

**RESEARCH ARTICLE**

“How do Pilates Trained Physiotherapists utilize and value Pilates Exercise for MSK conditions? A Qualitative Study”

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Email: petecuddy@hotmail.co.uk**Abstract**

Background: Pilates is a popular exercise therapy approach offering numerous benefits, including muscular strength, flexibility, control, and core stability. Pilates has been widely utilized in the prevention and rehabilitation of a variety of musculoskeletal disorders.

Objectives: The aim of this study was to explore the experiences and opinions of Pilates trained NHS and private practice physiotherapists in the UK, regarding the perceived benefits, risks, delivery and rationale for this exercise method.

Methods: This qualitative study used a self-designed electronic survey to retrieve the views of 30 physiotherapists, who had undertaken formal Pilates Instruction training, recruited by a purposive and snowball sampling method. Questions were either multiple choice or open-ended, examined via thematic analysis.

Results: Physiotherapists identified the most important benefits of Pilates as reduction in fear-avoidance, improving bodily awareness and increasing muscular strength. Exercises that promote general movement were highlighted as being particularly useful, with a majority recommending daily practice for optimum benefit. Participants recognized lack of core strength as a key indicator, whereas others criticized excessive focus on this principle.

Conclusions: Physiotherapists identified a range of inter-linked benefits and recognized that Pilates is hugely modifiable. Individualizing exercises can further encourage participation and negate the restriction of some health conditions. NHS and Private Practice Therapists utilize Pilates in a similar way, although rationales for its use may differ, as the justification for Pilates exercise may be evolving. Pilates appears a valuable methodology in the NHS, which can help patients engage with activity.

KEYWORDS

musculoskeletal, physiotherapists, Pilates, qualitative, rehabilitation

1 | INTRODUCTION

Pilates is a popular exercise therapy approach that focuses on strength, core stability, flexibility, muscle control, and posture (Wells,

Kolt, Marshall, & Bialocerowski, 2014a). This approach has evolved into a valuable therapeutic tool in the prevention and rehabilitation of a variety of injuries (Di Lorenzo, 2011). More recently, Pilates has become increasingly popular due to its wide-ranging health benefits

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for individuals with a range of MSK (musculoskeletal) disorders (Byrnes, Wu, & Whillier, 2018) and has become commercially recognized and accessible through various professional institutions. The Australian Physiotherapy & Pilates Institute (APPI) is a globally run organization licensed in 16 countries, delivering over 17 000 classes per year, as a "graduated system of specific exercise rehabilitation" (Appihealthgroup.com, 2019).

In the UK, Pilates based exercise therapy is used within both the National Health Service (NHS) and private healthcare sectors in the management of low back pain (LBP), general MSK pain, and various degenerative conditions (Yamato et al., 2015). An estimated 17.8 million people (28.9%) live with a musculoskeletal condition in the UK (Global Burden of Disease Network, 2016). Over 8.75 million people aged 45 and over have sought treatment for osteoarthritis (Arthritis Research UK, 2013), for which the main management strategy is exercise-based therapy. MSK healthcare services are under increasing pressure to provide care to the ageing population, and tackle the healthcare impact associated with inactivity (Hubbard et al., 2004). Group based exercise such as class Pilates offers an accessible opportunity to increase activity levels in such individuals (Karlsson, Gerdle, Takala, Andersson, & Larsson, 2018).

There is considerable evidence that Pilates has numerous physical benefits and may improve self-management of MSK conditions. Several systematic reviews have quantitatively demonstrated positive improvements on pain, quality of life and functionality (Aladro-Gonzalvo, Araya-Vargas, Machado-Díaz, & Salazar-Rojas, 2013; Byrnes et al., 2018). However, of the randomized controlled trials (RCTs) reviewed, high levels of heterogeneity were reported, in terms of sample (sub-types of back pain), exercise selection, delivery and frequency of treatment. In addition, qualitative research evaluating Pilates as a treatment approach is limited, mostly focusing on LBP populations (Gaskell & Williams, 2018). These methods can be valuable to review the definition, scope and rationale of Pilates treatment methods used by physiotherapists, to provide optimum rehabilitation. A qualitative approach could also gain understanding of how physiotherapists utilize Pilates for a range of conditions other than LBP (Wells, Kolt, Marshall, & Bialocerkowski, 2014b). This study aims to investigate the variation in Pilates delivery and in line with previous qualitative studies, further explore the perceived benefits, risks and rationale for this exercise approach. This is the first study to review NHS and private physiotherapists in their use of Pilates group exercise.

2 | METHODS

A self-designed qualitative questionnaire survey was used to investigate opinions and views among 30 Chartered Physiotherapists practicing in the UK, who had undertaken formal training in Pilates exercise therapy to treat people with MSK conditions. The study utilized a qualitative phenomenological approach, as this was an appropriate method to capture and collate physiotherapist's experiences, and gain further understanding of their beliefs and rationale (Kumar, 2012).

Carpenter and Streubert Speziale (2007)), describes phenomenology as "a science whose purpose is to describe a particular phenomenon or the appearance of things, as lived experiences" (p.43). Considered both a philosophical discipline and research method, the outcome of a phenomenological study is a detailed description of themes that capture the essential meaning of a 'lived' experience, including an individual's beliefs, meanings and attributes (Moser & Korstjens, 2018), in this instance, therapist's views and opinions regarding Pilates exercise therapy. This approach to data collection allows analysis of an individual's experiences without restriction of pre-existing theoretical pre-conceptions (Smith & Osborn, 2015).

Qualitative methodology has numerous advantages including rich and detailed data retrieval with greater depth of focus to one particular area and is suited to evaluating intricacies of a situation or method (Legard, Keegan, & Ward, 2003). This methodology is appropriate as quantitative methods may not explain why physiotherapists select specific Pilates exercises over others or determine suitability for participants with certain health conditions. It also allows for consensus or differences of opinion with rationale and sharing of common practices.

3 | SURVEY DESIGN

The questionnaire for this study was constructed to retrieve the desired views and opinions from physiotherapists. The questionnaire was designed by the lead researcher, with assistance from the secondary author. Both researchers had completed previous Pilates instruction training and had significant experience in conducting Pilates classes for individuals with MSK conditions. The study was cross-sectional as data was collected from a snapshot in time (Setia, 2016). During development, the SRQR (Standards for Reporting Qualitative Research) checklist was used to ensure research quality and transparency (O'Brien, Harris, Beckman, Reed, & Cook, 2014), the questionnaire was also piloted before use with experienced Pilates-trained physiotherapists. This resulted in minor amendments to question wording to improve flow, salience and ease of understanding. Piloting additionally tested face validity (Burns et al., 2008), promoting trustworthiness and usefulness of results.

The questionnaire was delivered in an electronic format via Google Forms (Appendix A). The first section consisted of a participant consent form, followed by a demographic data section. The main body of the survey consisted of four multiple choice questions followed by open questions allowing free text input, the aim being to facilitate sufficient narrative in participant's responses to provide a wealth of useful data and enable thematic analysis.

4 | ETHICS, RECRUITMENT AND SURVEY PROCESS

The University Ethics Committee (Ref HSR1617-150) approved the study prior to participant recruitment, which took place via two methods. Firstly, the lead researcher directly contacted NHS

Healthcare providers (Managers of MSK Physiotherapy Departments) via email or phone to gain consent to contact their staff, details and aims of the study were also explained fully at this point. NHS providers were identified from the online list of NHS Authorities and Trusts, aiming initially within the North West of England, then recruiting geographically further to achieve sufficient responses. Once consent was gained from NHS MSK managers, emails were sent with the appropriate hyperlink to the online survey, which managers were requested to then disseminate within their departments.

The second method utilized a purposive/snowball sampling approach to recruit physiotherapists in private practice. Pilates trained physiotherapists were directly contacted and onward dissemination to suitably qualified colleagues encouraged. When completing the survey, participants were required to give informed consent by selecting the relevant selection box, as well as electronically signing with their name. Survey information specified that participant's responses would remain anonymous and confidential, and that they also had the right to withdraw from participation at any time, by simply not completing the questionnaire, and exiting the electronic form. Access to the survey data was accessible only via password protected Google Account. Completed online survey responses were collected between February and June 2019.

5 | SELECTION CRITERIA

To participate in the study participants had to:

1. Have undertaken some form of formal Pilates instruction training, such as the Matwork Foundation Pilates courses with the APPI or BCP (Body Control Pilates, 2018). Physiotherapists did not have to be a fully certified instructor to participate in the study, however, they must have completed a minimum of one formal Pilates instruction course.
2. Be registered with the HCPC (Health and Care Professions Council) to currently practice as a physiotherapist without restriction in the UK, in keeping with the rationale of previous studies (Allen, 2014; Brennan & French, 2008; Wells et al., 2014b). Wells et al. (2014b) advocated that including only physiotherapists with formal Pilates training guaranteed similar standards of practice of participants, as standards and qualification level may vary otherwise. Extending the survey to other practitioners, for example Pilates instructors who are not physiotherapists, would also make further comparisons challenging through data analysis.
3. Be computer literate, have e-mail access, time to commit to completion of the survey, and ability to understand written English language.

6 | DATA COLLECTION

A sample size of 30 survey responses were retrieved for this study. Sufficient responses were required to achieve qualitative

data saturation and enable worthwhile analysis (Saunders et al., 2018). Data saturation refers to the collection of qualitative data until there are no new data emerging and redundancy occurs, in that no new analytical information arises any more, and the study provides maximum information on the phenomenon (Moser & Korstjens, 2018). Data saturation is considered a key principle in determining purposive sample size in health sciences research, however there is a lack of guidelines or tests of adequacy to determine how many sources are sufficient (Guest, Bunce, & Johnson, 2006). Moser and Korstjens (2018) propose that qualitative phenomenological studies require fewer than 10 interviews, whereas Creswell (1998) recommended that between five and 25 data sources are adequate. Mindful of this issue, this study retrieved 30 completed surveys, after no new analytical themes were emerging after analysis of the first 25 questionnaires. This helped ensure data saturation, and theoretically provided the maximum information available from the physiotherapists sampled. Once 30 survey responses were retrieved, the online questionnaire was closed.

A sample size of 30 was considered sufficient in other qualitative studies investigating exercise interventions (O'Hanlon & Kennedy, 2014; Wells et al., 2014b). Wells et al. (2014b) advocated representativeness of results improves with the quality of participants, who, as in the current study, are similarly trained and considered experts in their field. Additionally, retrieval and analysis of a greater number of surveys fell beyond the scope of this applied research given the time-frame and resources available.

7 | DATA ANALYSIS

7.1 | Participant Information

Demographic data such as length of time qualified as a physiotherapist, and type of Pilates instruction qualification, was summarized using descriptive statistics. All numerical data were inputted to Microsoft Excel and statistical calculations made to identify mean, range and standard deviation values where appropriate.

7.2 | Survey Multiple choice questions

Questions requiring participants to select a multiple-choice option regarding preferred treatment parameters, were similarly inputted and summarized via descriptive statistics to identify percentage agreements. Response frequency for each selected benefit of Pilates was summated to display the results in a ranking table.

7.3 | Open ended-questions

The main body of the survey comprised open-ended questions, providing qualitative data. This data was analyzed thematically (Braun &

Clarke, 2006): via a proposed six-step process to ensure methodological quality (Maguire & Delahunt, 2017).

Narrative answers were hand screened individually, using a color-coding system to highlight participant's comments according to their similarity. Similar comments were coded together to provide emerging themes, which were then condensed or combined with other sub-themes dependent on distinction. Themes were repeatedly reviewed for coherence and appropriateness before settling on the final selection. Final themes were divided into three distinct domains of practice relevant to the aims of this study:

- a. Pilates delivery
- b. Benefits of Pilates
- c. Risk and contraindications

Thematic analysis minimally organizes and describes a dataset in detail (Gale, Heath, Cameron, Rashid, & Redwood, 2013), and has been employed in qualitative research evaluating practitioners' views on physiotherapy interventions (Holden, Nicholls, Young, Hay, & Foster, 2009; Stenner, Swinkels, Mitchell, & Palmer, 2016; Ward, Stebbings, Sherman, Cherkin, & Baxter, 2014). Thematic analysis of all qualitative data was firstly completed by the lead researcher, this was then confirmed by the second author to identify and condense themes through repeated review of responses. The second researcher had no active role in initial data collection to reduce bias.

Thematic analysis can usefully summarize key features of a large body of data and highlight similarities and differences across the data set (Attride-Stirling, 2001). This is advantageous in facilitating comparison of physiotherapist's views from an NHS background, and those who work in the Private sector, as patients have previously reported differences in their experiences of treatment received from the two providers (Bradbury, Bishop, Yardley, & Lewith, 2013; Wiles & Higgins, 1996).

8 | RESULTS

Thirty UK physiotherapists who had undertaken formal training in Pilates exercise completed the electronic survey. Demographic data and descriptive statistics for the sample are detailed in Table 1.

Thematic analysis of narrative responses revealed six key themes:

1. Exercises that promote mobility and encourage general movement
2. Individual Pilates Practice should be completed daily
3. Benefit: Reduces fear avoidance and improves body awareness
4. Indicated in individuals who lack core stability, strength and spinal control
5. Situations where Pilates exercises were considered less useful
6. Pilates during the 1st Trimester of Pregnancy and Yellow Flags are only a precaution

9 | THEMATIC ANALYSIS

9.1 | Domain one – Pilates Delivery

9.1.1 | Theme 1: Exercises which promote mobility and encourage general movement

Participants reported various Pilates exercises that they found beneficial in the management of MSK conditions. Thirteen participants advocated exercises that promote general mobility and encourage movement. "I use a lot of the general mobility exercises to encourage patients to move more. I usually intermix this with general strengthening work to encourage movement, increase activity levels, balance and general function" [P2]. This was supported by another therapist, who said "I might give a range of exercises for a more general movement approach or specific ones to target a weakness etc." [P23].

The importance of gluteal exercises including bridging and clams were the most frequently cited followed by transversus abdominis activation, and low-level supine work including pelvic tilting and scissors. Eight physiotherapists reported these exercises were easy for patients to complete at home and required only simple instruction to achieve understanding.

9.1.2 | Theme 2: Individual Pilates practice should be completed daily

Despite general consensus regarding the optimum parameters for Pilates classes (Table 2), there was diversity in opinion concerning how often exercises should be practiced individually. A majority acknowledged that frequency is dependent on desired treatment effect, such as development of strength, flexibility or recruitment. 60% of participants felt daily repetition is the most beneficial approach; "I generally advise at least once daily whilst their symptoms are flared, then slowly wean off to maybe once weekly once their symptoms are settled in order to maintain their progress" [P4]. Several NHS physiotherapists acknowledged the importance of creating routine and familiarization: "To maintain the benefits I would recommend doing them once a day long term and find an exercise they can combine easily into their schedules, so it's a realistic and achievable goal" [P22].

9.2 | Domain two – Benefits of Pilates

Participants reported that Pilates exercise offers a wide range of health benefits. Over 20 different MSK conditions were highlighted specifically, with a majority in agreement that this intervention can benefit LBP. Other commonly cited conditions were hip pathologies and anterior knee pain. Physiotherapists were asked to select what they felt were the most important health benefits from a selection agreed by consensus in an earlier Australian study (Wells et al., 2014a) (Table 3). If a therapist selected a named benefit as one of their "top

TABLE 1 Demographic Characteristics of surveyed Physiotherapists

Participant Number	Time Qualified	Highest Qualification	Pilates Training	Classes currently taught per week	Location (Classes or 1:1 Pilates)
P1	33 Years	MSc	Multiple APPI Courses	2	Private Physiotherapy Practice/Provider
P2	15 Years	BSc (Hons)	Multiple APPI Courses	1	Activity Centre/Hall (Private Class)
P3	5 Years	BSc (Hons)	APPI Matwork Level 1	1	NHS Hospital/Clinic
P4	3 Years	BSc (Hons)	Multiple APPI Courses	1	Gym or fitness center
P5	2 Years	MSc	Multiple APPI Courses	1	NHS Hospital/Clinic
P6	3 Years	MSc	APPI Matwork Level 1	0	Private Physiotherapy Practice/Provider
P7	10 Years	BSc (Hons)	Multiple APPI Courses	3	Private Physiotherapy Practice/Provider
P8	13 Years	BSc (Hons)	Multiple APPI Courses	3	Pilates Studio
P9	33 Years	Diploma	Multiple APPI Courses	0	NHS Hospital/Clinic
P10	2 Years	BSc (Hons)	Modern Pilates Level 4	4	Pilates Studio
P11	10 Years	BSc (Hons)	Multiple APPI Courses	2	Activity Centre/Hall (Private Class)
P12	17 Years	BSc (Hons)	APPI Matwork Level 1	0	Private Physiotherapy Practice/Provider
P13	7 Years	BSc (Hons)	Multiple APPI Courses	0	Private Physiotherapy Practice/Provider
P14	11 Years	Post Grad Diploma	Multiple APPI Courses	2	NHS Hospital/Clinic
P15	23 Years	BSc (Hons)	Multiple APPI Courses	2	Gym or fitness center
P16	15 Years	Post Grad Diploma	Multiple APPI Courses	0	NHS Hospital/Clinic
P17	36 Years	Diploma	Multiple APPI Courses	1	Private Physiotherapy Practice/Provider
P18	15 Years	BSc (Hons)	APPI Matwork Level 1	0	NHS Hospital/Clinic
P19	37 Years	Post Grad Diploma	Multiple APPI Courses	0	NHS Hospital/Clinic
P20	8 Years	BSc (Hons)	APPI Matwork Level 1	0	NHS Hospital/Clinic
P21	25 Years	BSc (Hons)	Multiple APPI Courses	0	NHS Hospital/Clinic
P22	11 Years	BSc (Hons)	APPI Matwork Level 1	0	NHS Hospital/Clinic
P23	16 Years	MSc	Multiple APPI Courses	1	NHS Hospital/Clinic
P24	12 Years	BSc (Hons)	Multiple APPI Courses	1	NHS Hospital/Clinic
P25	10 Years	BSc (Hons)	Multiple APPI Courses	1	Private Physiotherapy Practice/Provider
P26	14 Years	BSc (Hons)	Multiple APPI Courses	0	NHS Hospital/Clinic
P27	7 Years	BSc (Hons)	Multiple APPI Courses	3	Private Physiotherapy Practice/Provider
P28	35 Years	Diploma	Multiple APPI Courses	10	Private Physiotherapy Practice/Provider
P29	32 Years	Diploma	Multiple APPI Courses	13	Private Physiotherapy Practice/Provider
P30	17 Years	MSc	Multiple APPI Courses	4	Private Physiotherapy Practice/Provider

APPI: Australian Physiotherapy & Pilates Institute

NHS: National Health Service

TABLE 2 Optimum Class parameters

	Private Practice (P = 19)			NHS (P = 11)	
Optimum Duration	0–30 min	2	10.5%	0	0%
	30–60 min	17	89.5%	10	91%
	60–90 min	0	0%	1	9%
	90 min +	0	0%	0	0%
Optimum Frequency	Once per week	14	73.7%	5	45.4%
	More than once per week	5	26.3%	6	54.5%
Optimum duration for a Pilates class program	3–6 sessions	6	31.6%	2	18.2%
	6–9 sessions	8	42.1%	7	63%
	9 sessions+	5	26.3%	2	18.2%

TABLE 3 Most important benefits of Pilates identified in rank order

Highest ranked health benefits of Pilates exercise				
Ranking Order	Selected Benefit	Total Number of Votes	NHS ($P = 11$)	Private practice ($P = 19$)
1	Improves body awareness	20	8	12
2	Reduces fear avoidance, unhelpful attitudes/beliefs	16	5	11
3	Improves muscle strength	12	5	7
3	Improves participation in exercise programs	12	4	8
4	Increases activation of stabilizing muscles of the spine	10	5	5

three" it received one vote, these were totaled to identify the most popular recognized benefits.

9.2.1 | Theme 3: Benefit: Reduces fear avoidance and improves body awareness

A third of participants agreed that improving body awareness was the single most important benefit of Pilates exercise followed by reducing fear avoidance. Three physiotherapists also suggested how these two benefits are interlinked: "Improving body awareness certainly helps movement patterns, encouraging normal functional movements is a huge part of rehab. This in turn can reduce fear avoidance and again encourage movement" [P30], and: "Many patients find that the controlled nature of Pilates means they can work within pain free ranges and slowly increase on them. Body awareness/postural control with the right guidance can be largely improved, making even small corrections can turn a movement which was painful into one that wasn't" [P4]. A key factor observed by five therapists in abolishing fearful behaviors was developing patient confidence: "The first significant change patients have reported to me in feedback from classes is increased confidence to move normally and move in ways which they were previously fearful of" [P7], this held close association with increasing exercise participation.

9.2.2 | Theme 4: Indicated in individuals who lack core stability, strength and spinal control

Thirteen therapists highlighted that lack of core stability or spinal control was a key indicator that people would benefit from Pilates: "weak anterior and posterior sling muscles, weak core muscles" [P6], another Therapist specified: "Weak core, Glutes and hamstrings" [P11]. One participant additionally stated that Pilates may offer advantages over other exercise types in this respect: "The education of working the deep stabilizing muscles is important, as often there is weakness here that other forms of exercise appear not to address" [P9]. Six participants also specifically recognized deficits in spinal and pelvic control: "Hyper-mobility benefits from a whole-body approach, also patients with poor hip/pelvis control" [P29].

9.3 | Domain three – Risks and Contraindications

Therapists acknowledged that there are few contraindications to Pilates exercise, seven participants also specified that Pilates can be adapted to avoid risk to the patient. However, some key conditions were recognized that may completely preclude participation, such as unstable cardiovascular issues, recent fracture and recent surgeries.

9.3.1 | Theme 5: Situations where Pilates exercises were considered less useful

Six therapists stated that excessive focus on elements such as core activation and positioning can lead to symptom aggravation. "Sometimes the pure Pilates form is too specific and may cause patients to be too body aware and move in ways that can perpetuate a pain cycle" [P2], this was reflected in other participant's comments: "Thinking they need to brace their core muscles to move can cause unnecessary tension and pain" [P19], and that: "The main risk associated with Pilates is that it is taught in a "purist" fashion i.e. too much emphasis on "neutral spine" and implying that the only safe way to move or exercise is in these specific postures and positions" [P14]. Seven therapists working in private practice advocated that Pilates exercise should be appropriately individualized to avoid risks. "If it is taught properly at the correct level for the patient considering their ability and irritability of pain – exercises should not aggravate symptoms" [P12].

9.3.2 | Theme 6: Pilates during the 1st Trimester of Pregnancy and Yellow Flags are only a precaution

A majority of physiotherapists felt that Pilates during the 1st Trimester of Pregnancy was a precaution, but not a contraindication, stating that previous experience is a factor: "It depends on whether the mother is someone who exercises regularly pre-pregnancy. I would be happy to recommend level one exercises in this instance. Otherwise I would be very cautious" [P12]. Six participants acknowledged the current evidence base: "Guidelines for exercise in first trimester generally recommend it is fine to continue any exercise. I think it depends on the pregnancy/if there are any risk factors/complications and how the individual feels" [P16].

Most reported that patients with yellow flags can greatly benefit from Pilates and this also did not preclude participation. "I think Pilates can be a great way to self-manage psychosocial complaints. Becoming more aware of the 'here and now' in postural/body awareness, allowing designated 'me time' to reduce constant stresses, and benefits of group exercise" [P25]. One Therapist added: "I feel these types of people would benefit from Pilates as its low level and not over strenuous, I've previously used it to overcome fear avoidance and catastrophizing" [P13].

10 | DISCUSSION

A majority of physiotherapists surveyed [18] reportedly taught more than one Pilates class a week and had on average been qualified for 15.8 years. The positive characteristics of this sample enhance the trustworthiness of their feedback, given regular contact with MSK conditions, and considerable physiotherapy experience. One challenge encountered was recruitment of NHS physiotherapists, resulting in the unbalanced response rate between this group and private practice. Perhaps reflective of the purposive sampling method used, and the author's existing contact with private practice physiotherapists.

Physiotherapists in the present study favored a range of Pilates exercises in the management of MSK conditions, but also acknowledged how exercises can be modified in line with participant's needs. The importance of gluteal exercises and posterior chain activation was acknowledged in line with other studies (Gaskell, Williams, & Prece, 2019). Strengthening these areas may reduce incidence and symptoms of LBP (Cooper et al., 2016) and gluteal tendinopathy (Mellor et al., 2018). Both groups generally agreed on optimum class parameters, albeit a small majority of NHS therapists (54.5%) felt classes should be completed more than once a week, an interesting finding given the time and resource pressures upon NHS MSK Departments (Minns Lowe & Bithell, 2000). Physiotherapists acknowledged that individual practice of Pilates exercise is needed for optimum rehabilitation, and many advocated daily repetition, reflecting both APPI recommendations (G. Withers. Australian Institute of Physiotherapy and Pilates Co-founder and CEO. Personal Communication. 14th August 2019) and current guidelines for Physical Activity in the UK (Department of Health, 2011). Therapists also recognized the importance of cardiovascular exercise during the week in contribution to the recommended 30 min of activity per day.

The World Health Organization (WHO) reports that physical inactivity is one of the 10 leading causes of death in developed countries and results in about 1.9 million preventable deaths worldwide annually (WHO, 2002), highlighting the importance of increasing exercise participation. There is recognition that most medical professionals have limited knowledge of exercise, therefore do not prescribe it (Thornton et al., 2016). Few refer patients to exercise specialists, who conversely have insufficient knowledge of disease pathophysiology (De Lyon, Neville, & Armour, 2016; Moore, 2004). Pilates trained physiotherapists are knowledgeable in both pathology and exercise prescription, making these clinicians suitably positioned to address

physical deficits and encourage exercise participation specific to patient needs.

Physiotherapists reported a range of health benefits of Pilates, identifying that reduction of fear avoidance, improving bodily awareness and improving muscular strength being the three most important benefits from a selection agreed by consensus in an earlier Australian Study (Wells et al., 2014a). There was considerable cross-over of narrative themes, suggesting how benefits of Pilates are strongly linked. Reducing fear-avoidance and improving exercise participation held a close association. Encouraging people with MSK conditions to engage with some form of activity facilitates lifestyle change and promotes self-management (Gardner et al., 2017) reducing dependency on healthcare providers for treatment as demonstrated by Hubbard et al. (2004). Regular exercise and successful self-management are positive steps towards relieving healthcare pressures.

In the present study, therapists identified that an individual with poor core stability and strength may benefit from Pilates, which corroborates with findings of a large-scale questionnaire of instructors (Allen, 2014). The principle of core activation often referred to as "centering" in APPI taught Pilates practice, was not ranked highly in comparison to other benefits in this study. Excessive focus on core activation and positioning was described by six participants as a possible risk, leading to hypervigilance, unnecessary core bracing and possibly perpetuating a pain cycle.

This is a novel concept but perhaps mirrors the recent "paradigm-shift" in the holistic management of LBP, whereby excessive core activation and bracing has been perceived negatively in a sub-population of patients (O'Sullivan & Lin, 2014). There is additional recognition of numerous RCTs which have demonstrated that specific stabilizing exercises for NSCLBP are not superior to other conservative approaches (O'Sullivan, 2012; Unsgaard-Tøndel, Fladmark, Salvesen, & Vasseljen, 2010). This suggests that the rationale and practice of Pilates exercise maybe evolving, improvements in pain and disability demonstrated in systematic reviews (Byrnes et al., 2018; Wells, Kolt, Marshall, Hill, & Bialocerowski, 2013) may be attributed to other global benefits highlighted in this study (such as facilitating movement) rather than "core stability".

Therapists acknowledged numerous health conditions which may contraindicate participation in Pilates exercise, such as unstable cardiovascular issues. However, a majority recognized that participants must be considered individually, and that Pilates can be adapted to accommodate these factors. This may offer further insight as to why consensus agreement was only reached on 55% of contraindications in an earlier qualitative study (Wells et al., 2014b), including radiculopathy and significant hypertension.

Discrepancies regarding risks and contraindications involved Pilates exercise during the first Trimester of pregnancy, similarly to Wells' et al. (2014b) research. Therapists in the current study recognized that modified Pilates is a safe form of exercise for most individuals, dependent on their medical history. This was in keeping with guideline recommendations from The American College of Obstetricians and Gynaecologists (American College of Obstetricians and Gynecologists, 2017). However, few therapists acknowledged the importance of

routine screening and assessment of medical and obstetric risks prior to commencing exercise, or acknowledged key contraindications such as pre-eclampsia, additionally stipulated in the guidelines. A previous survey of Pilates instructors (Mazzarino, Kerr, & Morris, 2018) investigating Pilates during pregnancy acknowledged that this was an issue of concern, given that women often self-refer to Pilates (particularly in private physiotherapy practice) without medical referral, therefore screening of absolute contraindications may be important in safeguarding practice.

Pilates is possibly an underused approach within the NHS; such an accessible exercise method can significantly influence patient's engagement with activity, and help individuals achieve recommended levels of exercise. Reduction in activity levels in elderly populations, and those with lifelong conditions is a prominent issue (Woolf & Pfleger, 2003), enabling these individuals to increase participation in exercise and activity is a vital way of combatting this crisis (Taylor, 2014). Future research could further investigate Pilates delivery within the NHS and how this influences factors such as fear avoidance and activity participation. Qualitative comparison of patient's views may draw further advantages over other class based rehabilitation programs (Hurley, Walsh, Mitchell, Nicholas, & Patel, 2012; Underwood, 2004).

A limitation of the present study was the purposive sampling method, considering the associated potential selection bias (Sharma, 2017), in addition to the level of evidence this study generates (expert opinion). However, this approach was warranted in order to gain suitably qualified, and therefore reliable views from Pilates trained physiotherapists. Although considered the lowest level of research evidence (Howick et al., 2011) this is negated somewhat by the benefits of qualitative research, investigating real world and lived experiences, and providing rich insight into therapists' viewpoints that quantitative research could not achieve (Legard et al., 2003).

Pilates trained NHS and Private Practice physiotherapists identified a range of inter-linked benefits of their exercise method. The most important factors identified were reduction in fear-avoidance, improving bodily awareness and increasing muscular strength. The benefits for a number of health conditions are not reflected in quantitative studies and guideline recommendations, justifying further research. Therapists identified that Pilates is a hugely modifiable exercise method, adapting exercises for the individual can further encourage participation, and negate the restriction of some health conditions or circumstances, which would otherwise contraindicate participation. NHS and private practice therapists utilize Pilates in a similar way, although the rationale for its use may differ, with some evidence that the justification for Pilates exercise may be evolving. Pilates appears a valuable and possibly under-used methodology in the NHS, which can help patients engage with activity.

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CONFLICT OF INTEREST STATEMENT OF ALL AUTHORS

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TRIAL REGISTRATION

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APPENDIX A: | Appendices**A.1. | Appendix A: Survey Questionnaire**

"How is Pilates based exercise therapy utilized and valued by MSK physiotherapists with formal Pilates training in current practice? A survey questionnaire".

* Required.

Rationale for the Project.

The aim of this research project is to investigate physiotherapist's opinions regarding the risks, contraindications, benefits and limitations of Pilates for the management of MSK conditions. It additionally aims to investigate physiotherapist's opinions on how Pilates should be delivered in terms of dosage and frequency.

There is a significant lack of qualitative evidence investigating how Pilates exercise is delivered. Existing studies have only focused on populations with low back pain and have additionally found discrepancy in clinician's views regarding contraindications and treatment parameters. Qualitative research in this area can be valuable in exploring how and why physiotherapists select specific Pilates exercises, why there are certain health contraindications to this method and whether Pilates can be beneficial for MSK conditions other than LBP. Physiotherapist's expert views may also identify other benefits of Pilates, not yet recognized in existing literature.

How to complete this questionnaire.

For the purposes of gaining valuable and informed opinion one of this project's inclusion criteria is that participants must have undertaken some form of Pilates instruction training.

This is not specific to any institution or training provider (i.e. BCP or APPI), as long as some type of training has been completed for example – APPI Foundation Matwork Level 1.

The first section is the participant consent form. Please read this to give your consent to participate, by ticking the selection box.

The questionnaire then follows in the next sections.

Several questions are to retrieve demographic data – this will not be used to identify you in the final project write-up or publication.

Some questions are comprised of multiple-choice questions. Please make your selections by ticking the appropriate box.

Other questions are open-ended questions – requiring text input response. Please type your responses in the text box for each section.

Please feel free to answer with as much text detail as you feel is required to explain your selection or rationale, all responses are valuable to achieve this project's aim in gaining further insight as to why physiotherapists hold certain views.

Your informed opinions and experience could potentially influence how Pilates is delivered individually and in class formats in the future.

The questionnaire should take approximately 15 minutes to complete.

You can withdraw at any time, simply do not complete the survey.

All your responses are confidential, the only people who will examine completed surveys for data analysis will be the lead researcher () and the project supervisor at the University of(). The study is a research project completed as part of a Masters in Advanced Physiotherapy Degree at the University of.

Your involvement in this research project is greatly appreciated, if you would like to find out more or discuss the study in any more detail, please do not hesitate to contact me on the above email or on.

Contact information for researchers:

(Removed as part of submission blinding)

Research Participant Consent Form.

Ethics Ref No: HST1819-194.Name of Researcher:

1. I can confirm that I am registered with the HCPC (Health and Care Professions council) to currently practice as a Physiotherapist without restriction in the UK * *Check all that apply.*

Yes

2. I can confirm that I have previously undertaken a recognised form of Pilates Training *

Check all that apply.

Yes

3. I understand that participation in the study is entirely voluntary and that I am free to withdraw at any stage without explanation * *Check all that apply.*

Yes

4. I understand that information collected during the study will be held in a secure location within the University of _____ and that at no time will I be identified as a participant in the study except as might be required by law and that I give my permission for the researcher to hold the personal data * *Check all that apply.*

Yes

5. I agree to participate in the study * *Check all that apply.*

Yes

6. Name of Participant:

Name of researcher:

Signature:

Demographics

7. How long have you been qualified as a Physiotherapist? *

*

8. Please select your highest level of university qualification related to physiotherapy: * *Mark only one oval.*

BSc (Hons)

MSc

PhD

Other: _____

9. What is your Pilates training qualification? *

10. . Do you currently instruct Pilates classes on a regular basis? If so how often? *

11. . Where do you usually teach Pilates? (Class format or 1:1) * *Mark only one oval.*

NHS Hospital / Clinic

Private Hospital

Private Physiotherapy practice

Gym or fitness centre

Other:

Pilates Delivery

This research is a Qualitative Study, therefore please feel free to answer with as much text detail as you feel is required to provide your answers or explain your rationale, all responses are valuable.

12. . If you see patients / clients on a 1:1 basis, do you use Pilates exercises as part of your treatment? Which exercises do you find more useful and why? *

For Pilates exercise to be effective in a class format for MSK conditions, please select the minimum parameter values you feel are appropriate

13. . In your opinion, what is the optimum duration for a Pilates class? * *Mark only one oval.*

0-30 minutes

30-60 minutes

60-90 minutes

90 minutes +

14. . To be beneficial, how often should Pilates classes be completed? * *Mark only one oval.*

Once per month

Fortnightly

Once per week

More than once per week

15. . What is the optimum duration for an entire Pilates class programme? * *Mark only one oval.*

- 0-3 sessions
- 3-6 sessions
- 6-9 sessions
- 9+ sessions

16. . For people with MSK conditions to benefit from Pilates exercise, how often would you recommend they complete exercises at home? Please briefly explain your rationale *

Benefits of Pilates

17. . Numerous MSK conditions reportedly benefit from Pilates as an intervention. In your opinion, which specific MSK conditions benefit the most from Pilates? *

18. The following benefits of Pilates have been suggested for people with MSK conditions. In your opinion, what are the three most important benefits of Pilates? Please make three selections, ranked in order of importance using the columns below. *Check all that apply.*

	Selection 1	Selection 2	Selection 3
Reduces fear avoidance, unhelpful attitudes/ beliefs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhances relaxation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improves body awareness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improves breathing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improves flexibility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improves muscle strength	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improves participation in exercise programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increases postural control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increases activation of stabilizing muscles of the spine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduces pain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. . Please could you explain why you selected the above most important three ranked benefits of Pilates? *

20. . Please list any other benefits of Pilates exercise for people with MSK conditions:

21. . What clinical features have you recognised in individuals whom you feel would benefit from Pilates exercise? Explain your rationale *

Risks and contraindications

22. . A discrete number of risks of Pilates exercise have been previously suggested, such as symptom aggravation. In your experience, in people with MSK conditions, are there other risks of Pilates? Please briefly explain your examples *

23. . Several complete contraindications to Pilates exercise have been suggested. Do you feel there are any medical conditions or instances which would contraindicate Pilates exercise, in people with MSK conditions? *
