm.

But usually they come in with a primary concern which is you know their neck being sore or their chest feeling tight or their mid back being tight and also you know the education of yes, your anxiety can be affecting your breathing and then that can then affect your physical somatic outcome (Osteopath transcript 1).

So they tend to you know breath through their upper chest quite a bit so we tend to see quite a lot of neck tightness and headaches associated with that. I also see lots of jaw clenching and jaw tightness and then what also happens is that their diaphragms doesn't move quite as well (Osteopath transcript 1).

When I stopped sleeping and and got super anxious, and that was like my body felt it's really hard to explain. It's it's like a really nervous energy like I felt like like I was all twitchy like I was that tired that I my muscles would jump, and and I was almost I probably felt like I was on drugs. To be honest. I was like I couldn't stop fidgeting, you know, like I was kind of like my knee would be like bouncing or Yeah, It's really hard to explain, because I've never been like that (Patient transcript 1).

Triangulation

The physical manifestation of anxiety tied to musculoskeletal presentations was evidenced by the Osteopath when she described her understanding of the physical presentation of anxiety and the patient who provided a very exact description of what happened to her body when she felt anxious. Interestingly, the patient did not appear anxious during their treatment and appeared relaxed, however, when being interviewed displayed signs of seeming slightly anxious when discussing their anxiety. This may suggest that in the treatment sessions the Osteopath was managing her anxiety through positive rapport which in turn meant that she may have missed some of her concerns.

Management of anxiety

This theme was identified extensively throughout both subjects transcripts. The patient discusses what did and didn't work for her as well as what she would suggest to people struggling with anxiety. The Osteopath talks about how she often advises her patients to manage their anxiety. The researcher observed that the treatment sessions were very positive but the patient did not contradict the osteopath.

But you know I think that Osteopathy alone hasn't really helped her I think it really has needed her Pilates her having the time to do her stretches and walking and it's been a team effort to get her to where she is now, so yea defiantly Osteopathy was just one part of the puzzle. So yea I think it's important for any practitioner to know that we are a part of the puzzle but we are not the be all end all (Osteopath transcript 2).

The patient was seeing an acupuncturist and I found that it helped a lot in regards to settling down her nervous system and relaxing her muscles, that helped her. Using mediation apps really helped her as well. I tend to recommend getting people to move, I find that meditation can be a great thing but I never say just go and mediate, I say let's just go and concentrate on your breathing as that in itself is a form of mediation, but yea telling her to go for walks and find something that they love doing and really reconnect with that, something that really kind of calms their nervous system. Whether it's being out in nature or swimming, whatever it is they need to find the time to do it. Magnesium is a supplement that I recommend to help calm their nervous system as well. the main one I recommend is magnesium. It's great for sleep

and calming the nervous system, it's also great for the endocrine system as well. so yea I also suggested that to her and other patients with anxiety and pain (Osteopath transcript 2).

And I think that was a combination of support. And you know some of the treatments like I that was, I was seeing back to you through that whole period, and counselling and medication. That I think it was like a combination of all of those things. And my anxiety came down, and then I could sleep more, and because I was sleeping better, I was able to handle things more (Patient transcript 2).

Doing some kind of mindfulness. What whether that's like guided or so I like, have I downloaded apps? But yeah, doing something in that space for doing some breathing exercises. I would say, going to see a counsellor if that's your thing, or talking to a close friend, or something just having like having an outlet to talk through stuff (Patient transcript 2).

I'm not a very good breather. I am. I think I'm a bit of a chest breather. And so, it doesn't come naturally to me. And so I really have to focus on shift, like, focus on my breathing and changing it. And so sometimes I remember to do that. My problem is I just I have such a busy life that by, like you're talking to me about this now and I'm thinking, Oh yeah, I haven't done that in ages but I was at night I was lying in bed and I like I had my hand in my chest and, and the other one on my stomach and I was doing like every night, I was doing those breathing exercises and breathing into my ribs and all that kind of stuff. So it's something that I'm really aware of but I, it goes when I get really busy falls off (Patient transcript 4).

But other than that, everything else I would say the same thing, meditation and breathing, and any exercise, cause, all of that will help with sleep, and it did feel like so for me was the most critical thing like when that was broken, everything else was broken, but I if I could fix that but then I was more resilient (Patient transcript 4).

Triangulation

The management of anxiety was very usefully presented by both Osteopath and patient, they both agreed that the engagement with the Osteopath was a vital part of managing anxiety and also that other factors were important. The Osteopath identified Pilates, meditation, acupuncture, being out in nature, swimming, magnesium. The patient identified counselling, medication, mindfulness, talking to a close friend. The patient also linked breathing with sleep and the importance of sleep. While both affirmed that a combination of activities/supports was very helpful, that they identified different activities and support may suggest a need for better communication between patient and Osteopath to ensure that advice is on point. It is interesting to note that there was not much discussion about breathwork throughout the management theme.

Anxiety related to diagnosis of a physical condition

This theme was identified solely from the patients transcripts. This theme was built around how all of the patient's anxiety came following her cancer diagnosis.

If you'd asked me a year and a half ago I would have said no. yeah, I would have said no to that. And then I've had a bit of a bumpy. The Osteopath might have told you I've had a bumpy health ride. So I got really anxious about it earlier in the year, like, super, super anxious (Patient transcript 3).

Well they say is, is really not that uncommon. Because you're in the active kind of treatment they call it the kill phase, like literally, because they're like, you know, trying to blast everything with poison. You you even though you're kind of it's still like a bit of a you know a head fuck. You you are doing all the things that you're supposed to be doing to you know, to deal with it. And then when you finish, and you've gone from like treatments at the hospital, like every single day, and it being so front and centre, and and then you were literally they say bye and and it's all over and I knew that because I read a lot about it and I was sort of like Okay, I was prepared for that, because all of a sudden, then you're like. But now I'm no longer being pumped full of these toxins, what if it's what if it's come back. What if it's growing you know so it's like a it's a different set of fears in a way But I was mindful of that, and I was getting some counselling and stuff and I thought that

was all good, and I was for kind of January through to march, and then the wheels fell off in April. so, and they say that sometimes about 6 roughly around 6 months post active treatment. People can sort of hit the wall a bit. yeah cause it's like cause it's Everything has changed lots of things haven't changed and and then everything has changed. and so you have to recalibrate your life basically and I think It's coming to terms with it (Patient transcript 3).

Triangulation

The patient's cancer is part of her lived experience of being unwell and continues to be part of her evolving engagement with anxiety and may not be separated from her musculoskeletal symptoms. It is highlighted that anxiety related to diagnosis of a physical condition is an evolving and complex experience. When the patient says "If you'd asked me a year and a half ago I would have said no. Yeah, I would have said no to that. And then I've had a bit of a bumpy. The Osteopath might have told you I've had a bumpy health ride. So I got really anxious about it earlier in the year, like, super, super anxious" (Patient transcript 3). It shows that the patient expresses a shift in her attitude over time. Initially hesitant to the idea of experiencing anxiety there is a marked change after facing challenges with their health. When the patient also says "And they say that sometimes about 6 roughly around 6 months post active treatment. People can sort of hit the wall a bit. Yeah, cause it's like cause it's everything has changed lots of things haven't changed and and then everything has changed. and so you have to recalibrate your life basically and I think It's coming to terms with it" (Patient transcript 3). This shows the challenges of post treatment life. The six month period post treatment is identified as a critical time where people can "hit the wall". This involves recalibrating life and coming to terms with the psychological impact of the experience. Sources of anxiety go beyond the physical symptoms presented by the patient as there is a influence of stemming from the background experience of cancer. This is shown in the patients narrative as her cancer journey unfolds as a intricate process. Her initial hesitancy to acknowledge anxiety turns into a reality following the challenges encountered in her health journey.

Anxiety and how it affects sleep

This theme was picked up in both transcripts of patient and Osteopath. The patient discusses the vicious cycle she developed not being able to sleep because of her anxiety and then how her anxiety got worse because she hadn't slept the night before. She also discusses how her anxiety improved once she started sleeping better.

And because I wasn't sleeping I think you know I remember her saying everything is so tired your body is so tight and yeah, So I really appreciated her giving me some information. But probably being a bit judicious with how much (Patient transcript 3)

But none of that really seem to help me sleep. And then at night I was trying. I would. I did like sign up for like a seven day how to sleep meditation thing that you know you supposed to listen to every night. Listen to, I think, for 20 min and It didn't work and then I like listen to those sleep stories. You know, those really boring ones I'd get even more upset because I'd get all the way to the end, and then start it again, and it'd be like Oh, my God like I'm supposed to be asleep this is so boring! and I was still awake, and then I did. I did breathe deep breathing, And And yeah, I think I kind of did all those things. And then I went to my GP and I went on medication. So she gave me a whole lot of different sleeping pills not like not at once, obviously, but we were trying heaps of different ones, and the only thing that really worked as Zopiclone or the others didn't quite work and then she put me on Sertraline. I think I told you which is the anti-depressant so, and I I guess it was a combination of some of those things. And I just started sleeping again, and as soon as I started sleeping, then everything else fell into place (Patient transcript 3).

When I stopped sleeping, that is what that's just what made everything worse. So, yeah, so it's, I think that the not sleeping was the thing that really made the anxiety spiral. But you know. And then, once you're not sleeping you're anxious about not sleeping, and then, you know, but and the way it showed up, I suppose, is obviously insomnia, and then, like not being able to fall asleep, and then, when I finally did, even with like sleeping pills, I would wake up after an hour and a half or two hours, and it was just and you're not really supposed to do that when you're taking sleeping pills. and like my GP just said that that was like an indication of how strongly anxiety

was that it would actually break through like pharmaceuticals, you know, that are supposed to sedate you basically so so it was the not being able to sleep (Patient transcript 3).

There definitely was as she wasn't sleeping much at all and was in a lot of pain and was also a prime carer for these kids so there was some anxiety for her surrounding that. So again dealing with her breathing and helping with techniques to kind of settle her down when she is in a state of pain so that was something I definitely helped her with (Osteopath transcript 2).

Well um when she had a lot of anxiety when she wasn't sleeping because of her chemo and because of the drugs she was on when she was waking up with night sweats (Osteopath transcript 2).

Triangulation

The way in which anxiety affects sleep was shown by both the patient and Osteopath. The patient expresses how her lack of sleep lead to increased feelings of tension and fatigue and how the absence of sleep was a catalyst for the worsening of anxiety. The osteopath also acknowledges the impact of anxiety related sleep disturbances in the context of medication and chemotherapy side effects. It is also evidenced by the patient that there is a cyclic pattern where the lack of sleep contributes to heightened anxiety and despite using the sleeping pills the patient still had interruptions in her sleep cycle. This emphasises the challenging interplay between experiencing anxiety and getting a good night sleep. The Osteopath acknowledges the patient's anxiety about not sleeping and also describes breathing techniques to help manage anxiety during periods of pain. However, the patient expresses that she tried breathing techniques when lying in bed with anxiety and not getting results from it. This shows that while the patient Osteopath relationship seems positive the Osteopath has not identified that the breathing techniques are not as effective as the Osteopath believes them to be.

Breathing

Breathing is an essential bodily function that allows the uptake of oxygen needed for metabolism and the elimination of carbon dioxide. This is an important theme as there is a close relationship between breathing and anxiety, a number of anxiety disorders have been

linked to abnormal breathing patterns, altered perceptions of breathing, and altered responses to breathing manipulations. The main sub themes that were identified were breathing dysfunction and breathing techniques.

Breathing dysfunction

Breathing dysfunction is an abnormal pattern of breathing that can result in musculoskeletal and physiological changes throughout the body (Courtney, 2009). This theme was identified solely in the Osteopaths transcript and is talked about what it looks like and how it can affect anxiety.

I check their ribs to see if they are appropriately expanding with their breath and see if the ribs are able to relax as well, then that gives me an indication to how the ribs are moving as well as how well the diaphragm is moving (Osteopath transcript 1).

But usually they come in with a primary concern which is you know their neck being sore or their chest feeling tight or their mid back being tight and also you know the education of yes your anxiety can be affecting your breathing and then that can then affect your physical somatic outcome (Osteopath transcript 1).

So they tend to you know breath through their upper chest quite a bit so we tend to see quite a lot of neck tightness and headaches associated with that. I also see lots of jaw clenching and jaw tightness and then what also happens is that their diaphragms doesn't move quite as well so their bottom ribs don't work in a bucket handle like action as they should, so that doesn't open up enough so they tend to get really really solid midbacks which don't move and therefore yea lots of headaches lots of midback issues lots of sometimes reflux too, as this can be caused by if your diaphragm is super tight and your midback is super tight (Osteopath transcript 1).

I look at a patient with anxiety I'm looking at their diaphragm within their body
I check their ribs to see if they are appropriately expanding with their breath and see if the ribs are able to relax as well, then that gives me an indication to how the ribs are moving as well as how well the diaphragm is moving (Osteopath transcript 1).

Triangulation

This highlights the Osteopath's approach to assessing breathing dysfunction in patients focusing on the movement of the diaphragm and the expansion and relaxation of the ribs. Here it is shown that the Osteopath observes that patients present with a primary issue of neck pain, mid back tension or chest tightness. The Osteopath links that patients who have dysfunctional breathing patterns and have compressed diaphragmatic movement may lead to these outcomes. The Osteopath seems to be discussing the concept of breathwork but not relating it back to the patient which shows a lack of connection between patient and Osteopath. This highlights that there may be a perceived difference in how effective breathing techniques are in managing anxiety between the patient and Osteopath.

Breathing Techniques

This theme is techniques described by the Osteopath that she uses on patients to help with anxiety. These are performed on the patient by the Osteopath or are given to the patient as exercises they can do themselves in their own time. Interestingly there are some conflicting statements from the Osteopath and the patient regarding the benefit and ease of the techniques.

I do this by either working on their diaphragm for anxiety or neck pain or I tend to use for hip flexor stretches I make sure they are using the breath. So for every patient I am teaching them how to breath properly through their diaphragm, hopefully, if they have anxiety then I am giving them a tool called box breathing, which is 5 counts breathing in hold for 5 counts, 5 counts whilst breathing out then hold for 5 counts again (Osteopath transcript 2).

It's a tool that they can use whilst driving to work or you know in a traffic jam or at the grocery store. So they can use it anywhere which is great for those patients that have anxiety because they need a tool they they can actually use anywhere when they are in situation when they are feeling stressed. My patients even use it as tool before bed to get to sleep as well, when they have busy minds a night and are thinking a lot. So yea it's a very useful tool because it also gets them in tune with themselves as well especially with anxiety because you know anxiety is always fearing something in the future or something outside of you that you can't control whereas the breathing really (Osteopath transcript 2).

So again dealing with her breathing and helping with techniques to kind of settle her down when she is in a state of pain so that was something I defiantly helped her with (Osteopath transcript 2).

I taught her the box breathing to make sure that she is doing some sort of breathing when she's focusing on taking a deep breath in holding and breathing out then holding, so which ever count like 4 or 5 as long as she's concentrating on that then it would have been helpful. I also taught her a technique where she would take a deep breath in and then take three more breaths in and ten hold then breathing out three more times and she found that quite helpful too. I used breathwork quite a bit for her especially in those situations where she couldn't sleep and had a lot of anxiety. I also use breathwork a lot on most patients just because I know it affects their pelvic floor and It affects their neck so if anyone comes in with neck pain I'm looking at their diaphragm, anyone with lower back pain I'm seeing how they breath as well. it's quite a huge thing, it's something so simple and can be used anywhere, you know the patient was having panic attacks so this was useful because she could use these breathing techniques anywhere you can use it at the drop of a hat. It's a simple tool but it's so powerful (Osteopath transcript 2).

Yeah. Yep, so she definitely has numerous times, and given me exercises like shows me how to do it. Taking me through it, while I was there and then I think simply video, you know video links and stuff (Patient transcript 4).

I'm not a very good breather. I am. I think I'm a bit of a chest breather. And so, it doesn't come naturally to me. And so I really have to focus on shift, like, focus on my breathing and changing it. And so sometimes I remember to do that. My problem is I just I have such a busy life that by, like you're talking to me about this now and I'm thinking, Oh yeah, I haven't done that in ages but I was at night I was lying in bed and I like I had my hand in my chest and, and the other one on my stomach and I was doing like every night, I was doing those breathing exercises and breathing into my ribs and all that kind of stuff. So it's something that I'm really aware of but I, it goes when I get really busy falls off (Patient transcript 4).

But other than that, everything else I would say the same thing, meditation and breathing, and any exercise, cause, all of that will help with sleep, and it did feel like so for me was the most critical thing like when that was broken, everything else was broken, but I if I could fix that but then I was more resilient (Patient transcript 4).

Triangulation

The Osteopath discusses some of her breathing techniques that she gives to her patients and how useful she thinks they are. The Osteopath discuss the benefits and convenience of the techniques she has prescribed. Both the Osteopath and the patient acknowledge box breathing as a tool for managing anxiety and the use of breathwork for managing pain and anxiety. The patient expresses how both meditation and breathing, and any exercise used in combination were most effective when used to help aid sleep. The researcher observed during interviews that the patient seemed less convinced about the value of breathing techniques than the osteopath. While the conversation was very relaxed and positive, the Osteopath has not probed to identify the patient's perspective fully.

Osteopathy

Osteopathy is a form of alternative medicine that has been around since 1874 (Kuchera et al., 1994). Osteopathy is distinguished for its hands-on, holistic approach that acknowledges the body systems as an interconnected functional unit primarily focusing on the musculoskeletal system. This theme is important as it is a vital component that forms our understanding of how Osteopathy works with breathing to influence the effects of anxiety.

Osteopathic treatment

This theme was identified in the Osteopaths transcripts and describes what the Osteopath chose in terms of physical treatment on the patient to get a positive effect on their musculoskeletal pain presentation.

So they usually end with this cranial stuff. And then, and then she says we're all done and to take your time getting off the bed. And then, and then, and then I sit in the chair and the often that's when their will be a discussion about, you know, I'll either

say or what did you know how am I, how did you find me or, I might ask or she might tell me. And then she might talk about doing some exercises (Patient transcript 1).

I just felt, cause it's rare. that I would lie on a bed, for you know, nearly an hour and not move, and so and have someone treat me so. It like I felt lovely. I felt better afterwards, just you know, because of the treatment, and also because of the stillness frankly (Patient transcript 1)

The osteopath is doing XFST [cross-fibre-soft-tissue] to The patient's gluteus, lots of articulation through the Csp regularly checking in with pain and pressure then does harmonic to the shoulder telling and reminding the patient to breath throughout the whole process (Field notes #1)

The osteopath works on both side of the patient's glutes then moves onto her back doing soft harmonics and then does some cranial through her head. (Field notes #2)

The osteopath is working on The patient's ribs encouraging her to breathe through her diaphragm correctly. (Field notes #2)

At the end of the session The osteopath prescribes The patient with the box breathing exercise as she says she had found it to be effective. (Field notes #2)

The osteopath is now working on the patient's upper shoulder and traps there has not been a moment of silence this whole time, The osteopath works on the patient's jaw very slowly and finishes working on her upper ribs (Field notes #3)

Very similar treatment to last times with the osteopath starting on the gluteus then working her way to the accessory breathing muscles, whilst she is doing this she is educating The patient about what happens when you are not breathing and that how these muscles get tight (Observation #4)

Triangulation

Transcripts from the patient along with field and observational notes give insight into the Osteopathic treatment process, showing the techniques used, patient experiences and integration of exercises. The patient describes the treatment process and speaks to the use of cranial techniques along with potential exercises.

Osteopathy fitting in with other modalities to manage patients

This theme was identified in both the patients and the Osteopaths transcripts. It is important as it suggests that the best way to manage a patient may be through a variety of practitioners so there can be a collaboration on treatment plans.

I was seeing a naturopath, and I was seeing an acupuncturist, and I was seeing The osteopath and was seeing a counsellor and I was going and doing all these walks. so, and I was trying to eat really healthy, and I have green juices and all that kind of stuff (Patient transcript 4).

But you know I think that osteopathy alone hasn't really helped her I think it really has needed her Pilates her having the time to do her stretches and walking and it's been a team effort to get her to where she is now, so yea defiantly osteopathy was just one part of the puzzle. So yea I think it's important for any practitioner to know that we are a part of the puzzle but we a not the be all end all (Osteopath transcript 2).

Triangulation

Here is the importance of a multimodal approach to managing a patient's health, where a patient actively seeks out and engages in different therapeutic modalities is shown. The patient's transcript highlights the integration of multiple health practices and the Osteopath's perspective further emphasises the collaborative nature of health care where Osteopathy plays a more global role within the framework of wellbeing. This aligns with the understanding that healthcare is best approached holistically. The patient's mention of "trying different things" is a testament to the acknowledgment that wellbeing and health are multifactorial. It goes against a reliance on just one modality such as breathing techniques alone. This fits with the Osteopath's idea of reinforcing the collaborative aspect of healthcare.

Further, this is an ethical and patient-centred way to deal with the approved scopes of various health practitioners including Osteopaths who are precluded in New Zealand from mental health work.

Rapport

This is an essential part of any interaction between patient and practitioner as without it no trust can be gained between the two. Rapport is also important when dealing with anxiety as relationships defined by trust and rapport not only lead to better patient experiences but also reduce stress and anxiety and increase patient engagement in healthcare decisions (Dang et al., 2017).

The osteopath is very encouraging of her surfing and throughout the case history process seems very interested, excited and inquisitive, this transitions seamlessly to the examination. (Observation #1)

The osteopath reassures the patient throughout the case history process and positively reinforces the fact that she can surf longer than she used to and that her muscles don't get as sore. (Observation #1)

The osteopath and the patient continue to talk throughout the appointment about house renovations, how the kids are doing and other small talk, it is almost like two friends are catching up (Observation #1)

Lots of laughing and joking throughout the appointment. (Observation #1)

The osteopath is asking The patient about her weekend making lots of eye contact and speaking very calmly (Observation #2)

The osteopath is asking the patient about her holiday and the family the conversation is very easy going and casual and it seems like two friends are catching up (Observation #3)

The osteopath has created a very safe and open space and is very supportive of what The patient says (Observation #3)

small talk continues through the treatment (Observation #3)

The osteopath is very interested in the patient's recent stress levels (Observation #4)

Triangulation

The observation of interactions between the patient and Osteopath shows a well-established and overall positive rapport. The Osteopath shows encouragement for the patient's activities and reinforces progress. The friendly conversation creates a relaxed atmosphere similar to two friends catching up. The focus on the patient's wellbeing beyond physical symptoms shows a sense of care and understanding in the practitioner-patient relationship. While the friendly dialogue creates an atmosphere similar to two friends catching up, there appears to be a misinterpretation in the perceived efficacy of the implemented breathing techniques as previously mentioned. The Osteopath may not entirely grasp the challenges that the patient experiences with the prescribed breathing techniques and does not provide further support.

Environment

Environment was a sub-theme identified from the researcher's field notes. It is an important part of treatment in an Osteopathic setting as a soothing environment can help to put a patient at ease and reduce levels of anxiety (Fenko & Loock, 2014). The environment in which the field notes were taken was a medium-sized room with a desk the Osteopath was sitting at and a chair for the patient to sit in whilst the Osteopath was asking the patient questions. The room had neutral calming grey and white paint covering the walls. There were some plants in a corner of the room with an aroma diffuser and a speaker that played gentle relaxing music. At the centre of the room there was the treatment table. This information was referenced from field notes made by the researcher.

There is very calming soothing music playing in the background (Observation #1)

There is calming music playing and the lights are set slightly dim (Observation #2)

Triangulation

The observed environmental aspect during the treatments contributes to a calming atmosphere. In both instances soothing music is noted enhancing the overall ambience. The

dim lighting further supports the tranquil environment. These environmental considerations likely play a role in creating a relaxed space for the patient. When the patient says “I felt better afterwards, just you know, because of the treatment, and also because of the stillness frankly” it speaks to the patients emotional and psychological response and underscores the impact of treatment beyond musculoskeletal pain relief.

Covid

Another element of the environment prominent at the time was Covid. This theme was rather small as there was not much data for it found in both participants. However, considering the effects that it has had globally on anxiety levels it deserves to be discussed. This theme was picked up in the Osteopaths transcript when she was discussing that since the Covid pandemic she has noticed that almost every second patient of hers has some form of anxiety.

I think since Covid every second patient that is coming through has anxiety at least as a secondary complaint to their musculoskeletal presentation (Osteopath transcript 1).

Triangulation

This shows the significant impact that the Covid pandemic had on the prevalence of anxiety amongst patients. The observation that almost every second patient had anxiety as a secondary complaint highlights the physiological effects of the pandemic. This implies a broader trend of individuals seeking health care having increased anxiety levels.

Discussion

The research question of this thesis was What is the role of breathing techniques in the osteopathic management of musculoskeletal pain, discomfort and self-reported anxiety that can be observed in an authentic case study? A single subject descriptive case study was carried out resulting in the identification of three core elements. The elements encompassed the inherent value of using qualitative case study methodology, the intricate relationship between musculoskeletal pain, discomfort and self-reported anxiety, and the role of breathing techniques in the context of this study. Thematic analysis of this data shed light on the

interplay between these elements. This discussion will delve into the findings and their implications, addressing key points that have been concluded from the analysis of this data.

Case study

Yin views case studies as a valuable research technique for studying complex phenomena within a real world setting (Yin, 2012). Yin places importance on investigating cases in their natural context as it aids researchers to better understand the complexities and dynamics of the topic under investigation. Yin's approach to case studies incorporates thorough examinations of specific cases to gain a holistic understanding of the topic. By conducting case studies in an intense and individualized manner, Yin proposes that researchers can produce useful information that can be used to solve practical issues or guide policy and decision making (Yin, 2012). Yin suggests that knowledge gathered from studying real world cases can contribute to the development of new theories and give foundation for future research in the field.

The descriptive case study methodology that was implemented in this thesis proved itself to be an effective approach in investigating the role of breathing techniques in the Osteopathic management of a patient including self-reported anxiety, enabling an analysis of its many facets within the authentic context. By looking into the intricate elements and complexities of this case, the methodology provided valuable insight and a deeper understanding of the role of breathing techniques in this context. One of the main benefits the researcher found of using the case study methodology was the facilitation of an in-depth contextualised analysis. The way in which the researcher experienced this firsthand was by first gaining a deeper understanding of the mechanics involved within an Osteopathic consultation. The researcher found that there was a large amount of rapport between the patient and Osteopath with the researcher noting that "It seemed like two old friends catching up". Having observed such a personal interaction it made the researcher reflect on how important having good rapport with a patient can be to a case. Not only did it enhance the overall therapeutic experience it also brought a strong element of mutual understanding, trust and effective communication to the appointment. It has been noted that rapport between patient and practitioner can improve treatment outcomes (Dang et al., 2017). The researcher noted that the solid rapport fostered a supportive and safe environment where the patient was encouraged to share their fears, concerns and expectations openly.

The case study methodology allowed the researcher to reflect on his preconceptions of the role that breathing techniques had on the effects of self-reported anxiety. Prior to carrying out this research the researcher's previous knowledge from reading literature and experiences from having talked with Osteopaths had led him to certain expectations regarding the results of this study. However, nuanced data collected via case study methodology showed that intricacies of individual experiences and responses to breathing techniques were more complex than anticipated. The divergence from the researcher's initial expectations made him reflect on and appreciate the gap between theoretical knowledge and real world application emphasizing the benefits of employing case study methodology.

The case study methodology proved valuable to this research as it allowed for true triangulation of the data. This was made possible by integrating data sources such as field notes from observations and interviews. An example of this triangulation is when the Osteopath expressed how breathing techniques were so effective as they could be done anywhere whilst the patient noted that she struggled to find time to do them. Another example of triangulation proving beneficial was when looking at both the patients and Osteopaths separate interview transcriptions it confirmed they both valued the strong rapport between them and the researcher could experience this in the observations..

The researcher found that this significantly enhanced the validity and credibility of the research findings. The observations were a great way to witness and record the phenomenon in a real world setting that helped document subtle details that may have otherwise been missed such as mood, environment and softer skills. The field notes served as a valuable addition to the observation as it allowed the researcher to document reflections, insights and techniques being used by the Osteopath. The interviews conducted by the researcher after the observations allowed an even deeper and more comprehensive exploration of the topic as they were able to obtain information on both the patient and Osteopaths perspectives and experiences of how the treatments went, and how they concurred and differed. The triangulation of these data strengthened the overall evidence base and provided a more comprehensive understanding of the topic, its complexities and contradictions.

Anxiety, pain and musculoskeletal discomfort

This thesis examined the interrelationship between anxiety, pain and injury, highlighting their interconnected nature rather than viewing them as separate entities with a one-way relationship.

One of the key elements identified in this study from the results of the case study was the reciprocal relationship between pain and anxiety. It is already well documented that pain can cause anxiety as it may lead to individuals experiencing fear, worry and even anticipation of future injury (Burston et al., 2019).

It is also noted that the literature acknowledges that anxiety can contribute to the experience and intensity of pain (Michaelides & Zis, 2019). This was evident from the interviews with the patient.

This study also highlighted a link between the patient's previous history of cancer and their musculoskeletal pain. The presence of anxiety in the patient and their articulation of this relationship evidences this link. The psychological impact of cancer such as fear of recurrence, traumatic experiences whilst undergoing treatment and uncertainty about the future can contribute to anxiety. This anxiety can then in-turn manifest itself as musculoskeletal pain either as a direct response or an indirect mechanism such as altered pain processing or muscle tension (Michaelides & Zis, 2019).

This research shed light on the specific case of a patient with a history of cancer, self-reported anxiety was thought to be a factor influencing their musculoskeletal pain. By continuing to recognise and highlight these interconnections it could lead to the development of comprehensive treatment approaches that address psychological and physical aspects of pain and anxiety leading to improved quality of life and patient outcome.

The patient under investigation self-reported anxiety which could be attributed to their previous history of cancer and the resulting pain and discomfort of undergoing treatment for cancer. By exploring this connection, the researcher aimed to get a better understanding of how anxiety influences the perception of pain and how breathing techniques could offer a potential avenue to manage the effects of anxiety.

The role of breathing

The research question at the start of this thesis revolved around the role of breathing techniques in the Osteopathic management of self-reported anxiety. The researcher's anticipation was that breathing techniques would play a significant role in anxiety reduction. However, the findings of this research revealed a more nuanced perspective deviating from the researchers initial thinking.

As an insight into their professional experiences of the impact of breathing techniques on management of the symptoms of anxiety, the Osteopath acknowledged the importance of breathing techniques in their practice and emphasized the potential for them to reduce some of the symptoms of anxiety. This viewpoint aligned with the researcher's original expectation. Somewhat conversely after analysing data from interviews with the patient it appeared that their experience and beliefs differed from the Osteopath. The patient's data brought forth that although breathing techniques were indeed a component of their treatment, they did not perceive them as having a very significant role in reducing the effects of symptoms produced by their self-reported anxiety. Instead, the patient highlighted the effectiveness of other strategies such as mindfulness, walking and other treatment from other health care providers such as acupuncture. These somewhat contradicting viewpoints shed light on the complexities of anxiety management within an Osteopathic context. It highlights the importance of considering individual variations and preferences when addressing the symptoms of anxiety and talking to your patient about their experiences of treatment. While breathing techniques might have a strong part of Osteopathic management, they may not hold the same level of importance and effectiveness for every patient. It may be that use of a different focus for the breathing may be more effective such as targeting specific physical manifestations or symptoms associated with anxiety. For example, incorporating breathing techniques that work on addressing hypertonic scalenes and diaphragmatic dysfunction could offer targeted relief for patients experiencing respiratory related anxiety symptoms. Additionally, exploring the integration of breathwork exercises that emphasise regulating the autonomic nervous system responses may prove beneficial in managing anxiety symptoms.

While the relationship was very positive, the Osteopath was not fully aware of some of the points of difference the researcher identified through interviews and observations. The Osteopath may have needed a more effective process of questioning and prompting to get a more thorough understanding of the patient's thoughts such as how the patient did not find

the breathing techniques as effective as the Osteopath thought they were. If the Osteopath used a more explicit inquiry process to see how the patient was finding the breathing techniques they may have then been able to change their approach and provide more accurate support. This shows the importance of ongoing and effective communication to gain insight of the patient's subjective experiences.

The patient reported positives from other strategies such as mindfulness, walking and seeing other practitioners which gives insight into the many different approaches that can aid in the reduction of anxiety symptoms. This suggests that a multifaceted approach incorporating many different techniques and modalities may be more effective in addressing anxiety in some cases (see Figure 1). As previously mentioned in the discussion the practitioner, working together with the patient to determine a shared strategy could help identify which methods suited the particular patient the best. The elements in Figure 1 were all present in the consultation and following interviews, the relative importance of each was less easily defined and may be a focus for future research. At the outset, the focus of this research was to examine the impacts of breathing techniques on self-reported anxiety in conjunction with musculoskeletal pain. However, this research not only shed light on the role of breathing techniques but also on the significance of other important aspects in the effective management of anxiety and musculoskeletal pain. The outcome of this study brings forward the valuable insight indicating that there are many elements identified in this case and in various combinations that are key for optimal management of anxiety and musculoskeletal pain and practitioners must ensure they build an accurate picture of what works for their patients beyond a pleasant positive relationship, see Figure 1 below for a representation of this concept.

Figure 1

Elements of Managing Self-Reported Anxiety



Strengths and limitations

A notable strength of this work was the utilization of case study methodology in challenging preconceived notions regarding the role of breathing techniques in Osteopathic management of self-reported anxiety. Through this approach the research was able to capture the complexities and contextual factors that influenced the effectiveness of breathing techniques which may have been overlooked in larger scale quantitative investigations. By focusing on a single case study, the research provided a detailed account of the individual's lived experiences. This enabled an in-depth analysis of the interplay between breathing techniques, anxiety symptoms, musculoskeletal pain and Osteopathic management. The case study methodology allowed for recognition of unexpected outcomes. The findings revealed a more nuanced picture suggesting that while breathing techniques do play a role other modalities and techniques may be as effective especially in well planned combinations.

A further strength was the breadth of data sources analysed in this research. This research incorporated multiple data sources such as interviews, field notes, transcriptions and archival notes, facilitating a comprehensive analysis and triangulation of results which strengthens the validity of the findings. By using a range of data collection methods the study was able to

capture a broader range of perspectives and information. For instance, the interviews allowed for an in-depth exploration of both participants experiences whilst the observations provided direct behavioural insights that complemented the transcriptions from the interviews. This comprehensive approach not only enriched the understanding of the role of breathing techniques in Osteopathic management of self-reported anxiety but also allowed for the identification of converging or conflicting evidence across different data sources. It is this triangulation of findings from multiple sources that gives the study's findings and conclusion a greater sense of robustness.

Another strength of this research was the utilization of a natural clinical environment that facilitated detailed observations. By conducting observations within the authentic setting of an Osteopathic clinic the study was able to embrace the richness and complexity of the real-world context of breathing techniques that are employed as part of Osteopathic management for self-reported anxiety. This allowed for deep exploration of this phenomena within its genuine clinical setting capturing how breathing techniques, Osteopathic management and self-reported anxiety relate to each other. Both qualitative and case study data benefit from the natural clinical environment because it provides a rich source of real life contexts (Baškarada, 2014). Due to the natural clinical environment the study was able to capture the situational factors and Osteopath to patient relationship that play a crucial role in anxiety management. The natural clinical environment also allowed for an authentic exchange between the researcher and the participants. This is as both the patient and the Osteopath where more likely to express their experiences and thoughts in a naturalistic setting, giving rich qualitative data that reflects their perspectives and relates to particular events. These may have been missed in a more controlled research setting.

A limitation for this study was generalizability. Due to the design and focus of the case study being on two individuals the findings may not be generalizable to the broader population. The results were individualised to the unique characteristics of the participants. The patient's background, treatment history and specific responses to breathing therapy may not be representative of others. It should be noted that to provide generalizability was not the original intent of this study. However, it has opened up leads for future research with larger and more diverse samples which then can be used to generalise the study's findings.

Another limitation of this study was the reliance on self-reported measures and qualitative data which may have allowed for subjective interpretation affecting the authenticity of the findings or could also be considered a strength through its accurate description of the individual experience. As well as this, the qualitative data analysis involved subjective judgments from the researcher which may have again affected the objectivity of the findings. However, the researcher undertook extensive work to ensure robust rigour throughout the study to minimise the risk of bias (see methodology section on rigour).

A further limitation was generated by the Case Study method. While the authentic environment was a considerable benefit in generating a fully lived experience, this would always be subject to everyday happenings including availability for interviews in a timely manner against the treatment sessions, however, with considerable good will 14 items of data were gathered including lengthy interview transcripts and researcher observation at all treatment sessions to ensure appropriate sources for analysis and to generate findings to underpin future research using a range of methods.

Future recommendations

Recommendations for research

Future research should focus on exploring how different elements of anxiety management such as mindfulness, walking, breathing techniques, Osteopathy and seeing other practitioners (see Figure 1) can synergistically contribute to improved patient outcomes. By researching the effects of these components, a more comprehensive understanding of their collective impact on self-reported anxiety management may be obtained. Furthermore, based on the findings of this research suggesting that breathing techniques alone may not be as significant as initially anticipated, further research is needed to investigate this outcome. Future researchers should explore the effectiveness of Osteopathic management of self-reported anxiety using breathing techniques in a larger sample size, more diverse populations, and different clinical contexts. Through this we can establish a clearer understanding of Osteopathic management of self-reported anxiety using breathing techniques.

Recommendations for practice

The findings of this study suggest that establishing a good rapport between patient and Osteopath is important in anxiety management. Osteopaths should prioritize developing a

strong therapeutic relationship characterized by trust, open communication and empathy. Active listening, empathy and creating a supportive environment can aid in the development of a robust rapport and effective questioning techniques can ensure that rapport does not preclude the patient from expressing negatives about their treatment. This allows patients to share their concerns and their progress more openly therefore enhancing the therapeutic alliance. In addition, regular check-ins with patients should continue to be incorporated into Osteopathic practice. By maintaining ongoing communication regarding chosen techniques, it may help identify potential challenges and adjustments that may be necessary in the treatment plan. This allows the Osteopath to assess the progress of their patients and address any concerns promptly. It is important to consider the patient's personal experiences and perspectives with different management strategies such as breathing techniques through observation and listening. It could prove beneficial to explore alternative approaches or modifications to breathing techniques that work better with the patient's requirements and goals.

By implementing these recommendations in both research and practice, the field of Osteopathy can gain a better understanding of the management of self-reported anxiety and the value of collaboration with the patient. Engaging in these future recommendations may contribute to the development of treatment protocols that embody multiple therapeutic elements and enhance the overall wellbeing of patients.

References

- Andrews, G., Hobbs, M. J., Borkovec, T. D., Beesdo, K., Craske, M. G., Heimberg, R. G., Rapee, R. M., Ruscio, A. M., & Stanley, M. A. (2010). Generalized worry disorder: A review of DSM-IV generalized anxiety disorder and options for DSM-V. *Depression and Anxiety, 27*(2), 134–147. <https://doi.org/10.1002/da.20658>
- Annual Update of Key Results 2019/20: New Zealand Health Survey.* (n.d.). Ministry of Health NZ. Retrieved October 22, 2021, from <https://www.health.govt.nz/publication/annual-update-key-results-2019-20-new-zealand-health-survey>
- Balban, M. Y., Neri, E., Kogon, M. M., Weed, L., Nouriani, B., Jo, B., Holl, G., Zeitzer, J. M., Spiegel, D., & Huberman, A. D. (2023). Brief structured respiration practices enhance mood and reduce physiological arousal. *Cell Reports Medicine, 4*(1), 100895. <https://doi.org/10.1016/j.xcrm.2022.100895>
- Bandelow, B., & Michaelis, S. (2015). Epidemiology of anxiety disorders in the 21st century. *Dialogues in Clinical Neuroscience, 17*(3), 327–335.
- Baškarada, S. (2014). Qualitative Case Study Guidelines. *The Qualitative Report.* <https://doi.org/10.46743/2160-3715/2014.1008>
- Baxter, A., Scott, K., Vos, T., & Whiteford, H. (2012). Global prevalence of anxiety disorders: A systematic review and meta-regression. *Psychological Medicine, 43*, 1–14. <https://doi.org/10.1017/S003329171200147X>
- Bazeley, P. (2018). “Mixed Methods in my Bones”: Transcending the Qualitative-Quantitative Divide. *INTERNATIONAL JOURNAL OF MULTIPLE RESEARCH APPROACHES, 10*, 334–341. <https://doi.org/10.29034/ijmra.v10n1a22>

- Benjamin, J. G., Bacon, C. J., Verhoeff, W. J., & Moran, R. W. (2016). Preliminary development of a complex intervention for osteopathic management of dysfunctional breathing. *International Journal of Osteopathic Medicine*, *21*, 29–39. <https://doi.org/10.1016/j.ijosm.2016.04.004>
- Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, *11*(4), 589–597. <https://doi.org/10.1080/2159676X.2019.1628806>
- Braun, V., & Clarke, V. (2021). Can I use TA? Should I use TA? Should I *not* use TA? Comparing reflexive thematic analysis and other pattern-based qualitative analytic approaches. *Counselling and Psychotherapy Research*, *21*(1), 37–47. <https://doi.org/10.1002/capr.12360>
- Buchholz, J. L., & Abramowitz, J. S. (2020). The therapeutic alliance in exposure therapy for anxiety-related disorders: A critical review. *Journal of Anxiety Disorders*, *70*, 102194. <https://doi.org/10.1016/j.janxdis.2020.102194>
- Bullough, R. V. (2015). Differences? Similarities? Male teacher, female teacher: An instrumental case study of teaching in a Head Start classroom. *Teaching and Teacher Education*, *47*, 13–21. <https://doi.org/10.1016/j.tate.2014.12.001>
- Burston, J. J., Valdes, A. M., Woodhams, S. G., Mapp, P. I., Stocks, J., Watson, D. J. G., Gowler, P. R. W., Xu, L., Sagar, D. R., Fernandes, G., Frowd, N., Marshall, L., Zhang, W., Doherty, M., Walsh, D. A., & Chapman, V. (2019). The impact of anxiety on chronic musculoskeletal pain and the role of astrocyte activation. *PAIN*, *160*(3), 658. <https://doi.org/10.1097/j.pain.0000000000001445>
- Bystritsky, A., Khalsa, S. S., Cameron, M. E., & Schiffman, J. (2013). Current Diagnosis and Treatment of Anxiety Disorders. *Pharmacy and Therapeutics*, *38*(1), 30–57.

- Chand, S. P., & Marwaha, R. (2021). Anxiety. In *StatPearls*. StatPearls Publishing.
<http://www.ncbi.nlm.nih.gov/books/NBK470361/>
- Chien, H.-C., Chung, Y.-C., Yeh, M.-L., & Lee, J.-F. (2015). Breathing exercise combined with cognitive behavioural intervention improves sleep quality and heart rate variability in major depression. *Journal of Clinical Nursing*, 24(21–22), 3206–3214.
<https://doi.org/10.1111/jocn.12972>
- Cicek, S., & Basar, F. (2017). The effects of breathing techniques training on the duration of labor and anxiety levels of pregnant women. *Complementary Therapies in Clinical Practice*, 29, 213–219. <https://doi.org/10.1016/j.ctcp.2017.10.006>
- Ciesielska, M., Boström, K. W., & Öhlander, M. (2018). Observation Methods. In M. Ciesielska & D. Jemielniak (Eds.), *Qualitative Methodologies in Organization Studies: Volume II: Methods and Possibilities* (pp. 33–52). Springer International Publishing.
https://doi.org/10.1007/978-3-319-65442-3_2
- Courtney, R. (2009). The functions of breathing and its dysfunctions and their relationship to breathing therapy. *International Journal of Osteopathic Medicine*, 12(3), 78–85.
<https://doi.org/10.1016/j.ijosm.2009.04.002>
- Coutinho, F. C., Dias, G. P., Nascimento Bevilaqua, M. C. do, Gardino, P. F., Rangé, B. P., & Nardi, A. E. (2010). Current concept of anxiety: Implications from Darwin to the DSM-V for the diagnosis of generalized anxiety disorder. *Expert Review of Neurotherapeutics*, 10(8), 1307–1320. <https://doi.org/10.1586/ern.10.101>
- Cypress, B. S. (2017). Rigor or Reliability and Validity in Qualitative Research: Perspectives, Strategies, Reconceptualization, and Recommendations. *Dimensions of Critical Care Nursing*, 36(4), 253. <https://doi.org/10.1097/DCC.0000000000000253>

- Dang, B. N., Westbrook, R. A., Njue, S. M., & Giordano, T. P. (2017). Building trust and rapport early in the new doctor-patient relationship: A longitudinal qualitative study. *BMC Medical Education, 17*(1), 32. <https://doi.org/10.1186/s12909-017-0868-5>
- Davies, M. R., Buckman, J. E. J., Adey, B. N., Armour, C., Bradley, J. R., Curzons, S. C. B., Davies, H. L., Davis, K. A. S., Goldsmith, K. A., Hirsch, C. R., Hotopf, M., Hübel, C., Jones, I. R., Kalsi, G., Krebs, G., Lin, Y., Marsh, I., McAtarsney-Kovacs, M., McIntosh, A. M., ... Eley, T. C. (2022). Comparison of symptom-based versus self-reported diagnostic measures of anxiety and depression disorders in the GLAD and COPING cohorts. *Journal of Anxiety Disorders, 85*, 102491. <https://doi.org/10.1016/j.janxdis.2021.102491>
- Deggs, D., & Hernandez, F. (2018). Enhancing the Value of Qualitative Field Notes Through Purposeful Reflection. *The Qualitative Report, 23*(1), 3715-3769. <https://doi.org/10.46743/2160-3715/2018.3569>
- Dixon, L., Fotinos, K., Sherifi, E., Lokuge, S., Fine, A., Furtado, M., Anand, L., Liberatore, K., & Katzman, M. A. (2020). Effect of Osteopathic Manipulative Therapy on Generalized Anxiety Disorder. *Journal of Osteopathic Medicine, 120*(3), 133–143. <https://doi.org/10.7556/jaoa.2020.026>
- Dunbar, S. B., Langberg, J. J., Reilly, C. M., Viswanathan, B., Mccarty, F., Culler, S. D., O'brien, M. C., & Weintraub, W. S. (2009). Effect of a Psychoeducational Intervention on Depression, Anxiety, and Health Resource Use in Implantable Cardioverter Defibrillator Patients. *Pacing and Clinical Electrophysiology, 32*(10), 1259–1271. <https://doi.org/10.1111/j.1540-8159.2009.02495.x>
- El-Tallawy, S. N., Nalamasu, R., Salem, G. I., LeQuang, J. A. K., Pergolizzi, J. V., & Christo, P. J. (2021). Management of Musculoskeletal Pain: An Update with Emphasis on Chronic

Musculoskeletal Pain. *Pain and Therapy*, 10(1), 181–209.

<https://doi.org/10.1007/s40122-021-00235-2>

Esterov, D., Thomas, A., & Weiss, K. (2021). Osteopathic manipulative medicine in the management of headaches associated with postconcussion syndrome. *Journal of Osteopathic Medicine*, 121(7), 651–656. <https://doi.org/10.1515/jom-2020-0035>

Fellmeth, G., Harrison, S., McNeill, J., Lynn, F., Redshaw, M., & Alderdice, F. (2022) Identifying postnatal anxiety: comparison of self-identified and self-reported anxiety using the Edinburgh Postnatal Depression Scale. *BMC Pregnancy and Childbirth* <https://doi.org/10.1186/s12884-022-04437-0>

Fenko, A., & Loock, C. (2014). The Influence of Ambient Scent and Music on Patients' Anxiety in a Waiting Room of a Plastic Surgeon. *HERD: Health Environments Research & Design Journal*, 7(3), 38–59. <https://doi.org/10.1177/193758671400700304>

Gale, C., & Davidson, O. (2007). Generalised anxiety disorder. *BMJ : British Medical Journal*, 334(7593), 579–581. <https://doi.org/10.1136/bmj.39133.559282.BE>

Halcomb, E., & Hickman, L. (2015). Mixed methods research. *Faculty of Science, Medicine and Health - Papers: Part A*, 41–47. <https://doi.org/10.7748/ns.29.32.41.e8858>

Harrison, H., Birks, M., Franklin, R., & Mills, J. (2017). Case Study Research: Foundations and Methodological Orientations. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, 18(1), Article 1. <https://doi.org/10.17169/fqs-18.1.2655>

He Ara Oranga: Report of the Government Inquiry into Mental Health and Addiction | Mental Health and Addiction Inquiry. (n.d.). Retrieved October 24, 2021, from <https://mentalhealth.inquiry.govt.nz/inquiry-report/he-ara-oranga/>

- Houghton, C., Casey, D., Shaw, D., & Murphy, K. (2013). Rigour in qualitative case-study research. *Nurse Researcher*, 20(4), 12–17.
<https://doi.org/10.7748/nr2013.03.20.4.12.e326>
- Is There a (Viable) Crucial-Case Method?* - John Gerring, 2007. (n.d.). Retrieved May 1, 2023, from
<https://journals.sagepub.com/doi/abs/10.1177/0010414006290784?journalCode=cp>
sa
- Jerath, R., Crawford, M. W., Barnes, V. A., & Harden, K. (2015). Self-regulation of breathing as a primary treatment for anxiety. *Applied Psychophysiology and Biofeedback*, 40(2), 107–115. <https://doi.org/10.1007/s10484-015-9279-8>
- Johnson, J. L., Adkins, D., & Chauvin, S. (2020). A Review of the Quality Indicators of Rigor in Qualitative Research. *American Journal of Pharmaceutical Education*, 84(1), 7120.
<https://doi.org/10.5688/ajpe7120>
- Konnopka, A., & König, H. (2020). Economic Burden of Anxiety Disorders: A Systematic Review and Meta-Analysis. *PharmacoEconomics*, 38(1), 25–37.
<https://doi.org/10.1007/s40273-019-00849-7>
- Kop, W. J., Synowski, S. J., Newell, M. E., Schmidt, L. A., Waldstein, S. R., & Fox, N. A. (2011). Autonomic nervous system reactivity to positive and negative mood induction: The role of acute psychological responses and frontal electrocortical activity. *Biological Psychology*, 86(3), 230–238. <https://doi.org/10.1016/j.biopsycho.2010.12.003>
- Kovanur Sampath, K., & Roy, D. E. (2015). Management of mood disorders by osteopaths in New Zealand: A survey of current clinical practice. *International Journal of Osteopathic Medicine*, 18(3), 161–170. <https://doi.org/10.1016/j.ijosm.2015.01.003>

- Kreibig, S. D., Gendolla, G. H. E., & Scherer, K. R. (2010). Psychophysiological effects of emotional responding to goal attainment. *Biological Psychology, 84*(3), 474–487. <https://doi.org/10.1016/j.biopsycho.2009.11.004>
- Kuchera, M. L., Faao, M. L. K., Do, & Kuchera, W. A. (1994). *Osteopathic Considerations in Systemic Dysfunction*. Greyden Press LLC.
- Leray, E., Camara, A., Drapier, D., Riou, F., Bougeant, N., Pelissolo, A., Lloyd, K. R., Bellamy, V., Roelandt, J. L., & Millet, B. (2011). Prevalence, characteristics and comorbidities of anxiety disorders in France: Results from the “Mental Health in General Population” Survey (MHGP). *European Psychiatry, 26*(6), 339–345. <https://doi.org/10.1016/j.eurpsy.2009.12.001>
- Lewit, K. (1980). Relation of faulty respiration to posture, with clinical implications. *The Journal of the American Osteopathic Association, 79*(8), 525–529.
- Ma, X., Yue, Z.-Q., Gong, Z.-Q., Zhang, H., Duan, N.-Y., Shi, Y.-T., Wei, G.-X., & Li, Y.-F. (2017). The Effect of Diaphragmatic Breathing on Attention, Negative Affect and Stress in Healthy Adults. *Frontiers in Psychology, 8*, 874. <https://doi.org/10.3389/fpsyg.2017.00874>
- Magaldi, D., & Berler, M. (2020). Semi-structured Interviews. In V. Zeigler-Hill & T. K. Shackelford (Eds.), *Encyclopedia of Personality and Individual Differences* (pp. 4825–4830). Springer International Publishing. https://doi.org/10.1007/978-3-319-24612-3_857
- Maher, C., Hadfield, M., Hutchings, M., & de Eyto, A. (2018). Ensuring Rigor in Qualitative Data Analysis: A Design Research Approach to Coding Combining NVivo With Traditional Material Methods. *International Journal of Qualitative Methods, 17*(1), 1609406918786362. <https://doi.org/10.1177/1609406918786362>

- McParlin, Z., Cerritelli, F., Friston, K. J., & Esteves, J. E. (2022). Therapeutic Alliance as Active Inference: The Role of Therapeutic Touch and Synchrony. *Frontiers in Psychology, 13*. <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.783694>
- Michaelides, A., & Zis, P. (2019). Depression, anxiety and acute pain: Links and management challenges. *Postgraduate Medicine, 131*(7), 438–444. <https://doi.org/10.1080/00325481.2019.1663705>
- Mills, A., Durepos, G., & Wiebe, E. (2010). *Encyclopedia of Case Study Research*. SAGE Publications, Inc. <https://doi.org/10.4135/9781412957397>
- Mohajan, H. (2018, December 10). *Qualitative Research Methodology in Social Sciences and Related Subjects* [MPRA Paper]. <https://mpra.ub.uni-muenchen.de/85654/>
- Mulhall, A. (2003). In the field: Notes on observation in qualitative research. *Journal of Advanced Nursing, 41*(3), 306–313. <https://doi.org/10.1046/j.1365-2648.2003.02514.x>
- Musculoskeletal health*. (n.d.). Retrieved April 2, 2023, from <https://www.who.int/news-room/fact-sheets/detail/musculoskeletal-conditions>
- Nardi, A. E. (2003). Social anxiety disorder has social and economic burden. *BMJ : British Medical Journal, 327*(7426), 1287.
- Nicholas Penney, J. (2010). The biopsychosocial model of pain and contemporary osteopathic practice. *International Journal of Osteopathic Medicine, 13*(2), 42–47. <https://doi.org/10.1016/j.ijosm.2010.01.004>
- Noyes, J., Booth, A., Moore, G., Flemming, K., Tunçalp, Ö., & Shakibazadeh, E. (2019). Synthesising quantitative and qualitative evidence to inform guidelines on complex interventions: Clarifying the purposes, designs and outlining some methods. *BMJ Global Health, 4*(Suppl 1), e000893. <https://doi.org/10.1136/bmjgh-2018-000893>

- O'Brien, B. C., Harris, I. B., Beckman, T. J., Reed, D. A., & Cook, D. A. (2014). Standards for reporting qualitative research: A synthesis of recommendations. *Academic Medicine: Journal of the Association of American Medical Colleges*, *89*(9), 1245–1251.
<https://doi.org/10.1097/ACM.0000000000000388>
- Olmos-Vega, F. M., Stalmeijer, R. E., Varpio, L., & Kahlke, R. (2022). A practical guide to reflexivity in qualitative research: AMEE Guide No. 149. *Medical Teacher*, 1–11.
<https://doi.org/10.1080/0142159X.2022.2057287>
- Onwuegbuzie, A. J., & Leech, N. L. (2010). Generalization practices in qualitative research: A mixed methods case study. *Quality & Quantity*, *44*(5), 881–892.
<https://doi.org/10.1007/s11135-009-9241-z>
- Orland-Barak, L., & Hasin, R. (2010). Exemplary mentors' perspectives towards mentoring across mentoring contexts: Lessons from collective case studies. *Teaching and Teacher Education*, *26*(3), 427–437. <https://doi.org/10.1016/j.tate.2009.05.009>
- O'Sullivan, P. B., Beales, D. J., Beetham, J. A., Cripps, J., Graf, F., Lin, I. B., Tucker, B., & Avery, A. (2002). Altered motor control strategies in subjects with sacroiliac joint pain during the active straight-leg-raise test. *Spine*, *27*(1), E1-8.
<https://doi.org/10.1097/00007632-200201010-00015>
- Otte, C. (2011). Cognitive behavioral therapy in anxiety disorders: Current state of the evidence. *Dialogues in Clinical Neuroscience*, *13*(4), 413–421.
- Parikh, S. V., Zaretsky, A., Beaulieu, S., Yatham, L. N., Young, L. T., Patelis-Siotis, I., Macqueen, G. M., Levitt, A., Arenovich, T., Cervantes, P., Velyvis, V., Kennedy, S. H., & Streiner, D. L. (2012). A randomized controlled trial of psychoeducation or cognitive-behavioral therapy in bipolar disorder: A Canadian Network for Mood and

Anxiety treatments (CANMAT) study [CME]. *The Journal of Clinical Psychiatry*, 73(6), 803–810. <https://doi.org/10.4088/JCP.11m07343>

Phillippi, J., & Lauderdale, J. (2018). A Guide to Field Notes for Qualitative Research: Context and Conversation. *Qualitative Health Research*, 28(3), 381–388.

<https://doi.org/10.1177/1049732317697102>

Poleshuck, E. L., Bair, M. J., Kroenke, K., Damush, T. M., Tu, W., Wu, J., Krebs, E. E., & Giles, D. E. (2009). Psychosocial stress and anxiety in musculoskeletal pain patients with and without depression. *General Hospital Psychiatry*, 31(2), 116–122.

<https://doi.org/10.1016/j.genhosppsy.2008.10.003>

Priya, A. (2021). Case Study Methodology of Qualitative Research: Key Attributes and Navigating the Conundrums in Its Application. *Sociological Bulletin*, 70(1), 94–110.

<https://doi.org/10.1177/0038022920970318>

Revicki, D. A., Travers, K., Wyrwich, K. W., Svedsäter, H., Locklear, J., Mattera, M. S., Sheehan, D. V., & Montgomery, S. (2012). Humanistic and economic burden of generalized anxiety disorder in North America and Europe. *Journal of Affective Disorders*, 140(2), 103–112. <https://doi.org/10.1016/j.jad.2011.11.014>

Ridder, H.-G. (2012). Review of Case Study Research. Design and Methods 4 th ed. [Review of *Review of Case Study Research. Design and Methods 4 th ed.*, by R. K. Yin].

Zeitschrift Für Personalforschung / German Journal of Research in Human Resource Management, 26(1), 93–95.

Roberts, A., Harris, K., Outen, B., Bukvic, A., Smith, B., Schultz, A., Bergman, S., & Mondal, D. (2022). Osteopathic Manipulative Medicine: A Brief Review of the Hands-On Treatment Approaches and Their Therapeutic Uses. *Medicines*, 9(5), 33.

<https://doi.org/10.3390/medicines9050033>

- Roussel, N. A., Nijs, J., Truijien, S., Smeuninx, L., & Stassijns, G. (2007). Low back pain: Clinimetric properties of the Trendelenburg test, active straight leg raise test, and breathing pattern during active straight leg raising. *Journal of Manipulative and Physiological Therapeutics*, *30*(4), 270–278.
<https://doi.org/10.1016/j.jmpt.2007.03.001>
- Saracutu, M., Rance, J., Davies, H., & Edwards, D. J. (2018). The effects of osteopathic treatment on psychosocial factors in people with persistent pain: A systematic review. *International Journal of Osteopathic Medicine*, *27*, 23–33.
<https://doi.org/10.1016/j.ijosm.2017.10.005>
- Sclafani, C. (n.d.). *A Case Study Primer: Origins and basic Principles. Scopes Of Practice*. (n.d.). Retrieved August 15, 2022, from
<https://osteopathiccouncil.org.nz/Public/Public/Registered-Osteopaths/Scope-Of-Practice.aspx>
- Seffinger, M. A., King, H. H., Ward, R. C., Jones, J. M., Rogers, F. J., & Patterson, M. M. (n.d.). *OSTEOPATHIC PHILOSOPHY*. 50.
- Sharma, S. K., Kala, N., & Telles, S. (2022). Volitional Yoga Breathing Influences Attention and Anxiety: An Exploratory Randomized Crossover Study. *Complementary Medicine Research*, *29*(2), 120–126. <https://doi.org/10.1159/000519715>
- Simon, N. M. (2009). Generalized Anxiety Disorder and Psychiatric Comorbidities Such as Depression, Bipolar Disorder, and Substance Abuse. *The Journal of Clinical Psychiatry*, *70*(suppl 2), 10–14. <https://doi.org/10.4088/JCP.s.7002.02>
- Sinnema, H., Terluin, B., Volker, D., Wensing, M., & van Balkom, A. (2018). Factors contributing to the recognition of anxiety and depression in general practice. *BMC Family Practice*, *19*(1), 99. <https://doi.org/10.1186/s12875-018-0784-8>

- Ströhle, A., Gensichen, J., & Domschke, K. (2018). The Diagnosis and Treatment of Anxiety Disorders. *Deutsches Ärzteblatt International*, *115*(37), 611–620.
<https://doi.org/10.3238/arztebl.2018.0611>
- Timans, R., Wouters, P., & Heilbron, J. (2019). Mixed methods research: What it is and what it could be. *Theory and Society*, *48*(2), 193–216. <https://doi.org/10.1007/s11186-019-09345-5>
- Wasti, S. P., Simkhada, P., van Teijlingen, E. R., Sathian, B., & Banerjee, I. (2022). The Growing Importance of Mixed-Methods Research in Health. *Nepal Journal of Epidemiology*, *12*(1), 1175–1178. <https://doi.org/10.3126/nje.v12i1.43633>
- Yang, Y., Wei, L., Wang, S., Ke, L., Zhao, H., Mao, J., Li, J., & Mao, Z. (2022). The effects of pursed lip breathing combined with diaphragmatic breathing on pulmonary function and exercise capacity in patients with COPD: A systematic review and meta-analysis. *Physiotherapy Theory and Practice*, *38*(7), 847–857.
<https://doi.org/10.1080/09593985.2020.1805834>
- Yin, R. K. (2012). Case study methods. In *APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological* (pp. 141–155). American Psychological Association. <https://doi.org/10.1037/13620-009>
- Zaccaro, A., Piarulli, A., Laurino, M., Garbella, E., Menicucci, D., Neri, B., & Gemignani, A. (2018). How Breath-Control Can Change Your Life: A Systematic Review on Psycho-Physiological Correlates of Slow Breathing. *Frontiers in Human Neuroscience*, *12*, 353. <https://doi.org/10.3389/fnhum.2018.00353>
- Zhu, B., Zhao, Z., Ye, W., Marciniak, M. D., & Swindle, R. (2009). The Cost of Comorbid Depression and Pain for Individuals Diagnosed With Generalized Anxiety Disorder.

Journal of Nervous & Mental Disease, 197(2), 136–139.

<https://doi.org/10.1097/NMD.0b013e3181963486>

Appendix A Standards for Reporting Qualitative Research

No. Topic	Item	Checked
Title and abstract		
S1 Title	Concise description of the nature and topic of the study identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	Found on page 6 – or page 1?
S2 Abstract	Summary of key elements of the study using the abstract format of the intended publication; typically includes objective, methods, results, and conclusions	Found on page 6
Introduction		
S3 Problem formulation	Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	Found on pages 6 through 18 within literature review
S4 Purpose or research question	Purpose of the study and specific objectives or questions	Found on page 18 at the bottom of the literature review
Methods		
S5 Qualitative approach and research paradigm	Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., positivist, constructivist/interpretivist) is also recommended	Found on page 18 underneath methodology section

S6 Researcher characteristics and reflexivity	Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, or transferability	Found on page 22 underneath section titled reflexivity and reflection
S7 Context	Setting/site and salient contextual factors; rationale ^a	NOT SURE IF I NOTE THIS SHOULD I ADD
S8 Sampling strategy	How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale ^a	Found on page 32 underneath section titled recruitments and participants
S9 Ethical issues pertaining to human subjects	Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	Found on page 37 underneath section titled Ethical Considerations
S10 Data collection methods	Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale ^a	Found on page 35 underneath section titled data collection and management of rigour
S11 Data collection instruments and technologies	Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the	Found on pages 34 under procedure through to 35

	instrument(s) changed over the course of the study	
S12 Units of study	Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	Found on pages 32 under recruitment and participants through to 33 under inclusion and exclusion criteria
S13 Data processing	Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/deidentification of excerpts	Found on page 35 under section "Data collection and management of rigour to 37"
S14 Data analysis	Process by which inferences, themes, etc., were identified and developed, including researchers involved in data analysis; usually references a specific paradigm or approach; rationale ^a	Found on page 36 under Data analysis
S15 Techniques to enhance trustworthiness	Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale ^a	Found on page 35 under section Data collection and management of rigour
Results/Findings		
S16 Synthesis and interpretation	Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	Found on page 40 under main themes
S17 Links to empirical data	Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	Found on page 40 to 56 underneath findings
Discussion		
S18 Integration with prior work, implications, transferability, and contribution(s) to the field	Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability;	Found on page 56 underneath discussion

	identification of unique contribution(s) to scholarship in a discipline or field	
S19 Limitations	Trustworthiness and limitations of findings	Found on page 62 underneath strengths and limitations
Other		
S20 Conflicts of interest	Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	Is this what I talk about with my own bias thinking breath work would have a more profound impact?
S21 Funding	Sources of funding and other support; role of funders in data collection, interpretation, and reporting	Not applicable

Commented [HA1]: Yes, reference this to your description of yourself

Appendix B Ethics Approval Letter

4 August 2022



Dear Applicant Thomsen,

Your file number for this application: **2022-1026**

Title: The role of breathing techniques in osteopathic management of self-reported anxiety: A descriptive case study

Your application for ethics approval to the requested amendments has been reviewed by the Unitec Research Ethics Committee (UREC) and has been approved for the following period:

Start date: **13/7/2022**

Finish date: **13/7/2023**

Please note that:

1. The above dates must be referred to on the information AND consent forms given to all participants.
2. You must inform UREC, in advance, of any ethically-relevant deviation in the project. This may require additional approval.

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

Yours sincerely,

Nigel Adams Deputy Chair, UREC

A handwritten signature in black ink, appearing to read 'N. Adams'.

Appendix C Information For Osteopath

Information for Participants

Project Title: The role of breathing techniques in osteopathic management of self-reported anxiety: A descriptive case study.

Invitation: My name is Luis and I am a student researcher studying Master of Osteopathy at UNITEC. You are invited to participate in a research project that will investigate osteopaths perspectives on breathing techniques in managing anxiety. Your knowledge and expertise will be a significant contribution.

What is the purpose of the study? The purpose of the study is to gather views and perspectives from an osteopath and their patient about breathing techniques and its role in anxiety. This data will provide future direction for more study to be done in this field.

How are people chosen to be asked to be part of the study? Osteopaths that have experience using breathing techniques and have an understanding of anxiety and their patients that have self-reported anxiety will be chosen.

What happens in the study? Participants will be contacted and asked to have an observer during a clinical session with one of their patients who has self-reported anxiety. The observer will be present during the treatment process for three sessions. Both the osteopath and the patient will be asked about their perspectives on breathing techniques and its relationship to managing self-reported anxiety after each session via zoom. The researcher will request to see the Osteopath's patient notes, with the patients consent.

What are the benefits? Participants will make a valuable contribution to this topic, aspects of which may result in publication. Participants will be involved in enhancing and enriching the body of knowledge about breathing techniques and its relationship to anxiety in the particular context of Osteopathy.

How will my privacy be protected? No individuals will be identified in reports of this research.

What are the costs of participating in the project? There are no costs attached to participating in this project beyond your time.

Opportunity to receive feedback on results of research: A copy of the transcripts will be returned to the participants for checking and a summary of the final report will be provided to the participants.

Participant Concerns: Participation in this project is optional. You may withdraw at any stage up to the completion of data collection and up to two weeks after you have received your transcript for checking. Any concerns regarding the nature of this project may be conveyed to the researcher's supervisor or to the UREC. Helplines are provided here if you feel you need help with anxiety. 0800 ANXIETY – Anxiety NZ 24 hour helpline. 09 846 6869 – Grow NZ. 0800 111 757 – depression and anxiety helpline.

Appendix D Information For Patient

Information for Participants

Project Title: The role of breathing techniques in osteopathic management of self-reported anxiety: A descriptive case study.

Invitation: My name is Luis and I am a student researcher studying Master of Osteopathy at UNITEC. You are invited to participate in a research project that will investigate osteopaths perspectives on breathing techniques in managing anxiety. Your knowledge and expertise will be a significant contribution.

What is the purpose of the study? The purpose of the study is to gather views and perspectives from an osteopath and their patient about breathing techniques and its role in anxiety. This data will provide future direction for more study to be done in this field.

How are people chosen to be asked to be part of the study? Osteopaths that have experience using breathing techniques and have an understanding of anxiety and their patients that have self-reported anxiety will be chosen.

What happens in the study? Participants will be contacted and asked to have an observer during a clinical session with one of their patients who has self-reported anxiety. The observer will be present during the treatment process for three sessions. Both the osteopath and the patient will be asked about their perspectives on breathing techniques and its relationship to managing self-reported anxiety after each session via zoom. The researcher will request to see the Osteopath's patient notes, with the patients consent.

What are the benefits? Participants will make a valuable contribution to this topic, aspects of which may result in publication. Participants will be involved in enhancing and enriching the body of knowledge about breathing techniques and its relationship to anxiety in the particular context of Osteopathy.

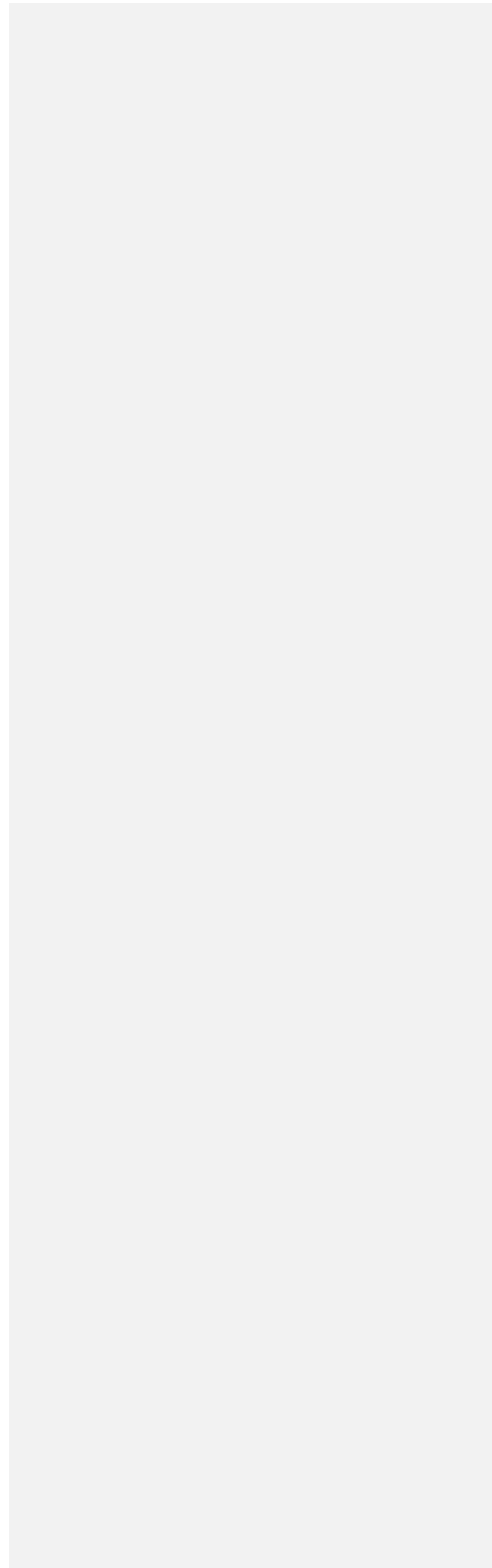
How will my privacy be protected? No individuals will be identified in reports of this research.

What are the costs of participating in the project? There are no costs attached to participating in this project beyond your time.

Opportunity to receive feedback on results of research: A copy of the transcripts will be returned to the participants for checking and a summary of the final report will be provided to the participants.

Participant Concerns: Participation in this project is optional. You may withdraw at any stage up to the completion of data collection and up to two weeks after you have received your transcript for checking. Any concerns regarding the nature of this project may be conveyed to the researcher's supervisor or to the UREC. Helplines are provided here if you

feel you need help with anxiety. 0800 ANXIETY – Anxiety NZ 24 hour helpline. 09 846 6869 – Grow NZ. 0800 111 757 – depression and anxiety helpline.



Appendix E Consent Form For Osteopath

Participant Consent Form

Research Project Title: The role of breathing techniques in osteopathic management of self-reported anxiety: A descriptive case study.

I have had the research project explained to me and I have read and understand the information sheet given to me.

I have had an opportunity to ask questions.

I understand that I don't have to be part of this research project should I chose not to participate and may withdraw at any time prior to the completion of the data collection and up to two weeks after I have received my transcript for checking.

I understand that I may ask the observer/student researcher to leave the treatment session at any time.

I understand that patient notes relating to the presenting condition and the observed session with be provided to the student researcher and will only be used as part of the case study. Notes will not be shared with anyone other than the research supervisor and will be stored safely and anonymously. The patient may review the notes during the study.

I understand I may withhold consent for patient notes to be shared with the student researcher at any time without affecting the continuation of the study.

I understand the interview will be recorded for transcribing. I may ask for the recorder to be turned off at any time.

I will be provided with my transcript for checking accuracy of my information

I understand that in any reports of this project my contributions will not be attributed to me, I will not be identified.

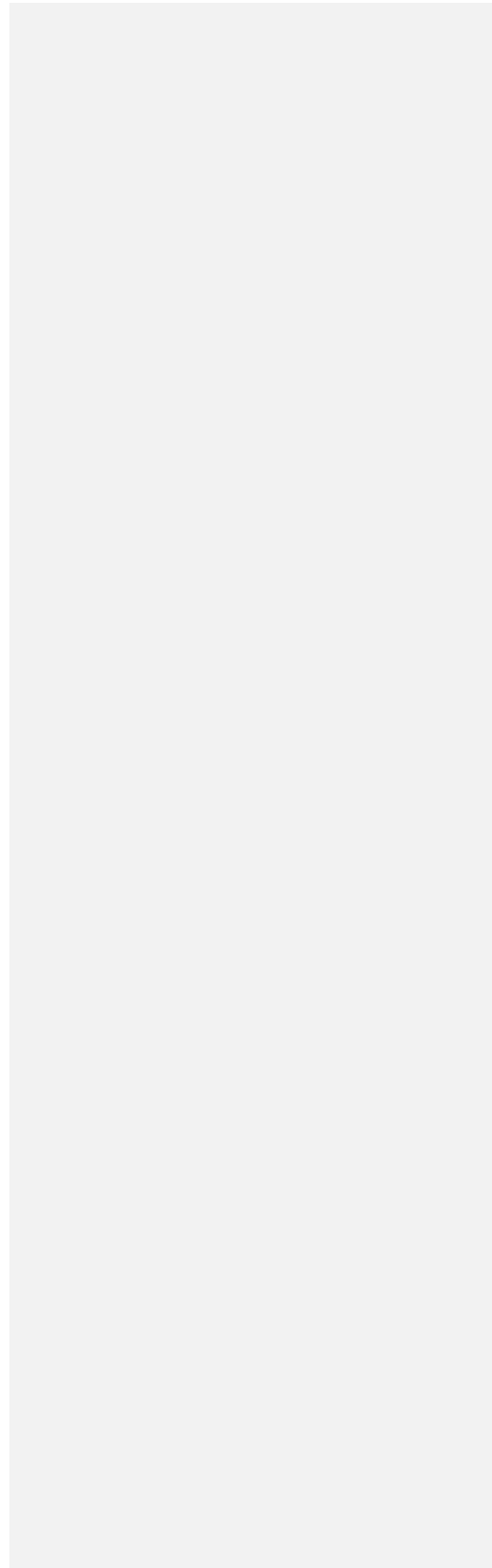
I understand that I will be invited to read and comment on the report of the completed research

I have had time to consider everything and I give my consent to be a part of this project.

Participant Name:

Participant Signature: **Date:**

Project Researcher: **Date:**



Appendix F Consent Form For Patient

Participant Consent Form

Research Project Title: The role of breathing techniques in osteopathic management of self-reported anxiety: A descriptive case study.

I have had the research project explained to me and I have read and understand the information sheet given to me.

I have had an opportunity to ask questions.

I understand that I don't have to be part of this research project should I chose not to participate and may withdraw at any time prior to the completion of the data collection and up to two weeks after I have received my transcript for checking.

I understand that I may ask the observer/student researcher to leave the treatment session at any time.

I understand that patient notes relating to the presenting condition and the observed session with be provided to the student researcher and will only be used as part of the case study. Notes will not be shared with anyone other than the research supervisor and will be stored safely and anonymously. The patient may review the notes during the study.

I understand I may withhold consent for patient notes to be shared with the student researcher at any time without affecting the continuation of the study.

I understand the interview will be recorded for transcribing. I may ask for the recorder to be turned off at any time.

I will be provided with my transcript for checking accuracy of my information

I understand that in any reports of this project my contributions will not be attributed to me, I will not be identified.

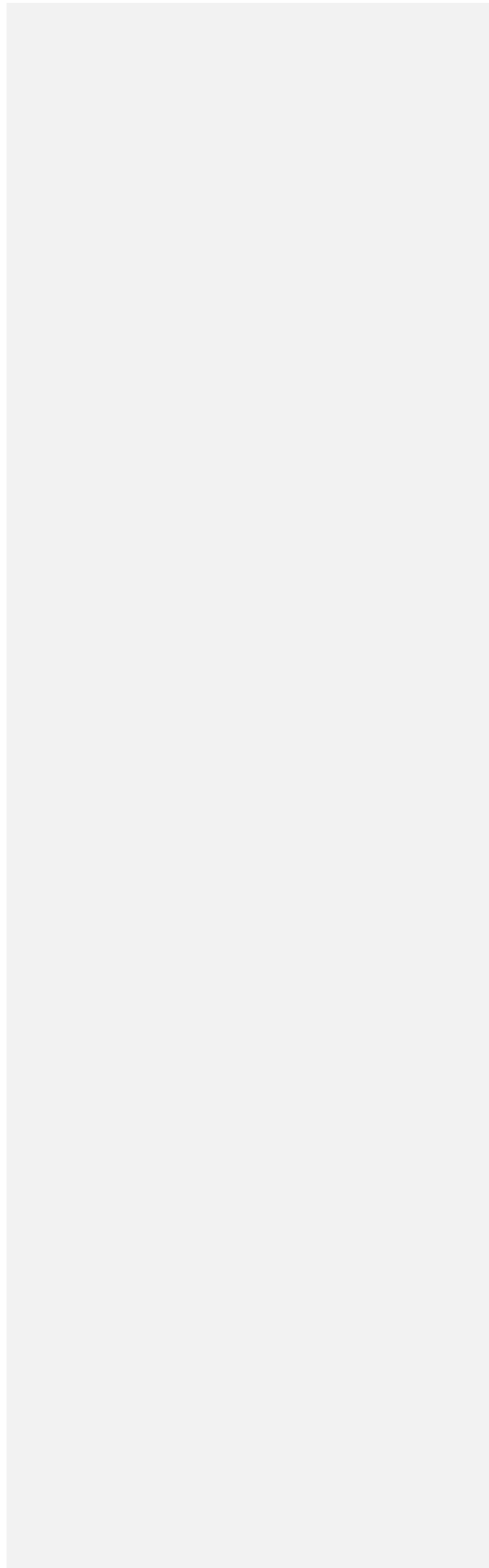
I understand that I will be invited to read and comment on the report of the completed research

I have had time to consider everything and I give my consent to be a part of this project.

Participant Name:

Participant Signature: **Date:**

Project Researcher: **Date:**



Appendix G Interview Schedule For Osteopath

****Note that these questions were used as prompts and the question were subject to change for each interview***

Questions for the osteopath

Part A general questions

1. How often do you use treatments to affect anxiety?
2. What are these treatments?
3. How often do you use breathwork on your patients?
4. How often do you use breathwork on your patients with the aim to affect anxiety?
5. Do you feel as though this is effective?
6. Do patients come to see you for anxiety?
7. Ask something about training

Part B About the session with your participant patient

8. Describe how you would go about a patient coming in with anxiety?
9. What do you first ask?
10. How do you establish rapport with the patient?
11. What questions do you usually ask?
12. What do you usually physically examine on the patient?
13. What are you looking for on your physical exam?
14. What answers are you looking for from the patient?
15. Are you observing the patient for any non-spoken cue when they are answering you?
16. How did you finish the session?
17. Is this usually how you would treat this patient?
18. Did anything unsuspecting come from this session?

Appendix H Interview Schedule For Patient

****Note that these questions were used as prompts and the question were subject to change for each interview***

Questions for the patient

Part A general Questions

1. Do you have self-reported anxiety?
2. Do you see the osteopath to help with your anxiety?
3. How often do you see the osteopath?
4. Have you tried treatments other than Osteopathy?

Part B Questions about the session

5. How do you feel after the session (more or less anxious)?
6. Is this how you usually feel afterwards?
7. What does the osteopath usually start the session with?
8. What questions do they usually ask you?
9. What do they usually physically test on you?
10. Do they often communicate their findings to you?
11. How did they treat you?
12. How did it make you feel?
13. Did you feel anxious throughout this process?
14. How did they end the session?
15. Do you feel as though what the osteopath does helps with your anxiety?
16. Do you feel as though breathwork is effective in managing your anxiety?

Appendix I Observation Form

Template for thesis observations:

Initial greeting

What happened:				
Impressions:				

Walk from waiting room to treatment room

What happened:				
Impressions:				

Rapport before taking case history

What happened:				
Impressions:				

Taking case history of return patient

What happened:				
Impressions:				

Exam (and discussion about exam findings)

What happened:				
Impressions:				

Treatment (is treatments explained to patient before it goes ahead)

What happened:				
Impressions:				

After treatment/ management

What happened:				
Impressions:				

Retest

What happened:				
Impressions:				

Finishing up appointment (walk back out to reception, rebook for next time?)

What happened:				
Impressions:				

Appendix J Initial Development Of Themes

Key

T = transcript

O = observations

Themes	Osteopath interviews	Patient interviews	Observations	Patient notes
Relationship between Covid and Anxiety	T1: 6-7			
Anxiety presenting itself with musculoskeletal presentations	T1: 11-14 20-23 25-26 27-29			
Anxiety in relationship to health complications		T1: 4-7 29-32 T2: 67-77 114-121 126-141		
Diaphragms and their relationship to anxiety	T1: 36-38			
Osteopathy and anxiety		T1: 14-15 28 32-37 76 T3: 60-69		
Breathing Dysfunction	T1: 56-59 65-70 76-78 89-90			
Breathing techniques	T1: 82-87 T2: 23-24 52-58 61-64 69-76	T1: 94-97 115-122		

Treatment for patient with anxiety	T1: 96-99	T1: 41-48 54-61 84-88 T2: 6-7 27 31 37-40 46-55		
Anxiety's relationship with sleep	T2: 10-12 21-22 49-50	T2: 90-93 147 152-165 T3: 30-33 T4: 7-14 14-43 48-61 100-106		
Multi practitioner approach to managing patients case	T2: 39-44 81-82	T1: 98-102 103-110 148-151 T3: 7-22 46-55		
Ways to manage anxiety at home	T2: 82-83 83-92	T1: 110-111 T2: 145-147 T3: 77-90 T4: 69-90		
Comparing felicity's anxiety at start of diagnosis vs at end		T2: 169-173		
Barriers to anxiety management		T3: 98-112		
Rapport			O1: 9 11 23 O2: 4	

			O3: 6 8 12 O4: 2 4	
Environment			O1: 13 O2: 2 O4:	
Osteopathic treatment			O1: 12 15 O2: 10 12 O3: 14 O4: 8	