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A Survey of Healthcare Professionals' Perceptions of the Effectiveness of Hydrotherapy on Improving Patient Mobility Compared to On-Land Interventions.

By

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Abstract

Background: Hydrotherapy, an aquatic therapy known for its therapeutic properties, has shown positive outcomes in treating various conditions. Despite its effectiveness, it remains underutilised compared to land-based interventions. There is a gap in understanding its benefits and the reasons for its underutilisation from a healthcare professionals' perspective, emphasising the need for research and awareness.

Objectives: To explore healthcare professionals' perceptions and knowledge of hydrotherapy's effectiveness on patients with mobility difficulties and understand barriers affecting its utilisation and accessibility.

Methods: A cross-sectional online survey was conducted. A pilot survey was conducted by three participants. The survey explored: demographics; experience and familiarity; patient populations; effectiveness perception; utilisation barriers; patient preferences; integration; research and evidence; potential solutions; and additional comments. The survey was composed of both qualitative and quantitative questions. The data was analysed using descriptive and content analysis.

Findings: Twenty-two healthcare professionals responded to the survey through volunteer sampling. Thirteen of the twenty-two participants met the inclusion criteria of having at least one year of experience with hydrotherapy. Four main themes from the results emerged: effectiveness perceptions, utilisation challenges, training/education needs, and hydrotherapy compared to land-based methods. Most participants recognised hydrotherapy's effectiveness in improving mobility but saw it as more effective when combined with land-based interventions. Barriers to utilisation included financial constraints, accessibility, and lack of awareness. Potential solutions to these barriers were addressed.

Conclusion: Hydrotherapy was viewed as an effective intervention for the improvement of mobility in patients, especially in conjunction with land-based exercises. However, barriers were raised to the utilisation of hydrotherapy, which must be addressed in future research and clinical practice.

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Abbreviations

ATACP	Aquatic Therapy Association of Chartered Physiotherapists
HCP	Healthcare Professional
LBP	Low Back Pain
MSK	Musculoskeletal
NICE	National Institute for Health and Care Excellence
OA	Osteoarthritis
QOL	Quality of Life
RCT	Randomised Control Trial
ROM	Range of Movement
TUG	Timed Up and Go
WHO	World Health Organisation

1. BACKGROUND

1.1. Introduction to Hydrotherapy

Hydrotherapy is an ancient therapeutic modality that traces back to the Greeks and the Romans, (Van Tubergen and Van der Linden, 2002), where public baths gained popularity over the centuries. In recent times, Sebastian Kneipp, often called the 'father of hydrotherapy,' extensively wrote about water's therapeutic benefits and pioneered the Kneipp Cure in the 19th century (Kneipp, 1896). This emphasised hydrotherapy as a more traditional approach to medicine and focused on exercise, herbalism, nutrition, and the balance of the mind and body (Ko, 2016). Today, hydrotherapy as defined by the Aquatic Therapy Association of Chartered Physiotherapists (ATACP), represents a warm pool designed for aquatic physiotherapy treatment, contributing to post-injury recovery and medical condition management (ATACP, 2021).

The principles, techniques, and benefits of hydrotherapy make it a versatile intervention. The physical properties of water, including buoyancy, resistance, turbulence, and hydrostatic pressure, can create an ideal environment for rehabilitative techniques such as passive and active Range of Movement (ROM) exercises, progressive resistive exercises, and goal-based activities (Recio, Steins and Kubrova, 2017). Furthermore, due to the buoyancy and warmth of the water, hydrotherapy is especially effective for offloading the pressure of gravity from the joints and promotes relaxation. The buoyancy allows for supported body weight where patients may usually be unable to move unaided on land (Vann, 2014), while the warmth of the water allows for relaxation and greater pain reduction with movements due to the stimulation of skin nerve endings (Becker, 2009). The effects of hydrotherapy have been seen to be beneficial with a diverse range of patient populations, such as rheumatic diseases, hip Osteoarthritis (OA), chronic Low Back Pain (LBP), and the geriatric community as outlined in a systematic review by Geytenbeek (2002).

There has also been evidence for hydrotherapy effectiveness among multiple sclerosis (Bekiari et al., 2021), traumatic brain injuries (Curcio et al., 2020), stroke (Veldema and Jansen, 2021), paediatrics (Chandolias et al., 2022), and acute orthopaedic injury (Dimitrakopoulou et al., 2023) populations.

1.2. Management of Patients with Mobility Issues

1.2.1. Impact of Mobility on Overall Health

Mobility is an important factor in the overall health and Quality of Life (QOL) of the population, aligning with the World Health Organization's (WHO) definition of QOL as "A state of complete physical, mental and social well-being not merely the absence of disease" (WHO, 1997, p1). The physical implications of immobility, including deep vein thrombosis, pressure ulcers, joint pain, loss of muscle and bone mass, pneumonia, and deformities (de Brito, Battistella and Guarita, 2018) are particularly pronounced in the elderly. This demographic faces a heightened risk of falls and fractures, hospitalisations, cognitive function decline, and increased morbidity and mortality (Shafrin et al., 2017; Musich et al, 2018). However, other patient populations such as athletes, stroke patients, paediatrics, tetraplegic patients, post-surgery, and many more suffer from the adverse effects of poor mobility.

Moreover, the physical consequences of immobility take a profound toll on psychological well-being (Selikson, Damus and Hamerman, 1988). Loss of muscle mass and strength, combined with joint pain and deformities, make exercise difficult and leads to a sedentary lifestyle for many (de Brito et al., 2018). Without mobility, people lose their sense of independence, freedom, and autonomy (D'Ambrosio et al., 2012). Consequently, mental health concerns, such as depression and anxiety, become more prevalent (Selikson et al., 1988). Therefore, the importance of

enhancing and sustaining mobility through effective interventions becomes increasingly evident for those facing mobility-related struggles.

1.2.2. Hydrotherapy Versus On-land Interventions

The comparison of hydrotherapy and land-based interventions is complex, with both modalities holding distinct advantages and considerations. Studies, such as those conducted by Zhu et al. (2015) and Khruakhorn and Chiwarakranon (2021), have explored the effects of hydrotherapy on mobility and QOL in patients with chronic stroke and knee OA, respectively. While both hydrotherapy and on-land intervention groups yielded positive outcomes, the hydrotherapy groups exhibited unique benefits to mobility improvement due to the water's unique properties. More specifically, in the study by Zhu et al. (2015), the chronic stroke participants in the hydrotherapy group significantly improved ($p < 0.01$) in the 2-minute walk test and functional reach test compared to the land-based group after four weeks. However, it is important to note limitations within studies such as the small sample group and lack of follow-up in the study by Zhu et al. (2015), which could make results less generalisable, and hard to scope the long-term effects of hydrotherapy.

However, the comparison of these two modalities is not simple, as highlighted by Carayannopoulos, Han and Burdenko (2020). Similar to that of Zhu et al. (2015) and Khruakhorn and Chiwarakranon (2021), Carayannopoulos et al. (2020) found in their exploration of chronic LPB that both hydrotherapy and on-land exercises were relevant, with hydrotherapy particularly excelling in enhancing spinal flexibility. This suggests that the choice between hydrotherapy and on-land interventions may hinge on the specific goals of the rehabilitation programme and the characteristics of the patient population.

1.3. Utilisation of Hydrotherapy

Despite growing clinical evidence supporting hydrotherapy's efficacy, its underutilisation remains a significant challenge (Recio et al., 2017). Several barriers to the utilisation and implementation of hydrotherapy are evident in research. For example, in the second phase of a study by Stevenson et al. (2021), they used a focus group to discuss the evidence, barriers, and facilitators in implementing hydrotherapy from the perspective of six Healthcare Professionals (HCP). Participants identified gaps in the evidence, misalignments in practice and research, and barriers in knowledge and availability as barriers to the implementation. However, the study was small and localised, and this limitation should be considered when interpreting the generalisability of the study's results.

An additional barrier to the utilisation of hydrotherapy is the 'evidence to practice gap' highlighted by Lau et al. (2014). The authors describe how evidence-based interventions often face challenges in becoming part of routine clinical practice, despite proven effectiveness in trials. This notion was supported in the study by Stevenson et al. (2021), where participants explained that knowledge of the techniques and benefits of hydrotherapy is not known among many HCPs, and often evidence does not filter down to the delivery of the intervention. There is currently a 17-year gap between knowledge generated from research to seeing the evidence in practice (Munro and Savel, 2016), and this is evident in the current utilisation of hydrotherapy in clinical practice.

These barriers have adverse effects on hydrotherapy being used within national guidelines. Consequently, hydrotherapy is subject to cost cuts, and funding has become limited (Hamilton et al., 2022). These cuts can result in hydrotherapy pool availability becoming scarce due to pool closures. The poor availability of hydrotherapy services has been reported as a barrier to the use of hydrotherapy by patients, in addition to high costs and far travel distances due to the

unavailability of local pools (Pourghane 2017; Martin, Gilbert and Jeffries 2018). This highlights that the barriers affecting the utilisation of hydrotherapy are multi-faceted and are affected by both HCPs and patients.

1.4. Perceptions of Hydrotherapy

The perceptions of HCPs are crucial within healthcare for several reasons; informed decision-making; treatment adoption; research and development; optimising patient outcomes; interdisciplinary collaboration; and quality improvement (Osuna et al., 2018; Kock, Mlezana and Frantz, 2021). HCPs have a central role in guiding patients through treatment options, and their perceptions influence the recommendations they provide (Street et al., 2009). If healthcare professionals have positive perceptions of a particular treatment, they are more likely to recommend and endorse it. Additionally, a positive perception will likely be accompanied by greater encouragement to participate, potentially leading to improved treatment outcomes. On the other hand, patients may not be referred to treatments because their HCP does not believe in its effectiveness or they are not aware of its availability (Yang et al., 2016).

By understanding healthcare professionals' perceptions, an insight can be made into areas where research development is needed, inform the development of training programmes, and contribute to ongoing advancements in therapeutic interventions. Feedback from healthcare professionals is essential for quality improvement of healthcare methods, and concerns and barriers can be addressed to enhance the overall quality and effectiveness of healthcare delivery.

1.5. Study Rational

Hydrotherapy is recognised for its versatile benefits in Musculoskeletal (MSK), rheumatic, neurological, and chronic conditions, but encounters challenges in the integration into routine healthcare practices. Literature reveals barriers such as poor accessibility, financial constraints, and limited awareness. While existing research has primarily focused on patients' perceptions, a noticeable gap in the understanding of HCPs' perceptions of the effectiveness and barriers affecting the intervention exists. By understanding these barriers from a HCPs' perspective, this research aims to contribute to the understanding of the effectiveness of hydrotherapy, and whether hydrotherapy is underutilised despite growing clinical evidence and strategies can be formed to enhance the integration of hydrotherapy into routine care.

HCPs have a significant influence on treatment decisions, impacting recommendations and patient adherence. Current research reveals that the positive short-term effects of hydrotherapy are comparable to dryland exercises (Stevenson et al., 2021). However, despite these benefits, the referral and implementation of hydrotherapy into treatment plans remain low. This research study therefore aims to understand HCPs' perceptions of the effectiveness of hydrotherapy for common patient issues such as mobility, compared to on-land interventions. Understanding this is vital for advancing patient-centred care and promoting evidence-based interventions.

1.6. Study Aims and Objectives

This study aimed to explore HCPs' perceptions and knowledge of the effectiveness of hydrotherapy versus on-land interventions for patients with mobility issues. The secondary aim was to explore the perceived barriers that affect the utilisation of hydrotherapy.

To complete the aims of this study, the following was achieved:

1. Gained ethical approval for the study from the University of Nottingham Ethics Committee
2. Designed an online survey that explored HCPs' perceptions and knowledge of the effectiveness of hydrotherapy.
3. Piloted the survey study to three HCPs, which allowed any potential areas to be improved.
4. Shared the finalised survey to the target population via emails, social media and QR codes.
5. Collected and analysed data using content analysis and descriptive statistics.
6. Discussed the study's results and concluded the implications on clinical practice and future research.

2. METHODS

2.1. Study Design

The study aimed to research the perceptions and knowledge of HCPs on the effectiveness of hydrotherapy versus on-land interventions for patients with mobility issues. To appropriately answer the research question, a cross-sectional online survey was created. A survey design was chosen as it allows the perceptions and knowledge of the participants to be explored, forming overarching attitudes of a population (Ponto, 2015). The anonymity of an online survey approach permits participants to answer more honestly without fear of judgment (Braun et al., 2021). This enables there to be less prevalence of social desirability bias within the results (Dodu and de Winter, 2014).

An additional benefit of an online survey is that it allows large populations of people to be reached quickly, easily and at a low cost (Sue and Ritter, 2012). However, despite reaching a larger audience, online surveys can still be at risk of low response rates (Jones, Baxter and Khanduja, 2013). To reduce survey non-response errors, it was designed to last a maximum of 10 minutes (Guo et al., 2016). Accessing the survey online was made simple through QR codes and URL links in invitations, which were sent out regularly. (Fan and Yan, 2010). The anonymity, privacy and confidentiality of the patients were also assured to increase participation (Saleh and Bista, 2017).

To guide the development of this study, the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist was adhered to (Appendix 3) (STROBE, 2023).

2.2. Sample

2.2.1. Inclusion and Exclusion Criteria

Any HCP for example, physiotherapists, sports rehabilitators, or occupational therapists, with at least one year's experience using hydrotherapy as an intervention was able to participate in the survey. Any HCP who didn't have access to the internet, was below the age of 18, or had less than one year's experience using hydrotherapy as an intervention, was excluded from the survey.

2.2.2. Recruitment

The study's target population were HCPs who had experience using hydrotherapy. The target population was engaged via social media platforms such as Twitter, Facebook, and LinkedIn, as well as through email. These contained a brief study description along with a poster providing a QR code and URL access to the survey. The social media posts were shared by the University of Nottingham staff in order to reach a larger audience. Emails were sent to various hydrotherapy clinics across the UK, containing the poster advertisement (Appendix 4) with access to the survey. The use of a multi-modal method of recruitment was appropriate for this study as it helped reach a greater population and increase response rates efficiently and at a low cost (Ali et al., 2020).

The study's recruitment aim was between 25 and 30 participants. The focus of this study was to gather a glimpse of HCPs' perceptions, therefore it was not necessary to conduct a sample size calculation. 22 participants responded to the survey. However, after exclusion, a sample size of 13 was achieved.

2.3. Ethics and Consent

2.3.1. Ethical Approval

The University of Nottingham Medical School Ethics Committee granted ethical approval for this study (Appendix 5).

2.3.2. Informed Consent

Before beginning the survey, participants accessed an information sheet containing information about the study, what was being conducted, what would be required of them and how their data would be collected, used, accessed, and stored. At the end of the information sheet, they could consent to be included in the study. Once they had given consent, the survey questions became available to them.

2.3.3. Withdrawal and Anonymity

Participants were made aware within the participation information sheet that they had the right to withdraw at any point during the survey before submitting their responses. Participants were informed that after the point of submission, they were no longer able to withdraw their data due to the anonymity of their responses. All data was stored in the University of Nottingham's OneDrive in a password-protected database.

2.4. Survey Design

Due to there being no current specific survey on HCPs' perceptions of hydrotherapy, the study used a unique survey created by the researcher. This is advantageous because it draws only essential information for the aims of the study and is specific to the research question. However,

the disadvantages are that the survey has not been validated by previous research and therefore cannot be easily compared (Boynton and Greenhalgh, 2004).

2.4.1. Survey Structure

The survey was piloted to three HCPs who had at least one year's experience with hydrotherapy. Feedback was given to check the validity of the survey, to test the timing to increase response rates, to improve the coherence of the questions, and to check the relevance of the questions for achieving the study's aims (Brooks, Reed and Savage, 2016). The necessary alterations were made to the survey sections and questions. The final result can be seen in Appendix 1.

The survey comprised of 22 questions, which were split into 9 sections. The sections explored; demographic information, patient populations, effectiveness perception, utilisation and barriers, patient preferences, integration, research evidence, potential solutions, and additional comments. The questions used a mix of open-ended questions, multiple choice and yes/no questions, and Linkert scales.

2.5. Data Analysis

The data collected was imported into Microsoft Excel for analysis. Open-text box data was analysed and interpreted into patterns and categories through content analysis (Vears and Gillam, 2022). An inductive approach was used in data collection, wherein the researcher derived categories and sub-categories from no preconceptions or expected outcomes. Quantitative data collected from closed-box answers were analysed using descriptive statistics, such as graphs and measures of variability. The data was analysed by a single researcher.

3. RESULTS

3.1. Demographics

A total of 13 participants met the inclusion criteria. The full responses to the survey can be seen in Appendix 2. Table 3-1 represents the categories and sub-categories derived from the participant's answers. Table 3-2 represents the speciality and experience data collected for all participants. Most participants enrolled in the study hold between six and ten years of experience in healthcare (30.8%). Physiotherapists were the most frequent respondents to the survey (46.2%). Participants most frequently had between one and five years of experience with hydrotherapy (38.5%).

Table 3- 1 Table of categories and sub-categories

Categories	Sub-categories
Effectiveness perceptions and positive outcomes	A) Positive effects of hydrotherapy B) Patient population who benefit from hydrotherapy C) Negative perceptions of hydrotherapy
Utilisation and Availability	A) Barriers to utilisation B) Potential solutions to barriers
Hydrotherapy versus on-land	A) Hydrotherapy B) On-land C) Both hydrotherapy and on-land

Table 3- 2 Participants' speciality and experience data

Variable	Number (n=)
Number of years experience in healthcare	
Less than 1 year	1
1-5 years	1
6-10 years	4
15-20 years	3
21-25 years	1
30-35 years	2
36-40 years	1
Area of healthcare specialism	
Physiotherapist	6
Sport Rehabilitator	3
Occupational Therapist	2
Medical Secretary	1
Aquatic Therapist	1
Number of years of experience with hydrotherapy	
Less than 1 year	1
1-5 years	5
6-10 years	2
11-15 years	1
16-20 years	2
20+ years	2

3.2. Effectiveness Perceptions of Hydrotherapy

3.2.1. Positive Effects of Hydrotherapy

Participants expressed a wide range of positive effects of hydrotherapy, as seen in Table 3-3. The participants mainly highlighted the physical benefits such as improved mobility and increased strength. Other advantages perceived were psychological benefits such as increased confidence and QOL, and social benefits such as increased interaction.

Table 3- 3 Participants' perceptions of the benefits of hydrotherapy

Physical	Psychological	Social
'improvements in mobility in hydrotherapy due to warmth of water and buoyancy' PT030	'increase in confidence levels' PT1108 'helps build confidence' PT2007	'patients who use group exercise classes also benefit from the social aspect' PT0107
'for those who are struggling with activities on dry land' PT2007 'for people who cannot weightbear unaided' PT0707	'It is a very effective method of improving QoL in people with low mobility and long term disability'. PT0722	
'they enjoy the sensory input' PT1807	'huge sense of independence' PT0207	
'provides support and reduces impact on joints' PT0107	'lots of patients enjoy it for the psychological benefits' PT0907	
'challenging strength and correctly retraining muscle patterns that translate to land based activities' PT1907	'it is excellent for having fun which makes it a great choice for children' PT1907	
'I've had lots of brilliant feedback regarding hydrotherapy and patients reporting they would be nowhere near their current mobility without it' PT0315		

3.2.2. Patient Populations that Benefit from Hydrotherapy

Participants highlighted the patient populations in which they perceive hydrotherapy to benefit from their mobility improvement. The most common patient populations highlighted by the

participants were neurological, orthopaedic, weight-bearing difficulties, and chronic pain patients. However, a few participants stated that hydrotherapy is beneficial to all patient populations and no particular patient population benefits more than another. Two participants also stated that hydrotherapy is useful to patients in the early stages of rehabilitation, but less so in the later stages.

'Neurological disorders such as stroke patients benefit a lot as the buoyancy of the water provides support and reduces the impact on joints whilst also providing reassurance if a fall were to happen'

PT0107

'For patients who struggle/cannot weightbear, hydrotherapy gives them access to exercises they aren't able to perform on land' **PT0108**

'Hydrotherapy is more effective on chronic pain as it alleviates gravity related challenges whilst still challenging strength and correctly retaining muscle patterns that translate to land based activities' **PT1907**

'sport MSK often benefit more from hydro in the initial phases but then benefit from land later in their rehab' **PT0307**

3.2.3. Negative Perceptions of Hydrotherapy

Although most respondents highlighted positive perceptions of hydrotherapy, most participants (n=8) highlighted the additional potential drawbacks of hydrotherapy for patients. One participant expressed how hydrotherapy could potentially lead the patient to over-exert themselves, due to the ease of movement in the water, leading to increased pain or delayed onset muscle soreness outside of the pools. Additionally, one participant perceived land-based exercises to be superior

to hydrotherapy for mobility improvement, while another reiterated that it is hard to progress to end-stage rehabilitation with hydrotherapy.

'patients can do too much in the pool due to it being easier/less painful and this results in increased DOMs/pain out of the pool. This can impact their daily mobility' **PT0308**

'I think that hydro does not improve mobility as much as loaded eccentrics' **PT0608**

'It is hard to progress to mid or end stage in the pool, there is a point with mobile people when they need to be on land.' **PT0708**

3.3. Utilisation and Availability

3.3.1. Barriers to the Utilisation of Hydrotherapy

11 of the 13 participants thought that hydrotherapy is underutilised in current healthcare practice (Figure 3-1).

Figure 3- 1 Pie chart showing opinions on the underutilisation of hydrotherapy.

11. In your opinion, do you think hydrotherapy is under-utilised in current healthcare practice?

[More Details](#)

● Yes	11
● Sometimes	2
● No	0



Participants were able to highlight several barriers that they thought contributed to the under-utilisation of hydrotherapy. The main barriers that were identified were finance, accessibility, and knowledge of the HCP/healthcare system. Examples of these responses can be seen in Table 3-4.

Table 3- 4 Participants' perceptions of the barriers affecting the utilisation of hydrotherapy

Financial	Accessibility	HCP Knowledge
'finance is a large factor due to it being costly to run and many patients cannot afford the price' PT0312	'access to hydrotherapy pools, very few pools making waiting lists long' PT0212	'NHS not knowing about hydro pools' PT0112 'patients in the past commenting on clinicians not knowing about pools in the area' PT0113
'cost of private treatment' PT0712	'Location is another factor due to limited hydro locations being available' PT0312 'patients have to travel quite far sometimes' PT0912	'expertise of the clinician' PT0612
'its almost always about space and finances' PT2012	'poor availability of pools' PT0712	'lack of teaching surrounding the area means some clinicians aren't aware of the benefits' PT0112
'funding' PT1612	'only a handful of places offer it' PT0912	'not enough trained facilities and trained therapists' PT1912

Figure 3-2 shows an average rating graph depicting participants' perceptions of whether HCPs' are adequately informed about the benefits and techniques of hydrotherapy. On the scale, one represented not very informed, and ten represented adequately informed. 53.8% (n=7) voted five or below, and 46.2% (n=6) voted six or above, leaving a mean value of 5.15.

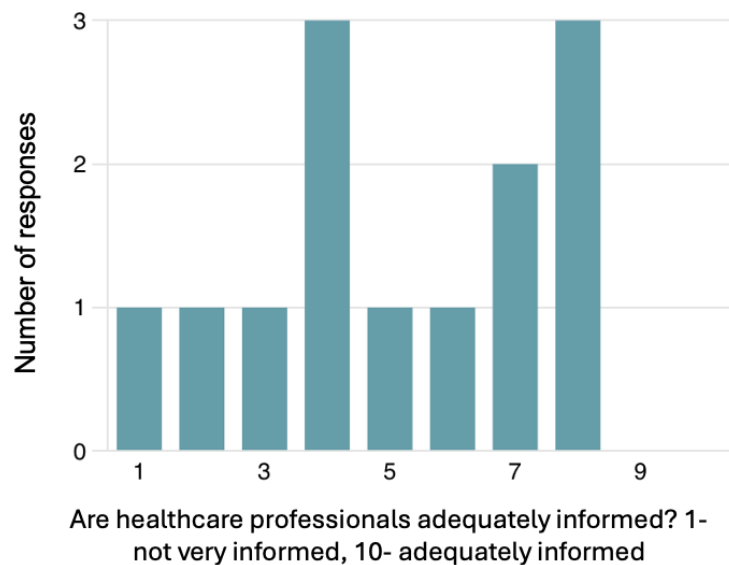
Figure 3- 2 Bar chart showing the average scores of participants' perceptions of whether HCPs are adequately informed of the benefits and techniques of hydrotherapy

19. Do you think healthcare professionals are adequately informed about the benefits and techniques of hydrotherapy?

[More Details](#)

 Insights

5.15
Average Rating



3.3.2. Potential Solutions

Participants showed awareness of potential strategies and initiatives that could enhance the utilisation of hydrotherapy and reduce the barriers. Key themes arose across the participant's responses, such as better understanding among HCPs, increasing awareness among patients, reducing costs and increasing funding, and partnerships with community or professional organisations.

'There are several professional associations and organizations that can collectively promote its use' **PT1921**

'Greater understanding and awareness of its benefits within society and in higher powers in healthcare to increase funding' **PT0321**

'Ringfenced funding as part of rehabilitation budget in hospital settings where there is existing hydrotherapy provision' **PT1121**

3.4. Hydrotherapy or On-land Interventions

The majority of participants (n=7) perceived hydrotherapy to be more effective in improving patients' mobility compared to on-land interventions, whereas the remaining participants expressed that they thought either a combined approach (n=3) or on-land exercises alone (n=3) could be more effective methods. Most participants stated drawbacks such as accessibility, financial constraints, and challenges to the therapist as being barriers that caused difficulties, or caused them to prefer an on-land approach.

'I would prefer to use on-land interventions due to ease of accessibility, clients may not be able to swim or do not like water, availability of accessing a pool to complete session' **PT0508**

'I think it is good to complete both as part of rehab. The hydro allows more progression and to handle/challenge in different positions. Equally handling in the pool can be more challenging when trying to keep head above water (for the therapist)' **PT0208**

'very efficient. You can do almost anything in hydrotherapy. The drawbacks are the financial elements of heating and maintaining a pool and the need for staff levels to manage health and safety' **PT2008**

Despite these perceptions, 84.6% (n=11) of participants use a combined approach of hydrotherapy and land-based interventions in their actual treatment programmes with patients. The participants explained how a combined approach is most effective in the early stages of rehabilitation when mobilising is painful. They further described how combining hydrotherapy with on-land is useful in preparing patients to advance to more challenging land-based exercises, allowing them to progress quicker.

'I always attempt to do both as the ultimate aim is to function well on dry land. The combination often allowed me to progress my dry land exercises more quickly for patients who were struggling initially.' **PT2016**

'Yes. When we have reached our mobility and strength goals and the patient can return to more challenging land-based exercise.' **PT1916**

'Yes. stroke rehab. MSK from acute to mid stage rehab. Lower back pain when mobilising is painful' **PT0616**

In summary, the results of this study emphasised that HCPs' do perceive hydrotherapy as an effective method for improving mobility and quality of life for various patient populations. The HCPs' also recognised the need to address barriers to its utilisation and enhance awareness among other HCPs.

4. DISCUSSION

4.1. Perceptions of Effectiveness of Hydrotherapy

This survey study highlights that most HCPs view hydrotherapy as an effective method for improving patient mobility, among other physiological, psychological, and social benefits. A major theme highlighted was that patient populations struggling to weight-bear or move unaided on land tend to benefit most from this modality, such as neurological, orthopaedic, and MSK populations. These perceptions align with current literature, such as the Randomised Control Trial (RCT) by Zhu et al. (2015) that explored the effects of hydrotherapy compared to a control group on land for the improvement of walking and balance in patients with chronic stroke. The RCT found that after four weeks, while the Timed Up and Go (TUG) test, the Berg Balance Scale, the functional reach test, and the 2-minute walk test had improved significantly in both groups, the mean improvement of the functional reach test and the 2-minute walk test in the hydrotherapy group was significantly higher than the control group. Similar effects were found in Pinto et al.'s (2019) systematic review and meta-analysis where they found moderate-quality evidence that hydrotherapy, combined or not with land-based therapy, improved the balance and functional mobility of patients with Parkinson's disease. Additionally, comparable to the results of Zhu et al. (2015), a study by Khruakhorn and Chiwarakranon (2021) found that while there were no significant differences between groups comparing hydrotherapy to land-based exercises in patients with knee OA, the hydrotherapy group found significant improvements ($p > 0.01$) in the TUG, Five Times Sit-to-Stand, and Stair Climbing Test. These results reinforce the perception of hydrotherapy's efficacy in improving patient mobility.

In a study by Marinho-Buzelli et al. (2019), they explored the perceptions of various HCPs on the use of aquatic therapy for patients with spinal cord injury or disorder. The HCPs found that the properties of the water in hydrotherapy facilitated proper movement, facilitated healing, reduced

swelling, and allowed for pain relief and relaxation. These views parallel the perceptions of HCPs in this study, where participants state that the properties of the water have unique benefits that are not always available on land, and therefore lead to greater mobility improvement. An article by Becker (2009) describes how the hydrostatic pressure, thermodynamics, buoyancy, and viscosity of the water off-loads gravity to support joints, relax muscles, and allow for gentle strengthening and ROM activities. This view is also supported in an article by Vann (2014) where they describe how the warmth of the water allows for greater relaxation and stretching for ROM, as well as buoyancy for supported body weight and gentle resistance from the water, all of which is not available on land.

4.2. Hydrotherapy Versus On-land

This study provides insight into HCPs' views on whether hydrotherapy is comparable to on-land interventions for improving patient mobility. Most participants shared they use a combined approach in practice and encourage patients to carry out land-based exercises alongside hydrotherapy to optimise rehabilitation and reach the ultimate goal of functioning on land. An article by Carayannopoulos, Han and Burdenko (2020) explored the benefits of combining water and land-based therapies and stated that an optimal exercise programme should not incorporate land without water, and vice versa. They concluded that hydrotherapy helps to restore biomechanical difficulties resulting from injuries, disorders or diseases, addressing foundational movements like balance, coordination, and flexibility. By addressing these foundational movements in water, a greater rehabilitation programme on land can be created to focus on strength and function for normal daily activity.

The participants expressed a preference for a combined approach in their practices, integrating hydrotherapy and land-based exercises for comprehensive rehabilitation. This approach is

reinforced in the article by Carayannopoulos et al. (2020) which explains The Burdenko Method (TBM). TBM emphasises hydrotherapy exercises that retrain movement patterns, facilitating a seamless transition to land-based activities. The method includes six essential qualities, progressing from regaining balance to strength and sport-specific movements. Most participants perceived hydrotherapy to be an advantageous way to instil confidence in patients to mobilise on land. However, some noted a potential plateau effect after the initial rehabilitation stages, where a shift to primarily land-based interventions becomes more beneficial.

Furthermore, opinions on the efficacy of hydrotherapy varied, with one participant noting its comparative disadvantage to land-based interventions, especially in terms of improving mobility compared to land-based loaded eccentrics. Loaded eccentric exercises, with their controlled muscle lengthening under resistance, promote flexibility and joint function (Diong et al. 2022). Nevertheless, caution is advised, particularly in the early stages of rehabilitation or among at-risk populations, where eccentric exercises may increase susceptibility to muscle injury (Harris-Love et al., 2017). In contrast, hydrotherapy offers a valuable alternative in these initial phases. The water provides gentle resistance for a more accommodating environment for individuals facing challenges with unaided land mobilisation and allows for a more gradual progression and foundation for those in the early stages of rehabilitation.

However, while evidence supports the short-term and immediate effects of hydrotherapy on mobility, there is a scarcity of research on its long-term sustainability (Liu et al., 2023). Existing studies tend to focus on short-term outcomes with limited exploration beyond a few months, therefore the long-term effects remain unknown (Al-Qubaeissy et al., 2013). This gap in the evidence base underscores the need for further research to clarify the longevity and sustained impact of hydrotherapy on mobility.

4.3. Utilisation and Availability

The majority of participants (n=11) perceived hydrotherapy to be under-utilised in current healthcare practice. Two Participants thought that hydrotherapy is only sometimes under-utilised. Three main barriers to the utilisation of hydrotherapy were prevalent among participants answers: finance, accessibility, and knowledge of the HCP.

Financial barriers negatively affecting the utilisation were one of the most predominant answers among participants, such as the cost of maintaining facilities, the lack of NHS funding, and the cost of hydrotherapy sessions for patients. Pourghane (2017) explored the barriers affecting participation in hydrotherapy among older women in a qualitative interview study. In line with the perceptions of HCPs in this study, the women named high expenses such as expensive entry fees, equipment, and transportation as limiting factors to their hydrotherapy use. Similarly, in a study by Fiskens et al. (2016), they found that in older adults with OA, the costs of hydrotherapy sessions were among the perceived reasons why they ceased their use of hydrotherapy. However, Teng et al. (2019) evaluated the cost-effectiveness of hydrotherapy versus land-based therapy in patients with MSK disorders in Singapore. The results found that overall, hydrotherapy was more effective and less costly than total hip replacements and total knee replacements, and cost-effective for LBP and rheumatoid arthritis. It was not however cost-effective for OA. Conversely, this study reflects the cost-effectiveness in Singapore in 2019 and is less relatable to current financial situations today in the United Kingdom.

Participants identified the second barrier as the limited accessibility to hydrotherapy services. They noted that there is a scarcity of hydrotherapy pools, and many are situated at a considerable distance for patients to travel. Martin, Gilbert, and Jeffries (2018) conducted an online survey within the NASS patient membership to gauge the utilisation and experiences related to

hydrotherapy. Among the respondents, 62.5% (n=85) expressed their inability to access hospital hydrotherapy during flare-ups. Barriers to access included prolonged waiting times, restricted session availability, and pool closures. Moreover, 18.5% (n=28) reported an imminent threat of their hospital hydrotherapy pool facing closure. Stevenson et al. (2023), in their research utilising a critically appraised topic, highlighted the best evidence and barriers to hydrotherapy implementation for MSK diseases. Among other factors, a lack of availability of hydrotherapy services was highlighted as a barrier to the implementation of hydrotherapy. This scarcity of facilities not only complicates HCPs' advocacy for hydrotherapy but also results in overpopulated pools and extensive waiting lists for the available resources.

The final barrier emphasised pertains to HCPs' limited awareness of the benefits and available services related to hydrotherapy. Participants observed that certain HCPs lack expertise in this domain, while others noted insufficient training capacity to support hydrotherapy sessions. Data analysis, when assessing participants' perceptions of HCPs' knowledge regarding hydrotherapy benefits and techniques, yielded a mean value of 5.15. This average further underscores the perceived knowledge gaps among HCPs. This perception aligns with findings from the study by Fiskén et al. (2016), where women highlighted a combination of poor instructor knowledge and a lack of suitable classes for older generations as barriers. Additionally, there was mention of inadequate education on hydrotherapy within the current study, contributing to some HCPs' unawareness of its potential advantages. Notably, a participant reported an instance where a patient remarked on clinicians' unfamiliarity with local pools, necessitating independent research on the patient's part. This lack of awareness among HCPs constitutes a critical barrier to the effective integration and promotion of hydrotherapy as a therapeutic modality. These perceptions are consistent with those highlighted in the study by Marinho-Buzelli et al. (2019), where HCPs similarly pointed out that the limited number of trained staff poses a barrier to the facilitation of hydrotherapy.

4.4. Potential Solutions

While barriers to the utilisation of hydrotherapy were emphasised, participants were able to highlight potential solutions and recommendations for future directions. Solutions to increase the utilisation of hydrotherapy consisted of increasing teaching and awareness among HCPs, increasing awareness of the benefits to patients through information outlets, increasing funding and reducing costs, increasing the knowledge of benefits among individuals in higher powers to boost funding, and using patient testimonials as an advertisement for potential future patients. The use of patient testimonials was said to have an important effect on the encouragement of participation in hydrotherapy among patients in the study by Stevenson et al. (2021), as the use of word of mouth is a powerful tool. Additionally, in 2021 the National Axial Spondyloarthritis Society, ATACP, and the Chartered Society of Physiotherapy created a national manifesto for hydrotherapy. This urged the safeguarding of hydrotherapy pools by ensuring reasonable access, halting closures, conducting coordinated research, embedding hydrotherapy in national guidelines, creating an audit tool, and promoting awareness and self-funding initiatives (National Axial Spondyloarthritis Society (NASS), 2021). This manifesto is in line with the solutions made by the participants in the study, and if done effectively, these solutions could ensure the sustained advancement of hydrotherapy services in healthcare.

4.5. Strengths

The study possesses strengths that contribute to its overall merit. Firstly, the study engaged a diverse group of HCPs, including physiotherapists, sports rehabilitators, occupational therapists, medical secretaries, and aquatic therapists. This ensures a comprehensive perspective and enriches the study's findings.

Secondly, the clear study design tailored to the research question reflects another strength. Piloting and feedback processes were employed to refine the survey structure, enhancing its validity and relevance as well as methodological robustness.

Moreover, the study's unique exploration of HCPs' perceptions of hydrotherapy effectiveness contributes to the limited existing literature. The research aids in further understanding the effectiveness and utilisation of hydrotherapy for the mobility of patients by shedding light on an unexplored area of study.

4.6. Limitations

This study is not without limitations, warranting careful consideration when interpreting its findings. Primarily, the intended sample size of 25-30 participants fell short, with only 13 participants included. Despite efforts to lessen non-response error, optimal response rates remained challenging, potentially introducing non-response bias and impacting the internal validity. The stringent exclusion criteria, requiring a minimum of one year of hydrotherapy experience, likely contributed to the limited sample size, limiting insights, particularly from early-career HCPs and affecting the study's overall breadth.

Furthermore, the study's reliance on online surveys, while cost-effective, made it susceptible to low response rates. This susceptibility to non-response bias poses challenges to the external validity, urging caution in interpreting findings beyond the study's immediate context.

Secondly, the unique survey design lacked validation from prior research, hindering comparability with existing literature. The scarcity of comparable studies in current literature adds complexity to benchmarking results against established evidence, especially concerning HCPs' perceptions.

Thirdly, the subjectivity in participants' perceptions, amplified by single-researcher analysis, introduces potential bias. Qualitative data interpretation may vary among analysts, and the presence of confirmation bias, rooted in the researcher's positive attitude toward hydrotherapy from a sports rehabilitation background, adds an extra layer of potential bias.

4.7. Implications for Clinical Practice

The study's insights carry significant implications for optimising hydrotherapy in clinical practice. The preference for a combined hydrotherapy and on-land approach suggests a holistic rehabilitation strategy, especially beneficial for populations struggling with weight-bearing. This integrated model aligns with the national manifesto, emphasising a comprehensive approach to hydrotherapy. Furthermore, the prominence of financial barriers highlights the need for sustained funding encouragement to secure hydrotherapy facilities' durability. Addressing HCPs' perceived lack of awareness underscores the importance of targeted educational initiatives. Patient testimonials emerge as a potent tool for fostering participation, reinforcing the need for a patient-centric, evidence-based approach. In summary, these implications call for collaborative efforts, emphasising financial support, education, and a patient-centred stance to optimise hydrotherapy's effectiveness in clinical practice.

4.8. Future Research

The study's findings suggest several avenues for future research to deepen our understanding of hydrotherapy's efficacy and implementation. Investigating the long-term sustainability of

hydrotherapy effects on mobility is crucial, as current evidence primarily focuses on short-term outcomes. Exploring the comparative effectiveness of hydrotherapy versus land-based interventions in diverse patient populations and conditions would contribute to evidence-based decision-making. Additionally, research into the economic implications and cost-effectiveness of hydrotherapy, especially in comparison to other interventions, can guide resource allocation. Further studies examining the impact of educational interventions on HCPs' awareness and knowledge of hydrotherapy would enhance its integration into clinical practice. Lastly, research on innovative funding models and community engagement strategies could address financial barriers and promote sustained hydrotherapy availability.

4.9. Conclusion

This research project aimed to explore HCPs' perceptions of the effectiveness of hydrotherapy for the improvement of mobility in patients, in addition to highlighting the barriers to the utilisation of hydrotherapy. The findings underscore the positive effects of hydrotherapy, particularly in enhancing mobility for diverse patient populations. However, the study faces limitations, including a modest sample size and a lack of survey validation, urging caution in generalising results. Despite this, the results contribute valuably to the limited existing literature on HCPs' perspectives.

The identified barriers, such as financial constraints and limited awareness, provide practical considerations for policymakers and healthcare practitioners. Moving forward, addressing these barriers and building on the study's strength can further advance our understanding of hydrotherapy's role in patient mobility and guide future research initiatives.

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6. APPENDICES

Appendix 1. Final Survey

Demographic information:

1. How many year's experience do you have with hydrotherapy?
 - a. Less than 1 year
 - b. 1-5 years
 - c. 6-10 years
 - d. 11-15 years
 - e. 16-20 years
 - f. 20+ years
2. What is your profession? (e.g., Sport Rehabilitator, Physiotherapist, Occupational Therapist, Nurse)?
3. How many year's experience do you have in healthcare?
4. In which type of healthcare setting do you primarily work (e.g., rehabilitation centre, private practice, hospital)?

Patient Population:

5. Which patient populations have you used hydrotherapy with (e.g., paediatrics, neurological, orthopaedic)?
6. What forms of mobility issues have you come across whilst using hydrotherapy with these patient populations?
7. Do you believe that certain patient populations benefit more from hydrotherapy, while others benefit more from on-land interventions? Explain your answer.

Effectiveness Perception:

8. In your experience, how effective is hydrotherapy for improving patients' mobility compared to on-land interventions? Do you think there are any drawbacks?
9. What specific outcomes have you observed when using hydrotherapy for mobility improvement?
10. Are the outcomes answered in question 12 the same as outcomes observed with on-land interventions for mobility improvement?

Utilisation and Barriers:

11. In your opinion, do you think hydrotherapy is under-utilised in current healthcare practice?
 - a. YES
 - b. SOMETIMES

c. NO

12. If YES to the above, what factors do you believe contribute to the under-utilisation of hydrotherapy?
13. Do you think that the factors you have listed in Question 12 prevent you from choosing hydrotherapy as an intervention for patients?

Patient Preferences:

14. Do patients generally express a preference for one type of intervention over the other?
- a. They prefer hydrotherapy
 - b. They prefer on-land
 - c. They prefer combined hydrotherapy and on-land
 - d. They do not have a preference
 - e. I'm not sure/I have not asked
15. Have you received feedback from patients regarding their interest or desire for hydrotherapy as part of their treatment?

Integration:

16. Do you often combine hydrotherapy and on-land interventions in patient treatment plans? If so, in what situations?

Research and Evidence:

17. Are there any specific research studies or evidence that influence your choice between hydrotherapy and on-land interventions?
18. How do you stay updated on the latest research and best practices in this area?
19. Do you think healthcare professionals are adequately informed about the benefits and techniques of hydrotherapy?
(Scale 0-10. 0 = not very informed. 10 = adequately informed)

Potential Solutions:

20. What strategies or changes do you believe could increase the utilisation of hydrotherapy in healthcare practice?
21. Are there any specific initiatives or resources you would recommend to promote hydrotherapy use?

Additional Comments:

22. Is there anything else you would like to add about your experiences and perceptions regarding hydrotherapy and on-land interventions for mobility improvement?

Appendix 2. Survey Answers

PT01	
01	1-5 years
02	Sports Rehabilitator
03	Less than 1 year
04	Private practice
05	Paediatrics, Neurological, Musculoskeletal conditions
06	Limited Range of Motion, Balance and Stability Issues, Weakness or Muscle Atrophy, Pain and Discomfort
07	Neurological disorders such as stroke patients benefit a lot as the buoyancy of the water provides support and reduces impact on joints whilst also providing reassurance that is a fall were to happen the pt does not hit the ground and cause further injuries. The warmth of the pool also can provide the pt with relief from chronic pain felt during movement. Patients who use group exercise classes also benefit from the social aspect whilst doing rehab. MSK patients or patients who are further along with rehab would benefit from functional and strength training by doing on-land exercises.
08	For patients who struggle/can not weightbear, hydrotherapy gives them access to exercises they arent able to perform on land and the buoyancy provides support which in some cases increases ROM for example.
09	Using different depths of the pool. An example being a squat at 1.3m depth then gradually decreasing the depth until pt is onland
10	They are able to be adapted and transferred to onland. The squatting example could be used in an athlete returning from a fib tib fracture, they would progress up the depths to on land then use body weight and up to weighted squats. A non athlete may use the squat in the pool and transfer to a sit to stand test on land.
11	Yes
12	NHS not knowing about hydro pools such as the DRSV. some clinicians in the nhs are aware of private health care pool - like the DRSV, but this sort of information isnt known trust wide. I also think the lack of teaching surrounding the area means some clinicians arent aware of the benefits
13	Not patients i have seen, however i have had patients in the past comment on nhs clinicians not knowing about pools in the area and patients going away and doing their own research into it
14	They prefer hydrotherapy
15	Not many. I have had experience with a long COVID patient who was interested in plunge pool therapy.
16	The only time i have had experience with this was rehab for a cyclist. They used the bike in the pool as a sport specific way of returning to exercise. This was used alongside a watt bike to gain confidence and also technique for the land based exercise
17	No, ive mainly learnt from shadowing as a student and used general hydro resources online

18	Generally go from case to case and read research around a spesific condition and the use og hydro
19	4/10
20	Better education as a student Partnerships with clinics and the nhs
21	Posters in nhs enviroments education to clinitions
22	na

PT02	
01	1-5 years
02	Physiotherapist
03	2
04	Private practice and NHS MSK outpatients
05	A mixture of paediatrics and adults with neuromuscular conditions. I have also use it wit adults post operatively who progressed to land rehab.
06	A huge range of people - some are unable to independently mobilise therefore using wheelchairs or electric chairs. Some mobilise with walking aids such as 4WW or sticks. Some mobilise unaided and independently but struggle with balance and strength.
07	No particular medical conditions or populations are better than others in the pool. However populations who struggle to move or exercise on land/ are limited in what they can do on land benefit hugely. Populations in pain can get a lot of relief from the gentle movement and warmth. Pts unable to mobilise without aids can get a huge sense of independence in the water being physically able to do a lot more. It is great for both adults and children. I do think individuals that reach a level of range of movement strength, balance and function post operatively can plateau, at which point they are ready to progress to land based activity.
08	I think it is good to complete both as part of rehab. The hydro allows more progression and to handle/ challenge in different positions. Equally handing in the pool can be more challenging when trying to keep head above water (for the therapist) for example standing practice
09	Improvements to Tinetti testing, timed up and go, 5 times STS, subjectively reported improvements to transfers, ADLs and function.
10	This is very patient dependent based on their clinical presentation/ level of abilities
11	Yes
12	Financial barriers, access to hydrotherapy pools, very few pools making waiting lists long and with limited sessions offered in NHS settings.
13	Yes
14	They prefer combined hydrotherapy and on-land
15	Yes, we get lots of people asking to attend hydrotherapy sessions. We often have a waiting list.

16	Yes in most clinical cases there is a combined approach. Neuromuscular conditions, neurological conditions, inflammatory/ rheumatology patients, post operatively. Particularly in adult patient I'll set land based activity outside of hydro sessions. Commonly paediatric patients have land physio through other means (E.g. NHS) but not always
17	Most literature surrounding neurological rehab/ MSK rehab has principles within it that can be applied on land and in hydrotherapy.
18	In clinic CPD, social media for latest research releases, self research through research databases based on a patients I am treating
19	7/10
20	Greater understanding and awareness of its benefits within society and in higher powers in healthcare to increase Funding for the building and maintenance and running of these pools. This way they become more accessible for people that need them. Money I think is a big barrier for both creation of pools but also for patients to be able to access.
21	I am not really aware of any
22	-

PT03	
01	6-10 years
02	Sports Rehabilitator
03	7 years
04	Private practice, Sport and Education
05	Paediatrics, Neurological, Sport MSK, Orthopaedic
06	Tetraplegic, bilateral and unilateral weaknesses/paralysis in upper limb/lower limb, limitations in walking/sporting activities
07	For some populations in depends on their stage of rehab. For example, sport MSK often benefit more from hydro in the initial phases but then benefit more from land later in their rehab. Some patient populations such as neuro benefit from hydro long term due to having reduced risk of falls etc. Overall, all patients should have hydro accompanied by on land programs.
08	Some patients have increased improvements in mobility in hydrotherapy due to warmth of water and buoyancy/water feedback on skin decreasing muscle tone. However, patients often loose some initial improvements in mobility once getting out of the pool and this can be disheartening. Also sometimes patients can do too much in the pool due to it being easier/less painful and this results in increased DOMS/pain out of the pool. This can then impact their daily mobility.
09	Steps/gait with or without aids ROM increase Strength improvements
10	yes

11	yes
12	Finance is a large factor due to it being costly to run and many patients cannot afford the price of hydro/insurance won't cover it. Location is another factor due to limited hydro locations being available (this can be attributed to by the finance issue)
13	Yes, I am conscious of the financial implication of this for patients and this may be a long term financial outgoing.
14	They prefer hydrotherapy
15	Yes, I've had a lot of brilliant feedback regarding hydrotherapy and patients reporting they would ne nowhere near their current mobility without it.
16	Often in MSK/Sporting patients due to background in on-land treatment plans. However, neuro patients often come with their own program from neuro rehabbers
17	Non to note
18	As part of CPD/conversations with colleagues
19	6/10
20	Increased knowledge of benefits might increase funding and therefore reduce cost of treatment making it more accessible.
21	Patient testimonies are very strong especially due to their passion regarding the benefits.
22	No

PT05	
01	1-5 years
02	Sports therapist
03	10
04	Private practice
05	MSk
06	-
07	Post operative care - ACL / Knee surgery / hip surgery
08	I would prefer to use on land interventions due to ease of accessibility, clients may not be able to swim or do not like water, availability of accessing a pool to complete session.
09	NA
10	-
11	Sometimes
12	-
13	yes
14	They prefer on-land
15	Yes, most prefer on land due to ease of accessibility and its free.
16	No. I have thought about it but due to comments listed previously these are barriers.

	I will give clients a sheet of recommendation of exercises to complete in a pool setting.
17	NA
18	Online material e.g. journals / webinars
19	3/10
20	Accessibility Equipped & trained staff Centre for hydrotherapy
21	-
22	-

PT06	
01	1-5 years
02	physiotherapy
03	8 years
04	private practice
05	paediatrics, neurological, ortho, sports
06	sporting mobility issues, neurological mobility issues e.g. tetraplegic and paraplegic, walking mobility issues, muscle weakness and atrophy
07	yes, stroke, rheumatoid, early ortho, OA tend to benefit from both, but they prefer hydro
08	I think that hydro does not improve mobility as much as loaded eccentrics but if patients engage with hydro and the clinician has good techniques for manual stretches this can help
09	TUG have improved stroke patients AROM and PROM have improved with some hip mobility
10	TUG and general AROM
11	Yes
12	cost, availability and expertise of the clinician
13	not really
14	They prefer hydrotherapy
15	yes they always enjoy it and helps with mobility and pain
16	Yes Stroke rehab MSK from acute to mid stage rehab Lower back pain when mobilising is painful
17	no
18	CPD with my colleagues
19	5/10
20	more placements in hydro for students More use of hydro in NHS Improving funding in this area more research in to hydro

21	getting well known healthcare facilities that work with disabilities or specific conditions to create information outlets that promote the use of hydro and specific interventions in the water
22	hydro does not need to be costly, it can be effective as long as clinicians are trained will in the area and can relate it to the pathology or disability

PT07	
01	20+ years
02	Physiotherapist
03	33
04	Private practice
05	orthopaedic, neuro, paediatric
06	gait, transfer, both UL & LL immobility
07	I think it is particularly helpful for people who cannot weight bear unaided on land.
08	It is hard to progress to mid or end stage in the pool, there is a point with mobile people when they need to be on land.
09	increased ability to walk unaided in the pool- doesn't always transfer onto land
10	different patients will respond differently- the outcomes tend to be individual based on assessment
11	Yes
12	the poor availability of pools and the cost of private treatment.
13	Yes- cost
14	I'm not sure/I have not asked
15	Yes we have surveyed our patients and they report it to be very beneficial.
16	Yes - rehab on both land and gym
17	The benefits of hydrotherapy to patients with spinal cord injuries Terry J. Ellapen, 1 Henriëtte V. Hammill,1 Mariëtte Swanepoel,1 and Gert L. Strydom1 Scientific Evidence-Based Effects of Hydrotherapy on Various Systems of the Body A Mooventhan and L Nivethitha1 The Use of Hydrotherapy for the Management of Spasticity N. Kesiktas, N. Paker, [...], and H. Yilmaz et
18	in a member of ATACP
19	8/10
20	better referral pathways, NHS funding, more research
21	more research
22	It is a very effective method of improving QoL in people with low mobility and long term disability.

PT08	
01	11-15 years
02	Physiotherapist
03	40 years
04	Private practice
05	-
06	Neuro/ ortho / paediatric
07	Yes
08	Equal Yes there are drawbacks
09	Improved strength and mobility
10	They could be
11	Yes
12	Management and cost of running a pool I managed x 2
13	Yes
14	They do not have a preference
15	They generally enjoy hydro when they have it
16	Yes often for all cases except paediatrics
17	Lots specific to all different conditions
18	Reading and courses
19	8/10
20	Cost of delivery and management of pools
21	Has to be availability of facilities
22	-

PT09	
01	16-20 years
02	Physiotherapist
03	17
04	Private practice
05	MSK and orthopaedic
06	Wheelchair, walking aids, fully mobile
07	I think you can tailor the hydrotherapy session to anyone's needs. Lots of patients enjoy it for the psychological benefits they can gain out of it whether they are marathon runners or wheelchair bounds. I have seen great results with it when for stiff joints (elbow, shoulder, knee etc), post op to help with mobility and for people with weight bearing restrictions. Patients with acute back pain can manage a lot more in the pool and so can a chronic pain patient.
08	Very effective. It helps with confidence, improving gait. I think it's just as useful but with neuro patients or one that's are anxious, it can be more useful than land. For patients with weight bearing restrictions, it's more useful.
09	MYMOP

10	Not always
11	Yes
12	Only a handful of places offer it. Patients have to travel quite far sometimes to access it which is not helpful, can flare some patients up etc..
13	Yes
14	They prefer hydrotherapy
15	They really enjoy hydrotherapy
16	Yes, I always recommend patients to continue with their land based treatment
17	Yes and no. Mainly go by my experience and how the patient presents.
18	ATACP
19	1/10
20	Make it more readily available Teach benefits to orthopaedic team, physiotherapists
21	Patient information sheets
22	I think the physiotherapist's experience makes a big difference. Their exercise repertoire can make a difference

PT11	
01	6-10 years
02	Occupational Therapist
03	10
04	Currently a student, but have worked in Acute care and Community hospitals, as well as in a charitable organisation providing community stroke aftercare
05	Predominantly Neurological, but some orthopaedic
06	Balance and coordination, gait, generalised limb weakness IE hemiplegia
07	No. I believe strongly that hydrotherapy intervention is of huge benefit to all of the patient populations with those conditions that will benefit from its provision, provided they can tolerate the pool environs. Hydrotherapy in a dedicated therapy pool provides heat therapy, weight reduction, aids development of 'saving' reactions where these have been adversely affected, and provides a gentle and consistent resistance to movement.
08	In my experience of providing hydrotherapy services (based on the before and after surveys completed as part of their treatment programmes, and with therapist input) we regularly saw evidence of an increase in confidence levels in our attendees. As for drawbacks, it is an expensive service to provide. Anything to do with a pool is expensive; heating, chemicals, sampling, maintenance, staffing.
09	Our surveys reported improvements in range of motion, limb strength, coordination and balance.
10	They can be? You can work on balance and coordination outside of the pool, and we often do so....but in my experience the process can be quite slow. My thinking is it shouldn't be a a case of either/or, more concomitant where possible.
11	Yes

12	Cost and general lack of staffing. Lack of facilities. A couple of case studies from places I've worked - DGH lost their hydro pool through lack of maintenance for in excess of 18 months, no alternative provision. Special needs school lost their onsite pool through breakdown. No money for repairs in budget, outsourced to local authority pool - unsuited to many of their patient group as too cold. Hydrotherapy provision via stroke charity unavailable for 12 months due to lack of effective staffing and funding.
13	Yes. It is, without doubt, very hard to supply a service which is either unsuitable, or non-existent entirely.
14	They prefer combined hydrotherapy and on-land
15	Not directly, I either assessed following referral from DGH or existing users of our service - or it was already an existing part of their treatment regime. Most of those who had experienced the service were keen to have repeat sessions, those who did not felt cited external factors (transport/transfer issues etc) in their reasons for service withdrawal.
16	I made every attempt to allow and encourage my hydro patients to engage with land-based seated exercise programmes in the community. In regard to Acute and Community settings, hydro was offered by the registered therapists where it was available and deemed to have therapeutic benefit to the patient.
17	No, I haven't written it yet ;)
18	Professional registrations, newsletters and monthly magazines.
19	8/10
20	Ringfenced funding as part of rehabilitation budget in hospital settings where there is existing hydrotherapy provision. Development of service provision with funding commitment where it is not offered.
21	I have used visual and written testimonials successfully to promote the service when I was running it - both to raise awareness of efficacy and as a fundraising tool. We were providing our service for 4 years through donations and legacy only, receiving no support from the clinical commissioning group.
22	None, I think I've been quite thorough.

PT16	
01	1-5 years
02	Stroke survivor
03	Medical secretary 20-25 years
04	Hospital
05	Neurological
06	Stiff muscles.
07	Yes.
08	Very very effective.
09	Confidence boosting and more muscle control.
10	No.
11	Yes

12	Funding and facilities
13	Yes
14	They prefer hydrotherapy
15	Yes
16	No
17	No
18	Via the stroke association.
19	4/10
20	Funding and advertising via GP surgeries.
21	Funding/media coverage.
22	Not at present

PT18	
01	1-5 years
02	Occupational therapist
03	18
04	Community
05	Paediatrics and learning disabilities
06	Cerebral palsy
07	Learning disabled and paediatrics as they enjoy the sensory input provided and it's often an experience that carers May struggle to provide (heated pool/lack of knowledge of physiology)
08	Better as reduces weight on joints, warms muscles and joints up, wider range of movement. Less tiring and painful for participants.
09	Increased range of movement, greater motivation to engage
10	No
11	Yes
12	Therapists willingness to facilitate, increased time required to change the patient, following treatment, maintaining the water temperature, chlorine levels, access to a pool, limited evidence base
13	Occasionally
14	They prefer combined hydrotherapy and on-land
15	Yes as keen to incorporate different treatments in order to obtain the best outcome
16	To encourage progress outside of appointments with family/school/carers
17	No just attempting to be holistic for the patient using the time and resources available equitably.
18	Using journal articles, sharing recommendations with other members of the team/mdt and being part of special interest groups forums under RCOT
19	4/10
20	More access to heated pools and stronger evidence base
21	No
22	No

PT19	
01	16-20 years
02	Aquatic therapist
03	18
04	Hospital/ private practice
05	Orthopaedic, neurological, rheumatological
06	Pain and stiffness on movement, pattern changes that cause pain
07	Yes. Hydrotherapy is more effective on chronic pain as it alleviates gravity related challenges while still challenging strength and correctly retraining muscle patterns that translate to land based activities. Geron Hydrotherapy is the most effective in my experience as it balances active and passive work, and ensures correct movement.
08	Very effective overall. Drawbacks are having to get wet, and the time and effort changing into and out of swimsuits. For some ladies, the drawback is having to revisit the hairdresser.
09	Reduced stiffness and pain on movement. Increased range. Reduced frequency and duration of pain episodes. Improved quality of life. Reduces latent pain post treatment. Reduced inflammation. Enjoyment of treatment. Better mindset and outlook.
10	Not all.
11	Yes
12	Not enough facilities and trained therapists
13	No, I still choose hydrotherapy over other interventions, as I know its effects are faster and more effective.
14	They prefer hydrotherapy
15	They specifically ask for it if they are well informed. Some that have a phobia of water want a lot of information and reassurance around what they will experience. I use videos to give them a detailed visual.
16	Yes. When we have reached our mobility and strength goals and the patient can return to more challenging land-based exercise.
17	No, just personal experience.
18	Yes
19	2/10
20	More research that quantifies its effectiveness. This will convince healthcare professionals of its effectiveness. Better communication around its application and effective.
21	Universities would be a great place to start. There are also several professional associations and organizations that can collectively promote its use.
22	There is a perception that the water is for older people who are frail, and doesn't do enough for other such as athletes and the younger population. This is usually

	dispelled by doctors that prescribe the therapy over other interventions, but for the broader public this perception still exists, and is incorrect.
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PT20	
01	20+ years
02	Physiotherapist, now lecturer
03	32
04	Education since 2005. Prior to that I worked in NHS and the sports sector.
05	A wide number of areas including paediatrics, spinal injuries, MSK/orthopaedics and elite sports.
06	A complete range from complete tetraplegia from the neck down through to neurological coordination issues, strength problems following trauma and slow progress in functional conditioning following surgery.
07	The water helps build confidence and is especially useful for those who are struggling with activities on dry land, for example when strength is insufficient to overcome gravity, or for elderly people who can feel supported by the buoyancy properties of the water. It is excellent for having fun which makes it a great choice for children. At the other end of the spectrum it is also good for working people very hard using techniques like Bad Ragaz or swimming against a flow/current.
08	Very efficient. You can do almost anything in hydrotherapy. The drawbacks are the financial elements of heating and maintaining a pool and the need for staff levels to manage health and safety. It is also space intensive, but it is great for small group work so space can be utilised well.
09	Increased confidence, increased muscle strength and range of movement, decreased pain.
10	Yes, the choice of using hydrotherapy is more about selecting the type of patient for whom this method will work best at achieving these generic goals.
11	Sometimes
12	Its almost always about space and finances.
13	Yes
14	They prefer combined hydrotherapy and on-land
15	Occasionally, although its nothing something a lot of people really understand or expect to receive from a rehab perspective..
16	I always attempted to do both as the ultimate aim is to function well on dry land. The combination often allowed me to progress my dry land exercises more quickly for patients who were struggling initially.
17	There is plenty of research out there on the benefits of different methods for select groups of individuals, for example hydrotherapy for Ankylosing Spondylitis, but this does not necessarily support or refute either method. The right choice sits with the assessment and subsequent re-assessment skills of the therapist.
18	All therapists need to keep up to date with reviewing literature regularly. This can be done through professional journal scanning and progressively I do this through networking and a receiving alerts/updates on social media.

19	7/10
20	Regular in-service training and raising the profile amongst social media networks. Given the huge pressures on resources in the NHS therapists must be pro-active in looking for entrepreneurial or creative ways of either accessing facilities or through business planning to highlight the advantages of hydrotherapy.
21	Partnership working with community organisations that are able to provide resources / facilities.
22	It is an excellent tool for addressing a wide range of therapeutic goals and we are in danger of losing it as a resource for the majority of NHS facilities which would be a real shame.

Appendix 3. STROBE checklist

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*	Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

Appendix 4. Dissertation advertisement poster

UNIVERSITY OF NOTTINGHAM


Take part in this dissertation survey!





10 MINS

The survey will take you approx. 10 minutes.



ANONYMOUS

Your answers will be 100% anonymous and stored securely.

YOU'RE INVITED TO PARTICIPATE IN THIS RESEARCH EXPLORING THE EFFECTIVENESS AND UTILISATION OF HYDROTHERAPY!

QR CODE FOR ONLINE SURVEY ACCESS:



This survey is online. Freedom to complete it at a time and place of your choosing!

URL LINK TO ONLINE SURVEY:

[HTTPS://FORMS.OFFICE.COM/E/POJGQK2BXB](https://forms.office.com/E/POJGQK2BXB)

Hydrotherapy is currently an under-utilised therapy in healthcare – many pools are shutting, or are too expensive/far away for patients to use. We hope that through this research and your participation, awareness of hydrotherapy will surge, and further research can be completed to increase the utilisation.



For any queries please contact:

Msytw2@nottingham.ac.uk - Primary researcher

ntzesa@exmail.nottingham.ac.uk - Research supervisor

Appendix 5. Ethical approval from the University of Nottingham Ethics Committee



**Faculty of Medicine & Health Sciences
Research Ethics Committee**

Faculty Hub
Room E41, E Floor, Medical School
Queen's Medical Centre Campus
Nottingham University Hospitals
Nottingham, NG7 2UH
Email: FMHS-ResearchEthics@nottingham.ac.uk

30 October 2023

Dr Emad Al-Yahya
Assistant Professor
Physiotherapy & Rehabilitation Sciences
School of Health Sciences
B Floor, Medical School
QMC Campus
Nottingham University Hospitals
NG7 2UH

Dear Emad and Tallulah-Honey

Ethics Reference No: FMHS 09-1023– please always quote	
Study Title: A Review of Healthcare professionals' Perception on the Effectiveness of Hydrotherapy on Improving Patient Mobility Compared to on-land Interventions.	
Supervisor: Dr Emad Al-Yahya, Assistant Professor	
Student: Tallulah-Honey Wyard , Year 3 Sports Rehabilitation	
Course: Research Methods and Planning module, Physiotherapy & Sports Rehabilitation Sciences, School of Health Sciences.	
Proposed Start Date: 03/10/23	Proposed End Date: 30/04/2024

Thank you for submitting this interesting application. It was considered at the Committee meeting on 17 October 2023. The following documents were received:

- FMHS REC Application Form and supporting documents version 1.0: 22.09.2023

These have been reviewed and are satisfactory and the research project is given a favourable research ethics opinion.

A favourable research ethics opinion is given on the understanding that:

1. All gatekeeper permissions if required are checked and in place before recruitment starts.
2. The protocol agreed is followed and the Committee is informed of any changes via e-mail.
3. The Chair is informed of any serious or unexpected event.
4. An End of Project Progress Report is completed and returned when the study has finished (Please request a form).

Yours sincerely



Dr John Williams, Associate Professor in Anaesthesia and Pain Medicine
Chair, Faculty of Medicine & Health Sciences Research Ethics Committee