EXPLORING THE INFLUENCE OF VIRTUAL REALITY TECHNOLOGY ON THE OCCUPATION OF PHYSIOTHERAPISTS IN TREATING CHRONIC LOW BACK PAIN: A QUALITATIVE STUDY ON THE PERSPECTIVE OF PHYSIOTHERAPISTS.

Student
Sophie van Riel
Student number: s2999366

University
University of Twente
Educational program: MSC Health sciences
Faculty: Science and Technology
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Supervisors
Pieter-Jan Klok
Lieke Heesink
Syl Slatman

Preface

Before you lies a qualitative study exploring how VR technology influences the occupational identity of physiotherapists in treating people with chronic low back pain from a physiotherapists perspective. This research was a master thesis research for the master Health Sciences of the University of Twente. This research took place from February to July 2024. I would like to thank all participants and my supervisors Pieter-Jan Klok, Lieke Heesink and Syl Slatman for the guidance and involvement during this research.

With kind regards,

Sophie van Riel

Abstract

Introduction

Chronic low back pain (CLBP) is a condition that is defined as back pain that last three months or longer. Treatment of CLBP poses challenges, as physiotherapy often results in small to moderate effects. Virtual Reality (VR) emerges as a new treatment option for CLBP. However, a knowledge gap in research regarding the perspective of physiotherapists on the treatment of CLBP with VR has been identified. To address this knowledge gap, this thesis looked into the perspective of physiotherapists regarding the use of VR in the treatment of CLBP and the effect VR has on the occupational identity, using the Model of Human Occupation (MOHO) framework to structure interview questions and interpretate the results.

Method

A qualitative research design was used, involving semi-structured interviews conducted online with six physiotherapists. The participants were recruited through the supervisor's network and online searches. Interviews were transcribed using Amberscript and analysed deductively based on the MOHO model.

Results

The analysis revealed four main themes and 10 subthemes based on the MOHO and the sub-research questions. The results show that VR technology needs a hands-off approach which requires new skills and is contrasting with traditional hands-on methods of physiotherapists. This shift does align with values of physiotherapists but requires new skills. Participants were generally positive about VR and its potential to reduce fear of movement and improve pain understanding. Patient-therapist relationships could be positively affected by the use of VR as a new treatment option. However, also neutral or negative effects were mentioned, caused by misalignment between skills of patients with technology and VR. In addition, significant barriers for use exist, including technological malfunctions, preparation time, high costs, and lack of insurance coverage.

Discussion

VR use does influence the occupational identity and practise of physiotherapists by changing the approach necessary from hands-on to hands-off, changing their daily activities, utilization of their time, and skills used for treatment. Recommendations were made to stimulate VR use in physiotherapy, reducing equipment costs, ensuring insurance coverage, simplifying VR technology, and providing standardized training. Further research is necessary to ensure VR's efficacy and explore its benefits for CLBP treatment.

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Introduction

Individual burden of chronic low back pain

Chronic low back pain (CLBP) is defined as persistent pain lasting for three months or longer (Meucci et al., 2015). It can stem from different causes such as vertebral fracture and infection. However, for most people with CLBP a specific source cannot be found, leading to the term non-specific low back pain (Hartvigsen et al., 2018). The pain of CLBP can range from sharp pain to a dull ache and may spread to other body parts. This discomfort can limit movement, leading to reduced activity (Meucci et al., 2015; World health organization, 2023).

Psychological factors are often comorbidities occurring with CLBP (Hartvigsen et al., 2018). Individuals with CLBP often battle with depression, catastrophising, and negative thoughts and beliefs. Catastrophising, described as when someone beliefs without evidence that something is far worse than it is in reality, can impact the individual's perception of pain (Hartvigsen et al., 2018). Moreover, negative thoughts and beliefs can cause avoidance behaviours, which, in turn, maintain the pain (Brea-Gómez et al., 2021; Hartvigsen et al., 2018). These psychological symptoms reflect underlying neuroplastic changes in the nervous system (Pelletier et al., 2015). Neuroplasticity, the brain's ability to reorganize and adapt in response to internal and external stimuli, contributes to changes in the central and peripheral sensitization. Such changes can render the nervous system to become more responsive to pain signals (Pelletier et al., 2015).

Societal burden of chronic low back pain

Globally, around 619 million people experienced low back pain in 2020 (Ferreira et al., 2023). A 36,4% increase in low back pain cases is expected globally by 2050 (Ferreira et al., 2023). Even after consulting their general practitioner, 60% of people experiencing low back pain report still to experience it one year later (Geurts et al., 2018). Comparatively, individuals with CLBP experience a loss of 64% in Quality-Adjusted Life Years (QALY) when compared with the healthy population (Geurts et al., 2018). The burden on society level is high, as highlighted by that around 0.6% of the gross national product is spend on CLBP in the Netherlands. These costs include direct healthcare costs such as pain treatment and indirect (societal) costs such as work absenteeism (Geurts et al., 2018).

Treatment of CLBP

For cases of specific CLBP where the underlying cause has been identified, treatment is tailored according to the cause (Hartvigsen et al., 2018). For non-specific CLBP, where the underlying cause is not identified, different treatments are available as for example described in The world health organisation (WHO) guideline for non-surgical management of chronic low back pain in adults in community and primary care

settings (Alperovitch-Najenson et al., 2023). This guideline mostly contains non-pharmaceutical interventions such as multi-component interventions, psychological interventions, education and physical interventions (Alperovitch-Najenson et al., 2023). As seen in the Royal Dutch Society for Physiotherapy (KNGF) guideline for treating low back pain (Swart et al., 2021), physiotherapists are proficient in delivering education and implementation of all psychological and physical interventions recommended by the WHO guideline (Alperovitch-Najenson et al., 2023).

Physiotherapy typically involves a combination of interventions such as exercises, education and manual therapy. Structured exercises therapy is aimed to enhance physical capacity, muscle strength and range of motion. Manual therapy can include spinal manipulative therapy, needling therapy and massage, administered to alleviate pain and improve functioning (Alperovitch-Najenson et al., 2023; Swart et al., 2021). The benefits of physiotherapy for treating CLBP is underscored by Atalay et al., 2013, who highlights the benefits including reduction of pain, increase in function, increase in quality of life, and decrease in anxiety and depression among people with CLBP. Despite these benefits, the effects of physiotherapy are often small to moderate and are not lasting, also due to lack of adherence of the patients to the treatment (Hayden et al., 2020).

Virtual reality (VR) as treatment for CLBP

VR is an immersive technology that creates interactive, real-time simulations that users can engage with through various sensory inputs. VR can promote skills for coping with pain and self-management (Matthie et al., 2022). It provides immersive experiences that distract individuals from their pain and promote relaxation (Elser et al., 2023). The interactive simulation of VR could possibly lead to neuroplastic changes in the sensory and motor brain regions, including those involved in the registration of pain (Austin & Siddall, 2021). While these neuroplastic changes may contribute to a reduction or management of pain, direct evidence of long-term effects remains limited and requires further research (Austin & Siddall, 2021; Brassel et al., 2021; Cheung et al., 2014). Additionally, the multisensory input provided by VR creates a realistic environment, which aids in transferring the acquired skills into real life (Bauer & Andringa, 2020; Brassel et al., 2021; Sevcenko & Lindgren, 2022).

The immersive features of VR create engagement of patients through immersive and interactive experiences. It is a promising treatment tool due to its ability to facilitate motivating practice by creating challenging environments and providing a sense of success and control (Glegg & Levac, 2018). Integrating VR alongside physiotherapy could offer a more effective and comprehensive treatment for people with CLBP. VR can be utilized in physiotherapy for interventions such as psychological treatment, meditation, relaxation, and physical exercises (Brassel et al., 2021; Matthie et al., 2022).

Physiotherapist perspective on VR

A focus group study by Brady et al., 2023, studied how physiotherapists view VR treatment for musculoskeletal shoulder pain. Physiotherapists stated that the immersion in VR would potentially reduce fear of movement among patients. They were positive about VR providing a more engaging way of rehabilitation and physical activity above traditional physiotherapy. Moreover, physiotherapists thought it could improve adherence with the rehabilitation program and increase the level of physical activity of patients. However, there were concerns about safety of patients and overdoing the exercises causing further injuries. Physiotherapists feel responsible for their patients and are concerned with the liability of an accident (Brady et al., 2023).

A focus group study by Dejaco et al., 2024, about experiences of physiotherapists considering VR for rehabilitation of the shoulder, stated that physiotherapists were positive about the potential of VR. The positives of VR described by physiotherapists were similar to the study by Brady et al., 2023. The physiotherapists did have concerns in both studies about financial burden and evidence base for VR treatment. It was highlighted that there is a need for guidelines, personalized applications of VR and training (Brady et al., 2023; Dejaco et al., 2024). In the focus group study by Dejaco et al., 2024, it mentioned the effect VR might have on their practise. Hereby, some physiotherapists expressed their difficulties on letting go of the patient-therapist contact. They felt that this contact is necessary to build trust. They considered that VR could create a new role for physiotherapists which is exciting and frighting at the same time according to them due to the lack of experience (Dejaco et al., 2024).

Addressing the knowledge gap

Physiotherapists' perspectives on VR treatment for musculoskeletal conditions, particularly shoulder pain, have been explored in recent studies (Brady et al., 2023; Dejaco et al., 2024). These studies indicate a generally positive outlook among physiotherapists toward VR, highlighting its potential to enhance rehabilitation and physical activity engagement. However, concerns mentioned regarding patient safety, evidence base, and the impact on traditional patient-therapist dynamics. Despite these insights a knowledge gap in research regarding the perspective of physiotherapists on the treatment of CLBP with VR has been identified. This knowledge gap is highlighted by Elser et al., 2023, by recommending undertaking more research on the perspective of healthcare professionals in relation to VR as treatment for individuals with chronic pain. To address this knowledge gap, this thesis looked into the perspective of physiotherapists regarding the use of VR in the treatment of CLBP.

However, to gain a comprehensive understanding of the perspective of physiotherapists, it was important to recognize the professional context of physiotherapy as an occupation. This implies that it includes defined roles, requirements, and specific activities which are expected to be consistent for all practitioners in this field. VR changes physiotherapy and how physiotherapists see themselves because of their change in job tasks. Occupational-focused models offer insights into various factors influencing the practise of physiotherapy. The Model Of Human Occupation (MOHO) is an occupational-focused model that explicitly involves the perspective and wishes of an individual. The MOHO forms the theoretical basis for this thesis. This model provides topics to get a more in depth comprehension of someone's perspective and situation. It emphasises the inclusion of all variables including the individual's characteristics, the occupation itself and the environment. The model provides a structure to look in a different way at an explanation of why people behave and act in certain ways (Park et al., 2019).

The elements of the MOHO have influence on the occupational identity. Occupational identity represent how we see ourselves at work and the work that we do. This identity is shaped by the tasks we perform (Verhoef & Zalmstra, 2017) In this research, the term occupational identity is used to describe professional self-image of physiotherapists and the scope of their profession. Examining VR's impact through the occupational-focused model and their four dimensions offered valuable insights into its influence on the practices of physiotherapists. It clarified how VR technology affects the roles and behaviours of physiotherapists, the environment in which physiotherapy is conducted, and the ability to effectively perform as a physiotherapist. This knowledge holds important value for various stakeholders.

Firstly, it can help with the development and refinement of VR technology and VR-based interventions. The technology and interventions can be more tailored to the preferences and needs of practitioners (Brassel et al., 2021; Ekstrand & Willemsen, 2016; Glegg & Levac, 2018). Moreover, such knowledge can add to the expansion of evidence-based practise within physiotherapy. This would ensure that

interventions, such as VR, align with best practices and guidelines (Walton, 2020). Furthermore, understanding how VR influences behaviours, roles and practices of physiotherapists can help develop trainings, and foster competencies in using VR technology (Glegg & Levac, 2018; Walton, 2020). This could facilitate acceptance of VR among healthcare professionals, which as identified by Brown et al., 2022, will contribute to the broader implementation of VR technology.

In conclusion, obtaining a deeper understanding of physiotherapists' perspectives on VR, can improve quality, accessibility and effectiveness of CLBP treatment, and hence ultimately improve patient outcomes. Therefore, this thesis explored how virtual reality technology influences the occupational identity of physiotherapists in treating people with chronic low back pain from a physiotherapists perspective.

Aim and research question

The aim of this thesis was to explore how VR technology influences the occupational identity of physiotherapists in treating people with CLBP from a physiotherapists perspective. The variables of the MOHO are taken into account during the development of the following research question and its sub-questions. The variables of the MOHO are discussed in the theoretical framework.

Research question

How does, from a physiotherapists perspective, virtual reality (VR) technology influence the occupational identity of physiotherapists in treating people with chronic low back pain (CLBP)?

Sub-questions

- How does the economic and physical environment consisting of factors as equipment and rooms used for VR treatment, and the coverage of the costs of VR by insurance or patients influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?
- How does the social environment consisting of the social influences from patients and colleagues influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?
- How do personal characteristics, such as interests, values, perceived personal effectiveness, habits and roles influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?
- How do occupational skill, occupational performance and occupational participation influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?

Theoretical framework

A theory can provide a framework to structure the data collection process and ensure that the research process is systematically ordered. It can safeguard that each factor influencing the researched topic is covered (Glegg et al., 2013). Therefore, it had been chosen to use a model as basis for this research.

Most research found having similar topics that used a model, looked into the implementation or intended use of VR by healthcare professionals. Therefore, implementation models and intended behavioural theories were considered such as the MIDI, NASSS, ADOPT-VR, (Decomposed) Planned behavioural theory and UTAUT model (Felsberg, 2021; Fleuren et al., 2014; Glegg et al., 2013; Greenhalgh et al., 2017; Levac et al., 2016).

The implementation models and intended use theories look at the factors before use of the innovation. Therefore, lack the variables to investigate how VR already in use affects behaviour and the occupation itself. An occupational-focussed model contributes to obtaining a total picture of an individual, his situation and his wishes with regard to his daily actions and participation (Verhoef & Zalmstra, 2017). While existing research has not utilized this type of model in the context of innovation within healthcare, these models offer an in-depth understanding of someone's perspective and situation. For that reason, this research used an occupational-focussed model as a theoretical basis.

Occupational-focussed model

Person- Environment-Occupation-Performance model (PEOP)

An example of an occupational-focussed model is the Person-Environment-Occupation-Performance model (PEOP) which is based on various sciences such as occupational, neuro, behavioural, social and biological science. This model is based on the interaction between a person, its environment, occupation and the performance of the different tasks and activities (van Hartingsveldt & Pellegrom, 2017). As seen in figure 1, per category a list of variables is given. Figure 1 also shows how these categories play a role together in creating a foundation for the performance of activities and tasks (van Hartingsveldt & Pellegrom, 2017). From this model the concept of multiple determinants influencing the performance of the occupation itself were fundamental for this research.

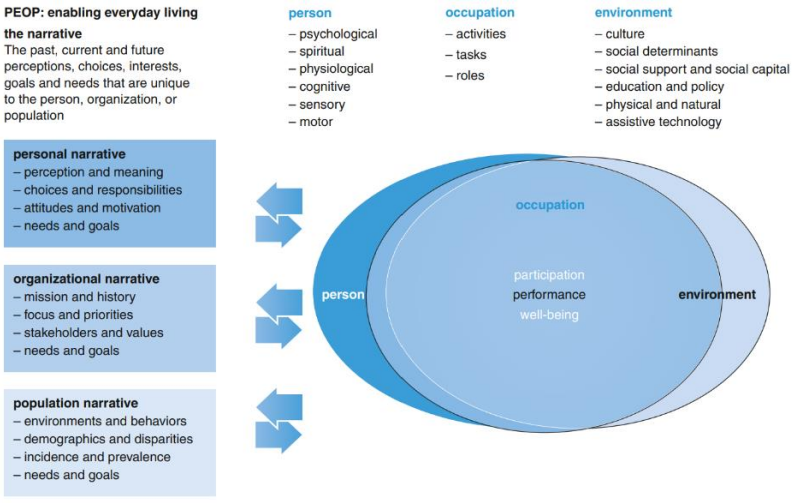

Figure 1: Person-Environment-Occupation-Performance model (PEOP) (van Hartingsveldt & Pellegrom, 2017).

Model Of Human Occupation (MOHO)

As explained in the introduction the Model Of Human Occupation (MOHO) is an occupational-focused model that explicitly involves the perspective and wishes of an individual (Verhoef & Zalmstra, 2017). This model is grounded in system theory, which defines a system as a gathering of elements and their relationships. A noteworthy characteristic of this theory is that the entirety of the system is more than just the elements itself because of their relationships among each other. By changing one element within this system, it can create new behaviours or tasks (Verhoef & Zalmstra, 2017).

In the context of this research, VR is a change for physiotherapists in their daily practices. With the elements of the MOHO applied, this research gave insight into the influence VR has, not only on the different elements, but also on the relationship between the elements and the changed behaviours and tasks. Figure 2 shows a causal model that includes the elements of the MOHO model that formed the basis of this research. The elements are slightly altered or excluded to fit this research. The next paragraphs explain the elements as shown in the causal model and their value within this research. The yellow elements are the variables that form the basis for this research and are shown in the next paragraphs in bold.

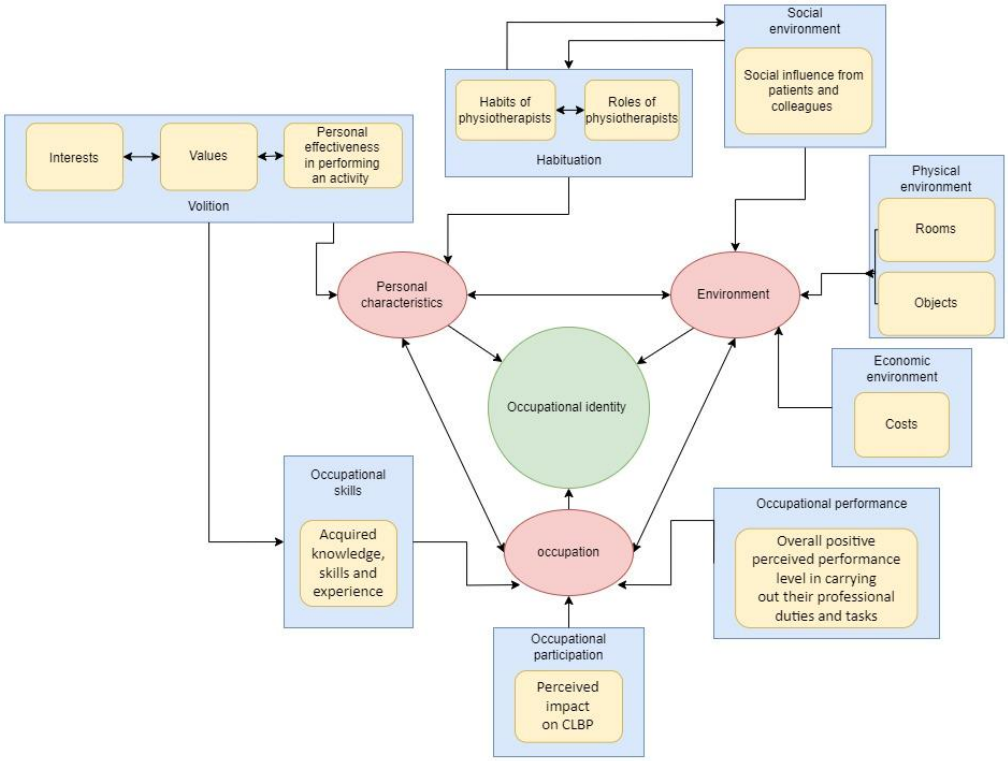

Figure 2: Causal model with the elements of the Model Of Human Occupation (MOHO) (Verhoef & Zalmstra, 2017).

Elements of the MOHO: Occupational identity

Occupational identity represent how we see ourselves in relation to the activities we do (Verhoef & Zalmstra, 2017). The term occupational identity is used to describe professional self-image of physiotherapists and the scope of their profession. According to the MOHO occupational identity consists of:

- "A sense of capability and effectiveness;
- what gives people satisfaction and what people find interesting;
- the roles and relationships people have;
- what people feel obliged to do and what they find important;
- what people have as routines and the observations of the environment and what the environment expects and offers" (Verhoef & Zalmstra, 2017).

Occupational identity is a combination of the personal characteristics, the environment and the occupation. However, it is a variable on its own because it is shaped by time and experiences also known as life experience or occupational narratives (Verhoef & Zalmstra, 2017). This is also shown in a qualitative study by Hammond et al., 2016, about the construction of professional identity according to physiotherapists. In that research, it is described that occupational identity is shaped over time but consists of the same factors shaping it. These factors are the same in the research by Hammond et al., 2016, as from the MOHO and can be categorized as environment, personal characteristics and occupation. Therefore, in this research occupational identity was seen as a distinct variable which remains inherently dynamic and is constantly evolving by the influences of personal characteristics, environmental contexts and the occupation.

Elements of MOHO: personal characteristics

The MOHO considers three personal characteristics as relevant: volition, habitation and performance capacity. Performance capacity refers to the physical and mental capacities of a person to perform the activities. This research included physiotherapists who have no physical or mental disabilities in relation to the use of VR. Thereby this variable was seen as a constant that has limited to no influence on the research and was thereby not taken into account (Lin & Fisher, 2020; Verhoef & Zalmstra, 2017).

Volition

In the MOHO, volition characterizes the motivation driving an individual's commitment to do an activity. Volition is shaped through a dynamic process between interests, values and personal effectiveness (Verhoef & Zalmstra, 2017).

Personal effectiveness refers to an individual's perceived ability to use their skills, knowledge, and resources to successfully accomplish predetermined goals within a given activity and context. It involves the individual's perceived ability to manage their time, energy, and efforts with the intention of maximizing achieving desired outcomes, regardless of the actuality (Verhoef & Zalmstra, 2017). VR introduces a change in activities for physiotherapists which can also come with a change in time, energy, and efforts to achieve the desired outcome. **Values** refers to the beliefs that lend significance to the activity. The values of an individual set standards for how they want to carry out the activity, regardless of whether these standards are met in practice (Verhoef & Zalmstra, 2017). If these standards are contradicting to what VR has to offer, then this could influence the use of VR and professional fulfilment of physiotherapists. **Interests** refers to what a person enjoys doing. The enjoyment executing a certain activity gives, is one element people base their choice on to do the activity (Verhoef & Zalmstra, 2017). If

using VR does not spark enjoyment with the physiotherapists, this influences the choice of using VR during treatment of CLBP.

Personal effectiveness, values and interests are closely intertwined: individuals want to pursue activities they both enjoy and excel in. The interaction between these components shapes patterns in thoughts and behaviours within an individual. As a result, this interaction forms the basis for decision-making and action selection of individuals (Lin & Fisher, 2020; Park et al., 2019; Verhoef & Zalmstra, 2017). Taking volition from the MOHO, physiotherapists' volition directly influences their approach in treatment selection, planning and implementation. When VR technology fails to meet the goals and needs of physiotherapists, volitional factors can show potential misalignment between VR and the personal strengths, interests, and values of physiotherapists. Enhancing alignment can foster professional fulfilment and growth within physiotherapy.

Habituation

Habituations plays an important role in shaping behaviours and routines of physiotherapists, influencing how they approach their occupation on a daily basis. Habits and the roles individuals form, habituations take on.

Habits mostly emerge as often semi-automatic behavioural patterns ingrained in the practitioner's routine (Lin & Fisher, 2020; Slavov, 2017; Verhoef & Zalmstra, 2017). The **roles** individuals take on are integrations of social and/or personal defined statuses and require coherent behaviour and attitude (Lin & Fisher, 2020; Verhoef & Zalmstra, 2017). This aligns with role theory which states that social participants assume certain social behaviours and identities (Biddle, 1986).

With physiotherapy, habits and roles influences the undertaking of certain tasks such as consistent treatment delivery and timely appointments. Traditional therapy follows set routines, but VR introduces new ways to vary treatments and break habits. As VR is used by physiotherapists it gets integrated into their routine practices and thereby evolve their habituation, reshaping their occupation. Therefore, habituation was explored within this research.

Elements of MOHO: environment

The environment influences a physiotherapist by on the one hand give opportunities and resources to act and on the other hand to restrict and set demands to the activities (Verhoef & Zalmstra, 2017).

Physical environment

The physical environment consists of the **objects** and **rooms** necessary to perform the activity (Verhoef & Zalmstra, 2017). This environment can facilitate or restrict the activity. In literature about implementation of VR in healthcare often VR itself and/or the treatment room used for VR is mentioned as stimulant or constraint.

Kouijzer et al., 2023, describes for example that the treatment room created limited space to move while using VR. This limit of free movement forms a barrier for creating a safe environment to treat with VR and thereby restricting the use of VR (Kouijzer et al., 2023). In addition, VR hardware and software are explained to have technical malfunctions, causing barriers to use it (Kouijzer et al., 2023). Facilitating the use of VR are, for example, the positive features of VR. Positive features are that it can closely monitor progression and regression of a patient's abilities, making it easier to monitor patients (Bauer & Andringa, 2020). The immersive feature of VR can make it able to create a realistic environment within

VR. This has a positive effect on transferring the acquired skills learned from VR into real life (Bauer & Andringa, 2020; Brassel et al., 2021; Sevcenko & Lindgren, 2022).

Social environment

Understanding the social environment of physiotherapists is essential for comprehending the impact of VR on physiotherapy. Sociology provides insight into people's behaviours by placing them in their social contexts. We show behaviours that suit expectations of the people around us (Hendrix, 2018; Weiss & Copelton, 2020). These expectations shape an individual's behaviour and actions (Verhoef & Zalmstra, 2017). The social environment is closely related to the roles physiotherapists possess. These are shaped by the social participants and scripts.

Because of the close interaction between social environment and roles of physiotherapists, it is chosen to look into **the influence of patients and colleagues**. This provided valuable insights into how VR can shape professional behaviours, patient interactions and overall practise of physiotherapists.

Economic environment

The economic environment has influence on the practice of physiotherapy by determining the availability of necessary resources (Verhoef & Zalmstra, 2017). For this research, this environment contained **the coverage of the costs of VR** which include the cost for the treatment with VR.

An example of the impact of the economic environment on the occupation is that physiotherapy is no longer covered by basic insurance in the Netherlands. As highlighted in two news articles by Pennarts, 2023, and de Gelder, 2023, the financial costs of physiotherapy have had effects on peoples' access to essential care. Both articles underscore the financial burden imposed by the out-of-pocket expenses for physiotherapy, resulting in people not undergoing necessary physiotherapy treatments to improve their wellbeing and health (de Gelder, 2023; Pennarts, 2023). This has substantial impact on the practise of physiotherapy, by shaping the accessibility and affordability of their services. With the introduction of VR technology into physiotherapy practice, questions about financial burdens and practicalities arise (Brady et al., 2023). Investigating the economic environment within this research provided a comprehensive understanding of how VR impacts physiotherapists' behaviours and practices in treating CLBP.

Elements of MOHO: Occupation

The occupation in the MOHO consist of occupational skill, occupational performance and occupational participation. These three together give an image of the skills the occupation requires, the overall execution level of the professional activities and the intended effect the professional activities have (Verhoef & Zalmstra, 2017).

Occupational skills

Occupational skills are necessary to perform the activity (Verhoef & Zalmstra, 2017). Overall practise of physiotherapists is influenced by the skills, knowledge and experience they have. Therefore, this research looked into **the acquired skills, knowledge and experience physiotherapists have to use VR**, according to them, providing insight into the occupation. The influence of skill, knowledge and experience is described by Perdani et al., 2021, in a literature review which state that healthcare professionals felt a lack of sufficient experience working with VR causing lack in confidence using it. The amount of skill physiotherapists poses for working with VR in treating CLBP influences the use and thereby the occupation. Therefore, looking into the skills of physiotherapists and VR its influence provided insight into the effect on physiotherapy.

Occupational performance

Occupational performance refers to **the overall perceived performance level of physiotherapists in carrying out their professional duties and tasks** (Verhoef & Zalmstra, 2017). American Physical Therapy Association, 2019, states a few core values of physiotherapists which include excellence in carrying out the duties and tasks of physiotherapy. This means that physiotherapists have as value to provide excellent occupational performance. Therefore, it was of value to look at the impact VR has on the occupational performance of physiotherapists.

Occupational performance looks specifically at the performance of the overall tasks and activities and excludes the effect these activities have. For example, an individual may excel in their job as a janitor, showing great skill and efficiency in performing their cleaning duties and tasks. However, if the overarching goal were to alleviate someone's stomach ache, the effectiveness of the janitor's performance in achieving that goal is not directly addressed. To look at the link between the goal of the tasks and duties and the performance of the tasks and duties, occupational participation was used.

Occupational participation

Occupational participation refers to the perceived **impact the overall practise of physiotherapists has on the treatment of CLBP** (Verhoef & Zalmstra, 2017). According to Atalay et al., 2013, physiotherapy reduces pain, increases function, increases quality of life, and decreases anxiety and depression among people with CLBP. This shows the impact physiotherapy has on CLBP. The same thing can be done for VR. Understanding how valuable VR and physiotherapy is for treating CLBP from a physiotherapists point of view, uncovered possible improvements and barriers experienced. It gave a comprehension of reasons for change and remaining consistencies within the occupation physiotherapy.

Method

Design

A qualitative research design was chosen to research the experiences and perspectives of physiotherapists on the use of VR in the treatment of CLBP. Qualitative research was seen as appropriate due to its ability to capture perspectives and to explore the subjective meanings and interpretations of individuals (Creswell & Poth, 2016). Additionally, qualitative research made it able to put findings within their broader social, cultural, and organizational contexts. By also exploring the contextual factors that influence physiotherapists' attitudes and behaviours towards VR technology, qualitative research did provide a better understanding of its impact on physiotherapy (Braun & Clarke, 2006; Creswell & Poth, 2016).

With this qualitative research, a deductive approach was used. The Model of Human Occupation (MOHO) is used as framework and foundations for the deductive approach. By using a deductive approach grounded in the MOHO, this study aimed to systematically analyse and research how VR technology interacts with key elements such as personal characteristics, environmental factors, and occupational elements that shape the occupational identity of physiotherapists (Lee et al., 2012). Additionally, using the deductive approach allowed to rely on existing knowledge and theories as shown in the theoretical framework, giving a strong base to understand the findings within a framework (Bingham, 2023). The theoretical framework and MOHO model helps to interpret and relate the findings to broader concepts.

Reflectivity

Setting aside previous knowledge and examining the researchers own influence on the results was performed during this research (Murray & Holmes, 2014; Tuffour, 2017). As in the research by Boland et al., 2012, a diary was kept reflecting on my own influence as researcher. In this diary, I reflected on my own position and roles and which effect this might have on the research (Mason-Bish, 2019). This diary took into account credibility, dependability, confirmability and transferability (Gunawan, 2015). With this diary I kept in mind the effect my perspective could have had on the results of this research.

Population

Participants were recruited through the network of Syl Slatman, supervisor, and through online searches conducted on the internet. The online searches consisted of researching physiotherapists' practises using VR. For inclusion in this study, the physiotherapists needed to treat patients with CLBP and needed to have one year or more experience working with VR in treating CLBP. It was not mandatory for participants to be currently using VR at the time of the interviews. Therefore included are physiotherapists that work and do not work anymore with VR. Excluded are participants no longer working with VR for over 2 years. A maximum of two physiotherapists per practise were included for heterogeneity. The research aimed to interview 8 to 10 participants, but this target was not achieved. 44 physiotherapists and physiotherapy practices were contacted. Figure 3 shows an overview of the participant recruitment and the reasons for exclusion from this research.

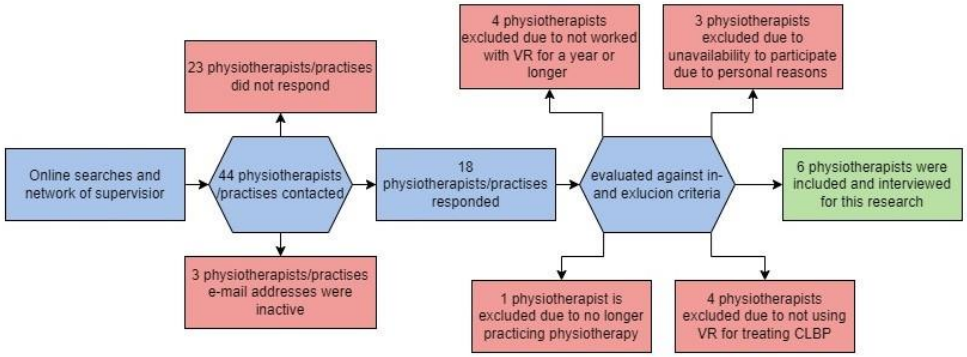

Figure 3: Summary of participant recruitment and reasons for exclusion.

Data collection

Semi-structured interviews were held. Semi-structured interviews allowed for an engaging dialogue between researcher and participant and was flexible for unexpected topics to arise (Murray & Holmes, 2014; Pietkiewicz & Smith, 2014). The interviews were audio recorded in Teams and transcribed with Amberscript. Online interviews were a good way to create a comfortable environment to discuss sensitive topics, had advantages related to cost/time efficiency and data transcription (Alase, 2017).

Interview guide

The interview questions were made based on the MOHO model (Verhoef & Zalmstra, 2017). The topics of the MOHO are the basis of the questions. The interview questions are open-ended questions, which allows participants to voice their experiences freely (Boland et al., 2012; Murray & Holmes, 2014). The questions concentrate on individual interpretations and mental phenomena such as thoughts and associations.

Two interview guides were made. The first one was made for physiotherapists still working with VR. The second one was for physiotherapists that had stopped working with VR. A test pilot interview had been done with the first interview guide for physiotherapists still working with VR. Based on the pilot interview, adjustments were made to the interview guides. The first interview guide has in total 8 main questions with follow up questions that cover five topics. These five topics are the variables as described in the theoretical framework and shown in the causal model in figure 2. These variables were researched with the interview questions. The second interview guide consists of the same 8 main questions with follow-up questions that cover the same five topics with an addition of 1 main question and changes in sentence structure and time. See appendix 1 and 2 for the interview guides.

Data saturation

Data saturation is collecting data until no new themes or insights occur (Saunders et al., 2018). For deductive approaches, as with this research, saturation can refer to how well pre-determined codes or themes are covered in the data (Saunders et al., 2018). For this research, data saturation was strived for. To put this into action, after every interview, a transcription was made, and analysis was done as soon as possible. During the analysis phase, efforts were made to ensure a thorough understanding of the impact of VR on physiotherapy was achieved and to ensure all themes were discussed in depth. While acknowledging that a single interview can provide valuable insights, it is important to recognize that achieving a comprehensive understanding of the effects of VR on physiotherapy typically requires more participants. Therefore, data saturation, where no new themes or insights have occurred and all pre-determined themes were sufficiently covered, has not been achieved. However, each interview did contribute to a deeper understanding of the topic and led to a broad and better understanding of the effects VR can have on physiotherapy in relation to treating CLBP.

Data analysis

The themes and sorting of information was done via a deductive approach. With a deductive approach, frameworks and/or research questions are used to create the themes for the coding process (Azungah, 2018). The subthemes were based on the MOHO and consist of habituation, volition, social environment, physical environment, economic environment, occupational skill, performance and participation. The main themes were based on sub research questions to structurally answer them. The following steps were taken during the analysis:

1. Making notes and reading transcripts multiple times

The first step undertaken was reading the transcript and listening to the audio recording a few times. This helped becoming immersed in the data by recalling the interview. Each time reading and listening provided new insights into the perspectives of the participants. A diary that was kept reflecting on my own influence on the data, was used to write up any thoughts I, as researcher, had about the data. Initial codes were made and linked to the relevant data. These codes consisted of a word or a small sentence describing what that data is about.

2. Add codes and assign subthemes from the MOHO

The subthemes are based on the MOHO model. The main themes are based on the sub research questions and the MOHO. See appendix 3 for an overview of the main and subthemes. After reading the transcripts again, codes were added to all the data. This was done first for every participant's case individually. After that, the codes and their data were sorted based on the subthemes and main themes.

3. Organizing subthemes and themes

The process of coding and subthemes assignment was done after every interview. The subthemes that belong to the same main theme were gathered in one document. This resulted in four document each with the data from all the interviews organized according to subthemes of the MOHO. Multiple readings of these documents had been done to adjust the data and codes accurately to the subthemes and main themes of the MOHO. This process led to four main themes and 10 subthemes that are shown in the results. In appendix 3 is shown the process of theme comparison.

Ethics

In qualitative research it is stressed that the interviewer monitors the affect the interview has on the participants (Sanjari et al., 2014). It is recommended to be aware of the impact the interview questions might have on participants (Sanjari et al., 2014). Therefore the effects of the interview were monitored. As an occupational therapist I am trained in interview skills. I have the necessary skills to monitor and adjust the interview when the participants give signals, he or she does not want to talk about something, starts feeling ashamed or awkward or becomes emotional. I used these skills to create safe environment and monitor participants own boundaries during this research. Ethical approval with case number 240074 was given by the ethical commission of the university of Twente before starting the research.

Procedure

Written consent was asked before participation (Alase, 2017). This was accompanied by an information letter which contained what the research entails. See appendix 4 for the informed consent form and the information letter. Via email, questions the participants had beforehand, were answered. The written consent statement and information letter stated that when the individual agrees to the terms, all data collected is pseudonymised and protected. See appendix 4 for all terms and conditions. All collected data were stored on a secure laptop during the length of this research and are stored for 10 years on the R-disk of the HAN. Before the interview started, all questions the participant had and not asked via email, were answered.

Results

This chapter starts with information about the participants that were included in this research. Next, the causal model is explained. This causal model, shown in figure 4, shows the relations between the results and is used to visually explain the effects of VR on occupational identity. Therefore, it adequately portrays the answer to the research question: How does, from a physiotherapists perspective, virtual reality (VR) technology influence the occupational identity of physiotherapists in treating people with chronic low back pain (CLBP)? The rest of the results are presented in four main themes with ten subthemes. Each main theme answers one sub-research question.

Participants

Six physiotherapists were interviewed. The interviews lasted approximately 1 hour each. The participants have various amount of experience with VR ranging from one year to six years working with VR. Participant 5 no longer uses VR at her current workplace. At her last workplace she used the health program Reducept for longer than a year in treating CLBP. The other five participants described various uses of VR and games or health programs. Table 2 shows an overview of the six participants demographic information and games or health programs used.

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6
Gender	Male	Female	Female	Male	Female	Male
Age	28	35	58	57	37	35
Years experience with VR	5 years	2 years	1 year	6 years	3-4 years*	5 years
VR programs	Mostly small games and demos	Reducept	Reducept	Inmotion VR, Sync VR	Reducept	Kana VR and Corpus VR

Table 2: demographic information of participants.
*Stopped using VR recently.

The causal model

A causal model is made to illustrate the relationship between the results and effects by contextualizing them within the MOHO. By relating the findings to the MOHO, the effects and meaning of the results can better be understood in the context of physiotherapy practice and the utilization of VR. To visualize the relationship between the results and their effects, a causal model incorporating elements of the MOHO was created, as shown in figure 4. In this model, the results are represented in yellow elements.

A distinction is made between two types of yellow elements:

- Inherent characteristics: Inherent characteristics describe the stable qualities and settings that influence how individuals and systems function, but they do not directly cause changes. These are the qualities or aspects that are part of specific elements in the MOHO model, for example volition, habituation or occupational performance. Inherent characteristics include specific activities, characteristics, attributes, and environmental factors that define how individuals function in their daily lives. These characteristics are depicted within the eight blue boxes, each representing an overarching element of the MOHO model.
- Active influences: Active influences are also represented in yellow. Unlike inherent characteristics, active influences are more dynamic and can directly impact or cause changes. In figure 4, these elements show the positive or negative effect they have on other active influences or inherent characteristics.

The causal model in figure 4 highlights the positive and negative effects of VR on for example patient-therapist relationship which in turn affect the occupational identity of physiotherapists according to the MOHO. By visualizing the results, it shows the perspective of physiotherapists on the use VR technology for treating CLBP. Additionally, it displays the overall influence VR has on functioning and outcomes in physiotherapy practise.

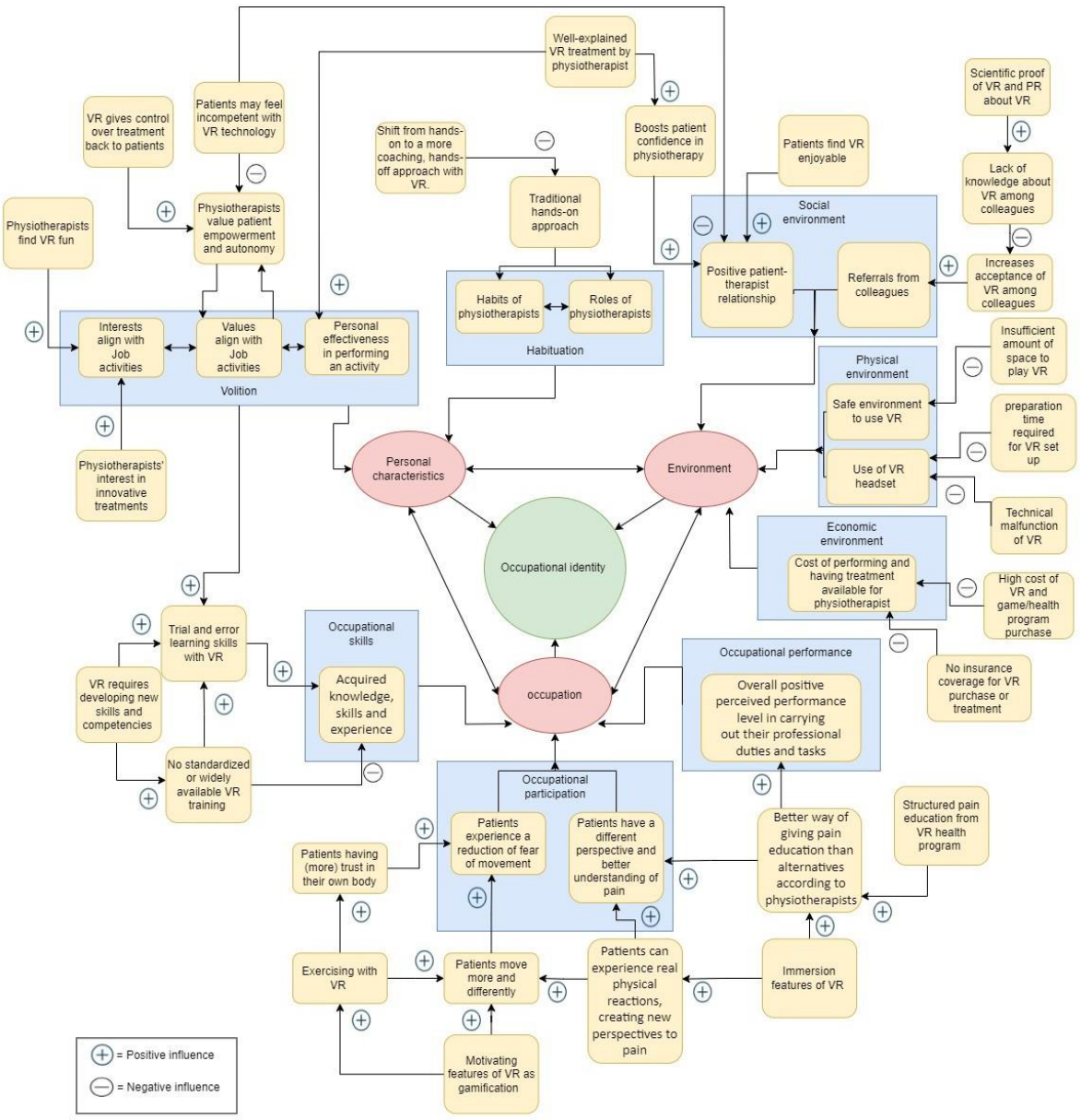

Figure 4: Causal model showing relations between the results using the structure of the elements of the Model Of Human Occupation (MOHO) (Verhoef & Zalmstra, 2017).

1. Physical and economic environment: accessibility of VR

This first theme, Physical and economic environment: accessibility of VR, looks into the influence of VR on the physical and economic environment mentioned by the participants. This first theme thereby gives an answer the sub-research question: How does the economic and physical environment consisting of factors as equipment and rooms used for VR treatment, and the coverage of the costs of VR by insurance or patients influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)? The changes and consistencies in relation to VR use by physiotherapists is discussed in two topics: Obstacles, and Costs and insurance coverage.

1.1 Obstacles

A variety in use of VR and setting was noted among the participants. Despite this variety, several practical obstacles for use and implementation of VR were mentioned. One obstacle is that the immersive feature of VR can cause overexercising due to lack of time awareness. Additionally, for at home, it is particularly mentioned the safety risk of not having enough room to use VR. The safety risk of not having sufficient and enough space to use VR is shown in the causal model in figure 4 as a negative effect on creating a safe environment to use VR. These risks are important to consider since it can lead to negative consequences for the patient.

> *Participant 4: "The obstacle is of course that the patient needs to have a very clear safe environment, where they can clearly say, "Well, I have space here, and I am not bumping into anything or hitting anything." I once had a patient who had their own VR headset at home independently of me, without any therapeutic exercises or instructions from me. …. She was trying it out, and while playing the game, she fell forward, fell through the TV, and indeed had a neck problem. … It really emphasizes that you need to be very aware."*

All participants discuss technical issues such as equipment malfunctions, connectivity issues or lack of battery. These obstacles takes time from the therapy sessions due to the inability to give the treatment. In addition, the VR needs more preparation time than other physiotherapy treatments. This is seen as an obstacle because therapy time is limited. This is also shown in the causal model in figure 4 were the preparation time is shown as a negative effect on the use of VR. According to some participants if they cannot set VR up before the patient comes into the therapy session too much time has passed, even if this is only 5 minutes, and they are not able to use the VR anymore. Some participants need preparation time that include setting up and bringing all the equipment to the patient. However, it is mentioned that this is less as an obstacle once you get the hang of it, then it is just a phone call or a technical issue that takes more time. Besides preparation time, longer time is also needed to explain to patients how VR works. This process takes longer then with other treatment options according to several participants.

1.2 Costs and insurance coverage

The high costs associated with VR applications and equipment pose a major barrier for use of VR. Some participants use only smaller games. These games are one time purchase and on average cost less per game then a whole licenced health program. The licenced health programs often are costs per year and include the purchase of a VR headset. The costs for licenses not only varies per game but also per practise. The effect of the high costs is also visualised in the causal model in figure 4. The high costs are shown to be a negative on the overall costs that physiotherapists have to give treatments. One consequence of the price of VR is that it makes it less accessible to use more than one health program or game for VR. For smaller practises, VR is even more inaccessible due to these high costs. Some practises lose revenue due to the use of VR, others do not even attempt to use it.

> *Participant 2: "Well, I know that those headsets and the Reducept subscription are quite expensive. Yes, if you only handle Hands-on, then you only have to sell your service, of course or pay for the space, so there are higher costs. We have a large practice with fourteen physiotherapists, so that is perfectly feasible, but in (different place), for example, that is not possible. I work there with one colleague and we cannot purchase VR headset and a subscription from Reducept for that, we are simply not there… being able to apply it lies in the luxury of having a large practice."*

The costs of VR are not covered by health insurance, meaning if physiotherapists want to be profitable it often becomes out of pocket expenses for patients. However, some practises take the costs for themselves, but this is not possible for everybody. These costs have a negative effect on the overall costs of the available treatments physiotherapists can provide for patients, as shown in the causal model in figure 4.

> *Participant 4: "Yes, it may also be partly up to the patient. If so, I find that quite difficult. Because yes, to what extent do you make it accessible? If you have people who say yes but have less to spend, then well, that quickly becomes a no go. That is really an obstacle."*

Additionally, there is also concern about the lack of insurance coverage for the amount of physiotherapy sessions. When VR is used alongside traditional therapy sessions the lowest package, with six sessions per year covered, is not enough for some participants. It is expressed that there is a need for insurers to recognize and cover these combined approaches.

Investing in VR as insurance can not only be beneficial for patients but can also decrease healthcare costs overall. The decrease in healthcare costs can be caused by the decrease in needing additional healthcare treatments. For example, one participant treated a patient with herniated discs who was confined to a wheelchair. This patient was on a waiting list for rehabilitation, yet this was inaccessible due to the covid-19 pandemic. It then was decided, in collaboration with colleagues, to combine traditional therapy with the use of VR headset. Over time, the patient's condition improved, and she eventually regained mobility, transitioning from a wheelchair to walking with assistance in the practise. This case highlighted the potential of VR therapy in rehabilitation, potentially saving extensive rehabilitation efforts. This experience underscores the value of VR therapy in pain management but also for cost effective healthcare practises on a national level.

The potential of VR being cost saving is also highlighted by the optimization of resources and processes. For example, by using VR for therapy sessions, healthcare providers might be able to reduce the need for physical infrastructure and equipment, which could result in lower operational costs.

> *Participant 1: "The execution of my profession, it means that we need different materials in our treatment room, that treatment rooms or practices might be able to set up differently in the future when you use it more often or more frequently. That means you do not need everything with their treatment bench and a sink and all that, maybe you do not need all that anymore, but that you might just need some empty spaces where a pair of headsets lies, that you guide people in. Go ahead and practice for a while and then we'll come back to discuss, meanwhile, you can see someone else and then you alternate….that means you could help more people at the same time."*

2. Social environment: surrounding parties influence on physiotherapy and the utilization of VR

This second theme, Social environment: surrounding parties influence on physiotherapy and the utilization of VR, looks into the influence of surround parties as colleagues and patients on the usages of VR and the performance of the occupation. Thereby this second theme answers the sub-research question: How does the social environment consisting of the social influences from patients and colleagues influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)? The influence is discussed in two topics: The

influence of colleagues on VR use according to physiotherapists, and effect of VR on patient-therapist relationship and patients' opinions.

2.1 The influence of colleagues on VR use according to physiotherapists

Participants point of view of what colleagues' opinions are of VR provide valuable context for understanding their influence on the use of VR as a treatment option. Most participants describe minimal influence from the opinions of their colleagues. When asked about the perspective of colleagues, the response was: Some colleagues are very enthusiastic about it, some do not see the use, and some do not like it at all. These different viewpoints seem to depend on how VR is used and what specialty the colleagues have.

> *Participant 2: "But one would see more use than the other, especially for example sport physiotherapists and manual therapists who would not easily fall back on us, even if they have athletes with a lot of frustration and many repetitive injuries where this could also be very suitable…. Different colleagues think: oh, how nice that you are here, because I cannot do anything with this, I try to explain something and it just does not stick. Go please do your thing."*

A major part in convincing colleagues of the use of VR, is the scientific proof of the effects of VR. This is also shown in the causal model in figure 4. The causal model visualised the positive effect scientific proof has on the knowledge colleagues have about VR. This in turn can increase the acceptance among colleagues. Knowledge about the use and effects of VR makes the difference of it being a fun different option to a serious treatment. However, due to time pressure in the first line practise, it is common that everybody is doing their own thing, resulting in colleagues not knowing the effect and results VR could give as treatment. Additionally, colleagues would have less knowledge about which patients would be suitable for VR treatment. This affects the practise of physiotherapists who use VR because patients that could benefit from VR do sometimes not get the treatment. Research into VR and creating more PR would help create more awareness among colleagues. An example of PR that helped create more awareness was an article in the magazine of the Royal Dutch Society for Physiotherapy (KNGF) about VR.

Having colleagues that use VR was also seen as a support to plead for the use and effectiveness of VR treatment. This could be in the form of direct colleagues working in the same practise to intervisions hosted by VR companies.

> *participant 6: "If you really have a specific question, then yes, it is nice, because there are of course several VR users in one meeting, all with their own experience. That is of course different from me sparring with someone in practice about a symptom, who has not used VR themselves. So in that respect it does have added value to develop yourself a little more."*

2.2 Effect of VR on patient-therapist relationship and patients' opinions

VR as treatment affects patient-therapist relationship. Different experiences with the effect of VR on patient-therapist relationship were described. It was described that VR can have a negative effect on patient-therapist relationship. Not all patients know how to use VR even with explanation and guidance. Patients can feel that they failed the exercise or feel like they should have had certain skills, leaving them feeling ashamed or guilty. This is also depicted as a negative effect on the patient-therapist relationship in the causal model in figure 4. When it comes to different treatments, alternatives are available, with

which trust and confidence can be restored. Without these alternatives, as with VR, patient-therapist relationship can be damaged.

> *Participant 5: "Well, I think with all my background, I can always fix it reasonably,... That is what I find difficult myself, that I think oh, yes, you know, you actually want to provide therapy, you have a specific goal. But now I am fixing something completely different than I wanted, let's face it. But sometimes you have someone who makes you think: oh, he can really handle technology, and then that turns out not to be the case at all."*

In contradiction, introducing a new treatment option such as VR can also benefit patient-therapist relationship. Due to VR being an option not every physiotherapist provides, it gives patients confidence in you as physiotherapist who considers their symptoms, as shown in the causal model in figure 4.

> *Participant 6: "They often think: hey, this is someone who, at least that is my interpretation, thinks along with my symptoms. Well, has a different approach than the average. So that often helps to be one zero ahead, so to speak, no guarantee of success. But in terms of relationships, it is often good."*

This positive effect does depend on how you describe VR to the patient. When explained well, patients will see the usefulness of VR and rate your expertise as a therapist higher. This is also shown in the causal model in figure 4 as a positive influence on patient-therapist relationship, making building a trust relationship between you as therapist and the patient easier. When introducing VR, expectations of patients plays a huge role. Patients have to realise that treatment could consist of different approach, in some cases an approach which consist of no physical contact. This approach is often in contrast to the practises and description of physiotherapy as hands-on, as is further discussed in theme 3.1 Habituation: exploring the definition of physiotherapy and the influence of VR. Even with this contradiction between VR treatment and the expectations of what physiotherapy is, positive signals from patients are heard. Patients find it enjoyable, and most participants describe having no or little experience with patients being against VR.

> *Participant 3: "VR is just beautiful, it is challenging for patients as well, they simply enjoy it. Pain education becomes enjoyable instead of just being obligatory. Which is really important."*

3. Habituation and volition: understanding physiotherapists and the impact of VR

This third theme, Habituation and volition: understanding physiotherapists and the impact of VR, looks into the definition of physiotherapy, and the values and characteristics of physiotherapists in relation to working with VR. Thereby this third theme answers the sub-research question: How do personal characteristics, such as interests, values, perceived personal effectiveness, habits and roles influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)? The mentioned changes and constancies in relation to the use of VR are discussed in two topics: Habituation: exploring the definition of Physiotherapy and the influence of VR, and Volition: values and characteristics of Physiotherapists in relation to VR.

3.1 Habituation: exploring the definition of Physiotherapy and the influence of VR

Traditionally physiotherapists were considered massage therapists, which to this day is still a perception being held by many people. However, younger generations see physiotherapy as being guided and involves exercising. One thing mentioned by all participants as crucial for the definition of physiotherapy is the hands-on working, creating meaningful movement from a physical perspective.

The meaning of physiotherapy was summarized as: a physiotherapist is someone who looks at achievable rehabilitation goals from a body-centred approach. Thereby the importance was added that the patient understands their own body and learn how to manage it in the right way. It also includes the trying to get patients moving and ultimately achieve patients rehabilitation goals. With some participants hoping that their contributions as physiotherapist can help people back on track, experience independence and a higher quality of life.

Some participants focus on a different aspect of physiotherapy, describing it as having a more coaching-oriented and patient-centred approach. It is noted that this coaching approach differs from the traditional hands-on methods often associated with physiotherapy. The shift in role from more hands-on to a coaching hands-off role is mentioned by all participants in relation to working with VR. As shown in the causal model in figure 4 the change in role is represented as a negative influence due to the clash with the initial thought of what a physiotherapist does.

> *Participant 1: "That makes it very difficult for many people to step away from it, because you are not going to touch a person anymore, or at least not at that moment. So the perception of how it is used or how it is useful can clash with how people view physiotherapy."*

Participants highlight this clash between VR and their profession, noting that no other paramedical professional works hands-on like physiotherapists. They emphasize the shift from hands-on to hands-off methods in physiotherapy with the introduction of VR. However, this change is not seen as a disadvantage or a negative effect by the participants. Participants find this change fun and see the advantages of using VR.

> *Participant 3: "If it works, and if I can offer something that appeals to people and also has a result, then I think, I am a better therapist than if I did not have it, so I can offer something extra."*

3.2 Volition: values and characteristics of Physiotherapists in relation to VR

When asked what values the participants have that relate to the use of VR, several different values are mentioned. All participants agree that the safety of the patient is important, but they see that as a given. Therefore, the rest of this subtheme only focuses on the other values mentioned.

The empowerment of the patient is highly valued as seen in the causal model in figure 4. Some participants find it important that patients do not become dependent on care. Additionally, it is valued that patients are well informed about how their body works. They highlight that knowledge is power, something people with chronic pain sometimes miss.

> *Participant 1: "Well, I am all about self-regulation. The patient must at all times be able to and should not become dependent on care or users. A physiotherapist, osteopath, you name it, but sometimes also just getting hospitalized for injections in*

the shoulder, those are all ways to become dependent on care. It is very easy for a physiotherapist to just loosen up, that has a temporary effect, in quotes, and then the patient keeps coming back or goes to the exercise room and before you know it, you are tied to something that a person cannot deviate from anymore, because deviating from that effects how they feel."

VR helps patients to self-regulate and give them knowledge, skills and understanding that they themselves can make themselves better. Some participants thereby emphasises that still different treatments such as exercise are necessary. They underline that the hands-off approach enhances the self-regulation of patients, therefore using VR is aligned with their values. The values self-regulation and autonomy were also mentioned with a different intent by some participants. The importance of therapy compliance was highlighted. Not only the physiotherapist needs to put time and effort into the treatment, but also the patient. The motivational assets of VR are an addition to make therapy compliance and own commitment for the patient easier to achieve. VR thereby not only aligns with the values, but also adds to the likelihood of fulfilling it.

Participant 4: "Therapy compliance part, also a part of their own commitment. And I think that is a bit easier to achieve with a VR-like or wearable-like application than just giving an exercise that then oh, yes, in the evening I come to the conclusion: I still have to do those exercises."

Participants also value the fun and humour that VR brings to therapy, as it makes the experience enjoyable for patients. Beyond enjoyment, they appreciate the challenges that VR presents, finding them beneficial for patient engagement. Increasing patient engagement is important, especially noted that many patients have already received a lot of information about chronic pain, mostly on paper. These VR sessions can however evoke strong emotions with patients, emphasizing the importance of aftercare. Providing sufficient aftercare was therefore also valued by some participants. Different from the value of the challenging feature of VR, is that the value of proper aftercare is an addition that needs to take place to fulfil this value. In contrast with the other values of the participants, one value clashes with VR. This value is explained as that the patient feels comfortable and like themselves during treatment. When patients do not know how the technology works or they cannot do the exercises in VR, they can feel ashamed or guilty and thereby clash with this value. This is represented in the causal model as a negative effect on the alignment of values with the job.

Participant 5: "…for me, safety is always very important in the treatment, that a patient feels comfortable, so that they can be themselves and I actually find it important in VR too that a patient does things autonomously. So if someone does not understand, for example, the technology, often people feel ashamed then, then they do not even realize themselves that oh, I cannot do it at all and that suddenly happens, while I want them to be themselves and not feel guilty for it, because then maybe that is also a valuable and I find an important value that they do not feel guilty in therapy, that they cannot do something. And with VR, if they cannot do it, you run into that very much, because then suddenly a patient also thinks I am not competent in something I should have been, because otherwise I cannot do the therapy now. And that is also a value that I encounter in VR that I find difficult."

Looking at characteristics and interests mentioned by the participants in relation to VR, the ones that are mentioned, are often recommendations for physiotherapists looking into VR. Some participants note that

you should be interested in chronicity and chronic problems to be able to provide the proper aftercare of VR treatment. It is mentioned that not all physiotherapists are interested in chronicity, which can result in them not knowing what to do with this target group. Besides those recommendations for wanting to use VR, all participants mention being someone that likes to try new thing or like innovations. Association with innovations, games and VR is mentioned as essential for working with VR. Most participants describe having these characteristics and interest even before working with VR and that is influenced their choice to start working with VR.

4. The influence of VR on occupational skill, occupational performance and occupational participation

This fourth and last theme, the influence of VR on occupational skill, occupational performance and occupational participation, looks into the affect VR has on occupational skill, performance and participation. The influence of VR is discussed in three topics: Occupational skill, occupational performance and occupational participation. With these three topics, theme 4 answers the sub-research question: How do occupational skill, occupational performance and occupational participation influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?

4.1 Occupational skill: Skills and competencies in VR-assisted physical therapy

Working with VR is a different way of performing physiotherapy, therefore needing different skills and competencies. Some participants highlight the shift from hands-on to more verbally oriented therapy during VR sessions, acknowledging the difficulty in maintaining patient engagement. The challenge of needing different skills than used with more traditional physiotherapy approaches was emphasized.

> *Participant 5: "No, no, it is really different. It is really something else. You have to learn to help someone from a distance while talking, and that is not something we are trained for, so that is really very different."*

New skills to adapt to VR therapy needed to be acquired. Skills as the challenge of learning to sit quietly during VR sessions, which contrasts with the typically more interactive nature of other physiotherapy treatments, was learned. Moreover, technical skills, such as knowing how to work the operating system, are deemed essential for seamless use of VR. However, the helpdesk from the VR programs also is often used and is deemed helpful. Nevertheless, having technical skills is not deemed a part of physiotherapy according to the participants.

These skills were primarily learned through trial and error. One participant describes that he played the VR games by himself to learn how to work with it but also by giving it to clients. In that way he could test what worked and what did not. It is highlighted that there is a lot of research being conducted looking into VR, but that the current data pool to draw from is not that large, thereby underscoring the reasoning to learn by doing. Besides the trial and error learning, participants describe using additional knowledge from courses as ACT, Dansante physiotherapy and psychosomatics. Moreover, development of expertise is created through practice, feedback and analysis with the help of peer review coaching and the development of modules for problem-solving within a group. Most participants describe looking into trainings or courses to learn VR skills, finding no available or suitable courses. There are demos you can follow but those are not accredited.

Participant 1: "It is not like if you go to a dry needling training and tomorrow you can get started. I am just saying something, you can start applying that, you have the materials you need. Well, yeah, with virtual reality it is not that simple, because yeah, okay, you play with an app in the afternoon, then you can also do it at home. They are certainly concerned about that too. Yeah, then you are not going to give quality points to it and apparently you have to pay tower costs, license costs for something that you do not even know if it is nice to use."

However, there is variety in the followed and available courses per participant. Some participants followed an introduction day that is mandatory when using a specific health program. Adding to this introduction day, an additional course for more information about VR can be taken. These courses are still in development according to some participants. However, they are particularly useful for when you have no knowledge about pain education. To effectively use VR therapy for chronic pain, a good understanding of pain education is necessary, and thereby emphasizing the usefulness of these courses. The price for the courses is included in the purchase costs of the specific health program. Other VR programs and games also provide training which cover technical aspects and practical applications through case studies. These trainings include e-learnings and opportunities to join a monthly peer review session which is beneficial for sharing experiences and learning from other VR users.

There is variation in the skills, guidance and availability of knowledge. This variability in guidance provided for physiotherapists in VR usage, emphasizing the need for more standardized training and support for practitioners. It is stressed by the participants that VR does need practise but that the available knowledge about VR is too expensive, limited and inaccessible. This is also shown in the causal model in figure 4. The causal model shows that the lack of standardized training has a positive effect on physiotherapists needing to learn skills through trial and error. Additionally, it shows the negative effect of the lack of training available on the required skills for the use of VR. A need for ongoing research, support and updates post-training, suggesting reoccurring reviews or seminars to deepen their knowledge about VR and how to use it, was expressed by the participants. It was mentioned that refinement of current practices and exploring new developments in VR technology and therapy is essential, with a focus on the importance on continuous learning. Additionally, a wish for more overview of what is possible with VR per game or health program was made.

4.2 Occupational performance: The use of VR in Practice

Changes in physiotherapy practise are by most seen during their physiotherapy sessions when they use VR together with the patient. To indicate how these practises and daily activities changed with VR, a comparison with traditional physiotherapy exercises is made. With traditional physiotherapy, physiotherapists may intervene to adjust posture during exercises. When it comes to exercises with VR, it requires a more hands-off approach. This hands-off approach allows patients to engage freely. Adjustments of posture with VR would also be challenging due to the immersion and due to the lack of visual communication.

Participant 5: "As for exercises, I often did them physically, either on a mat or standing. With VR, you have to stand, because otherwise, it does not work well. So, yes, and as I mentioned earlier, where previously, especially with low back pain, I was quite involved in movement. People often move very adaptively, very peculiarly, and sometimes just placing a hand somewhere and saying, 'You should try moving a bit more there at the bottom of your back,' that is something you can do with regular

physiotherapeutic exercises, but not with VR. With VR, you should not do that. ….. you should step back more and just observe from the sidelines what is happening. Yes, I think that changed a lot."

However, where one participant observes the patient from the side line, another uses this time for administrative tasks or treatment plan adjustments. This provides more peace in their day and thereby also benefits the patient according to some participants.

Several participants use a specific health program that provides a structured program for pain education. This program is used as a guideline, adjusted according to the participants expertise when found necessary. The structure of this program was seen as an addition to physiotherapy practise by most participants because of its ease to explain pain education to patients, as shown in the causal model in figure 4. With pain education you often can get lost within patients own personal experiences, what can be beneficial but also make giving pain education harder. It being a positive addition is highlighted by them combining it with different treatment options such as exercise therapy and educational conversations.

Participant 2: "VR will not make someone stronger, but it helps them learn how to become stronger. And then, exercise therapy becomes more effective. So, it reinforces each other."

However, adjustment from traditional pain education to VR pain education was needed for some participants. The health programs provides a very general pain education. Therefore an adjustment was necessary to incorporate in their tailored pain education approach to the patient, the general approach of the health program. This was done by using the language in the health program and combining it with their own pain education.

Where participants that use a health program describe the benefits of structure, some participants use many different games with different purposes. With these games you can make someone experience a feeling which makes concepts tangible and memorable according to these participants. Additionally, games are used because it can save a lot on healthcare costs due to games being cheaper than creating the same effect in a different way. Thereby highlighting the practicality of using VR over an alternative to create the same affect. The practicality of VR games is underscored by the expressed preference in use of games due to them being more focused on ease of use.

Participant 1: "The games that are developed, often by large organizations, are designed for ease of use. Setting them up and getting started is intuitive, and they offer many more features. You do not need controls anymore; you can just use your hands. So, in terms of development, they are far ahead of healthcare developments. Healthcare apps are now where commercial apps were five years ago when the first apps were released….and it also costs less."

All participants, with the exception of one, use VR mainly during their physiotherapy sessions. This one participant lends the VR headset, when possible, to patients to use for exercising at home. This participant still experiences a difference in practise in preparation time and explanation of VR to patients. This participant chooses to led VR to patients due to its motivational benefits to perform the exercises. Nevertheless, lending VR is not always possible. However, patients sometimes do purchase their own VR

headset to use for exercise. As described VR is used in many different ways. Table 3 provides an outline of the different usages of VR.

	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6
Years experience with VR	5 years	2 years	1 year	6 years	3-4 years*	5 years
Type of VR program(s) used	Mostly small games and demos	Health program (Reducept)	Health program (Reducept)	Exercise programs (Inmotion VR, Sync VR)	Health program (Reducept)	Exercise and stress management programs (Kana VR and Corpus VR)
Where VR is used	At their practise	At their practise and during treatments at patients homes	At their practise and during treatments at patients homes	Patients use VR by themselves at home. Additionally, VR is used during treatments at patients homes	At their practise and during treatments at patients homes	At their practise

Table 3: Overview of VR usage by participants.
*Stopped using VR recently.

4.3 Occupational participation: The effect and impact of VR

Despite varying backgrounds and contexts, all participants recognize the benefits of VR in enhancing traditional therapeutic approach. When specifically asked what the effects of VR are on CLBP in their experience, different aspects are mentioned. Most found it a difficult question due to not having enough scientific evidence to back their believes up, it being a small part of their treatment or not being able to compare the effect of the treatment with the effect of a treatment without VR. The effects of VR that were mentioned were the greater understanding of pain education created with patients and the encouragement and ability to overcome fear of movement. The greater understanding of pain education was explained by the enhanced knowledge transfer through use of more senses than with just an explanation or a 2D image.

> *Participant 2: "It offers something that you cannot achieve solely through explanation. You can show a 2D image, explain how the body works, or send a video demonstrating how the brain, body, or nervous system function. However, what VR does is combine all of these elements and also convey certain things to people on a subconscious level, such as the Theta waves synchronized with the background music, the EMDR aspect of a particular exercise, or certain parts within the VR experience. These are things we cannot quite accomplish face to face."*

Due to the immersive feature, patients can experience real physical reactions through VR use even though they are aware what they are experiencing is fake. Thereby VR encourages patients to consider alternative approaches to their pain, opening their minds to the influence of various factors beyond mere physical impairment.

> *Participant 1: “But for example, when we talk about reality health, you can have people put their hands into fire and they feel warmth, causing them to startle. They have a startled reaction, feeling warmth in their hands, even though they know it is not real, it is fake. Yet, they feel it, and that is such a strange sensation for people. I find that amusing, but also super interesting to discuss with them. It really opens them up to looking at their pain differently."*

The immersive feature of VR and performing exercises with VR have a positive effect on the reduction of fear of movement, as shown in the causal model in figure 4. The exercises and immersive feature, according to some participants, can restore people’s confidence and trust in the ability of their back to bear weight. This also causes them to take steps forward despite the pain and moving in ways they normally would not.

Some trainings are more focused on stress management with biofeedback in real time showing what is stress inducing and stress reducing. Even though it is more focused on stress management it does provide insight into the connection of feelings and the effect it has on the body. Creating motivation for performing exercises is also supported by VR because of VR its motivational benefits, as shown in the causal model in figure 4. The exercises are more visualised which leads to people being more challenged. This challenge leads to more motivation to perform the exercises according to several participants. In addition, the gamification is something many patients find enjoyable over typical fitness exercises. Furthermore, participants highlight the value of VR as a tool in their toolbox that can improve patients outcomes and that can complement other methods physiotherapists use.

> *Participant 2: "People with chronic conditions often arrive quite seasoned at our doorstep, having had numerous healthcare providers, been through many disappointments, and tried numerous treatment methods that did not give the desired results. With Reducept, we actually focus on shifting the perspective from solely trying to alleviate pain to enhancing overall quality of life. This approach can be quite refreshing for individuals, infusing them with new energy, and I have noticed it can make an important difference for many within that group."*

Discussion

This thesis explored how virtual reality (VR) technology influences the occupational identity of physiotherapy in treating people with chronic low back pain (CLBP) from a physiotherapists perspective. This was done to obtain an understanding of physiotherapists' perspectives on VR and its effect on the occupation, which could improve quality, accessibility and effectiveness of CLBP treatment, and hence ultimately improve patient outcomes.

Summary of results and comparison to other research studies and literature

Various ways VR changes physiotherapy practise were described by the participants. Participants mentioned that unlike conventional physiotherapy, where therapists may physically adjust patients' postures, VR requires a hands-off approach to allow patients to engage more freely. This shift enables physiotherapists to observe from the sidelines or utilize the time for administrative tasks. The use of VR provides structured health programs for pain education, simplified explanations and complement other treatments according to several participants. However, some participants had to make adaptations to the program and their approach of pain education to fit personalized approaches. These changes in practises, due to VR use, influence the occupational identity by influencing their daily activities.

The introduction of VR shifts the role of physiotherapists to a more coaching-centric approach. The switch of a more coaching role could challenge the traditional perception of physiotherapy being a hands-on occupation. The transition to a more hands-off approach also requires physiotherapists to adjust their skills and treatment methods. Skills for VR usage include a solid understanding of pain education, technical proficiency, and the ability to coach remotely. Physiotherapists being skilled in their provision of treatments is also found important by patients (Bastemeijer et al., 2021). Learning to use VR often involves trial and error and limited formal training, underscoring the need for more structured and accessible education on VR. A lack of standardized and widely available VR training was mentioned. A lack of standardized training could cause the lesser use of the technology and thereby missing the effect this technology has on treating CLBP (Mandato & Kulhanek, 2022). A standardized VR training could also have positive effect on the confidence using VR which could result in higher and increased quality patient interactions (Mandato & Kulhanek, 2022).

All participants agree that VR enhances traditional therapeutic approaches for CLBP. Despite challenges in substantiating VR its effects due to limited scientific evidence and its partial role in treatment, participants say that VR improves occupational participation. They highlight VR's ability to improve pain education by engaging multiple senses. This immersive feature of VR deepens patients' understanding of pain education and reducing their fear of movement. This feature also allows patients to experience physical reactions and thereby creating improving alternative pain perspectives. In a literature review and a qualitative study, the immersion of VR was reported to create more enjoyment than the same task performed from a desktop (Bauer & Andringa, 2020; Brown et al., 2022). This enjoyment thereby also increased motivation to participate (Bauer & Andringa, 2020; Brown et al., 2022). This is also mentioned in the results of this research and shown in the causal model in figure 4. Physiotherapists, looking into VR, mentioned the possible positive ability of the immersive feature of VR to reduce fear of movement and distract from pain (Brady et al., 2023; Dejaco et al., 2024). It also offers motivational benefits through its challenging features, gamification and real-time biofeedback, making exercises more appealing as seen in the causal model in figure 4. The physiotherapists in a focus group study were also positive about VR providing a more engaging way of rehabilitation and physical activity above traditional physiotherapy (Brady et al., 2023).

The attitudes and opinions of patients impact the use of VR in physiotherapy by a great deal. Physiotherapists included in this research work client-centred, thereby adjusting their treatments to the wishes of patients. The use of VR in some cases also affect the patient-therapist relationship. As mentioned in the introduction, there were concerns about reduce patient-therapist contact and the effect on patient-therapist relationship from physiotherapists in relation to using VR (Dejaco et al., 2024). They expressed their concern of letting go of the patient-therapist contact and the effect VR might have on patient-therapist relationships (Dejaco et al., 2024). VR has overall according to most participants a positive or neutral effect on patient-therapist relationship. VR had this positive effect by being an engaging and motivating tool with immersive features that could help patients reframe their perception of pain and reduce fear of movement according to the participants. While most participants expressed VR being a positive or neutral effect on patient-therapist relationship, it could also create negative experiences if patients struggle with the technology. These negative experiences could harm the therapeutic relationship. A good patient-therapist relationship is seen as important by physiotherapists due to the positive effect it is associated with. A good alliance between patient and therapist seems to have a positive effect on adherence to treatment, satisfaction of service and physical function of patient (O'Keeffe et al., 2016). Looking at influence from colleagues, most participants noted minimal direct influence from colleagues' opinions. Colleagues do have an effect on the amount of referrals for VR treatment and thereby the use of VR. Scientific evidence supporting VR's efficacy is thereby found crucial by the participants for gaining broader acceptance among physiotherapists. The participants emphasize the need for more research and publicity.

Participants generally view VR positively, finding it engaging and fun. When interest of individuals align with the job, this stimulates innovative behaviour. Innovation behaviour is crucial for exploiting new opportunities such as implementation and use of VR (Huang et al., 2019). With Key values of the participants also being in agreement with working with VR and include patient empowerment, autonomy, and safety, with a focus on self-regulation and therapy compliance. However, looking at specifically patient empowerment, VR could sometimes lead to patient feelings of incompetence if they struggle with the technology. With this instance the value of physiotherapist is in contradiction with working with VR. Patients value physiotherapists that look at their individual needs and symptoms, according to a qualitative study by Bastemeijer et al., 2021. This study mentions patients finding empowerment crucial (Bastemeijer et al., 2021). As seen in the causal model in figure 4, the value of patient empowerment and autonomy among physiotherapists is in alignment with the study.

The results also show that the use of VR in physiotherapy for treating CLBP faces financial and physical barriers. Within this research the costs for VR and the licenses are, especially for small practices, a financial burden. The costs for licenses do varies per game and per practice depending on how VR is used. As shown in the causal model in figure 4, the cost are a negative effect on using VR. In a focus group study about the experiences of physiotherapists with VR also mentioned among others concerns about financial burden (Dejaco et al., 2024). It mentions concerns about purchasing multiple VR headsets and licenses. The physiotherapists wondered how they would deal with these high costs (Dejaco et al., 2024). Health insurers also have a lot of influence on physiotherapy and the costs. One of the main reasons beginning physiotherapists quit their profession after a few years, is the negative influence of health insurers on the financial environment within their profession (Zurhake, 2023). Health insurers influence the amount of treatment by setting treatment indices. These treatment indices are predetermined standards set by health insurers that dictate the number of treatments or procedures deemed appropriate for specific medical conditions. If the standard number of treatments set by the treatment indices is exceeded, health insurers reduce the payment for those treatments (Zurhake, 2023). The lack of insurance coverage for VR treatments create often out-of-pocket expenses for patients,

further limiting accessibility as shown in the causal model in figure 4. These concerns about accessibility are very valid since 1 in 5 people in the Netherlands avoid healthcare due to costs (Patiëntenfederatie Nederland, 2023). Physiotherapy is thereby mentioned as one of the most prominent avoided care due to the costs (Patiëntenfederatie Nederland, 2023).

Furthermore, technical difficulties are experienced which include equipment malfunctions and connectivity problems. These malfunctions disrupt therapy sessions and reduce efficiency, posing additional challenges for use of VR. This is also the case with the additional preparation time that VR requires, as shown in the causal model in figure 4. It could cause lack of usage of VR due to the limited time physiotherapists have for treatment. Looking at equipment malfunctions, VR hardware and software malfunctions are also mentioned in different studies (Glegg & Levac, 2018; Kouijzer et al., 2023; Sevcenko & Lindgren, 2022). These malfunctions are described as barrier for use and implementation of VR (Kouijzer et al., 2023). However, to further understand this barrier, it is crucial to also focus on the limited time available in physiotherapy sessions. The current change in healthcare where activities as administrative work take up more time causes additional workload for physiotherapists. Physiotherapists mention needing to work overtime hours to keep up with the current workload (Klaassen, 2017). These additional activities decreased the actual time spend on treatment of patients (Klaassen, 2017). Furthermore, a decrease in physiotherapists in the Netherlands is noticed due to beginning physiotherapists quitting their profession after a few years (Zurhake, 2023). These factors contribute to the workload pressure within physiotherapy, causing pressure to effectively use the time available. Therefore additional preparation time and equipment malfunctions are seen as a barrier to use VR.

Additionally, as seen in the causal model in figure 4 looking at the physical environment, safety risks are mentioned for the required room needed to use VR. In a focus group study, there were concerns about safety of patients and overdoing the exercises causing further injuries with VR use (Brady et al., 2023). Some participants in this research also highlighted these risks. As mentioned in the results VR could cause injury by for example falling. Especially with elder patients a fall could cause long-term disability, increase mortality and dangerous fractures (GAJOS et al., 2016). Additionally, these consequences could lead to dependency on caregivers (GAJOS et al., 2016). This consequence would be in direct disagreement with some participants values of being not dependent on care. The safety risk of falling with VR was specifically mentioned in relation to VR use at home. The majority of falls among elderly happens at home (GAJOS et al., 2016). Therefore underscoring the importance of taking this risk into account when using VR as treatment option.

Limitations of this research

For this research and for the interpretation of the results, the model of human occupation (MOHO) was used. Occupational therapists often use the MOHO to assess daily activities, perspective and wishes of individuals, groups and occupations (Bugajska & Brooks, 2021; Prior et al., 2020; Schauer, 2018; Verhoef & Zalmstra, 2017). This model is based on psychology, system theory, biology and sociology (Verhoef & Zalmstra, 2017). Even though it has a solid theoretical foundation, using the MOHO as theoretical foundation for qualitative research looking at the effect of VR on physiotherapy has not been found. Therefore, it is difficult to say if all effects and relationships were included in this research. The MOHO for example does not provide additional factors related to technology that could influence the daily activities of physiotherapists and physiotherapy itself. While MOHO did provide valuable insights into the general occupational behaviours and motivations of physiotherapists, it may have fallen short in addressing all related effects and factors influencing physiotherapy.

Another limitation was the insufficient number of participants included in this research. The aim of 8 to 10 participants was not achieved. The online searches consisted of researching physiotherapists' practises using VR, were adequate for recruiting physiotherapists that still use VR but did not work sufficiently for recruiting physiotherapists that no longer use VR but have used VR for over a year. Looking at the number of participants, it is important to recognize that achieving a comprehensive understanding of the effects of VR on physiotherapy typically requires more participants. Therefore, data saturation, where no new themes or insights have occurred and all pre-determined themes were sufficiently covered, has not been achieved. This restricts the results from being generalizable to the whole population.

Additionally, it is recommended for research that aims to generalize results for a group of people, to aim for a homogeneous group of participants (Malterud et al., 2016; Robinson, 2014). However, how homogeneous the group of participants is depending on interpretative concerns such as how much variation can be contained (Malterud et al., 2016). It was decided that only physiotherapist with a year or more experience with VR use as treatment for CLBP were included. This makes for a homogenous group. Nevertheless, there was a lot of variety within this group of participants in the use of VR that was not accounted for.

To take language and interpretation into account throughout the research process, steps were taken to lessen the potential influence of researcher bias. A diary to record personal thoughts and roles before and during the interviews was kept. By reflecting on my thoughts and actions, I became more aware of my preconceptions and biases. This awareness helped me remain alert in questioning my interpretations and seeking alternative perspectives. For instance, recognizing my bias as an occupational therapist guided me to explore answers from multiple viewpoints, ensuring a more balanced analysis. Additionally, it also helped in making the research process transparent, which is critical for the trustworthiness of qualitative research. Furthermore, reflecting on my input of each interview, especially when dealing with less forthcoming participants, helped me develop strategies to obtain more detailed responses. However, it is important to note that this method is not perfect and bias should be taken into account when reading the results. Despite its limitations, this reflective process was important for ensuring the study was transparent and thorough.

Conclusion of discussion

The results provided valuable insights into the occupational identity of physiotherapy within the context of virtual reality (VR) treatment for Chronic Low Back Pain (CLBP). VR use does influence the occupational identity and practise of physiotherapists by changing the approach necessary from hands-on to hands-off, changing their daily activities and utilization of their time. This shift does align with values of physiotherapists such as patient empowerment and autonomy. However, new skills in coaching and technology needed to be learned by the physiotherapists to use VR. Additionally, a variation in the skills, guidance and availability of knowledge was identified.

Physiotherapist in this research are positive about the effect of VR on their practise as physiotherapists, as on the treatment of CLBP. The positive aspects mentioned were the immersive feature and the motivational aspects of VR which could potentially reduce fear of movement and improve pain understanding. The possible positive effect of VR on patient-therapists relationship was described due to VR being a new innovation and treatment option for CLBP. However, also neutral and negative effects of VR on patient-therapist relationship were described when patients could not work with VR. While VR is a promising tool to use for treating CLBP, its use requires overcoming physical and financial barriers. Physical barriers as the technological malfunctioning and longer preparation time were mentioned. These

aspects form a barrier to use VR due to the limited time available for physiotherapy treatment. Additionally, the costs of VR were identified as a barrier, due to the high purchase costs of VR and the lack of insurance coverage.

While the use of VR poses physical and financial barriers, its use does potentially be beneficial for treating CLBP according to the physiotherapists in this research. For physiotherapists, it requires new ways and skills to perform their occupational duties to use VR. Thereby it influences the occupational identity of physiotherapists.

Recommendations

Habituation and occupational skill

The switch from hands-on approach to hands-off approach, which is in contradiction with traditional physiotherapy, requires new skills. The results show that most participants learned their VR skills by trial and error. A lack of standardized and widely available VR training was mentioned. The understanding of this switch in role, habit and practise of physiotherapists could help develop trainings. In addition, it could foster competencies in using VR technology by looking into additional trainings that help develop hands-off skills such as coaching (Glegg & Levac, 2018; Walton, 2020). These trainings should be accessible, especially in costs, and widely available according to the results. There are trainings for physiotherapists to learn coaching skills, however these are not specifically adjusted to the use of VR (AVLEG, 2024). Developing specific trainings for the use of VR and making them accredited and widely available would help physiotherapist use VR efficiently and effectively (Glegg & Levac, 2018; Walton, 2020).

Occupational performance and occupational participation

Physiotherapist in this research are positive about the effect of VR on their practise as physiotherapists, as on the treatment of CLBP. They mention the immersive feature of VR causing for more motivation and a better way of providing pain education as seen in the causal model in figure 4. Additionally, participants were positive about the ability of VR to reduce fear of movement. Nonetheless, more studies are needed for a greater understanding of how VR could sustain and enhance engagement and motivation of patients to create adherence to treatment programs. Development of such systems could thereby increase use of VR (Glegg & Levac, 2018). Additionally, more research is needed to understand and prove that VR could cause positive effects on CLBP.

The social environment and volition

As found in this research, some participants mentioned that VR sometimes had a negative effect on patient-therapist relationship when the patient cannot work with VR. However this was also in contradiction with some participants value of patient empowerment, since it left patients feeling ashamed. Participants mentioned that with other treatments there are alternatives to perform the treatment causing options when patients cannot perform certain activities or have certain skills. This is not the case with VR. A recommendation therefore is for VR developers to look into creating a more accessible interaction with VR for patients with lesser skills in technology. Thereby giving physiotherapist more options with patients and letting VR align with physiotherapists values.

Additionally, it is recommended for physiotherapist to align with the value of safety for patients, to use fall prevention guidelines and assessments to assess the safety of the room where VR is used. As mentioned especially with elder patients a fall could cause long-term disability, increase mortality and dangerous fractures (GAJOS et al., 2016). An example of an assessment is a list of requirements the room

is checked for, like the requirement that there are no loose cords on the floor you may trip over (Franciscus: Gasthuis en Vlietland, 2016). Thereby it is recommended to adjust these requirements for the room to the use of VR.

The economic environment

The costs of VR purchase are a negative effect on using VR. These costs are also influenced by the lack of insurance coverage as also shown in the causal model in figure 4. These costs also have influence on the accessibility for patients to VR treatment, also due to lack of insurance coverage and necessary out-of-pocket costs (Patiëntenfederatie Nederland, 2023; Zurhake, 2023).

Physiotherapists say that the only solution to keep physiotherapy affordable is when physiotherapy goes back into the basic insurance (Zurhake, 2023). When innovations such as VR is deemed valuable to treating CLBP, it is recommended to create an extra way to cover the necessary costs of VR. An extra way within health insurance for physiotherapist to cover costs of innovations could also stimulate use of innovations such as VR. An example of this is the S3 segment for general practitioners. This segment is meant to stimulate general practitioners to adopt innovations to relieve pressure and increase efficiency of care (Nederlandse Zorgautoriteit, 2013).

The physical environment

Preparation time and equipment malfunction both form a barrier because of the limited time there is for treatment within physiotherapy. For the manufacturers of VR hardware and software, it is recommended to prevent potential failures in the VR technology by reducing the complexity of the hardware and software (Brassel et al., 2021). Nonetheless, this simplification should not impact the benefits VR could offer. It is recommended to the makers of VR to find an adequate balance between the intended use of VR and the possibilities VR has to reduce technical malfunctions (Glegg & Levac, 2018).

Furthermore the current workload for physiotherapists causes for time limitations (Klaassen, 2017). Administrative tasks decreased the actual time spend on treatment of patients (Klaassen, 2017). These factors contribute to the workload pressure within physiotherapy, causing pressure to effectively use the time available. Additional preparation time and equipment malfunctions are seen as a barrier to use VR due to the limited time. However, the use of VR could also help decrease the workload. The use of structure health programs with VR enabled some participants to do administrative tasks during treatment. Therefore it is recommended for physiotherapist to use the time patients use VR effectively, to create more rest within their daily activities and reduce the negative effect of preparation time and equipment malfunction.

In addition, it is recommended for the current and upcoming government to look at ways to reduce additional tasks load for physiotherapists. The current government already has a program and website called Deregulate Healthcare, which provides e-learnings and information for healthcare professionals on how to minimize the load of administrative tasks (Ministerie van Volksgezondheid, 2024). It is recommended for physiotherapist to look into these e-learnings to minimize the workload and for the government to further advertise and research ways to help physiotherapists.

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Appendix

Appendix 1: interview guide for participants who still use VR

Introductie

Hartelijk dank voor het deelnemen aan dit interview, mijn naam is Sophie van Riel. Ik ben een ergotherapeut en student van de master health sciences op de universiteit van Twente.
Het doel van dit onderzoek is om te onderzoeken hoe VR-technologie het beroep fysiotherapie beïnvloedt bij de behandeling van mensen met chronische lage rugpijn.

Het interview zal maximaal een uur duren en er zijn geen goede of foute antwoorden op de vragen die ik u ga stellen. Ik heb 5 onderwerpen die ik ga aanbrengen tijdens het interview zoals het onderwerp vaardigheden, kennis en ervaring.

Voordat we verder gaan, zou u zelf willen voorstellen waaronder uw naam, leeftijd en waar u werk? Daarnaast ga ik in op:
Demografische gegevens:

- Geslacht
- Naam
- Leeftijd
- Hoe lang ze VR gebruiken
- Welk programma ze gebruiken
- Beroepservaring
- Specialisaties
- Waar ze werken

Voordat ik begin met het interview geeft u toestemming om deel te nemen aan dit interview. Ik zal het interview opnemen en transcriberen. De gegevens zullen gepseudonimiseerd worden. Heeft u hierover vragen? Gaat u akkoord met deelnemen aan dit onderzoek en het opnemen van het interview?

Zo ja, dan start ik nu de opnamen en vraag ik opnieuw of u akkoord ben. Gaat u akkoord met het deelnemen aan dit onderzoek en het opnemen van dit interview?

Gerelateerde onderzoeksvragen:

1. How do personal characteristics, such as interests, values, perceived personal effectiveness, habits and roles influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?
2. How does the social environment consisting of the social influences from patients and colleagues influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?
3. How does the economic and physical environment consisting of factors as equipment and rooms used for VR treatment, and the coverage of the costs of VR by insurance or patients influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?
4. How do occupational skill, occupational performance and occupational participation influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?

<u>Onderwerp 1: waarden, interesses, ruimte en benodigdheden</u>
Gerelateerde onderzoeksvraag: 1 en 3

1. Waarom bent u VR gaan gebruiken?
   a. Wat vindt u leuk en niet leuk aan het gebruik van VR bij het behandelen van patiënten met chronisch lage rugpijn?
   b. Welke belemmeringen ervaart u bij het gebruik van VR, inclusief de benodigdheden en ruimte die u gebruikt bij de VR behandelingen?
   c. Welke waarden heeft u die passen bij het gebruik van VR? Bijvoorbeeld ik als ergotherapeut heb als waarde, dus wat ik belangrijk vind , dat mijn patiënten altijd

veilig zijn tijdens en na de behandeling, hierop pas ik mijn handelen en gedrag aan om dat te proberen te bereiken.

Onderwerp 2: rollen en gewoontes
Gerelateerde onderzoeksvraag: 1

Literatuur voor deze vraag: (Hammond et al., 2016b; Hammond & Wheeler, 2008; Rappazzo et al., 2022)

2. Ik heb in literatuur karakteristieken en specifieke taken gevonden waar je aan moet voldoen om fysiotherapeut te zijn. U bent fysiotherapeut, kunt u mij vertellen wat het voor u betekent om fysiotherapeut te zijn?
    a. De omschrijving van fysiotherapeut die u geeft, hoe past deze volgens u bij het gebruik van VR bij het behandelen van chronisch lage rugpijn?
    b. Hoe heeft het gebruik van VR uw dagelijkse taken (rollen en gewoontes) veranderd, met name bij de behandeling van chronisch lage rugpijn?

Onderwerp 3: sociale invloed van patiënten en collega's
Gerelateerde onderzoeksvraag: 2

3. Wat vinden uw collega's van het gebruik van VR bij de behandeling van chronisch lage rugpijn?
    a. Wat voor effect heeft de mening van uw collega's op uw gebruik van VR?
4. Wat voor effect heeft de behandeling met VR op uw relatie met de patiënt?
    a. Wat voor effect heeft de mening van uw patiënten op uw gebruik van VR?

Onderwerp 4: patiënten kosten en verzekeringsdekking
Gerelateerde onderzoeksvraag: 3

5. Hoe verschillen de kosten van de behandelingen met VR ten opzichte van zonder VR?
    a. Wat voor invloed hebben deze kosten op het geven van VR behandelingen?

Onderwerp 5: vaardigheden, kennis, ervaring, persoonlijke effectiviteit/overall en de verwachte en waargenomen impact op chronisch lage rugpijn
Gerelateerde onderzoeksvraag: 4

6. Welke kennis, vaardigheden en ervaringen heeft u om VR te kunnen gebruiken bij het behandelen van patiënten met chronische lage rugpijn?
    a. Hoe ervaarde u het gemak van het verkrijgen van deze kennis en vaardigheden?
7. Alleen kijkend naar de uitvoering van uw beroep en niet de resultaten, Wat voor effect heeft VR op het uitvoeren van uw beroep?
8. Kunt u beschrijven wat volgens u het gebruik van VR voor invloed heeft op chronisch lage rugpijn?

Onderwerp 6: extra

9. Zijn er nog onderwerpen die we nog niet hebben besproken maar wel volgens u belangrijk zijn om mee te nemen?
    a. Zo ja: kunt u hier meer over vertellen ?

Appendix 2: interview guide for participants who are not using VR anymore

Introductie

Hartelijk dank voor het deelnemen aan dit interview, mijn naam is Sophie van Riel. Ik ben een ergotherapeut en student van de master health sciences op de universiteit van Twente.
Het doel van dit onderzoek is om te onderzoeken hoe VR-technologie het beroep fysiotherapie beïnvloedt bij de behandeling van mensen met chronische lage rugpijn.

Het interview zal maximaal een uur duren en er zijn geen goede of foute antwoorden op de vragen die ik u ga stellen. Ik heb 5 onderwerpen die ik ga aanbrengen tijdens het interview zoals het onderwerp vaardigheden, kennis en ervaring.

Voordat we verder gaan, zou u zelf willen voorstellen waaronder uw naam, leeftijd en waar u werk?
Daarnaast ga ik in op:
Demografische gegevens:

- Geslacht
- Naam
- Leeftijd
- Hoe lang ze VR gebruiken
- Welk programma ze gebruiken
- Beroepservaring
- Specialisaties
- Waar ze werken

Voordat ik begin met het interview geeft u toestemming om deel te nemen aan dit interview. Ik zal het interview opnemen en transcriberen. De gegevens zullen gepseudonimiseerd worden. Heeft u hierover vragen? Gaat u akkoord met deelnemen aan dit onderzoek en het opnemen van het interview?

Zo ja, dan start ik nu de opnamen en vraag ik opnieuw of u akkoord ben. Gaat u akkoord met het deelnemen aan dit onderzoek en het opnemen van dit interview?

Gerelateerde onderzoeksvragen:

5. How do personal characteristics, such as interests, values, perceived personal effectiveness, habits and roles influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?
6. How does the social environment consisting of the social influences from patients and colleagues influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?
7. How does the economic and physical environment consisting of factors as equipment and rooms used for VR treatment, and the coverage of the costs of VR by insurance or patients influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?
8. How do occupational skill, occupational performance and occupational participation influence the occupational identity of physiotherapists regarding the use of virtual reality (VR) technology in treating chronic low back pain (CLBP)?

Onderwerp 1: waarden, interesses, ruimte en benodigdheden
Gerelateerde onderzoeksvraag: 1 en 3

1. Waarom bent u VR gaan gebruiken?
2. Waarom bent u gestopt met het gebruik van VR?
    a. Wat vindt u leuk en niet leuk aan het gebruik van VR bij het behandelen van patiënten met chronisch lage rugpijn?
    b. Welke belemmeringen ervaarde u bij het gebruik van VR, inclusief de benodigdheden en ruimte die u gebruikte bij de VR behandelingen?
    c. Welke waarden heeft u die passen bij het gebruik van VR? Bijvoorbeeld ik als ergotherapeut heb als waarde, dus wat ik belangrijk vind , dat mijn patiënten altijd veilig zijn tijdens en na de behandeling, hierop pas ik mijn handelen en gedrag aan om dat te proberen te bereiken.

Onderwerp 2: rollen en gewoontes
Gerelateerde onderzoeksvraag: 1

Literatuur voor deze vraag: (Hammond et al., 2016b; Hammond & Wheeler, 2008; Rappazzo et al., 2022)

3. Ik heb in literatuur karakteristieken en specifieke taken gevonden waar je aan moet voldoen om fysiotherapeut te zijn. U bent fysiotherapeut, kunt u mij vertellen wat het voor u betekent om fysiotherapeut te zijn?
    a. De omschrijving van fysiotherapeut die u geeft, hoe past deze volgens u bij het gebruik van VR bij het behandelen van chronisch lage rugpijn?
    b. Hoe veranderde het gebruik van VR uw dagelijkse taken (rollen en gewoontes), met name bij de behandeling van chronisch lage rugpijn?

Onderwerp 3: sociale invloed van patiënten en collega's
Gerelateerde onderzoeksvraag: 2

4. Wat vonden uw collega's van het gebruik van VR bij de behandeling van chronisch lage rugpijn?
    b. Wat voor effect had de mening van uw collega's op uw gebruik van VR?
5. Wat voor effect had de behandeling met VR op uw relatie met de patiënt?
    a. Wat voor effect heeft de mening van uw patiënten op uw gebruik van VR?

Onderwerp 4: patiënten kosten en verzekeringsdekking
Gerelateerde onderzoeksvraag: 3

6. Hoe verschillen de kosten van de behandelingen met VR ten opzichte van zonder VR?
    a. Wat voor invloed hadden deze kosten op het geven van VR behandelingen?

Onderwerp 5: vaardigheden, kennis, ervaring, persoonlijke effectiviteit/overall en de verwachte en waargenomen impact op chronisch lage rugpijn
Gerelateerde onderzoeksvraag: 4

7. Welke kennis, vaardigheden en ervaringen had u nodig om VR te kunnen gebruiken bij het behandelen van patiënten met chronische lage rugpijn?
    b. Hoe ervaarde u het gemak van het verkrijgen van deze kennis en vaardigheden?
8. Alleen kijkend naar de uitvoering van uw beroep en niet de resultaten, Wat voor effect had VR op het uitvoeren van uw beroep?
9. Kunt u beschrijven wat volgens u het gebruik van VR voor invloed heeft op chronisch lage rugpijn?

Onderwerp 6: extra

10. Zijn er nog onderwerpen die we nog niet hebben besproken maar wel volgens u belangrijk zijn om mee te nemen?
    a. Zo ja: kunt u hier meer over vertellen ?

Appendix 3: Codes and themes comparison process

To visualize the analysis process, I made a colour coded overview and tables of the codes. Table 4 shows that the main themes are based on the sub research question and the MOHO. Subthemes are based on the MOHO, with an addition of an extra colour code for information about the usage of VR by the participants and their demographic information.

Main themes based on sub research questions and MOHO	Subthemes MOHO
Physical an economic environment: Accessibility of VR	Obstacles
	Costs
	Insurance
Social environment: surrounding parties influence on physiotherapy and the utilization of VR	Patients
	collegeaus
Volition and habituation: understanding physiotherapists and the impact of VR	Volition
	Habituation
The influence of VR on occupational skill, occupational performance and occupational participation	occupational skill
	occupational performance
	occupational participation
extra: information about use of VR and demographic information about participants	

Table 4: overview of colour coded main themes and subthemes based on the MOHO

To show how the deductive process went, table 5 is made. This is a representation of one of the participants codes of the interview. As seen in table 5, the same colours are used as for the subthemes in table 4. This represents which codes, and thereby which parts of the interview, were used for which theme.

codes
Participant 1
Toegevoegde waarde VR
Effect van VR op CLBP
Keuze van VR gebruik
VR bijdrage aan kennis overbrengen aan patiënten
Leerproces om VR goed te kunnen gebruiken
Skills die participant 1 moest leren om VR te gebruiken
Gemak van het leren VR te gebruiken
wat participant 1 leuk vind aan VR gebruiken
Verandering in fysiotherapie van Hands-on naar hands-off
Botsing van VR met traditionele beeld van fysiotherapie
VR is een tool in de toolbox van fysiotherapeuten
Betekenis fysiotherapie volgens participant 1
Collega's mening over VR
Invloed van collega's op VR gebruik
Botsing van VR met zorg
Mening van patiënten over VR gebruik
Relatie met patiënt bij gebruik van VR
Effect mening van patiënt op VR gebruik
Kosten van aankopen VR
Inzetbaarheid en doeleinde van VR
Belemmeringen in gebruik van VR
VR in de toekomst gebruik voor efficienty en kosten besparing
Toekomstig onderzoek om verzekering erbij te betrekken
Behandelruimte en benodigdheden in de toekomst om efficienty zorg te verbeteren
Manier van inzet VR
Hoe participant 1 VR gbruikt
Hoe efficiëntie gebruik VR nu is

Table 5: representation of sorting codes of participant through colour coding

For every participant I did this process and combined all the interview parts for one subtheme together in one document. After that I combined the subthemes that belong under the same main together in one document. This resulted in 4 documents which included the subthemes as represented in table 4. I then used these documents to write the results.

Appendix 4: Informed consent form and information letter (Dutch)

Toestemmingsformulier (informed consent)

Toestemmingsformulier voor onderzoek naar: De invloed van VR op het beroep fysiotherapie bij het behandelen van chronisch lage rugpijn

U KRIJGT EEN KOPIE VAN DIT FORMULIER VOOR GEÏNFORMEERDE TOESTEMMING

Gelieve de juiste vakjes aan te kruisen	**Ja**	**Nee**
Meedoen aan het onderzoek		
Ik heb de studie-informatie gelezen en begrepen, of het is mij voorgelezen. Ik heb vragen kunnen stellen over het onderzoek en mijn vragen zijn naar tevredenheid beantwoord.	○	○

Ik stem er vrijwillig mee in om deel te nemen aan dit onderzoek en begrijp dat ik kan weigeren vragen te beantwoorden en dat ik me op elk moment kan terugtrekken uit het onderzoek, zonder dat ik een reden hoef op te geven.	○	○
Ik begrijp dat deelname aan het onderzoek een interview inhoudt waarbij de audio wordt opgenomen en getranscribeerd via Microsoft Teams. Hierbij wordt alles verzameld gepseudonimiseerd en na 10 jaar wordt alles vernietigd.	○	○
Risico's verbonden aan deelname aan het onderzoek Ik begrijp dat er geen juridische, economische, fysieke of mentale risico's verbonden zijn aan deelname aan dit onderzoek.	○	○
Gebruik van de informatie in het onderzoek Ik begrijp dat de informatie die ik verstrek zal worden gebruikt voor een master thesis, een presentatie (colloquium) en een peer reviewed wetenschappelijk artikel.	○	○
Ik begrijp dat persoonlijke informatie die over mij is verzameld en die mij kan identificeren, zoals naam en beroep, niet zal worden gedeeld buiten het onderzoeksteam.	○	○
Ik ga ermee akkoord dat mijn informatie kan worden geciteerd in onderzoeksresultaten	○	○
Toekomstig gebruik en hergebruik van de informatie door anderen Ik geef toestemming dat het gepseudonimiseerde transcript van het interview en de audio-opname die tijdens het huidige onderzoek zijn gegenereerd, niet openbaar beschikbaar zijn, maar dat de gegevens op redelijk verzoek door de corresponderende auteur beschikbaar kunnen worden gesteld aan geïnteresseerde partijen.	○	○

Handtekeningen

_____	_____	_____
Naam van de deelnemer	Handtekening	Datum

Voor deelnemers die hun naam niet kunnen ondertekenen, markeert u het vakje in plaats van ondertekenen

Ik heb het informatieblad nauwkeurig voorgelezen aan de potentiële deelnemer en er naar mijn beste vermogen voor gezorgd dat de deelnemer begrijpt waar hij vrijwillig mee instemt.

_____	_____	_____
Naam van de onderzoeker	Handtekening	Datum

Contactgegevens van de studie voor meer informatie:

Sophie van Riel

Contactgegevens voor vragen over uw rechten als onderzoek deelnemer
Als u vragen heeft over uw rechten als deelnemer aan het onderzoek, of informatie wilt inwinnen, vragen wilt stellen of zorgen over dit onderzoek wilt bespreken met iemand anders dan de onderzoeker(s), neem dan contact op met de secretaris van de Ethische Commissie/domein Geesteswetenschappen en Sociale Wetenschappen van de Faculteit Gedrags-, Management- en Maatschappijwetenschappen van de Universiteit Twente via

Onderzoek naar: De invloed van VR op het beroep fysiotherapie bij het behandelen van chronisch lage rugpijn

Informatie voor deelname

Onderzoeker: Sophie van Riel (masterstudent Gezondheidswetenschappen, Universiteit Twente)

Doel van het onderzoek
Het doel van dit onderzoek is om de invloed van VR op het beroep fysiotherapie te onderzoeken bij het behandelen van chronisch lage rugpijn. Door een dieper inzicht te krijgen in de perspectieven van fysiotherapeuten op VR, kunnen we de kwaliteit, toegankelijkheid en effectiviteit van chronisch lage rugpijn behandelingen verbeteren, en daarmee uiteindelijk de patiëntresultaten verbeteren.

Wat houdt het onderzoek in?
Deelnemers worden uitgenodigd om deel te nemen aan een semigestructureerd interview waarin zij worden gevraagd naar hun persoonlijke ervaringen en waargenomen barrières en facilitators met betrekking tot het gebruik van VR technologie in de behandeling van chronische pijn. De interviews zullen worden opgenomen in audioformaat en getranscribeerd voor analyse. Het interview zal online plaatsvinden met behulp van Microsoft Teams en zal ongeveer 1 uur duren.

Toestemming
We vragen uw toestemming om deel te nemen aan dit onderzoek, wat geldt voor de duur van dit onderzoek. Deelname aan dit onderzoek is vrijwillig. U heeft het recht om niet deel te nemen aan dit onderzoek. Als u besluit deel te nemen aan dit onderzoek, bent u vrij om op elk moment terug te trekken zonder negatieve gevolgen en zonder opgave van reden. U bent vrij om alleen vragen te beantwoorden waarop u wilt reageren.

De onderzoekers kunnen het onderzoek beëindigen indien nodig. De beslissing om het onderzoek te beëindigen kan worden genomen ter bescherming van uw gezondheid en veiligheid, of omdat het onderzoeksplan bepaalt dat personen die niet aan bepaalde voorwaarden voldoen of zich niet strikt aan de instructies houden, niet kunnen deelnemen.

Persoonsgegevens, welke rechten heb ik?

U heeft het recht om toegang te vragen tot, rectificatie van, verwijdering van, beperking van of bezwaar te maken tegen de verwerking van uw persoonsgegevens.

Bescherming van vertrouwelijkheid
Alle informatie verzameld tijdens dit onderzoek wordt vertrouwelijk opgeslagen. Uw onderzoeksgegevens worden gepseudonimiseerd met een codenaam of nummer. Persoonlijke informatie wordt niet vrijgegeven zonder uw schriftelijke toestemming.

Beleid voor het beheer van onderzoeksgegevens
De gepseudonimiseerde onderzoeksgegevens worden veilig opgeslagen voor een periode van 10 jaar. Alleen de onderzoekers hebben toegang tot deze gegevens. Wanneer de resultaten van dit onderzoek worden gepubliceerd en gepresenteerd in een presentatie, zal geen informatie worden gepresenteerd die uw persoonlijke identiteit kan onthullen.

Gegevensverwerking
Uw gegevens worden uitsluitend verwerkt voor de doeleinden van dit onderzoek. Dit omvat de transcriptie van interviews, analyse van gegevens en rapportage van bevindingen. Alle identificeerbare persoonlijke informatie wordt verwijderd tijdens de verwerking van gegevens om vertrouwelijkheid en anonimiteit te waarborgen.

Ethische goedkeuring
Dit onderzoek is goedgekeurd door de ethische beoordelingscommissie van de Universiteit Twente.

Deelname
Als u besluit deel te nemen aan dit onderzoek, kunt u het bijgevoegde toestemmingsformulier ondertekenen.

Contact
Voor eventuele vragen over dit onderzoek kunt u contact opnemen met:
Sophie van Riel

Bijlage
Toestemmingsformulier