

Introduction

An estimated 17.8 million people live with a musculoskeletal condition in the UK, which is around 28.9% of the total population (Global Burden of Disease, 2016). The prognosis is often poor with many people reporting persistent musculoskeletal pain 6 to 12 months after consulting their primary care practitioner (Henschke, Maher, Refshauge, Herbert, Cumming, Bleasel, et al. 2008: Von Korff and Miglioretti, 2005). Chronic musculoskeletal conditions such as osteoarthritis affect the back, neck, shoulder, knee and multiple sites and can result in reduced function and poorer quality of life for individuals and increased demands on health services (Vos, Flaxman, Naghavi, Lozano, Michaud, Ezzati, et al. 2010: Woolf and Pfleger, 2003). The persistent nature of musculoskeletal pain may impact on the person physically, psychologically, and socially leading to sedentary lifestyles (World Confederation for Physical Therapy (WCPT, 2012). Exercise based management is commonly advocated for the 8.75 million people aged 45 and over that have sought treatment for osteoarthritis (Arthritis Research UK, 2013: Hochberg, Altman, April, Benkhalti, Guyatt, McGowan, et al. 2012: Wang, Zheng, Yu, Bi, Lou, Liu, et al. 2012:).

Pilates exercise utilises a combination of core stability, posture, flexibility, strength, breathing, and movement control incorporating more than fifty different exercises with different levels of intensity. Contemporary systematic reviews of Pilates exercise have reported positive benefits including reduction in pain and disability (Aladro-Gonzalvo, Araya-argas, Machado-Diaz, Salazar-Rojas, 2012; Lim, Poh, Low, Wong, 2011). One approach to delivering Pilates is in a group which can also facilitate individualised exercises depending on an individual's needs, preferences, conditions, functional abilities and goals. Further, group Pilates may lead to long term adherence and better outcomes (Karlsson, Gerdle, Takala, Andersson, Larsson, 2018). Despite the fact that in the UK, Pilates based exercise therapy is commonly used within both the National Health Service (NHS) and in private healthcare, there is limited evidence for exercise prescription and clinical reasoning for optimal delivery of it which contrasts with over 500 randomised controlled trials of exercise (Wells, Kolt, Marshall & Bialocerkowski, 2014). Furthermore, clinical trials of Pilates exercises are heterogeneous in their description of Pilates exercise, the cohorts studied, programme parameters, equipment, type of exercise and levels of supervision,

making it difficult to apply the findings into clinical practice (Wells, Kolt, Marshall, Hill, Bialocerkowski, 2013). One Australian based study reviewed the indications, perceived benefits and risks of Pilates exercises for chronic low back pain (Wells, Kolt, Marshall, and Bialocerkowski, 2014) but did not review preferences regarding optimal delivery or clinical reasoning behind the exercises used.

To ensure maximal effectiveness of exercise approaches for a diverse range of musculoskeletal conditions clinical reasoning along with evidence should be used. (Latimer, Maher, et al 2012; Hayden, van Tulder, Tomlinson, 2005; Slade, Patel Underwood and Keating, 2015). Patient preference and being treated as an individual is also key to motivation (Stenner, Swinkels, Mitchell, and Palmer, 2016). Qualitative research can be used to investigate the wider concepts related to physiotherapy practice, including exercise prescription and use of evidence or patient preference in the delivery of Pilates classes for people with musculoskeletal pain. There is a paucity of qualitative evidence on the perceptions, clinical reasoning and use of evidence within the Physiotherapy led Pilates classes (Gaskell and Williams, 2019). Therefore, the aim of this study was to investigate the perceived benefits and rationale for Pilates classes for people with musculoskeletal conditions amongst Pilates trained physiotherapists as an exercise prescription.

Methods

A qualitative phenomenological approach was used to provide detailed data without any pre-existing theoretical preconceptions (Legard, Keegan and Ward, 2003; Jones, 2007). It is an inductive, descriptive research approach developed from phenomenological philosophy; its aim is to describe an experience as it is lived by the person including their beliefs, meanings, and attributes. It is useful to analyse topics which are complex, novel and involve experiences and processes (Lokman, 2006; Smith and Osborn, 2015).

A questionnaire was chosen to understand individual decision processes, usability and preferences for Pilates and to review if differences and similarities exist among reference group members. A nominal group technique was used to develop the questionnaire which consisted of two physiotherapy lecturers (one trained in Pilates)

and a Pilates trained clinical physiotherapist. The questionnaire took approximately 15 minutes to complete depending on the length of feedback given. The open-ended questions allowed for detailed exploration of a single respondent's reactions and reduced the likelihood of transcription errors (Jones, 2007). Further, this method of data collection reduces the risk of social desirability bias (Metcalf *et al.*, 2001) strengthens the repeatability of results by nullifying the influence of dominant individuals in a group setting (Hsu 2007) and is an efficient means of collecting data from a dispersed geographical sample (Smyth, Dillman, Christian, McBride, 2009). Ethical approval was given from the University of Salford Reference HST1819-194.

Recruitment

Pilates classes are frequently used in private physiotherapy clinics. Overall, private physiotherapy has been appraised more positively than physiotherapy within the National Health Service (Bradbury, Bishop and Yardley 2012). Participants were recruited via purposive sampling to select Physiotherapists formally trained in Pilates method working in private practice. Only physiotherapists who delivered weekly Pilates classes and had been dually qualified for three years were included in order to ensure that informed opinions were achieved as advocated by Keeney, Hasson, McKenna (2011). Snowballing techniques were utilised to identify potential respondents and to increase the sample size and diversity of respondents. Snowballing consisted of participants recommending others to be involved in the study based on the study inclusion criteria and aims (Portney and Watkins, 2009).

Inclusion Criteria

1. Chartered physiotherapist currently practicing in the UK with at least three years of experience teaching Pilates.
2. Experience managing people with musculoskeletal pain with Pilates exercise in private physiotherapy practice at least on a weekly basis.
3. Proficient in the use of written English language, have access to e-mail and to commit time to complete the questionnaire.

The primary researcher (L.G.) e-mailed Pilates trained physiotherapists who met the inclusion criteria with a study information sheet and a consent form. Participants

were invited to contact the primary researcher to discuss the project if needed. Interested participants e-mailed their signed consent forms to the principal researcher and were recruited into the study. Data collection commenced once 15 participants were recruited and responded to the questionnaire

Data Collection and analysis

The questionnaire (Table 1) consisted primarily of open-ended questions to allow participants to express their rationale, preferences and opinions without leading information to reduce bias (Choi and Pak 2013). Responses to the open-ended questions were summarized qualitatively using thematic analysis, which is defined as 'a method for identifying, analysing and reporting patterns (themes) within data (Braun and Clarke, 2006). Two independent researchers (L.G and AW) were involved in this process to ensure validity and consistency of the approach.

Results

Fifteen chartered physiotherapists (twelve female) from seven clinics within the North West of England with further Pilates Qualifications (either APPI or Certified Pilates instructor through Integrated Balance and Pilates Method Alliance) responded via electronic questionnaire. They each delivered weekly Pilates classes for people with a myriad of musculoskeletal conditions in middle and older age.

The length of time qualified as a chartered physiotherapist was (mean 19 years) and post Pilates instructor qualification was between three to 16 years (mean 10 years). They taught between one and five weekly Pilates classes with between four and 10 participants attending each class. (Table 2).

All participants ran Pilates classes which included patients with a range of chronic musculoskeletal conditions. Most of the classes were mixed ability, three of the seven clinics offered stratified classes depending on the participant's condition and ability. All Physiotherapists offered a range of different levels of each exercise within weekly Pilates classes. Patients with a range of musculoskeletal conditions were enrolled onto a rolling programme of between four to six 60-minute classes and had

the option of enrolling for further classes. Some patients continued for months and some for several years.

The age of patients attending the classes were reported to be 16 to 85 years of age with most classes being delivered to people of between 30 and 70 years. They had diverse musculoskeletal pain including chronic low back pain, neck pain, thoracic pain, chronic osteoarthritis affecting the hips and knees and a range of shoulder conditions including post-operative and shoulder instability, fractured humerus, fractured wrist, fractured tibia, discectomies', hernia repairs, and rotator cuff or capsular surgery.

Six key themes outlined below emerged from the physiotherapists including;

- 1.Perceived Benefits; Improved Function and Increased Levels of Activity;
- 2.Perceived Benefits; Ability to Self-Manage their Musculoskeletal Pain;
- 3.Adaptability and Efficacy of Group Pilates Exercise;
- 4.Optimum Combination of Exercises Used Within a Class;
- 5.Physiotherapist Opinion and Rationale for the Most Effective Exercises;
- 6.Precautions and Specific Exercises Thought to be Less Useful or Used Cautiously.

Thematic analysis

1. Perceived Benefits; Improved Function and Increased Levels of Activity

Most participants considered that Pilates group exercises resulted in a combination of physical benefits including increased core strength, improved posture and body awareness, improved flexibility, increased joint stability, improved balance and function as P9 reveals, *“The increase in physical activity, combined with increase in body awareness, general conditioning, muscular strength and core stability albeit difficult to measure – anecdotally with many makes a difference in everyday functioning”* . Increased function was considered important for older people and those with chronic conditions with P4 identifying that *“Increased strength and balance seen in people in middle and older age is essential for maintaining independence, reducing sarcopenia and risk of falls”*. Further, P5 had observed that *“Some older participants have returned to running, and golf and this improves their confidence and quality of life”* and P14 describes the benefits as *“Quick*

improvements in flexibility and strength, helps them with their job, hobbies and basic activities such as sitting to standing, stairs, and getting out of bed in a morning”.

Five participants agreed that Pilates enabled people to achieve the recommended levels of weekly physical activity. For example, *“Pilates is a catalyst to change sedentary lifestyles I advise them to do 30 minutes of purposeful activity every day, which “should” involve an increase in heart rate during the week”* [P9]. and *“Pilates could be classed as one of your two strengthening exercises a week but you need to emphasise some cardiovascular exercise as well including cycling, brisk walking etc”* [P1]. However, P4 identified that *“Some people do attend two Pilates classes a week and most people go on to do additional sports/exercises on top of the class after achieving better function”* [P4]. P2 reveals that persistence with Pilates based exercise results in increasing ability to do the exercises, *“Patients who have been coming to class 10 years swear by it, I have taught it for 8 years now and some people unable to do exercises initially are now better than me at them”.*

2. Perceived Benefits; Ability to Self-Manage their Musculoskeletal pain

Most commented that Pilates exercises promoted participants self-management by reducing their levels of pain and improving their movement patterns and posture. All gave Individualised exercises to facilitate self-management for a diverse range of MSK conditions. Six prescribed home exercises that specifically eased pain and controlled flare ups. Five prescribed exercises to ameliorate a specific problem such as a weakness, stiffness, asymmetry, or poor stability observed in the participant during Pilates classes. As P4 reveals, *“I consider the patient’s individual issues and tailor exercises that may be more difficult but ultimately more helpful for them depending on their irritability and goals”.*

Further, P3 comments *“People who have been doing classes for years appear to be consistently more active with less pain overall and not have a recurrence of back pain”.* And P6 identifies the benefits in that *“The difference in some people’s pain levels is evident on their face, they are different people from when they started and can manage it between class”.* The *“Knowledge of the importance of good posture and normal movement is key to people managing their condition”* [P10] and this is supported by P4 who states that *“They understand that good alignment and core*

strength is the only thing to help people with spine, hip and knee degeneration to improve their everyday function” and also P5, “The quick improvements they see in posture, control and strength is key to them being onboard with exercises and empowers them to manage themselves”.

Some suggested the smaller classes enabled them to give individual advice and exercises to promote self-management as P13 states *“The small classes are geared to individual needs and is a bridge between physiotherapy and gym-based Pilates”* and *“Physiotherapists are in an ideal position with their knowledge of anatomy and physiology to educate and devise specific exercise plans”*. Aligned with this P11 states that *“In large gym classes people are left to do exercises without supervision and are unsure if they are doing them properly. Gym instructors cannot instruct individually in larger groups”* and P9 supports this by stating that *“Regular supervision and correction of client with medical or musculoskeletal conditions is key as they will often continue to perform exercise (even if in pain) to keep up with peers”*. P6 summarises the importance of this by staying that *“Correction of exercises is important to improve compliance with exercise and reassures them to be able to continue at home”*.

Five commented that self-management was needed for people engaged in higher levels of activity to reduce recurrent injury risk and pain, as P1 states *“Sometimes it is key to strengthen the core and glutes for athletes, to reduce loading and tightness in the hamstrings”* and P4s thoughts align with this *“Pilates is useful for recreational runners and people who go to the gym because of improved alignment, strength and movement patterns to improve performance”*.

3. Adaptability and Efficacy of Group Pilates Exercise

Four emphasised the importance of a series of six weekly Pilates classes so that a *“Weekly class becomes routine”*[P3] and *“Access to a class in their locality is important for constant exercise in terms of reassurance, supervision, and feedback which precludes individual participation just using you tube Pilates”*[P4] and that *“It is useful as a social interaction especially for older people it is also good for mental wellbeing because it is a mindful type of exercise emphasising control and quality”* [P5]. *“The group dynamics help people compare the way they do exercise to others which may be helpful”* [P12].

Most agreed that Pilates is adaptable to people's needs, can be done by anyone, of all ages, doesn't need any equipment, and can be reproduced at home. All said that they used different levels of exercises depending on people in their class. *"I offer 3 different levels for most exercises"* [P14] and specifically examples included *"I had someone with fractured humerus (more shoulder ROM exercises, pillows to lie on, exercises in standing, rather than side lying, band exercises) and Fractured tibia and fibula -ORIF in early stages (no weight bearing on affected leg, all mat based activities, maintaining strength and ROM of affected leg"* [P2]. Another suggested modification such as *"If I have someone with an arthritic neck, I do reverse abdominal curls instead of sit up type exercises to keep necks supported and do more strengthening exercises specifically for their neck and avoid 4-point kneeling for people with knee and wrist pain or give them a pillow"* [P2].

4. Optimum Combination of Exercises Used Within a Class

Most included a combination of abdominal, gluteal and oblique exercises along with upper and lower limb strengthening with additional exercises for balance and flexibility. Examples were *"I always follow a pattern of warm up with gentle pulse raiser / whole body movement, main section and cool down stretches"* [P9]. Also, P5 reveals *"I emphasise the importance of a cylinder of strength and a balance of working all muscle groups to prevent muscle imbalance and work the triple leg extensors and arms in each class to give a full body workout"*. One suggested *"sometimes people need to do exercises they don't like more because the reason they don't like them is because they find them hard for example specific weakness or stiffness"* [P2]. They rationalised the progression of exercise by increasing leverage, altering speed, endurance or use of a challenging position and *"Increasing the exercises from level 1 to level 3"* [P14].

Six respondents suggested they changed the exercises week to week *"I use the activation of primary slings, and rotate week to week for example focus on lumbopelvic work, side lying work, prone work"* [P9] and *"to make it interesting I focus on one aspect for perhaps half of the class emphasising a particular set of exercises for example abdominals one week or extensors next week"* [P12] and *"Occasionally I will include different exercises including the ball or Theraband exercises to increase variety and challenge people with different needs"* [P4] and *"I*

tend to progress the difficulty of the exercises each week for 6 weeks (but still giving easier variations for the beginners) so the exercises are dictated by that. If I have a class with lots of similar aches and pains for example shoulder pains then I will try and incorporate more shoulder strengthening and stability exercises in prone lying or all 4's" [P2] and "Sometimes the exercises are decided by who is in the class for example if a class is smaller, they are given more appropriate exercises or asked what they prefer" [P11].

5. Physiotherapist Opinion and Rationale for the Most Effective Exercises

Interestingly, their preferred and most commonly utilised exercises were divided into three distinct areas 1. Stability, better movement patterns and motor control, 2. Abdominal exercises and 3. Posterior chain and gluteal exercises. This was aligned specifically to the needs of the people in the classes.

Five participants suggested correct technique and ability to achieve a neutral spine better stability and control of movement was the most important concept. *"The most important thing is to imprint the spine if they can't maintain neutral" [P8]. "Use of pelvic tilts- learning to engage the core developing stability and move segmentally through their spine using roller to get feedback" [P9].* This was reiterated by P13 who described that *"Incorporating Roll down for intersegmental flexibility is key for older people with poor posture and stiffness".* Three respondents suggested improving core stability in different directions to control flexion, extension, rotation give. *"I use balance exercises especially for the older participants when you can see the deterioration of balance when they stand on one leg" [P5] and "Standing balance exercises are useful for people with hip and knee OA" [P14].*

Five suggested that abdominal exercises were the most important exercises within classes and three respondents suggested including the obliques *"Side plank-core/shoulder adding UL or LL movement for multi-directional challenge and Side lying leg circles to challenge rotational instability essential for people recovering from disc herniation" [P4]. "Global stability and strength by knee folds and scissors controlled sit up for global and rotational stability and control of neutral spine and body alignment for people who have had children or deconditioned" [P11].*

Six stated posterior chain muscles were the most important to address imbalances within the trunk. *“Bridging with variations, is essential personally I feel a lot of low back pain patients who lack activation /strength/awareness of glutes therefore bridging offers a good way to influence this I use them in every class”* [P9]. *“Bridges including glut med and max good all-rounder and can be progressed in various ways unilateral and bilateral”* [P1]. *“The Superman exercise is good for posterior chain activation and rotational control and all people can do a version or level of it and is useful for people who sit all day”* [P6]. The bridge and gluteal exercises were seen to be important for the more active participants to control for overactivity or dominance in the anterior chain. Examples included, *“I use the side lying exercises, clams, hip abductions for glute strength/activation which tends to be a real problem in a lot of the athletes I treat and are very important in back pain and injury prevention”* [P1]. *“Posterior chain exercises are very important as my patients tend to be anterior chain dominant from a military background”* [P7]. This was reiterated by P4 who identified that, *“Some patients who have been very fit have over dominant abs/ hip flexors and had difficulty in lying prone so need to stretch and activate posterior muscles”*.

6. Precautions and Specific Exercises Thought to be Less Useful or Used Cautiously

Most physiotherapists agreed there were numerous precautions including red flag signs, acute disc herniations, severe stenosis and spondylolisthesis, worsening neurological symptoms, recent spinal fractures, tumour in the spine, severe osteoporosis, acute injury, time post operatively, pain levels above 5/10 numerical rating scale, high irritability in terms of movement. Specific examples included *“Participants following total hip replacements not able to any ‘Z sit’ or internal rotation of the operated hip”* [P8] and *“I am careful with pelvic injuries such as not overstretching adductors and hamstrings due to connection with sacroiliac ligaments/pubic ligaments”* [P1].

Seven stated specific directions of movement, positions and loading exercises may be contraindicated depending on a person’s pathology. Four suggested using caution during flexion type abdominals with prolonged neck flexion for people with neck pain. Five stated no extension work or prone exercises for people with

spondylolisthesis and stenosis. Five suggested excessive loading in flexion for disc pathologies such as straight leg scissors or bilateral straight leg raises may increase load along with 'spinal rotation especially combined with flexion or abdominal curls. Five said they did not use specific exercises including the 'Z sit', Seal or Crab type exercise, spine rolls with legs behind neck which *"could cause injury by loaded flexion and is too difficult for majority of clients without compensations to achieve movements"* [P8].

Improved function, increased levels of activity along with an improved ability to manage their own condition were seen to be the benefits of Pilates. This was achieved by the adaptability and variety of exercises utilised within the Pilates method of exercise. The small numbers within the classes were key in the choice of exercises utilised in line with evidence and patient preference. The Physiotherapists preferred different types of exercise including abdominal, gluteals, balance, stability and motor control. This was again related to evidence, clinical reasoning and the participants within the classes. Notably, the physiotherapists were aware of contraindications and precautions and were able to modify exercises for people with acute or irritable conditions. They also did avoid certain positions and specific exercises completely.

Discussion

This study has revealed that the perceived physical benefits of physiotherapy-based Pilates were seen to be a combination of reduced pain, improved stability, strength, flexibility, balance, and body awareness and function along with an ability for patients to manage their condition better. Physiotherapists are seen to be experts in movement and exercise, with a thorough knowledge of functional anatomy and pathology and are the ideal professionals to promote, guide, and prescribe group and individualised exercise appropriate for the patient's age, current injury, disease or symptoms (WCPTA, 2012).

Systematic reviews of Pilates (Aladro-Gonzalvo, Araya-Vargas, Machado-Diaz, Salazar-Rojas 2012; Wells, Kolt, Marshall, Hill, Bialocerkowski 2013; Byrnes, Wu, Whillier, 2018) have reported improvements on pain and disability outcomes. However, several of the other proposed benefits such as, improved posture and

movement control with carry over to some achieving recommended levels of weekly physical activity, continuing at work and hobbies and facilitation of self-management have not been verified by clinical trials (Wells et al, 2014). These holistic benefits may be significant particularly for older participants by reducing levels of inactivity seen as a result of ageing and chronic conditions demonstrated in a previous study of Pilates (Gaskell and Williams 2018).

The facilitation of a self-management approach was achieved by giving specific advice and exercise to reduce patients pain levels, manage flare ups and give them the confidence to be more active. Support and advice from health care professionals to continue to exercise during short exacerbations of pain may be crucial to reduce fear avoidance and inactivity, and positively affect patients' attitudes and beliefs, and health outcomes (Darlow, Fullen, Dean, Hurlwy, Baxter, Dowell, 2012; Gardner, Refshauge, Smith, McAuley, Hubscher and Goodall, 2017; Littlewood et al, 2015). Reducing physical inactivity is essential since it is one of the 10 leading risk factors for death worldwide, costing an estimated €1.9 billion a year in healthcare and €9.4 billion a year in economic costs in the UK (World Health Organisation WHO, 2009).

The Physiotherapists in this study suggested the adaptability of Pilates for a range of musculoskeletal conditions was achieved by using a combination of exercises for the trunk, upper and lower limbs aligned to participants function to restore stability deficits and improve global strength. The small weekly classes facilitated this patient centred approach. Physiotherapists had preferences for either abdominals / anterior chain, gluteal and posterior chain, balance, stability, flexibility and motor control exercises depending on the participants of the class. Examples included posterior chain activation for people who were anterior dominant (gym, military staff or people who sat for long periods during the day). Anterior chain activation for the spine, post-partum and generally deconditioned participants. Balance and increased flexibility for the elderly. Exercises were linked to evidence including movement direction preference for specific pathologies McKenzie method (Hefford, 2008), motor control deficits and directional stability (O'Sullivan, 2005; Dankaerts and, O'Sullivan, 2011) and graded activity (Macedo, Latimer and Maher, 2012).

All the physiotherapists in this study were aware of the potential risks of exercise and avoided or modified exercises in line with the patient's condition. They modified the position, load direction, leverage and repetitions of exercises and did not include common exercises that could put excessive strain on the spine. Some clinics even stratified classes according to the participants ability and condition. Education regarding correct technique, supervision of exercises, and small classes were seen to increase efficacy and safety of Pilates exercise for people with chronic conditions in agreement with the study by Wells, Kolt, Marshall and Bialocenkowski (2014). This is important for the demographics within the Pilates classes since the incidence of adverse events with exercise may be higher in people with comorbidities common in the ageing population (Burr, Shephard, Cornish et al, 2012).

Systematic reviews have demonstrated evidence for the effectiveness of Pilates for musculoskeletal pain, however, there is no conclusive evidence that it is superior to other forms of exercise on specific outcomes. The decision to use Pilates will ultimately be based on the patient's or care provider's preferences, and costs (Yamato, *et al.* 2015). People respond to different exercises according to their specific condition, needs and preferences. However, this study has shown that Pilates can be modified to benefit people with a wide range of conditions that result in musculoskeletal pain.

A limitation of this study is the small sample size. However, a purposive sample was selected to produce reliable data and enhance credibility of findings by including only experienced Physiotherapists with formal Pilates training and experience. This exploratory study has provided a unique insight into the proposed benefits and rationale for the delivery and utility of group Pilates exercise classes for a myriad of conditions. Further studies may include patients within the National Health Service.

Conclusion

The perceived benefits of Pilates group exercise as revealed by physiotherapists included physical improvements and improved self-management for people with a range of musculoskeletal conditions. The physiotherapists used a combination of exercises in each class to address all the main muscle groups and rationalised to the patients' needs and ensuring safety. Exercises were also linked to evidence around

motor control, neuromuscular control, direction preference and biomechanical principles. Most physiotherapists advocated a self-management active approach that encouraged people to be active beyond their baseline level. In some cases, this was seen to facilitate levels of recommended weekly physical activity as recommended by Department of Health 2011.

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