

https://dspace.org/

The use of therapeutic gaming by occupational therapists at Chris Hani Baragwanath academic hospital

Govender, Karessa

2019
https://hdl.handle.net/10539/27980

Downloaded from a DSpace repository. https://dspace.org/

THE USE OF THERAPEUTIC GAMING BY OCCUPATIONAL THERAPISTS AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

Karessa Govender

A research report submitted to the Faculty of Health Sciences, University of Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Occupational Therapy.

Johannesburg, 2019

DECLARATION

I, Karessa Govender, declare that this research report is my own unaided work. It is being submitted for the degree of Master of Science in Occupational Therapy at the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.



_____

Karessa Govender

26th day of February 2019

To all occupational therapists serving in the public sector, your commitment to improving the lives of people with disabilities has not gone unnoticed.

ABSTRACT

This study was born out of a lack of data on the use of therapeutic gaming by occupational therapists in South Africa. A qualitative descriptive exploratory case study was used with semi-structured interviews as the main research tool. Ten occupational therapists employed at Chris Hani Baragwanath Academic Hospital were interviewed to determine the factors motivating and limiting the use of therapeutic gaming in therapy, the fit of therapeutic gaming into the occupational therapy philosophy and their perception of evidence based practice in the use of therapeutic gaming at their setting. The following were identified as facilitators to therapeutic gaming use: peer support, routinising the use of therapeutic gaming, gaming is an occupation and lastly, it was fun and motivating. The following were identified as limiting factors: time constraints, limited knowledge, training and exposure to therapeutic gaming, the lack of suitability of therapeutic gaming for people with disabilities, and high costs associated with therapeutic gaming. Therapists followed the typical occupational therapy processes when using therapeutic gaming and perceive therapeutic gaming to be a good fit within the philosophy of occupational therapy. Therapists used a variety of strategies to determine the level of effectiveness of therapeutic gaming. These included research evidence, peer feedback, clinical experience and patient feedback. More research is needed in this area in the South African setting.

ACKNOWLEDGEMENTS

I am thankful for the following people for their assistance:

- My parents; Vasanthie and Logan and brothers; Kimolin and Kiroshen.
- Deenan and Nisha Vythilingam and family for their ongoing support and encouragement.
- Mrs. Juliana Freeme, for her outstanding supervision and patience throughout the research process.
- My former occupational therapy colleagues at Chris Hani Baragwanath Academic Hospital for their drive and commitment to their clients and the occupational therapy profession.
- The adult neurology team at Chris Hani Baragawanath Academic Hospital – your service is a shining example of what our profession can achieve in this challenging public health system.
- The clients and their families whom I have had the privilege to engage with and learn from.
- The participants of this study who sacrificed their personal time for data collection.

TABLE OF CONTENTS

DECLARATION ii
DEDICATION iii
ABSTRACT iv
ACKNOWLEDGEMENTS v
TABLE OF CONTENTS vi
LIST OF TABLES xi
DEFINITIONS xii
ABBREVIATIONS xiii
CHAPTER 1: INTRODUCTION 14
1.1 Introduction to the study 14
1.2 Statement of the problem 17
1.3 Purpose of the study 17
1.4 Research question 18
1.5 Aim of the study 18
1.6 Objectives for the study 18
1.7 Justification for the study 18
CHAPTER 2: LITERATURE REVIEW 20
2.1 Introduction to the literature review 20
2.2 The philosophy of occupational therapy 20
2.3 The occupational therapy process 21
2.4 Activity analysis in occupational therapy 23
2.5 The changing nature of occupational therapy 24
2.5.1 An overview of developments in occupational therapy 24
2.5.2 The influence of generational differences in occupational therapy 26

2.5.3 The status of crafts in occupational therapy 28
2.6 The relationship between occupational therapy and meaningful activity 30
2.7 Introduction to virtual reality and therapeutic gaming 31
2.8 The relationship between virtual reality and occupational therapy 33
2.9 The role of the occupational therapist in therapeutic gaming 36
2.10 Occupational therapy and technology 37
2.11 The perception of occupational therapists on evidence based practice in therapeutic gaming 39
2.12 Barriers for the use of therapeutic gaming by occupational therapists 42
2.13 Facilitators for the adoption of therapeutic gaming by occupational therapists 45
2.14 Conclusion to the literature review 47
CHAPTER 3: METHODOLOGY 49
3.1 Introduction to methodology 49
3.2 Study design 49
3.3 Study participants 50
3.3.1 Study population 50
3.3.2 Study sample 51
3.3.3 Selection criteria 51
3.4 Research instruments 52
3.5 Research procedure 53
3.6 Pilot study 54
3.7 Data collection 55
3.8 Trustworthiness 55
3.9 Data analysis 56
3.10 Ethical considerations 58

3.11 Researcher's assumptions 59
CHAPTER 4: RESULTS 61
4.1 Introduction to results 61
4.2 Background to study setting 61
4.2.1 Context of Chris Hani Baragwanath Academic Hospital 61
4.2.2 Context of occupational therapy department 61
4.2.3 Study participants 63
4.2.4 Participant demographics 64
4.3 Description of themes arising from semi-structured interviews 68
4.4 Theme1: Facilitators to the use of therapeutic gaming in occupational therapy 69
4.4.1 Subtheme 1.1: Peer pressure 69
4.4.2 Subtheme 1.2: Time efficient 70
4.4.3 Subtheme 1.3: Technology is part of life 70
4.4.4 Subtheme 1.4: Technology is an alternative to traditional activities 72
4.4.5 Subtheme 1.5: It is easy to learn and with practice it will be perfect 73
4.4.6 Subtheme 1.6: Therapeutic gaming is enjoyable and motivating 74
4.5 Theme 2: Barriers to the use of therapeutic gaming by occupational therapists 75
4.5.1 Subtheme 2.1: Time consuming 75
4.5.2 Subtheme 2.2: Limited knowledge, training and exposure 77
4.5.3 Subtheme 2.3: High cost of therapeutic gaming 79
4.5.4 Subtheme 2.4: Not all clients are suitable for therapeutic gaming 80
4.6 Theme 3: The fit of therapeutic gaming in the philosophy of occupational therapy 81
4.6.1 Subtheme 3.1: Activities and activity analysis 81
4.6.2 Subtheme 3.2: Therapy is meaningful 83

4.6.3 Subtheme 3.3: Flow 84
4.6.4 Subtheme 3.4: Holistic 84
4.7 Theme 4: Occupational therapists' perception on evidence based practice in the use of therapeutic gaming 85
4.7.1 Subtheme 4.1: Research evidence 85
4.7.2 Subtheme 4.2: Peer feedback 85
4.7.3 Subtheme 4.3: Clinical experience 85
4.7.4 Subtheme 4.4: Patient feedback 85
4.7.5 Subtheme 4.5: Lack of research evidence in South Africa 86
4.8 Summary of Results 86
CHAPTER 5: DISCUSSION 90
5.1 Introduction to discussion 90
5.2 Theme 1: Facilitators to the use of therapeutic gaming in occupational therapy 90
5.2.1 Subtheme 1.1: Peer pressure 90
5.2.2 Subtheme 1.2: Time efficient 91
5.2.3 Subtheme 1.3: Technology is part of life 92
5.2.4 Subtheme 1.4: Technology is an alternative to traditional activities 93
5.2.5 Subtheme 1.5: It is easy to learn and with practice it will be perfect 94
5.2.6 Subtheme 1.6: Therapeutic gaming is enjoyable and motivating 95
5.3 Theme 2: Barriers to the use of therapeutic gaming in occupational therapy ... 96
5.3.1 Subtheme 2.1: Time consuming 96
5.3.2 Subtheme 2.2: Limited knowledge, training and exposure 98
5.3.3 Subtheme 2.3: High cost of therapeutic gaming 100
5.3.4 Subtheme 2.4: Not all clients are suitable for therapeutic gaming 100

5.4 Theme 3: The fit of therapeutic gaming in the philosophy of occupational therapy 101
5.4.1 Subtheme 3.1: Activities and activity analysis 101
5.4.2 Subtheme 3.2: Therapy is meaningful 102
5.4.3 Subtheme 3.3: Flow 103
5.4.4 Subtheme 3.4: Holistic 103
5.5 Theme 4: Occupational therapists' perception on evidence based practice in the use of therapeutic gaming 104
5.5.1 Subtheme 4.1: Research evidence 104
5.5.2 Subtheme 4.2: Peer feedback 105
5.5.3 Subtheme 4.3: Clinical experience 106
5.5.4 Subtheme 4.4: Patient feedback 106
5.5.5 Subtheme 4.5: Lack of research evidence in South Africa 106
5.6 Study limitations 107
CHAPTER 6: CONCLUSION 111
6.1 Study conclusions 111
6.2 General recommendations and recommendations for future studies 114
APPENDICES 127
Appendix A: Ethical clearance 127
Appendix B: Background information questionnaire 128
Appendix C: Semi-structured interview guide 130
Appendix D: Information letter to head of department and ethics committee 132
Appendix E: Permission to perform research 134
Appendix F: Information letter to participants 135
Appendix G: Informed Consent Form for interview 137
Appendix H: Informed Consent Form for audio recording 138

LIST OF TABLES

Table 1: Demographic details of participants in the study (n=10) 64
Table 2: Details of participants' TG use at CHBAH occupational therapy department .. 65
Table 3: Themes and subthemes 68

DEFINITIONS

Applications: Applications are commonly referred to as ‘apps’. They are software programmes that can be downloaded onto cellular phones or tablets. (1)

WhatsApp: This refers to an application that allows users to communicate with each other in real time. (2)

Uber: Uber is an application found on cellular phones. The user is able to book transportation via the application. (3)

Nintendo Wii®: This refers to a commercially available active video gaming device. (4)

Xbox Kinect®: This refers to a commercially available active video gaming device. (5)

PlayStation Move®: This refers to a commercially available active video gaming device. (6)

Therapeutic gaming: A video gaming device used for the purpose of rehabilitation. (7)

ABBREVIATIONS

3D	:	Three-dimensional
Apps	:	Applications
AVGs	:	Active video games
CHBAH	:	Chris Hani Baragwanath Academic Hospital
HMDs	:	Head mounted displays
TG	:	Therapeutic gaming
VR	:	Virtual reality

CHAPTER 1: INTRODUCTION

1.1 Introduction to the study

Occupational therapy practices of today may sport a few striking changes from those of yesteryear. Plastic stacking cones synonymous with dated occupational therapy practice may have moved from the main treatment table to the back of the cupboard. Not so long ago, the most technologically advanced piece of equipment found in an occupational therapists practice may have been the Intermediate Time Switch or what was commonly referred to as the 'ITS machine'. For the technologically savvy, this was a rudimentary tool, but a stark reminder that a perception could exist that occupational therapists were possibly not comfortable with technology. Fast forward a few years and a different picture emerges. Patients are seen controlling virtual images on a screen…Is *this* the new face of occupational therapy?

The inroads technology has made into healthcare and rehabilitation has been phenomenal. Recent advancements include robots that are able to perform surgical procedures and robotic limbs and exoskeletons that are able to assist individuals with paraplegia and amputations. It is an exciting time to be involved in rehabilitation. The internet and the explosion of information have lead people from different professions and different parts of the world to collaborate to create innovative solutions that make the lives of people with disabilities easier and more importantly, aid independence and participation.

Early occupational therapy interventions were characterized by arts and crafts. This was influenced by the Arts and Crafts movement of the 19th and 20th century. (8) The activities chosen were in keeping with the activities that people traditionally engaged in during their leisure time during that era. Occupational therapy students at the time were taught needlework, weaving, leather work and metal work, to name a few. (8) It is interesting to note that generations later, similar if not the same activities, are taught to occupational therapy students in universities across South Africa today.

Occupational therapists are able to incorporate technology into their intervention programmes to assist people with disabilities. This may range from basic skills such as using mobile phones to prompt reminders, or using applications (apps) on tablets to improve cognitive or perceptual skills. More advanced uses may include specially designed virtual reality (VR) systems to train, for example, driving after a stroke.

However, while observing those around us and reflecting on our own use of free time, there has definitely been a shift. As the world evolves and progresses, so do the nature of people's occupations. The nature of activities people engage in today may differ vastly from those performed by previous generations. The resources we use when engaging in occupations has changed dramatically. Modern day living has been heavily influenced by technology and we have become increasingly more dependent on everyday technology to complete daily tasks. (9) For example, communicating using WhatsApp® or ordering a cab via the Uber® app has become common practice for many. There is a growing need for occupational therapists to become more attuned to the electronic resources clients are using in their daily occupations. (10) It is evident that occupational therapists internationally have taken note of this. So much so, that the Occupational Therapy Practice Framework III has added the virtual environment to the list of contexts that an individual can perform occupations in. This inclusion is a big step for the profession as the Occupational Therapy Practice Framework III holds significant relevance and impact for occupational therapists practicing worldwide. It acknowledges the increasing role technology plays in the performance of occupations. (11) It further acknowledges that this development is important to occupational therapists and other health care professionals. (11) In becoming more aware of the variety of activities and contexts in which people perform these occupations, as well as the current resources they use, occupational therapists are in a better position to prescribe the most appropriate activity to the most appropriate client. In keeping with the change in times and maintaining relevance in the technological era, the Occupational Therapy Practice Framework III has replaced the term 'assistive device' with 'assistive technology'. (11) This new terminology is more inclusive of technology based solutions which is in keeping with the equipment available to assist people with disabilities today. It is thus

evident that the occupational therapy fraternity is gradually becoming more aware of the significant role technology has in enabling occupation.

Occupational therapists have started to utilise commercial gaming devices such as Nintendo Wii®, Xbox Kinect® and PlayStation Move® as therapy tools. These products were previously used for entertainment but are now making their way into therapy rooms and rehabilitation practices. Gaming devices make for dynamic therapeutic tools. They are interactive and require active participation from the individual. They encourage the individual to perform gross motor movements which are task orientated in nature. (12) They can be used in both adult and paediatric populations, for young and old and both males and females. It is an occupation, in itself, as millions of people around the world participate in active video games as a leisure activity. These off the shelf products also have the advantage of being less expensive than formal rehabilitation systems and more easily accessible, making it appealing treatment tools for therapists. Most importantly, research shows promising results in patients' recovery when used in both adult and paediatric populations. (13)

The occupational therapy department at Chris Hani Baragwanath Academic Hospital (CHBAH) uses therapeutic gaming (TG) as part of its treatment protocols. The researcher therefore chose to undertake the study in this setting. CHBAH is a public hospital situated in Diepkloof, Soweto. It is the largest hospital in Sub-Saharan Africa. It provides services to residents of Soweto but does receive referrals from other regions for patients requiring specialised care. The hospital is a hive of research activity and is one of the main teaching hospitals for medical and allied health students from the University of the Witwatersrand. The occupational therapy department at CHBAH began using TG in early 2016. At the time, the department had access to one console which needed to be shared across four subsections (adult neurology, orthopaedics, psychiatry and paediatrics). Of these four subsections, TG was used primarily by the adult neurology and paediatrics sections.

Anecdotal evidence suggests occupational therapists in South Africa are using commercially available gaming devices in therapy. Despite many studies on the effectiveness of TG, very little is known regarding the use of this technology in

occupational therapy. TG is still in its infancy in South Africa; it is therefore necessary to explore why occupational therapists are using this technology and the processes they use when implementing it with their patients.

1.2 Statement of the problem

Although many research studies have shown the effectiveness of TG in many patient populations (14) (15) (16), there is currently a lack of information regarding its use in the South African context. There is also limited information available regarding the use of TG in occupational therapy, how occupational therapists use the devices in their intervention programmes, and whether it is a suitable tool to apply within the occupational therapy philosophy. There are several research articles on factors motivating and limiting the use of TG in therapy, (17) (18) (19) but there is no information regarding these factors in a resource constrained environment such as CHBAH and other similar settings in South Africa. This gap in information makes it difficult for further developments to take place in TG and occupational therapy. Occupational therapists also do not have access to information that will assist them in making evidence based and effective treatment decisions. TG is still in its infancy stage in South African rehabilitation. A baseline study of this nature is therefore necessary to determine what the perspectives of occupational therapists are on TG and how they are currently using it.

1.3 Purpose of the study

As TG is in its early stages in rehabilitation in South Africa, it would be beneficial to determine what is motivating and limiting occupational therapists from using it in clinical practice based on their own clinical experience as well as factors that they believe may hinder or encourage its use on a provincial and national level. There is a strong need for local research which acutely takes into account contextual factors. This information is especially important for occupational therapists practicing in South Africa who are interested in TG to be able to review and make well informed decisions regarding rehabilitation. It is also important for researchers to tackle the issues hindering the use

of TG and investigate and propose solutions to overcome these challenges. There needs to be an open and lively discourse surrounding TG. It is the intention of the researcher that this body of work will spark the conversation around TG as well as encourage occupational therapists to begin using it in clinical practice.

1.4 Research question

How and why are occupational therapists at CHBAH using TG?

1.5 Aim of the study

The aim of the study is to determine how and why TG is being used by occupational therapists at CHBAH.

1.6 Objectives for the study

1.6.1 To determine the factors motivating and limiting occupational therapists use of TG at CHBAH

1.6.2 To explore the fit of TG at CHBAH in the philosophy of occupational therapy.

1.6.3 To explore the occupational therapists' perception on evidence based practice in the use of TG at CHBAH.

1.7 Justification for the study

TG is an emerging area in the field of occupational therapy. Most studies have focused on the effectiveness of therapeutic gaming; however there is no literature on how this technology is being applied in occupational therapy. An introductory study of this nature is therefore necessary to explore the 'how and why' behind the use of gaming by occupational therapists. The South African healthcare system is faced with a multitude of challenges. South African occupational therapists are pressured to provide comprehensive therapy despite high caseloads and poorly resourced departments. (20) The quadruple burden of disease (21) will lead to a greater demand for rehabilitation services in the future. TG is an ideal solution to the South African context; however it is

not clear how occupational therapists are applying this technology in therapy. Effectiveness studies in gaming are exhaustive and therefore a further study would not be useful. This study therefore aims to explore the unique role of the occupational therapist during gaming. This study explores the effect of local contextual factors on occupational therapists' adoption of TG in the public sector. To date, no study conducted locally has explored this area of TG use by therapists.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction to the literature review

The literature review will start by describing the philosophy of occupational therapy, the occupational therapy process and the role of activity analysis in the occupational therapy process. The influence of the 'changing times' and generational differences on occupational therapy practice will be discussed. The relationship between occupational therapy and meaningful activity will be explored. An overview of VR and TG will be provided. The relationship between VR and occupational therapy will be explored. Literature on the role of the occupational therapist when using TG will be discussed. The relationship between occupational therapy and technology will be explored. The perceptions of occupational therapists on evidence based practice in TG will be discussed. The researcher will discuss the facilitators and barriers to adoption of TG use based on literature findings. The literature review will conclude with a summary of the key points from literature.

2.2 The philosophy of occupational therapy

Occupational therapy practice is a holistic profession. It considers the person in his entirety when assessing and planning treatment. This is a shift in healthcare from the medical model which focused on the disease and physical components of the individual to the biopsychosocial approach which considered the individual's subjective experience of illness. (8)The latter sees the individual in relation to the systems that he interacts with. This is in keeping with the systems approach inherent in occupational models such as the Person-Environment-Occupation model (22) and the Model of Human Occupation. (23)

A client centred approach is a hallmark feature of occupational therapy. (11) This approach acknowledges the active role that the client plays in directing his/her intervention. (24) The client's occupational goals are at the forefront of assessment and

treatment, and both the client and the occupational therapist form a partnership and work together to achieve the goals that the client has selected. (24)

2.3 The occupational therapy process

The occupational therapy process delineates the processes that need to be undertaken by an occupational therapist during intervention. (11) It is carried out by all occupational therapists irrespective of the field they are working in. The occupational therapy process is characterised by three distinct but interrelated processes: evaluation, intervention and targeting of outcomes. (11) Despite other professions using similar processes, occupational therapy is the only profession which uses purposefully selected occupations and activities as the primary intervention. (11) This is in keeping with the occupational therapy philosophy which expounds on the use of occupation to promote health, wellbeing and participation. (11) The process should not be thought of as linear and one directional. Rather it can be described as a cyclical process where each step has the ability to influence the step before and after it. (11) The boundary of each step is not clearly defined and the overlapping of phases reflects the dynamic nature of the occupational therapy process.

During the evaluation phase the occupational therapist obtains information regarding the occupational profile and occupational performance of the client. (11) The occupational profile allows the occupational therapist to contextualise the client. Through exploring the client's occupational history, his patterns of daily living, as well as his needs, values and interests, the occupational therapist is able to create a narrative which she uses to plan intervention. (11) Careful consideration of the occupational profile in the occupational therapy process is indicative of a client centred approach. It is during this step where the occupational therapist is able to determine what the client considers meaningful in his life and uses this information to tailor intervention, ensuring the most appropriate activities and goals are selected.

Part two of the evaluation phase is analysis of the client's occupational performance. (11) Here the occupational therapist may use a number of different strategies to obtain information such as directly observing the client perform daily activities, reviewing his

medical records and direct assessment of specific assessment of performance. (11) Standardized assessments are the most preferred as they are able to provide objective data on the client's performance and engagement. (11) The use of evidence based measures by occupational therapists will be discussed later in the literature review.

The intervention process comprises three steps: intervention plan, intervention implementation and intervention review. (11) The intervention plan is formulated based on the information obtained in the occupational profile and occupational performance. (11) It is important to note that the intervention is delivered within the context of the service delivery model. (11) In the public healthcare system in South Africa, this is referred to as levels of care. Levels of care are defined according to the status of the health facility. Rehabilitation departments are obligated to provide services within the levels of care their health facility is classified under. CHBAH is classified as a central level hospital where therapists are required to provide acute and specialised intervention. Once clients are deemed medically stable, they are discharged. Clients that require long term in-patient rehabilitation are transferred to a rehabilitation facility. It must be acknowledged however, that the vast majority of clients are not transferred to rehabilitation facilities as these are far and few between in the public health system.

The **intervention plan** is designed to improve current and anticipated difficulties in areas of occupation and engagement. (11) The occupational therapist sets specific goals which are measurable within a time frame. (11) A client centred approach dictates that the client be actively involved in goal setting and selecting treatment intervention. (11)

Intervention implementation involves putting the plan into action. (11) This may involve focusing on a specific occupation or components that influence the performance of a specific occupation such as context and environment, performance patterns and performance skills. (11) During the course of intervention, improvement in one area may influence another. (11) As a result, ongoing evaluation and adapting intervention is necessary to keep up with changes. (11) This describes the dynamic role of the occupational therapist throughout the course of the occupational therapy process. The occupational therapist uses a combination of intervention methods such as direct

occupations, activities and preparatory methods, in addition to other methods. (11) Frequent monitoring of the client's response to intervention is necessary to make changes to treatment goals and modify demands of the intervention. (11) In order to implement an intervention, the therapist must have sufficient knowledge on how to use it therapeutically. This has been supported by literature that states that when therapists do not know how to use TG, they are less motivated to use it clinically. Lack of knowledge on how to use the VR system and the clinical application of it was deemed a significant barrier to VR adoption. (17)

Intervention review is the last step of intervention. (11) It involves continuously re-evaluating the intervention plan, the effectiveness of it and its progress towards meeting the goals set. (11) Targeting of outcomes involves setting indicators or markers for the end of therapy. (11) This step of the process is necessary to evaluate the intervention and to set further goals for therapy, if indicated. (11) It is important to note that outcomes may be subjective or objective. (11) Subjective outcomes refer to the client's perspective on his current occupations. (11) It can include factors such as playfulness, confidence, hope, self-efficacy, resilience and perceived well-being. (11)

2.4 Activity analysis in occupational therapy

Activities are the cornerstone of occupational therapy. It is therefore goes without saying that if activities are used as a therapeutic medium, they must be analysed to determine their suitability and appropriateness for the purpose of intervention. This process is known as activity analysis and similarly to the occupational process, it is conducted routinely with all occupational therapy clients. Activity analysis has been defined as 'a process by which properties inherent in a given activity, task or occupation may be gauged for their ability to elicit individual motivation and to fulfil patient needs in occupational performance and performance components'. (25)

To further elaborate, activity analysis fulfils the following functions. It allows the occupational therapist to determine what the steps of the activity are and which are steps are crucial for success of the activity. (11) It allows the occupational therapist to understand what skills are required to perform the activity. After analysing the client's

occupational performance, she will have an understanding of what the client's abilities and impairments are. This information is important in understanding how the client's impairments reflect in how he performs the activity and understanding why the client may have difficulty with certain components of the activity. (11) The ability to integrate these two pieces of information is significant when planning treatment. It allows the therapist to pitch the activity at the right level so as to ensure success of the activity as well as to challenge occupational performance. Activity analysis allows the occupational therapist to understand the demands the activity places on the individual and how the activity can be used therapeutically to challenge the client and work towards improving occupational performance. Lastly activity analysis allows the occupational therapist to understand the relevance and meaning the client attaches to the activity in their unique cultural context. (11)

The end result of activity analysis is the 'just right challenge'; an activity that gradually pushes the client just beyond their current abilities. (26) It is a fine balancing act between the client's abilities and the demands of the activity. Activity analysis promotes a client centred approach; as what is a just right challenge for one person may not be a just right challenge for another. In addition, a client's function can vary from week to week and therefore activity analysis must be ongoing in nature to keep up with the changes of the client. It is evident that activity analysis is a complex process and thus it cannot be done superficially for it to be effective. The effects of poor activity analysis are multiple. The client may not want to engage fully in the activity because he/she is disinterested and thus not motivated to perform the activity. (27) If the occupational therapist does not have a comprehensive understanding of the activity, she will not be able to maximise its therapeutic potential. She may not know how to grade it appropriately or what the key points of control are to ensure success of the activity.

2.5 The changing nature of occupational therapy

2.5.1 An overview of developments in occupational therapy

Last year marked the 100th anniversary of occupational therapy as a profession; the American Association of Occupational Therapy was founded in 1917. The profession is

even younger in South Africa with the first occupational therapists arriving in the country in 1942. (28) Occupational therapy is considered a young profession compared to other health professions. Despite its youth, the profession has undergone a number of changes.

The origins of occupational therapy as well as the early developments within the profession have been very much influenced by trends in society and medicine. (8) The use of arts and crafts as therapeutic agents has its roots in the Arts and Crafts Movement which was prominent in the late 19th century and early 20th century. (8) The movement came about for the need for a more meaningful lifestyle. (8) It is important to note that despite the many changes within the profession, the concept of a 'meaningful' life has endured. (11)

Around the same period, medicine was becoming increasingly more science based. (8) Despite the benefits of technological advancements, there was growing dissent within the medical fraternity that the focus of medicine was being shifted from the patient to the disease. (8) There was a need for a more humanised approach to the treatment of patients with chronic and mental illnesses. (8) It was here that medicine was beginning to understand and appreciate the significance of occupation to health. This led to the development of therapeutic programmes which were based on the principles of the Arts and Crafts Movement. (8)

Early occupational therapy programmes focused heavily on teaching the proficiency in arts and crafts subjects. (8) The crafts of the time may have included needlework, metalwork, weaving and leatherwork. (8) It is important to note that these were typical craft activities of the period and population. In this respect, not much has changed, with many South African occupational therapy programmes of today incorporating similar crafts into their curricula.

With the adoption of occupational therapy into the medical profession, the focus became more on treating specific bodily impairments rather than the holistic management of the client. (8) Crafts were adapted to illicit specific movements and protocols were devised outlining the use of specific crafts for specific conditions. (8) Over time, clinicians became less concerned with the crafts and began using the

adaptive equipment in isolation as treatment. (8) It was in the 1970s that occupational therapy scholars remarked that the profession needed to return to its core principles. (8)

As occupational therapists we are trained to adopt a client centred approach and determine the activities and occupations that the individual finds meaningful. (11) This is a significant point as many of our clients' value and find meaning in the technology based tools they use. (9) Previously, the use and fascination of technology was dominated by a certain population – most likely young and male. Studies show that older adults want support in using information and communication tools for their wellbeing. (29) This support contributed positively towards participation and perceived self-confidence. (30) It is no longer a 'nice to have' for the few. Nowadays, the variety of products available at different cost points means that a more diverse population benefits from technology. Case in point, a 70 year old father looks forward to his weekly Skype session with his son, who has emigrated. During the week, he logs onto Facebook to view the digital albums his son has uploaded. These activities provide meaning for him. The connectivity that technology can provide plays a significant role in how people communicate and socialise with each other. With the increasing development of electronic assistive technology, the role of the occupational therapist will expand, (31) especially with the sophistication of products. (32)

2.5.2 The influence of generational differences in occupational therapy

It can be said that each generation possesses characteristics that are specific to that group. (33) Further, the generation an individual has been born in can influence their way of thinking and values. It must acknowledged that the western way of classifying generations such as 'Traditionalists, Baby Boomers, Generation X, Generation Y and Generation Z' may not strictly apply to the South African context as these classifications arose as a response to major events in Western history. However, some broader traits can be relevant to local populations. Differences in generations may be evident in therapist-client relationships, lecturer-student relationships and within the work environment.

The younger generations of today were exposed to technology from a very early age through mobile phones, social media, video gaming and computers. (34) (35) For this

generation, technology is not a change from their previous way of life because they have grown up actively engaging with technology as part of their occupations. (36) (37) The above describes Generation Y (1982-2002) however in the South African context, this description is more appropriate to Generation Z. The relationship this generation has with technology is significant for two reasons. They are potential occupational therapy clients and they are also occupational therapy students and occupational therapists. The most positive attribute of this generation of students and therapists is their confidence with technology. (38) This may mean that they are more open to using technology in clinical practice. This has been supported by literature which shows that these students use technology in occupational therapy practice: documentation, using online databases for information, assistive technology and in direct client intervention. (38) Their familiarity with technology may contrast with older therapists who would not have ordinarily grown up using technology. It has been suggested that technology has the ability to develop the profession and provide opportunities for innovation. (39) It is important for occupational therapy lecturers and fieldwork supervisors to acknowledge students' use of technology and integrate into their daily practice. (38)

Literature has acknowledged that multiple generations are currently represented in the field of occupational therapy. (40) It is important to be aware of generational differences to better understand their attitudes towards technology. Traditionalists can be been described as being rigid. This can be attributed to their upbringing which was structured around discipline and obedience. (40) This is the same generation that does not appreciate management decisions being made by younger people. (40) This may explain why therapists and lecturers from this generation may be less inclined to adopting technology based interventions in curriculum and practice. They were also trained during a period where occupational therapy was still aligned very closely to crafts. Traditionalists and baby boomers grew up in a time where crafts and outdoor play were the norm. They may not feel comfortable with technology and thus are reluctant to use it therapeutically. Whereas Generation Y and Generation Z have been exposed to television and video games from a young age and this might very likely constitute their leisure and recreational activities. (34) Their relationship with technology is all encompassing; (36) they may have formed meaningful relationships through

technology and thus it contributes strongly to their identity. They are used to accessing information instantly through mobile phones and playing fast paced video games. It could be that this 'want it now' personality does not lend itself well to the process of craft making which often requires patience and delay of gratification to produce a tangible end product. Younger therapists not used to this and may have an aversion to the steps required in creating an end product. This extends to collecting items that can be 'upcycled' in craft making, which is widely encouraged in developing countries. This generation may thus find it more convenient to use technology based interventions rather than become involved in collecting resources over a long period of time.

2.5.3 The status of crafts in occupational therapy

As stated earlier, crafts played a large role in the origin of occupational therapy and despite the influence of the medical model, crafts have continued into the profession until the present day. However crafts are noticeably absent in the Occupational Therapy Practice Framework III. (11) Despite this obvious omission, craft activities are still taught in most undergraduate occupational therapy curricula in South Africa.

The discussion regarding crafts has become a contentious issue in occupational therapy. (41) In support of this, crafts as a therapeutic activity has not been adequately validated in research. (42) There also appears to be a decline in research in crafts as a therapeutic medium within occupational therapy.

Occupational therapists reported using crafts to improve self-esteem, occupational performance and well-being. (43) The expected outcomes of using crafts were to support self-expression and experience joy and desire. (43) The creative process involved in craft making may provide a distraction from negative thoughts, (44) assist with focusing attention, (44) physical relaxation, (44) reflection, (45) a sense of belonging (46) and a tool for individual expression. (47) The creation of an end product has reported to facilitate feelings of joy, (48) proudness, (49) competence (50) (47) and doing something with visible results. (51) Crafts are used to motivate clients to continue with therapy and to improve overall motivation required for occupational performance. (43) They provide a novelty experience for clients involved in rehabilitation. (43) Craft activities were associated with encouraging the experience of flow. (43)

There has been a decrease in the use of creative activities in occupational therapy. (52) (53) Harris found that the personal experience of performing crafts heavily influences the selection of it as a therapeutic activity. (54) This is particularly relevant to modern living where engaging in crafts may not be a popular activity for therapists and clients alike. Other factors include a lack of evidence supporting crafts, (43) a lack of skill in doing crafts (43) and embarrassment surrounding the use of crafts as a therapeutic tool (52). A shortage of time, resources and the often short admission periods of clients were other barriers to the use of crafts in therapy. (43)

It is interesting to note that therapists have similar reasons for using crafts and TG such as motivation, a distraction from negative thoughts and enjoyment. Both engagement in craft activities and TG also encourage the experience of flow. Whilst engaging in craft activities, the individual is able to temporarily forget about whatever is bothering him or her and enjoy the experience of creating. (41) Craft making can be an area in which the individual has full control and gain a sense of control. (54) It can assist in giving the client a feeling of life management which may be lacking in other areas of life. (54) In light of this, can we say that TG is to current therapists what craft making was to early therapists?

It is found that crafts are used mostly in the mental health field of occupational therapy. (55) Approximately a third of all occupational therapists do not use crafts in therapy and more than half wished they used it more and there was an interest in increasing knowledge and skills in implementing crafts in therapy. (43)

There has been resurgence in popularity of crafts in mainstream culture. This has been fuelled by websites such as Pinterest which expose creative activities and the ‘do it yourself’ approach and therefore a return to crafts as a meaningful occupation and thus a stronger feature in current occupational therapy practice is a possibility. (56)

2.6 The relationship between occupational therapy and meaningful activity

Professor Mary Reilly was able to aptly capture the philosophy of occupational therapy when she remarked: 'Man, through the use of his hands, as they are energised by his mind and will, can influence the state of his own health.' (57) This commonly used quotation has come to embody the essence of occupational therapy practice. Early stalwarts within the occupational therapy fraternity long waxed lyrical about the therapeutic benefits of engaging in occupations, in aiding mental and physical health. Conversely, a dysfunction in a person's occupation can also contribute to ill health. The interrelatedness of health, wellbeing, participation and occupations is one of the fundamental tenets of occupational therapy; (11) and has endured despite the many changes within the profession over the generations.

Humans are occupational beings. (11) Individuals regardless of their age and abilities require occupations to grow and most importantly, thrive. (58) It is only through occupations that humans are able to express the totality of their being. (58)

The Occupational Therapy Practice Framework III defines occupational therapy as 'the therapeutic use of everyday life activities with individuals or groups for the purpose of enhancing and enabling participation in roles, habits, and routines in home, school, workplace, community and other settings.' (11) Occupational therapy values participation and engagement in occupations. (11) Participation refers to the act of performing the task whereas engagement refers to the level of satisfaction the individual derives from the performance. As a result, occupational therapists create opportunities for their clients to participate and engage in occupations. (11)

Occupational therapy practitioners can use a combination of occupation based and activity based interventions in their treatment programmes. (11) Whereas the former refers to interventions that mimic real life daily tasks, the latter refers to actions that are often components of occupations and are chosen because of their motivating properties and their relevance to the individual's life. (11) Occupational therapists have a strong understanding of the individualistic nature of occupations and that occupations reflect

the unique roles, habits and interests of a person. (59) Context and environment are significant factors to consider when understanding the occupational performance of an individual because of their role in facilitating or limiting the individual's ability to perform occupations. (11)

Meaningful occupation and activities has been a fundamental feature of occupational therapy practice. Meaningful activities are used as a therapeutic medium to encourage motivation and engagement in therapy. The end goal of occupational therapy intervention is the return to meaningful occupation. The early premise was that the engagement in meaningful activities led to increased feelings of wellbeing. The evaluation process undertaken by occupational therapists involves determining the activities and occupations that the client deems meaningful. (11)

Recently TG has been one such activity that occupational therapists have begun using as a therapeutic modality in therapy sessions. TG has drawn from commercial video games, which are popular leisure activities used by children and adults.

2.7 Introduction to virtual reality and therapeutic gaming

VR is a computer based technology that makes use of hardware and software to create multi-sensory experiences and environments with which the user interacts with in real time. (60) VR systems draw heavily from immersion (61) and presence (62) to create virtual environments that are as life like as possible. This can be achieved through the use of head mounted displays (HMDs) (63) and large immersive screens. VR impacts the human senses by making use of different sensory stimuli such as vibratory sense through remote controls and overwhelming visual and auditory sensations. (7)

There has been a recent surge in awareness of VR based technology in mainstream culture. Google cardboard® and the Samsung VR® headset are examples of off-the-shelf products that allow an individual to experience VR using software from a smartphone. However, VR has been around for a while. It was during the 1930s that writers and moviemakers began exploring this concept in their work. Popular uses of VR in mainstream culture include three-dimensional (3D) movies. Recently, it has been used to train medical students for surgery and to prepare soldiers for combat. (64) (65)

The success of VR is based on two central features: immersion (66) and presence (61). These features are also what make it an appealing tool to clinicians and researchers. VR attempts to create an environment or experience that is as realistic and believable as possible to the user. It does this by exploiting the user's senses. Through the use of vivid and lifelike images, surround sound and sometimes haptic feedback; it is able to trick the user's brain into believing it is experiencing reality. This concept is known as immersion. (66) Presence is the feeling of being in the virtual world. (67) The more the person identifies with being in the virtual world, the greater the degree of presence. (63) Watching a 3D movie is a perfect example of how VR makes use of immersion and presence. 3D glasses enhance the illusion of depth perception. By doing so, the viewer feels like he is experiencing scenes from the movie first hand. Often 3D movies are supplemented with multiple sensory stimuli such as surround sound and extremely vivid graphics which further enhance presence.

VR systems can be divided into two distinct groups. The first group comprises devices that are available to the general public. Nintendo Wii®, Sony PlayStation®, and Xbox® Kinect® are a few of the popular consoles on the market. These products were created solely for the purpose of recreation and entertainment. Active video games (AVGs) are one type of video game available commercially. AVGs are also referred to as exergames. During play, the individual physically interacts with an onscreen avatar by performing certain movements. (68) (69) Avatar refers to the graphical representation of the individual on the screen. AVGs operate by using a sensor which is able to detect the individual's movement and project it onto the screen in real time. Approximately 1.8 billion people engage in video games globally. (70) In the United States of America, 42% of people play video games regularly (three hours or more per week) and the average age of game player is 35. (70) Males account for 56% of video game players compared to 44% of females. (70) This puts to rest the notion that video game users are children and males only. These AVGs have also been adopted by clinicians for rehabilitation despite not being created for this purpose.

The second group of devices are those that are designed solely for the purpose of rehabilitation. They are usually very costly and are not available to the general public.

They were created taking into account the unique needs of the disabled population and are designed to be therapeutic. (7)

A commercially available gaming unit is commonly referred to as a 'console'. The console can be considered the brain of the unit and can be compared to the central processing unit of a personal computer. The Kinect® sensor sets the gaming system apart from traditional video games; whereas early video games were controlled via a joystick or keypad, the Kinect® Sensor allows the player to interact with the system using bodily movements (motion) and voice controls. The Kinect® Sensor is also able to detect facial recognition and depth. A monitor is not included in the gaming system and must be purchased separately. The monitor is necessary for projecting the images and graphics from the game. One can use a television or a projector to display the images onto a wall or screen. The television and projector must be HDMI capable. A monitor with a large screen is recommended as it allows for the player to experience a larger avatar on screen. Avatar refers to the graphic representation of the user onto the monitor.

For the purpose of this study, the term therapeutic gaming (TG) will be used to imply video gaming that is used for rehabilitation. This study will only be exploring the use of commercially available devices as this is what is currently being used at CHBAH, where the study was conducted. However, due to limited literature available on the use of commercially available gaming devices by occupational therapists, literature on other devices such as those created specifically for rehabilitation will be considered as well.

2.8 The relationship between virtual reality and occupational therapy

Recently, there has been a growing focus in occupational therapy on the experience one has whilst engaging in occupations. (71) (72) Commentators say that the fields of occupational therapy and VR both have principles from which the other can benefit. (73)

Virtual reality relies heavily on the concept of flow for its success. Flow theory shares many constructs with the 'just right challenge'. Both occupational therapy and flow are focused with the engagement in activities. Flow is described as an experience that results from the engagement in activity. (74) Csikszentmihalyi described the following

conditions that are conducive to flow: an appropriate fit between the challenges of the activity and the skills of the individual, the activity must have clear, short term goals, the individual must have a sense of control over the activity, and the activity must provide immediate and clear feedback to the individual. (27) If the activity exceeds the demands of the individual, it may result in anxiety. Conversely, if the individual's skills are far greater than the activity, the individual may become bored. As the individual's skills increase over time, the activities must also adapt and provide an appropriate challenge. (74) In a study of women with mental illness, participating in a weekly crafts group: their description of their occupational performance in the group was similar to the experience of flow. (74) This bears similarity to the 'just right challenge' commonly referenced in occupational therapy. The 'just right challenge' refers to the optimal fit between the demands of the occupation and the skills of the individual. (26) It is required for initiating and sustaining engagement in occupation. (26) A lack of fit between the occupations available and the skills and perceived abilities of the individual leads to a decreased quality of life. (75) Occupational therapists focus on engagement in occupations and flow results in sustained engagement in activities, flow may be used to encourage engagement and occupational performance. (74)

Non flow activities were those activities that led to boredom or anxiety. (76) Non flow had a negative impact on goal attainment. (76) These activities were perceived to be non-enjoyable (77) and correlated with a decreased quality of life (78). Activities of daily living are considered a non-flow activity. Non flow activities are associated with a decreased quality of life. (78) This is especially significant for occupational therapists.

In flow, the subjective experience of the process outweighs the outcome. (74)The focus is on the experience itself rather than the benefit it may bring. (79) This description is very similar to experiences of clients engaging in TG – where the focus was not on achieving a rehabilitation outcome but rather enjoyment of the game.

During the flow state, the individual experiences heightened concentration, the loss of sense of time and a transcendence of self. (27) Flow has been found to be beneficial in occupational therapy because when a client is completely absorbed in the activity that is also appropriately stimulating and challenging, he is likely to experience feelings of

pleasure and clarity. (74) In support of this, people experience a deeper connection to an activity and thus attach more meaning to the activity when the environment responds to their actions. Therefore, environments that encourage the user to feel control over his environment and are realistic, are necessary for creating meaningful experiences. (73)

Numerous models used within the occupational therapy describe the relationship between the individual and the environment in achieving occupational performance. The Person – Environment – Occupation Model is one such model that expounds on the interdependence of the individual, occupation and environment. The practical implication of this model is that the environment can be adapted to aid occupational performance of the client. Virtual reality also makes use of the environment to create optimal experiences for users. It was found that users experienced a greater level of enjoyment when the VR system had more visual and spatial cues in the environment. (80)

Occupational deprivation refers to instances where individuals' needs for engagement in occupations that are necessary and/or provide meaning are denied. (81) These limitations are due to factors outside of the individual's control such as physical, social, attitudinal, discriminatory, professional, legislative, racial and political factors. (81) People with disabilities are often at risk of occupational deprivation because of the above mentioned factors. Technology has found to be beneficial to people with disabilities in aiding independence, personal autonomy, control and competence. (82) This leads to contributing an individual's sense of self and wellbeing. (82) This sense of control assists in developing competence and satisfaction in life. (83) Physical and other barriers also restrict people with disabilities in engaging typical life roles and activities. The environments created by VR provide an opportunity for the user to explore different roles in a safe space. (84) For example, one of the X-Box® games that users at CHBAH could engage in was rock climbing. Users with trunk and lower limb immobility would struggle to perform such an activity under typical circumstances. However the therapists frequently employed this game at CHBAH with users with limited mobility with much success.

2.9 The role of the occupational therapist in therapeutic gaming

The knowledge and skills the occupational therapist requires when using TG is similar to those needed when using other rehabilitation tools. (63) The occupational therapist must be sufficiently trained to use the tool therapeutically. (63) It is essential that the therapist becomes comfortable with using the tool so that she can focus her attention on the client and not on trying to figure out how to use the tool during therapy. (63) She must know how the tool can be used to achieve client goals, the limitations and benefits of the tool when compared to other interventions, how to monitor progress using the tool and to document outcomes. (63)

Therapists need support in implementing VR based therapy. (63) It cannot be assumed that the therapist will possess the necessary skills required to use TG and this is as applicable to commercially available video gaming systems. (63) The methods employed to train therapists should use evidence based knowledge translation strategies (85) and be multifaceted to overcome the barriers that are inherent in adopting this type of intervention. (17) It has been found that training methods that included more than one type of intervention were more effective. (85) Training programmes must teach the therapist how to use the system therapeutically, how to set client goals, how to critically analyse the system, how to monitor progress and document outcomes. (63) The programmes should be run by experienced mentors, include abundant hands-on experience with the equipment and the therapists should be provided with relevant literature on the evidence of the system. (63)

When selecting a device for the purpose of rehabilitation, it is important to analyse and compare each device to determine their therapeutic properties. It was found that the Xbox® Kinect® and Sony PlayStation® Move had higher exercise intensities and repetitions compared to the Nintendo Wii®. (86)

Occupational therapists perform multiple tasks when using TG. (7) An overview of the tasks performed will be given. Some tasks are related directly to the handling of the client. The occupational therapist will have to transfer the client from the wheelchair to the treating surface and provide physical support by facilitating movements and

ensuring the client is seated optimally. (7) She will have to provide instructions to the client, encourage the client to participate, assist with problem solving by asking questions and contextualising the activity so that the client can relate the activity to occupational performance. (7) This promotes carryover of the session's gains into the client's daily life. (7) (63) Depending on the abilities of the client, the occupational therapist may adjust the game to increase or decrease the demands. (7) These techniques and handling principles are part and parcel of occupational therapy practice and are frequently observed in therapy sessions. Some tasks performed by the occupational therapist may be dependent on the setting in which she is employed. She may have to fetch the client from his ward or classroom and take him back. It has been found that in some settings, a large amount of time is spent on taking the client to and from therapy. (7) So much so that only half of a 30 minute session using TG was spent on direct intervention and a large amount of time was lost during preparation for the session. (7)

2.10 Occupational therapy and technology

The relationship between occupational therapy and technology is twofold. The first refers to the awareness occupational therapists have of the electronic devices clients are using when participating in occupations and the acknowledgment of this when planning treatment programmes. The second refers to the use of technology based devices as therapeutic tools.

The use of electronic assistive technology has been found to have numerous positive effects. Some of these benefits include a positive perception of self-esteem, (87) increased adaptability, (87) decreased levels of frustration, (87) decreased personal assistance time, (88) improved quality of life (88) (87) and changed relationships. (32)

Commentators urge occupational therapists to become more aware of the role mainstream technology plays in their clients' lives. (89) A humorous but poignant quote is to 'consider exchanging therapeutic cones for computers and video game consoles'. (89) This highlights the need for occupational therapists to keep up to date on current interventions. Literature states that occupational therapists must become aware of more

diverse forms of technology whether it is in the domestic or public space (10) and that there is a need for occupational therapists to become more open minded towards mainstream assistive technology. (89) Occupational therapists are equipped with the necessary skills to analyse various mainstream technology to determine their use for therapy, whether it be as a treatment tool or enabling agent. (89) These skills must also be used to determine the risks the device may have to the client. (89) Literature shows that occupational therapists may have become experts in the use of assistive technology and how this can benefit their clients. (90) However, they have not responded the same way to the role electronic technology plays in a client's life. (10) Occupational therapists have a long history with dealing with assistive technology and have a better understanding of the everyday activities clients engage in; it therefore makes sense that they would adopt a stronger role in the customisations of electronic technology and the awareness of the role of electronic technology in occupations. (10)

Studies show that although occupational therapists may have a positive attitude towards implementing a new intervention, this rarely translates into clinical practice. (91) While the majority of occupational therapists felt like they should be able to assess and prescribe electronic assistive technology, only a third was able to do so. (32) Almost half of therapists were not able to when required to. (32) This is a significant factor to consider as rehabilitation professionals who do not perceive themselves as technically skilled may avoid learning new technologies and thus not prescribe them. (92) Occupational therapists felt that the role of prescribing assistive technology should be multi-disciplinary. (32) This is a valid approach however this may lead to role confusion. A possible contributing factor for the lack of consideration by therapists is the non-inclusion of electronic technology in assessment tools for activities daily living. (93) Other factors include clients not being perceived as electronic technology users. (10) When technology was included in treatment, it was generally done superficially, focusing mainly on safety or use of basic devices within the house such as the remote control for the television or using the home telephone in the event of an emergency. (10) In addition, therapists would investigate the client's technology use to determine underlying impairments rather than including it as a treatment goal. (10) If we take into

consideration the extent to which technology use has become engrained in everyday life of individuals, this degree of technology inclusion in therapy is significantly insufficient.

It was found that after receiving training on an assessment tool on technology use, occupational therapists realised that this data could be used to aid occupation and participation. (10) This training has spurred ideas on a role revision in occupational therapy. As such, occupational therapists could be more active in advising clients and family members on appropriate electronic technology based on the client's needs. Their role could extend into public health by advising on public policies related to technology. (10) It was found that the use of an assessment tool addressing the client's use of electronic technology humanised the client by considering him as an individual rather than a diagnosis. (10) It gave clients the opportunity to express themselves outside the restrictive role of the patient. (10)

Despite wanting to address the use of electronic technology, therapists felt conflicted about assessing areas of difficulty which they did not have the ability to address. (10) Training has found to be insufficient in this area. (94) Undergraduate and post graduate training (95) has been recommended to encourage therapists to remain current with advancements in technology and carryover into practice. (89)

2.11 The perception of occupational therapists on evidence based practice in therapeutic gaming

Developments in the profession have led to the push to adopt evidence based practice. There is a greater demand on occupational therapists to validate their practices. This has been spurred by a demand for quality interventions and the pressure on health professionals to use resources prudently. Evidence based practice has been defined as the 'conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients'. (96) It involves the synthesis of different sources of information; clinical expertise with the best evidence available from systematic research in the context of the values and preferences of the patient. (96) It is important to note that it does not replace clinical experience and judgement but rather builds on these concepts. (97) Clinical reasoning is still required to determine whether

the intervention is appropriate for the specific client and setting. (98) Clinical reasoning can be described as the thinking processes required when performing a clinical practice. (99) (100) It is the process of mentally juggling multiple pieces of information simultaneously in order to make the best clinical decision for a client.

A level of evidence is a hierarchical guide which classifies evidence based on their soundness. These guides are useful in guiding clinicians in evaluating evidence available. On this scale, systematic reviews randomized controlled trials and meta-analyses are found on the top and therefore considered more reliable sources of evidence with a high level of generalisability. Case studies and expert opinions are found at the bottom and are considered less reliable sources of information with a low level of generalisability. There has been conflict regarding the use of these models in rehabilitation. Commentators' remark that due to highly individualized treatments and the heterogeneity of clients receiving occupational therapy; randomized controlled trials are not always appropriate. (98) The Canadian Association of Occupational Therapy states that evidence based practice must require the synthesis of research, with information from the client and the clinical experience of the therapist. (101) As a result, quasi-design or single case experimental designs may be more suited to answering questions of effectiveness in occupational therapy. (102)

Occupational therapists perceive professional training, input from their client, information from colleagues, continuing education workshops and their personal clinical experiences as valid sources of evidence. (103) Other studies show that they use their undergraduate training, clinical experience and informal continuing education opportunities to aid their clinical decision making. (104) Evidence for informing clinical decisions can come from a variety of sources: clinical experience, education, textbooks, and discussions with peers and from clients. It has been found that evidence from undergraduate training may be outdated. (98) However evidence from well conducted research may be less prone to bias (105) hence the focus on clinically relevant research evidence. (106)

Clinicians value their own clinical experience when required to make clinical decisions. (103) They compare interventions that they performed previously with different clients or

a given client. (103) They also value the evidence they received through their professional programmes. (103) This statement must be analysed in context of the clinician whose primary duty in a clinical setting such as a hospital or clinic will be to provide occupational therapy intervention. This can be compared to an occupational therapist in the academic field that is required to keep up to date with latest developments in evidence as she may be directly involved in research and teaching.

Therapists believed that standardized evaluation should be conducted to provide valid data. (103) However they noted that the results of these assessments often conflicted with their observations of the client and that the information from the assessments was not sufficient to make holistic treatment decisions. (103) When their assessment results differed from their own observations, they relied on their observations. (103) It must be acknowledged that many standardized evaluations used by local therapists were not developed for South African populations and contexts and therein lies the conflict between relying on personal observations versus evaluation findings.

Therapists value scientific evidence in assisting them in making decisions regarding the effectiveness of interventions. (103) However they expressed that they were conflicted regarding the use of this information as it was not always related to the field of occupational therapy but was rather conducted within the biomedical model. (103) As client centred practitioners, they felt that their client should direct their treatment and that there should be a balance between scientific evidence and the client's wishes regarding treatment. (103)

Therapists sought evidence from their occupational therapist peers and other healthcare workers. (103) They associated this source of evidence with being helpful, supportive and easily available. (103) Therapists sought information from more senior therapists and experts in the field. (103) This may be particularly relevant in settings where there is a defined hierarchy within a team based on levels of experience. It is only natural that less experienced therapists would seek advice regarding clinical decisions from more experienced therapists.

Therapists valued the client as an important source of evidence. (103) They also perceived their effectiveness based on the response from the client such as a change in attitude or their level of involvement in therapy. (103)

Therapists valued continuing professional development and attending formal programmes to keep abreast of current developments. (103) Therapists have a poor knowledge of TG (107)and therefore this is an important strategy to consider in improving knowledge.

Therapists cited a lack of time as one of the barriers to using evidence based practice. (108) Lack of time for reporting on clients' performance during after sessions has also been commonly reported by therapists. (7) A lack of time may be a barrier to using standardized measurement tools during intervention.

2.12 Barriers for the use of therapeutic gaming by occupational therapists

Studies on the barriers and facilitators to VR adoption were heterogeneous in nature because each study used a different system. (17) This makes it difficult to generalize results across all VR and TG systems. (17) As stated earlier, the use of VR and TG is a relatively new phenomenon in occupational therapy. This is congruent with the knowledge deficit that occupational therapists have regarding the use of VR systems. The lack of general knowledge on how to use VR systems was reported as one of the main barriers to implementation by occupational therapists. (17) Therapists lacked skills in identifying appropriate clients (17), setting up the equipment (19), modifying the software parameters and using the VR system to develop client programmes. (17)

Therapists are using a limited number of game titles in therapy when compared to the actual number of titles available. (109) It was found that therapists were only familiar with a few titles and not aware of the newer titles available. (109) There is a lack of information available to assist therapists in determining which titles are appropriate for therapy as well as evidence on specific game titles and their effectiveness for addressing specific goals. (109)

Therapists have cited time to be a strong barrier to the implementation of VR systems in therapy. (17) It is common knowledge that occupational therapists are required to perform multiple tasks when using TG in a session. As a result, only half of a 30 minute session was spent on the client involved in TG. Time related factors when using TG include time required for set up, multiple cut screens in the game which could not be skipped during game play, settings for creating client profiles and decreased flexibility of the game. It was also found that therapists spent more time on preparation when using TG compared to other treatment modalities. Some studies have found that an average of 24% was spent on starting and setting up the game, with a maximum time recorded of 38%. (109) This is especially significant in the South African context where therapists are pressured with high caseloads. It can be inferred that if therapists are unable to maximise intervention time when using TG, they are more likely to use other treatment modalities.

Therapists have cited cost and equipment requirements as a challenge to implementing TG in practice. (19) In addition to purchasing the gaming console, additional funds are required for a TV/projector, projector screen, data for updating the software and purchasing new game titles. This is especially important in the South African context where severe budget constraints exist in the public sector. The additional costs must be carefully considered before purchasing the console and factored into ongoing budgeting required to use gaming therapeutically.

Some evidence suggests that therapists perceive clients to have a low motivation to participate in VR based therapy. This was not in keeping with the majority of studies conducted which concluded that patients found VR as interesting, enjoyable and motivating. The conflicting findings may be attributed to the low level of experience of the therapists using VR in the first study. (17)

There are currently no off the shelf game titles that are designed for the purpose of rehabilitation or developed to be used for people with disabilities. As a result therapists are using commercially available game titles for clinical purposes. These titles often had components and features that made it poorly compatible for people with disabilities and therapists have found that commercially available devices did not meet the accessibility

needs of clients. Therapists treating individuals with cerebral palsy and stroke found that the devices lacked tailoring which was required to individualise treatment for each client. (19) Therapists reported that games which required too much time to grasp would be a limitation for clients with neurological deficits such as CP and CVA. (19) Some devices did not pick up the movements of clients if they were seated in a wheelchair. (19) Occupational therapists frequently treat individuals who are wheelchair users and therefore the lack of sensitivity of the device to this population can be a hindrance to adoption in practice. Therapists found the appearance of cut screens and on screen instructions frustrating, especially if they were unable to skip these steps and had to wait for game play to resume. (7) Due to varying abilities between patients and the changes of a particular patient from session to session, therapists would have to reconfigure the game and then start from the beginning. Therapists found this aspect particularly frustrating. (7) Individuals with brain injury often present with cognitive fallout. Therapists have found that commercially available games were too cognitively demanding; they required too much sequencing. In addition these games presented with too many distractions such as noise. (109)

The logistics of using TG was raised in literature. (107) Therapists reported that TG should not burden the therapist with additional tasks which could be spent on direct client intervention but rather it should support the therapist and allow her to be more effective. (7) Equipment set up was deemed as a limiting factor to VR adoption. (17) A possible solution to this cited by therapists was to delegate non clinical tasks such as setup and take down of equipment to support staff. (17) Therapists cited access and availability of the therapeutic system affected the adoption of it. (17) It has been recommended that improving the accessibility and availability of system could improve the ease of use. (17) Ensuring the system is in close proximity to commonly used treatment areas, (110) having a dedicated treatment space (17) and purchasing multiple devices were cited as possible solutions. (17)

2.13 Facilitators for the adoption of therapeutic gaming by occupational therapists

There was a strong correlation between social norms and the behavioural intention of occupational therapists in using VR. (17) Influence from superiors and peers were one of the top rated facilitators by occupational therapists when deciding whether to use VR, accounting for 37% of participants responses. (17) This information can suggest that overt support from management together with a clear expectation on the use of VR can improve use its use. (17) Involving fellow therapists as knowledge experts and mentoring could also encourage VR use by therapists. (17)

A number of studies conclude that clients find TG extremely enjoyable and motivating. According to therapists, the inclusion of TG provided a more varied treatment programme for clients. (7) It was found that the most motivating factors to use TG were to add fun and introduce novelty. (109)

Traditional exercise programmes have a tendency of being monotonous and repetitive. As a result, clients do not comply with treatment programmes and this leads to poor rehabilitation outcomes. It was found that TG broke the monotonous nature of therapy. Clients were observed to exert more effort during TG. Due to the fun nature of the intervention, clients did not typically feel like they were engaging in exercise, but rather that the exercise is secondary to the enjoyment they were experiencing. It was found that these clients were more likely to perform for longer than usual and were more motivated to perform the same activity again. (18)

Emotions play a significant role in memory consolidation. (111) Engagement in activities such as TG which produce a strong emotional response may have a positive effect in aiding recovery. The concept of motivation plays a significant role in rehabilitation. It is a strong prognostic indicator with literature showing that clients who are intrinsically motivated perform better in rehabilitation and have better outcomes than those who are not. (59) Literature shows that it is difficult to motivate individuals who have sustained a brain injury, to participate in therapy and more especially, to perform repetitive exercises that have been prescribed to improve motor outcomes. (112)

The concept of motivation is equally important when developing paediatric rehabilitation programmes. Occupational therapists use the motivating potential of play as a medium to improve rehabilitation outcomes with children. This is significant when treating children as they may not have the capacity to understand the treatment programmes they are expected to participate in. Occupational therapists place a strong emphasis on ensuring therapy is fun and enjoyable. By using play, the therapist is using fun and engaging activities to address certain areas of occupational dysfunction. It has been found that children were able to engage in therapy much longer when using TG compared to traditional therapy. (19) Similar to adult studies, TG was a strong motivator for more frequent practice. (19) In addition to being a therapeutic medium, play is a primary occupation for children. Incorporating play into therapy also encourages engagement in developmentally appropriate life roles. This is especially important with children with disabilities as they are known for being less active in typical life roles compared to their able bodied counterparts. Therapists reported that the addition of TG allowed for a more varied treatment program. (7) This is particularly significant in children who are hospitalised for long periods of time due to illness. These children experience the effects of institutionalisation and lose the ability to engage in everyday childlike activities such as play.

It has been shown that therapists who have a positive attitude towards VR and being familiar with technology were cited as facilitators for the adoption of VR as an intervention. (17) This is particularly significant with younger occupational therapists and students who use technology and video gaming in their personal lives. (34) (35) However this statement is based on Western literature and therefore it cannot be assumed that all occupational therapists or occupational therapy students are familiar with VR or have used gaming for their personal use. This must be acknowledged in the South African setting and any setting where TG use by young adults may not be the norm. One way of developing a positive attitude towards TG would be to create positive and meaningful experiences with the equipment during undergraduate training. This negates the assumption that all young therapists would ordinarily be exposed to TG.

As above, we see that the younger generations are more closely in touch with technology. However we should avoid pigeon holing patients into specific interventions because they belong to a certain age group or generation. Literature shows that even older generations found TG appealing and promising results were found. (113) VR allowed older clients the opportunity to connect with their former selves, by engaging in previous leisure interests such as golf, it offered a distraction from pain, limitations and disability, social interaction and opportunities to increase strength and endurance. (113)

2.14 Conclusion to the literature review

Occupational therapists are gradually moving towards incorporating more technology based tools in intervention. This is reflective of the nature of activities societies engage in, which as of late has been more technologically focused. Both VR and occupational therapy share common ideologies. TG can be considered a meaningful activity and occupational therapy is heavily dependent on incorporating meaningful activities as a means of enhancing occupational performance. VR and occupational therapy are both grounded on the principles of flow theory to increase an individual's engagement in occupational performance.

The process undertaken by occupational therapists when applying TG is no different to when they are using typical interventions. (63) This involves the occupational therapy process which comprises evaluation, intervention and targeting of outcomes. (11) The occupational therapist is also required to undertake activity analysis. (11)

It was found that occupational therapists are lacking in knowledge and skills in carrying out TG effectively with clients. (17) (19) They require support and it has been recommended that training methods involve multiple methods and include knowledge translation strategies which are evidence based, (85) include expert mentorship, and abundant hands on training and evidence on the efficacy of TG. (17)

Literature shows that the majority of occupational therapists unable to prescribe electronic assistive technology (114) and are less likely to use it if they are unskilled in how to use it clinically. (92) This was further supported by literature which states that

assessment tools for evaluating occupational performance do not include current forms of technology that clients commonly use in everyday life. (93)

Despite the increasing use of technology in societies, this has not been reflected accordingly in the occupational therapy curricula at local universities. Local occupational therapy programmes still include arts and crafts activities despite its minimal use by therapists in clinical practice. It must be noted that the reasoning for using craft activities are similar to using TG.

The generational differences that exist across occupational therapists and the clients they manage must be acknowledged. The younger generation of therapists and clients have a close relationship with technology which they use seamlessly in social, leisure and educational areas. (36) (37) Younger therapists have been known for incorporating technology in performing clinical tasks. (38) The use of technology in therapist's personal lives may be why they are more motivated to adopt technology based tools in therapy.

Occupational therapists value scientific evidence in assisting them in making clinical decisions. (103) They however tended to rely heavily on feedback from their client and observations, input from colleagues and their own clinical experiences. (103) Time was found to be a strong limiting factor for using standardized assessments. (108)

Lack of knowledge and skill in applying TG, (17) (19) lack of time, (17) poor suitability of TG with people with disabilities (19) (7) (109) and the logistics associated with using TG were all found to be limiting factors for therapists to adopt TG. (17) (63)

Peer support and mentoring, the inherent therapeutic properties of TG; it is highly motivating (19) and enjoyable, (7) the therapist's attitude towards TG and experience using TG were all found to be motivating factors for therapists to adopt TG in therapy.

CHAPTER 3: METHODOLOGY

3.1 Introduction to methodology

In this chapter, the researcher will detail the methodology used in this study. The specific study design adopted and the rationale behind its use, a description of the study participants, the inclusion criteria, a step by step description of the research procedure, the data collection tools used, data collection, data analysis and lastly the ethical considerations taken into account when the study was taking place.

3.2 Study design

This study followed a qualitative design. Qualitative research has been defined as 'a means for exploring and understanding individuals or groups ascribe to a social or human problem.' (115) The researcher selected this design because virtual reality and therapeutic gaming are emerging fields in South Africa with little research done to date. This study is an introductory study into the ways in which occupational therapists use therapeutic gaming. This type of study as well as the status of therapeutic gaming in South Africa lends itself well to qualitative design. A qualitative descriptive exploratory case study was used. This design is best used when the researcher wants to answer questions related to the 'how' and 'why' of a phenomenon. (116) It is also used when the researcher would like to understand the contextual conditions related to a phenomenon. (116) In this particular study, the researcher sought to understand the 'how' and 'why' behind the use of TG by occupational therapists at CHBAH. CHBAH represents a busy, tertiary level academic hospital in the public sector. And thus it was important to interpret the findings within this context. This study uses a combination of explorative and descriptive qualitative approaches. The former explorative approach is the dominant one and was applied through the use of semi-structured interviews. Constructivism was selected as a research paradigm as it was most appropriate to the nature of information the researcher sought regarding the use of therapeutic gaming. Constructivism is founded on 'interpreting the meanings others have about the world.'

(115) In addition, it does not start off with a theory but rather allows a theory or pattern of meaning to develop inductively through the course of the study. (115) This aligned with nature of the topic. As discussed earlier, virtual reality and therapeutic gaming are emerging fields. Thus the researcher did not set out with a theory but rather sought to understand occupational therapists' experiences with therapeutic gaming during its infancy in South Africa. Semi-structured interviews were conducted face to face at the occupational therapy department at CHBAH, soon after the end of the working day. The venue and times were discussed with participants and both were found to be convenient for all participants.

It must be acknowledged that the researcher had an interest in therapeutic gaming and was instrumental in procuring the X-Box® for the occupational therapy department. The researcher conducted tutorials for the occupational therapists at CHBAH. This included a formal presentation as well as practical demonstrations where therapists were encouraged to practice using the device. The presentation focused on the therapeutic benefits of TG, the evidence supporting its use and key points of control to ensure the smooth running of the activity. The researcher also presented at the *CHBAH Occupational Therapy Expo* in 2016. Here attendees were given the opportunity to try out TG in a fun and relaxed environment.

3.3 Study participants

3.3.1 Study population

Occupational therapists employed at CHBAH are divided into four sections: neurology, orthopaedics, psychiatry and paediatrics. Each section comprises a mixture of production level therapists and community service therapists who are overseen by a chief therapist.

Purposive sampling was used. Purposive sampling refers to the identification and selection of information rich cases related to the field of enquiry. (117) The rationale behind this was the population being studied is a very specific one presenting with a unique set of characteristics i.e. must be using gaming as a therapeutic tool and must be employed at CHBAH, and therefore random sampling of the general occupational

therapist population would not be useful. Participants were drawn from the following pools: a) community service b) production level therapists and c) chief occupational therapists. These pools reflect the current structure of the occupational therapy department at CHBAH. It also reflects the therapists currently using gaming as a therapeutic tool at CHBAH.

3.3.2 Study sample

Participants were only occupational therapists working at CHBAH as the researcher wished to explore how therapists were using gaming in this specific setting. The sample size was 20 occupational therapists. Therapists must have had an interest in therapeutic gaming and experience using TG. Initially 6 months was set as the minimum number of months using TG however therapists with less experience were included because they were identified as individuals who could provide valuable insights to the research topic.

All therapists who showed interest in participating in the study were interviewed; a total of ten: four community service therapists, four production level therapists and two chief therapists. Participants were from the neurology and paediatrics sections as these teams were actively involved in using TG as a treatment tool.

3.3.3 Selection criteria

Participants were occupational therapists working within the occupational therapy department at CHBAH. Inadvertently, therapists from neurology and paediatrics were selected as they were most involved with therapeutic gaming within the occupational therapy department. The console was not easily accessible to the orthopaedic and psychiatric departments and thus no therapists from these sections were selected.

Initially 6 months of experience using TG was set as the baseline. However it was found that some therapists had fewer than 6 months experience but were identified as still being able to contribute valuable data to the study. Consequently, the inclusion criteria were changed to include therapists with fewer than 6 months of experience.

The participants had an interest in gaming and were willing to actively share their perspectives and experiences with gaming.

Participants provided informed written consent.

Ten therapists were interested in participating in the study. Collectively these therapists represented the range of experience levels within the occupational therapy department. All interested therapists who met the selection criteria were available and willing to be interviewed, and data saturation was reached after the 10 semi-structured interviews were completed.

3.4 Research instruments

Two data collection tools were used to collect data from participants' viz. a background information form (Appendix B) and semi-structured interviews. English was used as the medium of communication for both the background information form and the interviews as this was the language commonly used amongst health professionals at CHBAH. The interview guide (Appendix C) was used a means to ensure all relevant questions had been answered in order to meet the objectives and aims identified. The researcher used the questionnaire to obtain background information from the participants. The questionnaire comprised of two sections. The first section requested information on the participant's demographics. This included their highest level of education, the year the participant obtained their undergraduate degrees and the number of years the participant had been practicing as an occupational therapist. The section sought information on the field the participant was employed in, the gaming tools they were using and for how long they had been using it, the conditions, impairments and activities of daily living they treated using TG, how many sessions per week they using TG and the percentage of time they using gaming within the session, how they gauged the effectiveness of TG, their most commonly uses frames of reference in practice, whether they had received training or read any literature on TG. The background information questionnaire allowed for the collection of background information and touched on themes which were further explored in the interviews. The questionnaire also allowed

the participants to mentally prepare themselves for the topics to be addressed in the interviews.

The use of semi-structured interviews is well suited for exploring opinions and attitudes towards a topic and extraction of in-depth information and exploration of personal experiences is made possible. (118) This was in keeping with the nature of information the researcher sought from the participants on their perceptions and experiences with TG. Semi-structured interviews allows for a predetermined set of questions, which ensured all information required to meet the objectives and aims, was gathered. (118) However, the flexibility of semi-structured interviews (118) stimulated the emergence of new questions which were probed further and included in following interviews. Open ended questions were imperative to gain the unique subjective experience and perspective from subjects. The interview guide served the following purposes viz. a) a visual checklist for the researcher to ensure all questions had been asked, b) focus on the topic at hand while still having the freedom to explore new areas. The interview followed a set structure starting off with opening questions to build a rapport with participants, followed by key questions to answer the objectives of the study and the interview ended through closing questions.

Audio recordings were used to record the participants' responses. An audio recorder was used to record all verbal responses for analysis. The researcher used a notebook to record key questions that arose from the interviews which could be raised in future interviews as well notes to rephrase questions that were found to be unclear.

3.5 Research procedure

Ethical clearance was obtained via the Human Research Ethics Committee (Medical) from the University of the Witwatersrand (M121042) (Appendix A). Permission was obtained via the HOD of the occupational therapy department at CHBAH and the research committee at CHBAH by sending the information letter (Appendix D), after which permission to conduct research was granted (Appendix E).

A background information form was developed which can be found in Appendix B. This form was required to obtain the following information from the participants: demographic

information on their qualifications and years of working experience as an occupational therapist, the field of occupational therapy they were working in for the past 6 months, quantitative data regarding their use of TG. An interview guide was developed (Appendix C). The questions were formulated based on the objectives of the research project. Three documents were sent via email to occupational therapists that were known to be using TG at CHBAH. The first document was the information sheet (Appendix F) which outlined the purpose of the study and the research procedure to be undertaken. The second and third documents were consent forms for participation to the study (Appendix G) and permission to be recorded (Appendix H), respectively.

Background information forms (Appendix B) were printed and hand delivered to each participant. Participants were given one week to complete the questionnaires. The participants were advised verbally to seek clarity from the researcher if they were unsure of any of the questions in the questionnaire. Participants returned the completed questionnaires to the researcher the day before their scheduled interview.

The researcher chose to perform the interviews directly after the end of the work day. A roster was drawn up for the data collection period and therapists were informed verbally to choose a day that was convenient for them. The roster was then stuck on the staff room door in the event that a therapist wanted to change her interview date with another participant.

All interviews took place in the lunch room of the occupational therapy department at CHBAH and were 30 to 45 minutes long.

3.6 Pilot study

Both the background information form and interview guide were reviewed by an occupational therapist from the University of the Witwatersrand who was involved in teaching adult physical rehabilitation, had a special interest in VR and TG, and research experience. Changes to the form and interview guide were made according to the recommendations by the reviewer. The questionnaire and interview guide can be found in appendix B and appendix C respectively.

A single practice interview was conducted with the same reviewer to gain experience with interviewing and to test the effectiveness of the interview guide and make necessary revisions. The inclusion of trigger questions was found to be an effective way of extracting further information from participants. Some questions were also rephrased to ensure ease of understanding.

3.7 Data collection

Since the interviews took place directly after work, participants were given the opportunity to have a short break and have something to drink before the interviews commenced. As it was the first time many of the therapists had participated in a study like this, this cool down period allowed for some light conversation and broke the tension associated with a research interview. The staff lunch room was intentionally chosen as it is associated with a relaxing atmosphere and was noise and distraction free. Participants were free to choose to sit directly across the researcher or at right angles. The researcher used the interview guide (Appendix C) to prompt questions. Prior to the interview, the researcher transferred pertinent information from the background information questionnaire (Appendix B) to the interview guide (Appendix C) to aid ease of questioning. The interviews began once the participants gave the go ahead. All participants were thanked for their participation at the beginning and end of interview.

There was no limit to the number of therapists who were interviewed. All therapists who showed interest in the project were interviewed.

3.8 Trustworthiness

Transferability was encouraged by providing detailed background on all participants and the setting in which the study was conducted. This would allow others to determine transferability judgements based on the characteristics of the participants and the study environment. (119)

Credibility was achieved by ensuring that the line of questioning remained consistent throughout all interviews. This was done by consistently using an interview guide during the interview and ticking off questions as they were answered. The researcher also consistently encouraged clarification of participants' responses by rephrasing questions. The researcher conducted one mock interview with her research supervisor. This has been cited as a method of achieving credibility. (119) This aided in testing the phrasing and delivery of the interview questions. Collectively, the researcher and supervisor were able to identify questions that required rephrasing. Peer examination was also used to aid credibility. (119) This was done at the end of data collection. The research supervisor acted as a form of peer examiner and both the researcher and the supervisor discussed the categories developed in order to identify disconfirming or negative cases.

Dependability was achieved by clearly describing the methods used for data gathering, analysis and interpretation. (119)

In order to achieve confirmability, the researcher ensured that her supervisor was made aware of every step of the research process. The supervisor thus had ample opportunities to provide input at each stage of research. The researcher updated the supervisor on the rationale behind planning, provided access to some of the transcribed data as well as instrument development information. (119)

3.9 Data analysis

Data analysis was ongoing throughout the data collection phase. Sequential analysis also known as interim analysis was applied. (120) This took place during and between interviews as the interviewer analysed and compared data to previous interviews. During this process, new themes and points of inquiry emerged which allowed the researcher to refine questions and explore new areas which may not have been considered prior to formulation of the research question, aims and objectives. The researcher employed content analysis to analyse the data.

Content analysis was used to analyse the data. Through content analysis, the researcher extracts similar pieces of information and groups them together. It is understood that the information in these groups, which can take the form of phrases and

words, have the same meaning. (121) Content analysis is used to obtain a condensed and broad idea of the original data. The final outcome of the process is the production of categories to describe the phenomena. (122) The benefits of content analysis are that it is content sensitive and flexible. (123)

The following steps were undertaken to analyse the data:

- During the process of interviewing, the researcher organized and prepared the data for analysis. This involved transcribing the interviews which was done by a professional transcriber.
- Confidentiality of the participants was ensured by allocating a code to each participant for e.g. Participant 1 = A
- Inductive coding was used. Inductive coding originated from the themes and ideas from the interviews.
- A combination of electronic and manual methods was used to analyse the data.
- Initially the researcher read through the transcript as a whole to gain a general impression of the data. This was followed by in depth reading of the raw data.
- The researcher divided the data according to the objectives they fulfilled. This was done electronically and made it easier to manage the large amounts of data.
- The researcher then identified units of information representing certain ideas or meaning.
- Each unit was electronically highlighted in the text and was then assigned a label. Each label was indicated next to the unit selected on the word document.
- These units of information were then copied and pasted onto an Excel spreadsheet with its corresponding code.
- Subthemes were identified from the data and recorded in a codebook.
- Similar subthemes were grouped together.
- Each group of subthemes was given a theme.
- The codes from each objective were represented in a separate Excel spreadsheet.
- Information from each objective was then analysed as a whole.
- To ensure reliability, the following steps were undertaken:

- The researcher recruited the assistance of an expert researcher to code check.
- Transcripts were checked to ensure no mistakes were made during transcription. This included checking that interviews were transcribed accurately and appropriately.
- No drift in the definition of codes. This was done by ensuring data were described well and transparently.

3.10 Ethical considerations

The researcher obtained ethics approval from the Human Research Ethics Committee (Medical). The certificate number is M121042 (Appendix A).

An information letter (Appendix F) was given to willing participants introducing the researcher, a brief description of the research to be undertaken, the inclusion criteria of the study and the research procedure.

Therapists who were interested in participating in the study signed a consent form (Appendix G) indicating willingness to participate and a consent form to allow for audio recording of the interview (Appendix H).

Participation in the study was completely voluntary and participants were advised verbally and in writing in the information letter (Appendix F) that they could withdraw from the study at any point without consequence.

Each participant was allocated an alphabetical code to ensure anonymity. For example, the first participant was known as ‘A’ and so forth.

All audio recordings were stored on the researcher’s personal laptop which was password protected. Each recording was allocated the same code as above to ensure anonymity. After completion of the study, the audio recordings were transferred onto an external hard drive and the folder was password protected. The audio recordings will be stored on the external hard drive for a period of 15 years, after which, it will be deleted permanently.

3.11 Researcher's assumptions

The researcher's assumptions were influenced by two factors: a) literature she had reviewed on therapeutic gaming and b) her experiences as an occupational therapist at CHBAH using TG.

Peer support as an enabler for TG use by occupational therapists was supported by literature. The researcher also identified this being effective in the occupational therapy department where therapists were paired during the weekly, 'X-Box® group'.

Activities form an integral part of occupational therapy and thus it was assumed that occupational therapists would share the sentiment that therapeutic gaming fit into the philosophy of occupational therapy. Literature and traditional occupational therapy practice also strongly support fun and motivating activities as a means to attain optimal occupational performance.

Therapeutic gaming is not always suitable for people with disabilities. This was supported by literature and the therapist's experiences using TG as a therapeutic modality.

Occupational therapists do not receive adequate training to support their use of therapeutic gaming. The use of TG is in its infancy in South Africa and therefore knowledge on using TG by occupational therapists will be limited.

The costs associated with using TG were assumed to be a limiting factor for its use by occupational therapists. This was informed by the researcher's experiences working in the public sector which is challenged with resource constraints. The cost of commercially available gaming units is out of reach of most South Africans and therefore would not be suitable for home use for the majority of occupational therapy clients receiving care in the public sector.

As stated earlier, the use of TG by occupational therapists is in its early stages in South Africa. This leaves a very limited evidence base for local therapists to support them in aiding its use as an intervention.

The researcher is employed within the same department in which the study was conducted and she also used therapeutic gaming as part of her rehabilitation interventions. As a result, some of the insights shared by participants were familiar to her and were not unexpected when they were raised during the interviews. The following were a few of the core assumptions that researcher held prior to conducting the study:

Questions related to philosophical assumptions are shared widely by occupational therapists; factors such as enjoyable and motivating factors.

Having worked in an extremely busy department, the researcher was aware that high patient loads and subsequent time restraints would be a limiting factor to the use of therapeutic gaming at CHBAH.

CHAPTER 4: RESULTS

4.1 Introduction to results

The results chapter is outlined as follows: a description of the physical environment of the study setting, a description of the study participants, the three main themes that arose from the semi-structured interviews: the factors motivating and limiting the use of TG in occupational therapy, the fit of TG in occupational therapy and lastly, the occupational therapists' perspectives on evidence based practice in the use of TG in occupational therapy.

4.2 Background to study setting

4.2.1 Context of Chris Hani Baragwanath Academic Hospital

The research study was undertaken at CHBAH which is situated in Diepkloof, Soweto. Census 2011 reported the Soweto population as 1 271 628. (124) Soweto is classified as an urban area. The most common language spoken is isiZulu. It is a central level hospital that provides health services to individuals in southern Johannesburg as well as cases requiring specialized treatment from further afield. CHBAH is a teaching hospital and receives medical and allied students from the University of the Witwatersrand and Sefako Makgatho Health Science University. It is also a popular placement for elective students; both local and international.

CHBAH typically sees patients requiring acute medical intervention; and due to the large catchment area, patient turn-over is high. The occupational therapy department at CHBAH is busy and good time management is paramount to juggle patient care, student supervision and professional development programmes.

4.2.2 Context of occupational therapy department

The occupational therapy department at CHBAH acquired the Xbox® One in late 2015 and began using it clinically in early 2016. The occupational therapists within the adult

neurology section were responsible for selecting the specific TG system. The Xbox® One was chosen over the PlayStation® Move and Nintendo Wii® as the latter consoles required the user to be able to control the game using a hand held remote. It was noted that this would be a limiting factor for many clients who did not have sufficient hand function to manipulate the remotes. The Xbox® One would allow a more diverse population because it would accommodate clients with impaired hand function.

The Xbox® One unit included the following items: an Xbox® One console, a Kinect® sensor, power supply, power cord, a wireless controller, an HDMI cable and a manual. Two games were also included; Sports Rival Kinect® as well as Need for Speed®. A dance game was freely available for download. The sports game was specifically chosen because of the movements it inherently included (gross upper limb and lower limb movements) and the therapeutic benefits it provided.

The Xbox® One was intended to be used by all subsections within the department however it was found that the projectors could not be connected to the console without purchasing an additional cable. It was difficult to share a single console amongst the four subsections. For e.g. If therapists in the psychiatry subsection wanted to use the Xbox®, they had to commute to the main occupational therapy department to fetch the system. This posed a hindrance due to time constraints. The manual recommends a minimum room size of 1.8 – 2.4m. Despite the room allowing for the minimum physical space requirements, it proved difficult and cumbersome when using the console with clients in wheelchairs, seated on a chair or using a standing frame. These additions reduced the physical space available to include more participants or an audience. This also affected the ease of mobility of the clients; frequent change in positions proved frustrating for the therapist and the clients. The Xbox® room was adjoining the paediatric treatment room. Noise in either of the two treatment spaces posed a disturbance to the therapist and clients in the neighbouring space.

The physical set up of the console took less than 5 minutes. The gaming system was stored in a locked up storeroom approximately 15 metres away from the treatment room and the treating therapist was required to unlock and lock the storeroom to gain access to the console. The therapist had to fetch the keys from the staff office and return them

immediately, as they were often required by other therapists. The console could not be left unattended in the treatment room and the treating therapist had to make sure that someone else ‘stood guard’ if she had to leave the treatment room. Due to a shortage of porters, therapists were often required to fetch their clients from their wards. These wards were a considerable distance away from the occupational therapy department and this was time consuming.

4.2.3 Study participants

At the time of data collection, the occupational therapy department at CHBAH comprised 26 occupational therapists, one occupational therapy assistant and one head of department. There are four sections within the department: orthopaedics, neurology, paediatrics and psychiatry. Each section comprises of community service therapists and production level therapists who are overseen by a chief occupational therapist.

Of the 10 occupational therapists who participated in the study, two were chief occupational therapists, four were production level therapists and four were community service therapists. The participants ranged in years of clinical experience from 10 months (community service therapists) to 16 years. One participant obtained a master’s degree in occupational therapy. All participants were female and the department can be described as ‘youthful’, with most therapists under the age of 30.

4.2.4 Participant demographics

Table 1: Demographic details of participants in the study (n=10)

Participant	Highest Qualification	Years of clinical experience	Area of practice	Duration of TG use	Frequency of TG use
A	B. OT	3 years	Paediatrics	6 months	Once every 2-3 weeks
B	MSc. OT	16 years	Adult neurology	6 months	Once a month
C	BSc. OT	5 years	Paediatrics	6 months	Once every 2 weeks
D	B. OT	1 year and 10 months	Paediatrics	6 months	Twice in 4 months
E	BSc. OT	10 months	Psychiatry; Adult neurology	3 months	Twice in 4 months
F	BSc. OT	10 months	Orthopaedics 6 months; Neurology 4 months	4 months	Twice in 4 months
G	BSc. OT	2 years and 6 months	Adult Neurology	10 months	Once a month over a 6 month period
H	MSc. OT	4 years and 9 months	Adult Neurology	12 months	Once a month over a 6 month period
I	BSc. OT	10 months	Psychiatry; Neurology	10 months	Once over a 6 month period
J	BSc. OT	10 months	Orthopaedics; Adult Neurology	6 months	+/- once per week

Table 2: Details of participants' TG use at CHBAH occupational therapy department

Participant	Conditions commonly treated with TG	Impairments and ADLs commonly treated using TG	Measures used to determine overall effectiveness	Frames of reference/theoretical frameworks	Previous training? Y/N	Previous literature? Y/N
A	Neurological conditions: CVA, TBI, brain tumours	Balance (sitting and standing) Mood Motivation Muscle strength	Observation	NDT Creative Ability Sensory Integration	N	N
B	Spinal Cord Injuries	Muscle strength (upper limb) Hand function: mass grasp and strengthening Balance	Observation	Motor relearning Biomechanical Dynamic systems theory	Y. As part of masters (neuro)	N
C	TBIs, brain tumours	Muscle strength (UL) Hand function Task concept Following instructions	Improvement in aims being addressed	NDT Basic SI Creative ability Developmental	N	N
D	SCI	Following instructions Hand function Balance Motor planning	Improvement in aims being addressed	NDT Family centred Developmental	N	N. In-house tutorial
E	CVA, SCI, TBI	Motivation Social participation Muscle strength (UL and hand) Selective control of movement (UL and hand)	Observation (patient interaction and active engagement) Fugl Meyer Assessment	Motor relearning Neurofacilitatory approaches Biomechanical Model of Creative Ability	N	N

Participant	Conditions commonly treated with TG	Impairments and ADLs commonly treated using TG	Measures used to determine overall effectiveness	Frames of reference/theoretical frameworks	Previous training? Y/N	Previous literature? Y/N
F	CVA, neuropathy, peripheral neuropathy, SCI	Muscle strength (Upper body) Spatial perception	Observation (level of enjoyment, endurance, fatigue)	NDT Motor relearning Biomechanical	N. In- house tutorial	N
G	SCI, CVA, TBI	Muscle strength (UL) Endurance Balance Leisure Social interaction	Observation (ADLs) Re-assess comparing SCOM Quality of transfers	Creative Ability	UG Exposure, not formal training.	N. Bara expo TG presentation
H	SCI, Mild strokes	Balance (dynamic) Trunk control Muscle strength (UL) Endurance Mood Motivation Social participation	Unanswered.	Motor relearning NDT Brunnstrom (assessment only)	Y. Masters (neuro) In-house tutorial	Y
I	CVA, SCI, TBI	Muscle strength (UL) Endurance Balance ROM Activation Attention Socialization Leisure (exploration and participation) Following instructions	Unanswered.	Motor relearning Biomechanical Client centred	N. In-house tutorial	N
J	CVA, SCI, Peripheral neuropathy	Muscle strength (UL) Social participation Leisure Balance Endurance (muscular)	Patient satisfaction Quality of patient's movement	Task oriented OT Practice Framework	N. In-house tutorial.	N

Table 2 continued

4.3 Description of themes arising from semi-structured interviews

The table below summarises the themes and subthemes that emerged from the data analysis of the study findings.

Table 3: Themes and subthemes

THEMES	SUBTHEMES
Theme 1: Facilitators to the use of therapeutic gaming by occupational therapists	Subtheme 1.1: Peer pressure
	Subtheme 1.2: Time efficient
	Subtheme 1.3: Technology is part of life
	Subtheme 1.4: Technology is an alternative to traditional activities
	Subtheme 1.5: it is easy to learn and with practice it will be perfect
	Subtheme 1.6: Therapeutic gaming is enjoyable and motivating
Theme 2: Barriers to the use of therapeutic gaming by occupational therapists	Subtheme 2.1: Time consuming
	Subtheme 2.2: Limited knowledge, training and exposure
	Subtheme 2.3: High cost of therapeutic gaming
	Subtheme 2.4: Not all clients are suitable for therapeutic gaming
Theme 3: The fit of therapeutic gaming in the philosophy of occupational therapy	Subtheme 3.1: Activities and activity analysis
	Subtheme 3.2: Therapy is meaningful
	Subtheme 3.3: Flow
	Subtheme 3.4: Holistic
Theme 4: Occupational therapists' perception on evidence based practice in the use of therapeutic gaming	Subtheme 4.1: Research evidence
	Subtheme 4.2: Peer feedback
	Subtheme 4.3: Clinical experience
	Subtheme 4.4: Patient feedback
	Subtheme 4.5: Lack of research evidence in South Africa

4.4 Theme1: Facilitators to the use of therapeutic gaming in occupational therapy

4.4.1 Subtheme 1.1: Peer pressure

Participants reported that peer pressure was one of the motivating factors that encouraged them to use TG and other treatment modalities as therapeutic tools. They felt more motivated to use TG if therapists and patients were actively using it, especially if those therapists were in the same section as them.

"...if other people are using it and if patients are actually using it and if it's used in your subsection, if people are motivated to use it, it motivates you to also get involved in the new therapeutic methods that people are using." [D]

Participants stated that they were motivated by their peers' feedback regarding how the session went was useful in helping them determine which patients were appropriate for TG. They would then choose patients that shared similar characteristics to those that were previously successful with TG. This appeared to aid therapists' clinical reasoning when selecting patients.

"...how the therapists react to how their patients were in that session and now feedback whether it worked for certain patients and we'll try to use it on similar patients in the future." [E]

The therapists actively motivated each other to use it if those therapists were not using it.

"And then therapists they are motivating other therapists that haven't used the technique, those that have used it and I also encourage therapists to use the technique." [B]

Occupational therapists were becoming more aware of TG as an occupational therapy tool and seeing it being used at other hospitals may encourage therapists to motivate for TG in their own places of work.

"...it is peoples' awareness as an option is becoming bigger, so I think through that people being exposed to it and also seeing it at other hospitals. I think people want to motivate for it more..." [H]

4.4.2 Subtheme 1.2: Time efficient

Xbox® group is an initiative of the adult neurology section. Therapists within the section take turns to run the group which is held every Friday afternoon. Participants reported that by formalising and routinising the process, the team was able to ensure that TG was actually being implemented with patients. The set time table also ensured that therapists used it even if they personally found it time consuming to set up. Some participants felt, that by adopting a team approach, the use of TG was not left to the discretion of the therapist as they were required to use it as part of the section's protocols, and thus the Xbox® group was a factor motivating the use as TG, as it made the use more time efficient.

"So definitely a motivating thing at Bara is we have a set time we do Xbox®, because it is time consuming to set up. What's a motivating thing is you have a team approach and you actually have a set time to do it and suitable patients to be part of the group. So that actually makes the group happen." [H]

4.4.3 Subtheme 1.3: Technology is part of life

One participant stated that she was excited about using TG as part of occupational therapy practice because technology was very much a part of her life. It made sense to her that TG was used to improve function because it was already part of her occupations.

"When it was mentioned I immediately jumped at it because my family is very IT orientated and technology enthusiasts so for me it seemed logical to start using virtual gaming or gaming to improve functioning because it is starting to become part of everyday living, so why not use the technology especially if it's available." [J]

Some participants felt that people were becoming more technologically inclined, and that a motivating factor was that technology had a promising role to play in the future.

Some participants also felt that the ethos at CHBAH is to maintain current with technological trends and therefore it made sense to incorporate technology into therapy.

"I think the fact that it's where the world is going. Like technology based, and everybody wants to keep up with that and make breakthroughs in that area. So I think the mind set at Bara is definitely that to be doing that. I think that encourages the use." [E]

Exposing young patients to electronic resources was deemed as a motivator, as it could be a potential career they could consider going into.

"...it's also very good for your younger population to use because they need to be exposed to some virtual or your electronic resources because that is the way the world is shifting and it might even be good for some of your young patients to have a bit of that motivation because it is such a good field to go into." [J]

Some participants commented that technology forms part of our occupations and everyday life. Students and patients alike are motivated use technology as part of their daily routines. If these activities are considered to be meaningful to clients, then occupational therapy needs to incorporate them into treatment interventions. This was more relevant to the younger population as they are more likely to choose interactive games over traditional leisure activities like board games.

"As technology has grown so have sort of students and patients' awareness of using smartphones, using interactive games and stuff. So I think in occupational therapy we focused mostly on meaningful activities. And if meaningful activities are becoming more and more part of peoples' day to day thing with social media and using their cell phones, why don't we incorporate it as part of leisure instead of sticking to typical board games and stuff, which is not currently realistic for a lot of our younger generation." [H]

Others commented that it was definitely a leisure activity that people often engage in during everyday life and therapists use leisure activities routinely in therapy.

"The fact that it is a leisure activity, so it is one of the motivating technique that I would also like always use when treating my patients." [B]

4.4.4 Subtheme 1.4: Technology is an alternative to traditional activities

Some participants compared using technology based tools to more traditional occupational therapy tools. Technology had the ability to advance over time resulting in better therapeutic tools whereas traditional tools were limited in their properties. Participants also stated that the world was moving towards technology and therefore therapists are motivated to use it.

"It's also improving, the technology is improving its not static, it's not like we have tried cones a 100 times over and it's not actually improving whereas your gaming is improving the graphics, the sensitivity, the equipment is all improving and the world is shifting that way." [J]

A frequent theme that arose from the interviews was related to the types of activities that were deemed to be appropriate for clients. Some participants commented that therapists were stuck using traditional methods and that it was difficult to break the traditional mind set of using crafts as therapeutic activities.

"People are like this is how it should be done and this is how it stayed being done." [J]

Participants felt that it was not appropriate to teach traditional craft activities in occupational curricula if these activities were not going to be used by occupational therapists in practice. They stated that it was more appropriate to introduce technology based intervention, if this was the direction people and occupational therapy was moving towards. Below is one of the therapist's responses when asked if TG should be introduced into the undergraduate occupational therapy curriculum:

"It definitely should because that's the way we're heading or that's the direction occupational therapy itself is heading and there is no point teaching knitting and all of those types of things if those are not the things that we are doing in our therapy." [D]

Some participants felt that craft activities were not always practical to implement because it was difficult to find resources when needed, and they were motivated to use TG as an alternative.

"Also resources become a problem, having the resource for crafts is difficult, even your low cost resources, because if you have so many patients you need to collect so many 2L bottles. It's not always easy and it's not always practical..." [J]

Participants stated that it was important to acknowledge that technological products are resources and they can be used over traditional resources in the current age, in therapy, and it could be more accessible than physical materials and tools.

"Why do you have to encourage a parent to go and buy a perceptual game when they can just download it onto an iPad? So for me we are not utilising resources that the patients have and we are forgetting that electronics are resources." [J]

4.4.5 Subtheme 1.5: It is easy to learn and with practice it will be perfect

Learning was continuous in nature and the more direct experience the therapists had using TG with patients, the more comfortable they became with the device. They were able to carry over the skills they learnt to the following sessions, and therefore they were motivated to know that practice makes perfect:

"So it's also using some clinical reasoning with that and I do find that the more you use the Xbox® and the more you see your patients using it the more you understand how to kind off compensate, just standing behind them and providing them with a bit more assistance or setting up before hand and letting it get used to them and making sure that they have more time so it's not like structured planning its learning as you go." [J]

It was important to know the key points of control of TG, which increased with more frequent usage. In doing so, it allowed therapists to use TG more effectively with patients. Here a participant explains how she struggled with the correct setup before, but with practice she became more efficient and knew how to position herself, the game and the patient.

"A stroke patient for instance, if you wanted to do bowling or something, you need to make sure that you set it up according to which side of the body you're going to be working on... I think we had it before where it was picking the therapist up and then it's

taking away from the patient. So then where do you position yourself in order to be able to still facilitate movement but not interfere with the whole gaming?" [I]

4.4.6 Subtheme 1.6: Therapeutic gaming is enjoyable and motivating

Some participants noted that patients found TG fun and motivating and that this resulted in an improvement in function.

"So just observation, how they do in their ADL's in the ward, often the parents will say they're so much more motivated or they really enjoyed that, and now they can do this."[C]

Some participants used the positive patients' response as a motivator to use TG again in a session.

"...so sometimes when like when I wasn't on the actual Xbox® that week, I'd hear from the patients oh you know, they really enjoy it and they were tired afterwards, so feedback from them." [G]

TG is appealing to young and 'modern' patients as they were already accustomed to using technology, thus they are motivated to use it in therapy.

"...it's something which modern patients, especially younger patients are familiar with gaming and other technological activities would want to do." [E]

This comment was further supported by another participant who worked closely with adolescents.

"And in my wards, I have adolescent patients, so I feel like it really appropriate for them because they're more interested in doing gaming……whether it's like on their cell phone or like PlayStation, so yes, with that I feel like it's therapeutic for them." [G]

According to the interviews, TG was not just for the young and that patients across different age bands enjoyed it.

"I was very surprised, because I thought that perhaps the younger patients would be more into it and the older patients not so interested, but from what I've experienced is that the patients at all ages enjoyed it.... It didn't matter if they were in their thirties,

which the one gentleman was or in their fifties or sixties where my other patients were" [E]

Previous experience with TG was not necessarily a determinant of whether a patient enjoyed using it or not. It was found that even patients with no prior experience enjoyed it.

"...even if they've never done this kind of thing before, they found the concept fascinating and when they saw how it worked, they were engaged." [E]

Some participants found that the features of Xbox® created an atmosphere that was uplifting for patients.

"...introducing them to a game that has some music, some cheering and some pretty different pictures can sometimes help the patient feel moved from a hospital and more in a social environment." [J]

The goal directed nature of TG meant patients were more motivated to participate, and performed better than during traditional exercise.

"...you can really see a patient come out with the gaming... you might see more performance in them doing like bowling with their upper limbs as opposed to them just lifting their arm up where there's no goal..." [G]

Some participants stated that some patients benefitted more from TG than using ADLs as a treatment activity. TG may act as a motivating tool for them to engage in therapy.

"It's so much better than sometimes just getting a patient up and getting them dressed, sometimes they just need that little bit more fun." [J]

4.5 Theme 2: Barriers to the use of therapeutic gaming by occupational therapists

4.5.1 Subtheme 2.1: Time consuming

During the interviews, the theme of 'time consuming' was raised frequently. Participants stated that despite having appropriate patients for TG, they were limited in using it

because they did not have the time for Xbox®. Time constraints were influenced by high patient loads as well as the time required to get patients to the occupational therapy gym for TG.

"Unfortunately also at Baragwanath hospital we have high loads... we can't always find the time to get the patients up to the department and use the machine the way we would like to even though we would have patients that are appropriate for it, finding the time is difficult." [J]

Therapists found it much easier to use other therapeutic tools and activities that were easily available and did not require the preparation time.

"...it still has to be set up and packed away and like it is not just an easy accessible just go and use it. It is much quicker just to go to the cupboard and take something out the cupboard than to actually set up..." [A]

Therapists stated that the logistics of TG limited the implementation, in addition to all the other duties they were required to perform. They stated that finding time to use TG was difficult. Therapists appeared to find the process a lot of effort and frustrating as it involved looking for the keys, setting up the device and requesting another therapist to stand guard over the device whilst they brought their patient up to the occupational therapy gym. This subtheme implies that therapists may be more open to using TG if the process was more efficient.

"...you first have to find the time on top of everything else, so then it's time to first set it up, find the keys, set everything up and then someone has to wait because you have to fetch your patient." [D]

Participants noted that one of the limitations to using TG was that it did not always go according to plan. These glitches were disruptive to the session especially since their patients often presented with poor frustration tolerance and therefore the glitches were counter therapeutic for these individuals.

"And just from our own experience technology can be very glitchy and especially when you are working with patients that you need things to work....Because a lot of the

time they don't....they are not on the level to...frustration tolerance...those things that they don't want to wait, so it needs to be able to work then and there. " [A]

According to some participants, the lack of time and high patient loads acted as barriers to using formal measurement tools to evaluate efficacy of intervention.

"...to say if we use any measuring tools it's a little bit more difficult because of time and number of patients..." [J]

4.5.2 Subtheme 2.2: Limited knowledge, training and exposure

Some participants commented that therapists have limited knowledge on using TG in terms of setting it up and applying it clinically with patients. This deterred therapists from using it and was further compounded by high patient loads.

"I think what limits, is that not everyone has the knowledge on how to use it. So not everyone has been exposed to Xbox®. I'm talking therapists and that, so they might be put off the whole needing how to set it up and how to work it themselves. So that almost seems like a bit too much effort for them to use it in therapy. Especially with high patient loads that we do have." [I]

Others commented that they were unsure on how to grade using Xbox® because their knowledge was limited on how to adjust the game.

"I haven't really graded the length that a patient would be involved in the game. I think more from the fact that I'm not totally savvy on how to manipulate the actual game itself." [E]

Some participants commented that their lack of exposure to TG affected their ability to use it. They further went to say, that if therapists were exposed to TG as part of the undergraduate curriculum, they would be less limited in using it and be more inclined to use it in practice.

"...but if for instance everyone got provided with an Xbox® I think that a limitation would be the experience you get in at University. So if you are exposed to it as a therapeutic modality which you get taught I think you would totally be used. But it's not. So people will naturally be a little bit more apprehensive towards you." [F]

Participants felt that there was definitely a future in TG. However therapists needed more exposure to TG as well as learning opportunities for this to happen. She acknowledged the benefits of 'peer learnings' which are in-service learning opportunities provided at CHBAH occupational therapy department, as well as educational initiatives on a larger scale, such as presentations at the CHBAH Occupational Therapy Expo. She found that fun, interactive demonstrations such as that held at the Occupational Therapy Expo gave therapists the opportunity to experiment with TG, learn the benefits of TG to patients, and clarify concerns regarding safety of the tool.

"There definitely is a future. I definitely think it is something that we need to be exposed to more one, at Bara first, so that we can kind of promote and, like you've done with your peer learning, you've done the expo presentation and so on. I definitely think the more we speak about it and even at expo when we had it set up, I think people realized how much fun it could be and as much as I think people think there is a possibility that it will injure people or whatever it could do, the possibility of it having good effects on our patients is relevant." [D]

Therapists needed to take initiative if they wanted to learn more about TG. Reading textbooks and journal articles were a few of the ways of doing this.

"I think we could do just resource wise in terms of information. I think we could do more research in terms of what games are out there and appropriate for our patients. So I do think there is information out there or just read journals or maybe text books and stuff that have more information about it." [H]

Teaching occupational therapy students about TG in the undergraduate curriculum could increase the range of activities therapists could use as treatment modalities.

"I think there is a lot to say for it to be introduced even if it is a few lectures just focused on this. Because, I think, first of all it opens the minds of students as to what kind of other activities can be used in therapy..." [E]

Therapists stated that they had little to no awareness of resources that could assist them in using gaming therapeutically. The comment below was in response to being

asked if they were aware of resources that could decrease the limitationsin their ability in using TG:

"Honestly no. Like I know of the gaming stuff that is available but it's not necessarily going to assist me in using it with like the patients that we see." *[A]*

Another participant commented that she did come across articles on TG but none of the studies were conducted in South Africa. She also struggled to find other useful resources online such as handouts on TG.

"So I have seen that there are articles, I've seen, I think there was a Canadian one and a few more like overseas, but not really sort of handouts that I have seen here or I haven't come across any articles that have been written here."[I]

Participants stated that there were limited sufficient resources on TG and people with disabilities.

"I must admit, I looked up Xbox® games for people with disabilities or for people with disabilities and I couldn't find much." [J]

4.5.3 Subtheme 2.3: High cost of therapeutic gaming

Cost was a frequent theme that arose from the interviews. Many participants commented that a limitation was the fact that the whole TG experience was very expensive as it required multiple individual components for it to be used successfully.

"...it is so expensive and it's not just that you need an Xbox®, you need an Xbox®, plus the television, plus you need the games." [D]

Another participant agreed with the above statement saying that public hospitals and patients would have difficulty accessing TG because of the cost factor.

"I do think that we're still very limited to certain hospitals that have the funding. I think a lot of private places have it, but government or public sector it won't be widely accessible and then also I don't think the patients we see in the public sector have the money to buy for home." [H]

Some participants were concerned about using TG with patients if they did not have the means to carry over to home.

"...you also don't want to get the patient not hooked but like into it at hospital and then if they cannot afford that sort of carryover..." [I]

Some participants were aware of the cost implications **limiting** the use of TG. They were still hopeful about the future of TG because they were of the opinion that TG would become more affordable and thus accessible to a wider population.

"...there's definitely a future for it, and that it does depend on access to it again, and like the resources that people have. But I think, 'cause technology is like improving and moving all the time, so eventually things will become a little bit cheaper and more accessible to people with lower social economic status..." [G]

4.5.4 Subtheme 2.4: Not all clients are suitable for therapeutic gaming

Some participants felt that the CHBAH setting was limited as it did not provide services to patients that were appropriate for Xbox® due to the acuteness of their condition. CHBAH is an acute setting and therefore during this period, most patients are still medically unstable and thus were too acute to handle the demands of gaming. During this phase, cognitive symptoms may be marked especially with patients suffering from head injuries and stroke.

"...sometimes our patients at Bara are too acute or they have cognitive impairments and so they can't actually participate in the game." [H]

A frequent theme that arose from the interviews was the limitations of TG for people with disabilities. Many participants felt that TG isn't PWD friendly. The device posed problems for seated play and that the technological glitches frustrated the therapist and the patient and resulted in a waste of time.

"...some of the games are a little bit too sensitive for our patients for instance if they are not standing but sitting then the game kind off glitches and doesn't work as smoothly as it should and it can be frustrating for both the therapist and for the patient and can also be time consuming to work through the glitches." [J]

Other participants found that the games were not easily adaptable and limiting to older patients and those with cognitive impairments and this affected the patient's performance in the game.

"...we in neuro, we treat the older population that also have cognitive impairment. So I think those are limiting things that a person might not be familiar with or they might not actually understand the concept of the game so they really struggle with actually succeeding in it." [H]

Some participants found it difficult to grade, and thus the use of the Xbox® was limited when used with people with disabilities.

"It is very difficult because obviously like I said the Xbox® is meant, is made for able bodied people and to adapt for disability is very difficult." [A]

Some participants felt that TG has the potential to become a popular therapy tool in occupational therapy if they were more adaptable for people with disabilities. This would allow for more rehabilitation friendly games which were easily gradable.

"...if therapeutic gaming can get to a point where the research has been done into to how it can be adapted for disability I think it should be one of the like main tools. Because it would be so easy to grade the games." [F]

4.6 Theme 3: The fit of therapeutic gaming in the philosophy of occupational therapy

4.6.1 Subtheme 3.1: Activities and activity analysis

Many participants commented on using the typical occupational therapy processes when choosing an appropriate game or therapy tool for their patients.

"...patient's needs first, look at client context...limitations, activity participation and body structures that are affected...what is the patient going to do when they go back to home, should I like compensate for the loss of functioning or should I treat the motor dysfunction and improve it or which one is more important for that particular patient."[B]

Some participants felt that they did not have enough time for activity analysis because of the high caseloads.

"Not long at all, honestly....you see one patient after the next one you don't have time to sit down analyse what you are doing, thinking about it. So it's sort of like on the spot. Okay I know I need to work on balance – let me quickly choose the game that I'm going to use." [A]

Some participants considered whether the game chosen will meet the aims they are working on with the patient.

"...what sort of aims you are trying to work with that patient and then select the game that's appropriate." [I]

Some participants found that TG was a versatile product and this was appealing to therapists.

"...there are a variety of games that can be used in virtual gaming and Xbox® it's just a matter of picking the right ones according to what your patient needs, for instance dancing can be a very good game for just overall sequencing, for bilateral movement, for balance, for motivation, improving mood." [J]

Some participants felt that analysing the games before using it with patients made it easier for them to select an appropriate game for patients.

"So playing each of those games and sitting down and analysing it the way you would in university it does help you to know what is appropriate for what type of patient." [J]

Many participants felt that activity analysis was not a once off process but was rather ongoing.

"...it's very much included in my previous therapy sessions. Discerning what my patients' level of ability is. Physically and obviously mentally and emotionally like that comes in..." [F]

4.6.2 Subtheme 3.2: Therapy is meaningful

TG could form part of occupational therapy practice because the profession's use of meaningful activities as well as the fact that TG was an activity in itself and part of the occupational performance areas.

"...our philosophy in occupational therapy of using meaningful tasks to improve the patients and to enable the patients. I think VR definitely is applicable to improving our practice, but also to use as an activity in itself. It's part of an OPA." [H]

Therapists want to use meaningful tasks in therapy and TG was an example of this.

"...why am I doing little hand function tasks when I could be doing things like that, things that you want to be doing, things that are meaningful."

There was potential for TG games to become more meaningful by offering more variety and a better fit of game to patient.

"...if therapeutic gaming were to grow, you would create so much choice for people to be able to like choose from different games and like develop not just physical areas, but like themselves in the games. So that would be a big one for me like finding the match between the game and the patient."

Fulfilment in activities was an extremely significant goal in occupational therapy and therefore it made sense for occupational therapists to become more aware of the technological context of people.

"...I think that fulfilment is really the ultimate goal...So I think that a big part of that is looking into contextually how people are living and they are living in a technological world." [F]

Some participants commented on the effect TG has on function. The motivation and fun they experienced in TG carried over to their performance in functional tasks.

"So just observation, how they do in their ADL's in the ward, often the parents will say they're so much more motivated or they really enjoyed that, and now they can do this."[C]

4.6.3 Subtheme 3.3: Flow

TG allows patients to achieve a state of 'flow'. Some participants found this property therapeutic as it distracted patients from their problems. They also reported that, as a result, patients engaged for longer than usual.

"So they sort of get lost in it...so they get into the flow of it and then they lose sort of, you know, they forget about the ailment or the pain or whatever they're having and then you can have a therapy session that is longer." [I]

4.6.4 Subtheme 3.4: Holistic

Some participants felt that it was necessary for occupational therapists to learn more about technology because it would better able us to treat patients holistically.

"And I think if us as therapists want to be holistic if we are looking at a patient who is working in I.T. and we know absolutely nothing; or they are a gamer as their...ja their leisure or even like as a job...And we have – we know nothing about it we don't know how to – we are trying to – we are doing therapy to get them back to work and get them back to leisure..." [J]

Other participants agreed and found that many of the aims that could be addressed were suited to client factors and performance skills.

"...So your endurance, your muscle strength, your range of motion, all of those kinds of things, as well as concentration, attention and then branching into socialization and all, you know, leisure as I have said, relaxation, all of it. So I think it covers a broad spectrum of your OPA's client factors and performance skills." [I]

Participants compared Xbox® to other gaming devices and found that Xbox® was more suited for occupational therapy as it addresses physical and psychosocial aims.

"I think when we looked at Xbox®, specifically the Kinect, we saw it as something that can involve the whole body and even the mind...So it's a nice tool to be able to reach the aims you want to reach. You know, if it's muscle strength or its endurance or concentration or socialization." [I]

4.7 Theme 4: Occupational therapists' perception on evidence based practice in the use of therapeutic gaming

4.7.1 Subtheme 4.1: Research evidence

Some participants stated that there is evidence supporting gaming in therapy.

"...its effectiveness, it has been researched." [B]

4.7.2 Subtheme 4.2: Peer feedback

Some participants felt that because therapists encourage each other to use the tool, it must be effective. Peer feedback was evident in the following statement from one of the participants:

"And then therapists they are motivating other therapists that haven't used the technique, those that have used it and I also encourage therapists to use the technique." [B]

4.7.3 Subtheme 4.3: Clinical experience

Some participants based their perception of the TG's effectiveness on their personal experience using the tool with patients.

"I've only observed with my own kids...with Mbali I can tell you that it definitely worked. We got her way more where we wanted her from before, so it was really nice" [D]

4.7.4 Subtheme 4.4: Patient feedback

Some participants used feedback from the patient to determine whether TG was effective.

"...so sometimes when like when I wasn't on the actual Xbox® that week, I'd hear from the patients oh you know, they really enjoy it and they were tired afterwards, so feedback from them." [G]

4.7.5 Subtheme 4.5: Lack of research evidence in South Africa

Some participants found that TG was still in the early stages at CHBAH and that therapists needed to apply more effort in learning how to use it effectively with patients.

"I think in Bara it's still in experimental phases. So I think that people need to put the time and energy into figuring out how to actually use that effectively and efficiently and that more patients do benefit mostly from it." [F]

In a similar vein, another participant felt that the use of TG needed to be actively encouraged at CHBAH because therapists often ignored using it in favour of other activities, due to time constraint.

"I think like people can easily neglect it and they're so busy and they just want an hour like to see the patients and do like sort of normal sessions in the ward." [G]

Other participants found that the use of gaming in the occupational therapy field was still in its infancy because of the technological glitches and poor suitability for people with disabilities. Much could be done to improve the technology to ensure it is more appropriate for people with disabilities.

"...our virtual gaming is not quite there yet to be used the way we would like it to be used. In the sense that isn't always catered for your population disabilities such as the glitches and it would be cool if they could come up with a game that include being in wheelchairs like wheelchair racing virtually..." [J]

4.8 Summary of Results

Peer pressure in the form of support from colleagues, identification of knowledge experts in the team and external expectation from superiors and management to use TG was a strong motivating factor for occupational therapists to adopt TG in clinical practice. A team approach also encouraged buy in from therapists and routinised the use of TG. As a result, the decision to use TG did not rely solely on the therapist and his/her preferences.

Some therapists were of the opinion that technology played an integral role in everyday life and contributed to occupational performance. TG is an activity, enjoyable, motivating, and meaningful and its inclusion fostered a holistic outlook of the client. These factors contributed to it being a good fit for occupational therapists.

Some participants found that TG was time efficient however this was not strongly supported by literature. The majority of therapists found TG very time consuming; which was strongly supported by literature. The factors that contributed to this was the additional preparation time required to use TG compared to traditional activities, high caseloads which did not lend itself well to using TG, the logistics of using TG at CHBAH which required the use of porters to transfer patients to and from the occupational therapy department and commercial gaming devices which had numerous cut screens which lengthened the session.

Therapists perceived that TG could be seen as an alternative to traditional activities used within occupational therapy. TG was found to be used to achieve similar outcomes to craft activities and this could be a motivating factor to use TG.

Some therapists felt that TG was easy to learn how to use and that with more practice; it would be easier to implement. Literature showed that therapists did not have adequate knowledge and skills to implement TG effectively and that abundant hands on training, expert mentorship and access to evidence based literature is necessary to improve clinical use of TG.

Participants found that the high price associated with TG was a limiting factor for adoption by occupational therapists. It must be noted that therapists employed in the public sector are challenged with accessing funding.

The lack of suitability of commercially available gaming devices for people with disabilities was found to be a major limiting factor for occupational therapists. This was strongly supported by literature.

It was found that the participants, despite perceiving research evidence as a valid form of evidence, they relied heavily on feedback from peers and clients and their own

personal experience. It was also found that there is a lack of research evidence on TG in South Africa.

CHAPTER 5: DISCUSSION

5.1 Introduction to discussion

In this chapter, the results of the study will be discussed in depth. The study aimed to determine the factors motivating and limiting occupational therapists' use of TG at CHBAH, to explore the fit of TG at CHBAH in the philosophy of occupational therapy and to explore the occupational therapists' perception on evidence based practice in the use of TG at CHBAH. The themes and subthemes that arose from this study will be discussed here.

5.2 Theme 1: Facilitators to the use of therapeutic gaming in occupational therapy

5.2.1 Subtheme 1.1: Peer pressure

Peer pressure as a motivating factor for using TG was strongly supported by previous literature, and this was the same for the current study, as seen in subtheme 1.1. In this study, participants indicated they were motivated to use TG if other therapists within the same section were actively using it. They would discuss their sessions using TG with each other and this feedback was useful in learning how TG could be used practically and which types of patients would be suitable for TG. They also motivated their peers who were not using it in the department. Participants stated that occupational therapists are becoming more aware of TG, and from the interviews it was clear that the more they saw it being used in other hospitals; the more likely they were to motivate for the procurement of it at their respective occupational therapy departments.

Participants stated that occupational therapists with knowledge and previous experience in using TG were identified in the department and fellow therapists consulted them with queries regarding TG. This is in keeping with previous literature which shows that Influence from superiors and colleagues were highly rated by occupational therapists when deciding to use VR. (17) Involving fellow therapists as knowledge experts and

mentors could encourage the use of VR (17) because therapists perceive information from colleagues as valid sources of evidence. (103) The adult neurology team at CHBAH used the daily morning meeting and the weekly meeting to discuss troubleshooting related to TG and identifying appropriate clients. For the Xbox® group, a therapist experienced in using Xbox® was paired with a less experienced therapist to aid peer learning. In order to increase awareness of TG within the occupational therapy fraternity in the public health sector, a presentation on TG was delivered at the *CHBAH Occupational Therapy Expo* in September 2016. This was accompanied by a practical demonstration where occupational therapists were given the opportunity to try out the Xbox®. This gained a lot of interest from attendees and was especially important in showing therapists that TG could be done in public health settings.

Further research is recommended on the use of TG based on other settings in Gauteng, as this current study was only focused on CHBAH.

5.2.2 Subtheme 1.2: Time efficient

As seen in subtheme 1.2, the use of TG was deemed time efficient if a team approach was adopted and if the process was routinised. By formalising the use of TG, the adult neurology team at CHBAH was able to remove personal factors that might limit it from being used for example therapists opting to use familiar activities over TG because of the time associated with TG set up. By adopting a team approach at CHBAH and a roster which defined when each therapist would be using TG within the month, the use of TG was not left to the discretion of the therapist, who may choose not to use it because of the time required to set up the device. The team approach clearly defined the expectation from superiors on the use of TG within the team and has been supported by literature. (17) Participants indicated that this worked well within the adult neurology section and ensured regular and consistent use of TG by all therapists within the section. TG being time efficient was not raised as a strong theme in literature. Rather, the opposite was found. This will be discussed in subtheme 2.1: TG is time consuming.

5.2.3 Subtheme 1.3: Technology is part of life

Study participants reported that individuals were engaging in meaningful activities using technology and therefore it made sense for it to be included in occupational therapy programmes. Gaming is a leisure activity and it was commonly selected by therapists at CHBAH for this reason. Participants expressed that TG may be very appealing to younger patients because of their interest in technology. The mere fact that TG was current and that people in general were moving towards being more technology inclined was also a motivating factor. Some participants reported that it was in keeping with the CHBAH mindset to keep up to date with current advancements in occupational therapy and TG was an example of this.

Previous literature supports the comments from this study's participants that many occupational therapy clients find meaning and value in technology based tools they use (9) (19) and that clients use technology to fulfil social and leisure purposes. (19) Some literature reported that younger adults may prefer interventions that involve TG over traditional leisure activities, such as board games. (19) From the participants' comments, it could be assumed that TG would only be appealing for younger clients. However literature shows that older adults were also interested in TG. (113) It is therefore recommended that therapists be open to the idea of using TG with older clients. Literature supports the theme that therapists were motivated to use TG because of its novelty as it was a recent development in occupational therapy. (18) Therapeutic gaming being a current technology and thus a motivating factor was not strongly supported by literature. Participants' views on using TG because of its leisure properties was supported by previous studies where therapists expressed selecting a specific game such as golf or bowling because the client had previously enjoyed this sport. (18)

Chris Hani Baragwanath Academic Hospital is one of the main teaching hospitals for health science students from the University of the Witwatersrand and thus is also a hub of research activity. It would therefore make sense for the occupational therapy department to keep abreast of new developments in the field. Public health facilities that are responsible for student training must keep updated on current developments within the field. In addition, it is recommended that therapists conduct activity profiles on

members of the surrounding communities. This information will be useful in determining whether TG is an activity community members participate in and would guide therapists in selecting appropriate activities.

5.2.4 Subtheme 1.4: Technology is an alternative to traditional activities

Participants compared traditional tools used in occupational therapy to technology based tools. They expressed that traditional tools were limited in their therapeutic properties. However technology is always progressing and thus is more dynamic and has more therapeutic opportunities. Participants reported that traditional craft activities were outdated and was not part of current occupations for many individuals. Despite this, participants felt that the occupational therapy fraternity was stuck with traditional activities and that it is difficult to change this mind set.

Participants raised the relevance of teaching undergraduate occupational therapy students craft activities was questioned and it was suggested that the curriculum move towards including more technology based activities. It was said that this would be more appropriate for the current patient populations that therapists treat.

Participants raised that technological resources were said to be more easily accessible than sourcing materials for craft activities. Participants felt that there was a need to consider electronic tools as resources that could be used in treatment.

Literature shows that there has been a decrease in the use of craft activities as intervention tools in occupational therapy. (52) (53) This is in keeping with the comments from participants regarding crafts being outdated. Studies also show that therapists who have personal experiences doing crafts are more likely to use it in occupational therapy. (54) It may be those younger therapists who did not do crafts whilst growing up and that lack the skill (43) opt out of using crafts as intervention tools. This may be contributing to the decline of crafts as intervention tools. It was found that the embarrassment (52) associated with using crafts may be a significant limiting factor. Literature also showed that that a lack of resources required for craft activities was a limiting factor. (43) Therapists expressed that some of the traditional activities were not as versatile compared to TG. (19)

Commentators urge occupational therapists to become more aware of the role mainstream technology plays in their clients' lives'. (89) Undergraduate and post graduate training (95)has been recommended to encourage therapists to remain current with advancements in technology and carryover into practice. (89) Thus far, only anecdotal evidence exists on the extent to which TG and crafts are included in undergraduate occupational therapy curricula. Formal research is necessary to determine whether TG is taught in undergraduate curricula and the degree to which it is taught. Further research into the extent to which crafts are included in undergraduate curricula, the theoretical and evidence bases of these activities and whether craft activities reflect current occupational patterns in South Africa is necessary.

5.2.5 Subtheme 1.5: It is easy to learn and with practice it will be perfect

Participants expressed that with sufficient practice, they would be able to master using TG. This was supported by literature; for TG to be used effectively, therapists needed to be trained properly with 'abundant hands on practice' and needed to be comfortable with the technology for them to be able to use it seamlessly in the session without being preoccupied with the workings of the technology. (107) This would allow the therapist to focus on the client and provide input to the client when necessary. (63) Participants stated that it was important to know the key points of control when using TG clinically. This was also in keeping with previous literature. (125)

It must be reiterated that at the time of this study, TG was still in its early stages at CHBAH. The comments from the participants reflect this, as they are aware that they may not be fully competent in using TG but could do with more practice to improve this competency. This is important to acknowledge when introducing new interventions or processes into a department; frequent exposure and opportunities for practice is necessary to encourage adoption.

Adopting a team approach was found to be a strong motivating factor or TG implementation. This is supported by literature and therapists' experiences at CHBAH. Pairing less experienced therapists with more experienced therapists allowed for knowledge sharing and supervision. Through this type of practice, therapists are likely

to become faster with setting up of equipment and require less time for clinical reasoning.

5.2.6 Subtheme 1.6: Therapeutic gaming is enjoyable and motivating

From subtheme 1.6, participants found TG enjoyable and motivating for clients and that this lead to an improvement in function. Often clients found TG more enjoyable than traditional exercise. This was strongly supported by literature. (7) (109) Participants stated that the novel nature of TG broke away from the monotonous nature of performing ADLs. This was also supported by literature where it was found that therapists chose TG specifically because of the novelty it provided in the treatment programme. (109) It was found that despite TG generating more initial enthusiasm compared to traditional therapies, the higher level of enthusiasm wasn't maintained, indicating a need for novelty. (109) This must be considered when attempting to include TG in rehabilitation departments because it will necessitate having a variety of game titles available for clients.

The goal directed nature of TG and the lively features such as music and visuals made it enjoyable and motivating. (126) Therapists tended to select gaming for younger patients (adolescents) and those who had previous experience with gaming. (63) However at CHBAH, it was found that clients did not need previous experience to enjoy TG.

Literature shows that using motivating activities was an inherent part of occupational therapy practice. (19) Therapeutic gaming was used predominantly in the adult neurology section. It is challenging to motivate individuals with neurological impairments, especially to comply with traditional repetitive exercises. (112) It was found that clients with neurological injuries were able to comply with TG interventions compared to traditional exercise programmes. Therapeutic gaming also increased the frequency of practice (19)

The philosophy of occupational therapy is grounded in active participation of the individual in attaining his/her health goals. The success of TG can only be achieved through active participation from the individual and thus the principles of TG align very

well with occupational therapy. Therapeutic gaming allows patients the platform to actively channel their drive into an activity that is not only enjoyable, but which brings self-fulfilment during engagement in occupations. In gist, this is the essence of occupational therapy and what occupational therapists endeavour to achieve with patients.

5.3 Theme 2: Barriers to the use of therapeutic gaming in occupational therapy

5.3.1 Subtheme 2.1: Time consuming

Time was raised frequently by participants. High caseloads made it challenging for therapists using TG at CHBAH to make time available to treat their clients in the occupational therapy gym, where TG took place. Participants expressed that the logistics involved in using TG limited its use; it was not easily accessible and the time needed to set up the console hindered their motivation to use TG clinically. They further reported experiencing glitches when using TG and that this was not conducive for clients with low frustration tolerance. The general lack of time and high caseloads contributed to the study participants not using formal measurement tools to evaluate efficacy of intervention.

Because of the logistics associated with using TG, therapists opted for activities that required less preparation time and was easily accessible. It was implied that therapists would be more open to using TG if the process was more time efficient.

Time was found to be a strong barrier to TG implementation in literature. (17) Factors related to the console specifically, such as having to create user profiles and the multiple cut screens were also found to be a barrier to TG use. This reduced the amount of time available for direct intervention. It was reported that therapists spent more time on preparation when using TG compared to traditional occupational therapy activities. (109) It was found that only half of a 30 minute session is spent actually using TG. It is therefore understandable why therapists would opt for other activities where they can spend the bulk of the session on direct intervention.

South African therapists are challenged with high caseloads (20) and if TG is to be successfully adopted by occupational therapy departments in public health facilities, strategies must be implemented to address this. The Xbox® group, used within the adult neurology section proved to be a good motivating factor. Therapeutic gaming is also performed in a dedicated space which has been supported by literature. (17) Literature recommends close proximity of the console to the treatment area, (110) purchasing multiple consoles and having a standardized set up for the configuration of the console to avoid technical issues. (17) At CHBAH, the Xbox® console was stored in a locked storeroom because of safety concerns. Having the console secured permanently in the treatment room is recommended. The therapists at CHBAH have created a standardized user profile which does reduce the time required to set up the console. Currently TG is only accessible to therapists that are based in the main occupational therapy department at CHBAH. Therapists based in other parts of the hospital; psychiatry, burns and hands unit, are unable to use it and thus purchasing more consoles may be an option going forward. Delegating set up of Xbox® to non-clinical staff was a recommendation from previous studies. (17) This is a realistic suggestion for the CHBAH context because of the availability of non-clinical staff that can assist with this task. One of the glitches experienced whilst using TG at CHBAH was that it would not pick up the movements of individuals who were seated or in wheelchairs. This has also been found in previous studies on commercial gaming devices used for rehabilitation. (19) In the future, commercially available TG should be more adaptable for people with varying needs and abilities.

Therapists have previously cited a lack of time for not using formal measurement tools to evaluate efficacy of intervention. (108) Formal outcome measures were introduced into the adult neurology section at CHBAH through frequent tutorials. The use of these outcome measures were then enforced through senior therapists and management. With frequent use of the outcome measure, therapists began to administer the outcome measures mush faster. It is therefore strongly recommended that the use of outcome measures is aggressively pushed in rehabilitation departments.

A number of studies exist highlighting the challenges of using TG clinically. (109) (19) Game developers must take cognisance of this and use this feedback in creating systems that are therapist and patient friendly. (109) Occupational therapists are perfectly positioned, based on their background in activity analysis and their comprehensive understanding of the occupations individuals engage in, to advise game developers in creating appropriate therapeutic games. (10)

5.3.2 Subtheme 2.2: Limited knowledge, training and exposure

It was found that some participants had limited knowledge on how to use TG clinically and that the lack of exposure to TG, especially in their undergraduate studies hindered their ability to use TG effectively. Therapists felt that TG has a promising future in occupational therapy. However for this to happen, therapists required more exposure to TG and learning opportunities to improve their knowledge and skills in using it. Study participants strongly recommended that TG be introduced into the undergraduate curriculum as a therapeutic modality. Participants were uncertain about where to locate resources to assist them with using TG and that there is insufficient resources on how to use TG with people with disabilities.

The lack of knowledge and experience was recognised as a significant limiting factor in using TG clinically. (17) There have been no studies to date investigating whether South African universities include TG in undergraduate and/or postgraduate curricula. The same applies to courses and workshops that educate therapists on TG. Anecdotal data obtained informally through conversations with occupational therapists from different universities suggest that TG is either not taught at all at an undergraduate level or touched on very briefly. This was not sufficient preparation for the therapists to use TG independently and effectively.

Therapists have limited knowledge on how to incorporate motor learning principles into TG programmes to achieve real life functional goals. (107) Studies show that therapists face challenges when using VR systems with a motor relearning approach. (17) This issue may be further compounded in the South African context where the motor relearning approach is not routinely used by the majority of occupational therapists practicing in the field of neuro-rehabilitation. (127) This may be due to the fact that the

Neurodevelopmental Treatment (NDT) approach is the most commonly taught neurorehabilitation approach in undergraduate (127) and postgraduate studies for the management of individuals with motor impairment following neurological insult. As a result therapists are not greatly aware of the motor relearning approach and its practical implication in improving motor skills. (127)

One of the primary roles of the therapist is to promote the transfer of rehabilitation gains to real world performance. (63) It was also found that there was a lack of resources, clinical tools and general knowledge as well as training opportunities to support therapists in applying TG clinically. (17) The skills required to use TG are similar to those required for other tools in rehabilitation. (63) Best practice strongly recommends therapists need to be sufficiently trained on how to use the tool to achieve specific client goals, the benefits and challenges using TG compared to other tools, and to be able to monitor and document progress using the tool. (63) Educational strategies should be evidence based (85) and include abundant hands-on training. (63) Concerns were raised in literature on the harmful effects of untrained therapists using TG clinically and therefore it is imperative that it is not taken for granted that therapists will be naturally know how to use it effectively and safely. (63)

Previous studies have also shown that therapists did not have information on which games were available to address specific aims. (18)

The researcher conducted tutorials for occupational therapists at CHBAH. This included a formal presentation as well as practical demonstrations where therapists were encouraged to practice using the device. The presentation focused on the therapeutic benefits of TG, the evidence supporting its use and key points of control to ensure the smooth running of the activity. The researcher also presented at the *CHBAH Occupational Therapy Expo* in 2016. Here attendees were given the opportunity to try out TG. The Xbox® group ensures hands on practice using TG. It is recommended that the other teams within the department adopt a similar strategy. Due to the high turnover of therapists at CHBAH, it is recommended that tutorials are done more frequently with the most up to date information available at the time.

Despite CHBAH occupational therapy being a relatively young department – most therapists were under the age of 30 at the time of the study, most of the participants interviewed did not have personal experience using gaming. It is therefore important to consider this when attempting to include TG in rehabilitation departments. The younger generations may be the most technology savvy but this does not necessarily mean that they are familiar and experienced with all types of new technology and therefore will need training, the content of which has been described above.

5.3.3 Subtheme 2.3: High cost of therapeutic gaming

From subtheme 2.3, it was found that the high cost of TG was a limiting factor in using TG in health facilities in the public sector. Participants were also wary of whether patients accessing public health services would be able to afford this technology and use it at home. This was only identified as a limiting factor in one other study. (19) However, it must be acknowledged that the majority of these studies were conducted in developed countries where access to financing for TG was not as difficult. Low cost commercially available hardware has been recommended to reduce costs, (7) but it is still important to ensure that the cost of the console at the expense of the capabilities and therapeutic features it has.

Research must be done to determine feasible options. Therapists can purchase older versions of gaming consoles and project the visuals onto a wall or use a projector screen, rather than purchasing a television. Alternative methods of funding could be considered such as fundraising or requesting donations of older models. In order to request the Xbox® at CHBAH, an extensive literature review was done on the technology which accompanied a comprehensive letter of motivation to the procurement department within the hospital. Therapists are urged to do their research well on the technology and motivate extensively.

5.3.4 Subtheme 2.4: Not all clients are suitable for therapeutic gaming

Participants of this study felt that many of the patients at CHBAH were not appropriate for TG because of the acuity of their illness. They also expressed that TG was not suitable for people with disabilities because it was difficult to grade, too cognitively

challenging for older clients and that it did not always detect movements of clients in seated position, for example when they were sitting on a wheelchair. However the participants felt that TG has a promising future if the technology is more suited for people with disabilities and their unique needs.

The above comments were supported by literature. It was found that commercially available gaming devices lacked customization features to meet the varying needs of individuals with physical, cognitive, social and development impairments, commonly found in clients with cerebral palsy and stroke. (19) Therapists complained that commercial gaming devices had too many distractions such as noise, too many cut screens and did not pick up the movements of clients seated in wheelchairs. (19) In addition, the controllers were difficult to understand and use because of the fine motor control required. (18) Gaming that demanded too much sequencing was also problematic for individuals with brain injuries. (126) Clients were unlikely to enjoy games that were too cognitively demanding and were likely to become frustrated. (19) The feedback provided by the game should not be excessively harsh but should still be accurate and guide the client in how to improve their movements. (18)

Literature recommends that game developers need to be more inclusive in their game design to cater for people with disabilities whilst still being able to achieve therapeutic goals. (109)

5.4 Theme 3: The fit of therapeutic gaming in the philosophy of occupational therapy

5.4.1 Subtheme 3.1: Activities and activity analysis

The participants reported using the typical occupational therapy processes when using TG such as assessing the client's context and goals and selecting a game that will work towards those aims. (109) Therapists also consider the abilities of the client and the personal client factors that would affect game play. (109) Literature states that therapists will have to employ the same skills using TG as with other activities used for therapy – selecting the initial parameters of the game, monitoring the interaction, modify

or progress the challenge depending on the performance of the client and evaluating the outcome. (63) This is in keeping with the tasks undertaken by the participants in this study.

Participants reported that activity analysis was continuous whilst others preferred analysing the game prior to using it with clients. This is also in keeping with the Occupational Therapy Practice Framework which states that assessment is ongoing and takes places throughout the occupational therapy process. (11) It was found that some participants did not have enough time to do activity analysis. This was consistent with literature on South African therapists experiencing high caseloads. (20) Therapists have complained of a lack of time to learn how to use TG clinically. This is supported by previous literature. (107) This is an important factor to consider because understanding of the device is necessary for activity analysis. The same study shows that out of 30 therapists interviewed, only five had used it during normal working hours outside of treatment sessions. This shows that therapists did not have sufficient opportunity to learn how the game works without the pressure of using it in a formal treatment session with a client.

5.4.2 Subtheme 3.2: Therapy is meaningful

Participants reported that TG had a role to play in occupational therapy because it was a meaningful activity and it had a positive effect on occupational performance. As stated earlier, the use of meaningful activities as intervention activities is a core component of occupational therapy philosophy and practice. (11) Meaning, motivation and feelings of wellbeing are interlinked. It has been found that occupational therapists employ activities that are deemed meaningful to the client as a way to encourage motivation and facilitate feelings of wellbeing. (11)

Occupational therapists have found that across the generations, individuals find meaning in using technology (9) and that older generations want support on how they can use technology to perform occupations they deem meaningful. (29) This must be acknowledged and therapists must engage more actively in the unique ways individuals across generations use technology and how therapists can better support patients in the event of occupational dysfunction.

Gaming is an occupational activity in itself and because of the enjoyment and meaning derived from TG, it must be understood that TG can be used as a standalone activity and not just for the goal of improving other impairments.

Participants reported that if TG was more occupation oriented, then it would have more potential as a promising role in occupational therapy. This has also been supported by literature where therapists have expressed a need for more functional or reality based games, especially for clients with cognitive and perceptual problems. (18) In a previous study, a therapist selected game titles that the client previously performed and which were meaningful to him such as golf and bowling. (18)

5.4.3 Subtheme 3.3: Flow

Participants reported that TG contributed towards a state of flow and that they employed this technique to distract patients when they experience pain or to encourage longer sessions. This is in keeping with previous literature which shows that the desire to distract patients was rated one of the top motivators for using TG. (109)

Flow has been found to be beneficial in occupational therapy because when a client is completely absorbed in the activity that is also appropriately stimulating and challenging, he is likely to experience feelings of pleasure and clarity. (74) This relates closely to a previous finding from this study that shows therapists find TG appealing because it is enjoyable and motivating.

5.4.4 Subtheme 3.4: Holistic

Participants reported that it was important for therapists to be more informed on technology so that it would aid holistic intervention. This has been supported by literature and commentators have urged therapists to become more aware of the role of mainstream technology in individuals' lives. (10) Previous studies show that the majority of occupational therapists feel they should be able to assess and prescribe electronic assistive technology however only a third was able to do so. These therapists are thus less likely to prescribe them, even when it is indicated. (92) Therapists may be less interested in electronic technology because it does not feature routinely in assessment tools for activities of daily living. (93) Other factors include clients not being perceived as

electronic technology users. (10) It has been seen that when electronic technology is included in treatment, it is done so superficially. (10) It is therefore strongly recommended that this is addressed extensively in undergraduate studies and assessments.

Participants stated that the wide range of aims that TG, specifically X-Box® could address made it an appealing treatment tool. This was in keeping with a previous finding in this study that showed therapists found TG much more dynamic and had a lot more to offer therapeutically than traditional activities. This theme was strongly supported by literature as an appealing factor for therapists however evidence that TG is used to address a variety of aims and with people of varying conditions may be testimony to this.

An earlier finding in this study showed therapists were of the perspective that TG was not suitable for people with disabilities. In order for technology to enable people with disabilities, it must take into consideration the unique needs and challenges of people with disabilities. If for example, the device contains many components which are beyond the abilities of the client, he/she would be less likely to use it.

5.5 Theme 4: Occupational therapists' perception on evidence based practice in the use of therapeutic gaming

5.5.1 Subtheme 4.1: Research evidence

Some participants based the effectiveness of TG on evidence based practice. Literature shows that evidence from well conducted research may be less prone to bias. (105) Therapists believed that standardized evaluation should be conducted to provide valid data. (103) However they noted that the results of these assessments often conflicted with their observations of the client and that the information from the assessments was not sufficient to make holistic treatment decisions. (103) When their assessment results differed from their own observations, they relied on their observations. (103) This is significant in the South African context where standardized evaluations may not be appropriate for the local populations.

There are limitations to applying recommendations from international studies to the local South African context. For example, the issue of cost was not raised as a limiting factor in studies conducted in developed countries. However this was raised repeatedly by participants in this study. The context and environment in which health services are delivered locally differ vastly from that of developed countries. Consequently, the environments in which studies are conducted differ. The CHBAH context is a unique one – staff work under severe time constraints and working hours must be divided amongst many commitments; training and supervising students, administration duties, meetings and numerous professional and clinical trainings. There is also a need for effectiveness to be investigated in the local context, taking into account time and funding constraints on both behalf of the service provider (therapist) and the patient. It must be noted that clients using TG in the CHBAH context had significantly lower intervention doses (once/twice a month) for approximately 30-40 minutes compared to international studies.

5.5.2 Subtheme 4.2: Peer feedback

Some participants used feedback from colleagues to determine the effectiveness of TG. Literature shows that therapists sought evidence from their occupational therapist peers and other healthcare workers. (103) They associated this source of evidence with being helpful, supportive and easily available. (103) Therapists sought information from more senior therapists and experts in the field. (103) This may be particularly relevant in settings where there is a defined hierarchy within a team based on levels of experience. It is only natural that less experienced therapists would seek advice regarding clinical decisions from more experienced therapists. This is commonly done at CHBAH occupational therapy department. It is therefore strongly recommended that senior therapists are up to date on current occupational therapy practice and also assist junior therapists in developing their own clinical reasoning and how to access their evidence based information independently.

As stated earlier, peer pressure was found to be a strong motivating factor amongst therapists in adopting a new intervention. Therapists relied heavily on input from each other in facilitating clinical reasoning and determining the effectiveness of interventions.

This may be influenced by a lack of local studies on TG and thus therapists rely on each other clinical experiences. This level of evidence however is lacking in validity and therefore to counter the over reliance on this level of evidence, more formal research must be conducted locally. More so, this data must be easily accessible to therapists in the field.

5.5.3 Subtheme 4.3: Clinical experience

Some participants reported basing the effectiveness of TG on their own personal experience and observations using TG. Literature states that therapists must use their clinical experience to tailor TG to suit each client and their needs. (107) Clinicians value their own clinical experience when required to make clinical decisions. (103) They compare interventions that they performed previously with different clients or a given client. (103) In terms of levels of evidence, clinical experience may be equivalent to case studies. As stated earlier in the literature review, case studies are considered a weak level of evidence with low levels of reliability and generalisability. However we acknowledge that in the absence of formal evidence in South Africa, clinical experiences can be drawn on to aid clinical reasoning.

5.5.4 Subtheme 4.4: Patient feedback

Some participants used feedback from the patient as an indicator of whether TG was effective. As client centred practitioners, they felt that their client should direct their treatment and that there should be a balance between scientific evidence and the client's wishes regarding treatment. (103) This finding is supported by previous literature where 40% of therapists reported the therapeutic benefits of TG as a reason to use it again. (107) However, similar to clinical experiences and case studies, patient feedback is also considered a weak level of evidence because of its low levels of reliability and generalisability. Therefore, this cannot be the only level of evidence we use in evaluating the effectiveness of our interventions.

5.5.5 Subtheme 4.5: Lack of research evidence in South Africa

Participants felt that TG was still in the early stages in CHBAH and that therapists needed to make a concerted effort to investigate further on TG in order to use it more

effectively. The use of TG needs to be encouraged more at CHBAH as therapists favoured other activities over TG because of time constraints. TG is still in its infancy in occupational therapy and the technology needs to be improved for people with disabilities.

The majority of the studies conducted on TG were in developed countries. This makes the generalisation of findings to South African settings challenging. Literature states that technology used for rehabilitation have different requirements than regular video games. The following should be considered when designing TG for rehabilitation: appropriate game genres, reinforcement and motivation strategies, the level of challenge, degree of realism, gender, cultural background and developmental, emotional and physical states. (128) The number of settings the therapist needs to adjust for each client should be kept to a minimum. (7) This includes cut screens and on screen instructions. (7) User profiles should be easy to create, store and retrieve. (7) Calibration of the console must be straightforward. (7) The game must be easy to grade without expecting the client to start the game over. (7) The device should be able to log meaningful data on the individual's performance and this must be easily retrieved. (7) (129) The games must have a fair balance of being fun, meet therapy goals and still be adjustable to address a range of client abilities. There is also a need for a greater variety of game titles to address novelty and personal preferences. (18)

5.6 Study limitations

Member checking and peer examination could have been applied to aid credibility.

The use of the interview notebook could have been used more effectively as a tool to aid reflexivity and thus credibility.

Triangulation of data by including participant observations could have also aided credibility.

The focus of this study was on occupational therapists at CHBAH. This setting has its own unique characteristics such as acuity of patients and time constraints. It is

recommended that this study is conducted in different clinical settings such as rehabilitation centres in the public sector and private rehabilitation facilities.

CHAPTER 6: CONCLUSION

6.1 Study conclusions

This chapter will summarise the main conclusions under each objective of the study:

Objective 1: To determine the factors motivating and limiting occupational therapists use of TG at CHBAH:

The presence of peer support and knowledge experts on TG within the occupational therapy department was found to be a strong motivating factor for the adoption of TG by therapists. Therapists were more motivated to use TG if peers were using it and the sharing of information on treatment sessions aided clinical reasoning.

The weekly 'X-Box group' encouraged the consistent use of TG by the therapists within the adult neurology section. The overt expectation from senior therapists as well as allocation of a specific time during the week for TG use formalised and routinised the process and thus did not leave the use of TG to the personal discretion of the therapist. This is particularly significant in busy clinical settings and during the early stages of adopting a new intervention.

The mainstream use of technology by individuals and the influence of technology on the completion of occupations was found to be a motivating factor for therapists to include TG in treatment programmes. Technology also has widespread appeal and is used by both young and old. This also made TG appealing to therapists. The appeal of technology to younger generations was especially identified as a motivating factor to use TG.

Sentiments arose regarding the appropriateness of traditional activities in today's practice of occupational therapy. Participants felt that therapists were stuck using traditional activities such as crafts. Therapists also felt that traditional activities were not always practical and that they lacked the versatility which technology interventions had.

Participants found it easy to learn how to use TG and that with sufficient practice, they would be able to master how to use it effectively.

Some participants noted that patients found TG fun and motivating and that this resulted in an improvement in function. This enjoyment and motivation carried over other parts of the treatment programme such as the patient's willingness to complete activities of daily living in the ward, in addition to other occupations. It was found that even patients with no prior exposure to TG enjoyed it.

Therapists found that despite having appropriate patients for TG, time constraints were a barrier to TG use. These time constraints were influenced by high caseloads. The logistics involved in using TG; portering patients to the OT gym and setting up the equipment. The 'glitches' experienced when using TG was also found to be frustrating for therapists and patients and also reduced the time available for actual intervention. Therapists also stated that time constraints also limited their use of measuring tools regularly.

Therapists felt that their limited knowledge, training and exposure to TG deters therapists from using it clinically. Therapists were unsure of how to grade using TG. Therapists noted that a lack of exposure to TG at an undergrad level as a possible limiting factor for the use of TG by therapists. The inclusion of TG in the undergrad curriculum was strongly encouraged in order to increase knowledge and skills in TG application as well as to increase the range of treatment modalities available. Therapists had little awareness of resources available to assist them in their use of TG and that that was especially a gap in the market for therapeutic gaming that was tailored for people with disabilities.

The high cost of TG was raised by therapists as a limiting factor. Cost limits access to patients as they were not able to carry out the intervention within the home setting post discharge. Accessing TG within the public health sector may also be challenging because of budget constraints. Therapists were however still optimistic about the use of TG going forwards as they believed that over time, TG would become more affordable and easily accessible.

Therapists were of the opinion that TG was not suited for all people with disabilities and that there is a need for TG to be tailored for this population, taking into their accounts their unique needs.

Objective 2: The fit of TG in the philosophy of occupational therapy

Therapists reported using the typical occupational therapy process when using TG with patients. Some indicated that they performed activity analysis continuously throughout the occupational therapy process whilst others preferred analysing the activity before using it. Time constraints were also a deterrent to being able to undertake activity analysis.

Therapists want to use meaningful activities in therapy and TG was found to be one such example of this. There is potential for TG to be more meaningful for patients in the future. The fulfilment of activities is a significant goal in occupational therapy and therefore it is necessary for therapists to be aware of the technological context in which individuals live.

Participants reported that TG contributed towards a state of flow and that they employed this technique to distract patients when they experience pain or to encourage longer sessions.

Participants reported that it was important for therapists to be more informed on technology and the role it plays in their clients live and how this information can be used to aid holistic intervention.

Objective 3: Occupational therapist's perceptions on evidence based practice in the use of TG

Therapists employed a variety of techniques in determining the effectiveness of TG. These include research evidence, peer feedback, clinical experience and patient feedback. Therapists expressed a lack of research evidence on TG in South Africa.

6.2 General recommendations and recommendations for future studies

The Xbox® group employed by the adult neurology section ensured regular and consistent use of the technology within the team. This was supported by a firm expectation from senior therapists within the team to use TG. This team approach also encouraged knowledge transfer from more experienced therapists to less experienced therapists in the team.

In order for therapists to become competent in therapeutic gaming, knowledge translation strategies must be evidence based and include abundant hands on practice. Therapists need to be more informed on technology and the role that it plays in occupational performance. This will aid holistic – person centred intervention. Greater awareness on game titles and the therapeutic properties of these titles is needed.

In general, it is imperative that therapists keep up to date on developments within the occupational therapy fraternity and evidence based interventions.

There needs to be a concerted effort by experts in TG within the occupational therapy fraternity to share their knowledge with the broader rehabilitation community. This can be achieved through journal clubs at public hospitals where therapists are employed and presenting at rehabilitation conferences. The CHBAH Occupational Therapy Expo and district meetings can be used to share latest findings on TG and therapists' personal experiences using TG. Findings from this study must be published in South African based journals for greater dispersion of information.

To encourage adoption of TG in time constrained departments, the following is recommended: delegating set up of TG to support staff, having a dedicated space for TG, close proximity of TG to frequently used treatment areas, multiple consoles, standardised set up for configuration of console and a permanent location for the equipment. More frequent practice and exposure to TG also allows for faster set up.

Time constraints has hindered therapists' use of evidence based outcome measures. However during the researcher's clinical experience at CHBAH, it was found that the

more practice therapists had on using formal measurement tools, the faster they became on conducting them. The expectation from senior therapists within the team ensured it was used routinely. This is recommended for other teams within the department.

It is strongly recommended that universities include more technology based tools in their occupational therapy curricula. This is not only limited to TG but other mainstream technology (cellular phones, tablets etc.) and how these can be incorporated into interventions.

There is a need for games that are suited for people with disabilities. Occupational therapists have the knowledge and skills to advise game developers on developing appropriate games.

The financial implications of using TG were raised frequently in this study. To counter this, therapists may need to consider alternative options such as purchasing older consoles or request donations if funding is problematic. To further reduce costs, visuals from the game can be projected onto a wall/projector screen using a projector. This negates extra costs involved in purchasing a television.

The relationship younger therapists and students have with technology must be acknowledged by lecturers and fieldwork supervisors. As stated in literature, this relationship can be used positively to aid clinical practice.

As evidenced in the discussion, there is a dire shortage of research in South Africa on TG. More research needs to be conducted in this field to aid local therapists in making clinical decisions on TG as an intervention. Further research is also indicated into the status of crafts in occupational therapy and undergraduate curricula, in addition to the relevance of crafts as an occupation in the South African context.

Literature shows that electronic technology is not routinely incorporated into formal assessments. This has been identified as a possible limiting factor for therapists including electronic technology in treatment programmes. This area requires further investigations.

Bibliography

1. www.wikipedia.org. [Online]. [cited 2019 January 5. Available from: https://en.wikipedia.org/wiki/Mobile_app.

2. www.searchmobilecomputing.techtarget.com. [Online].; 2013 [cited 2019 January 5. Available from: https://searchmobilecomputing.techtarget.com/definition/WhatsApp.

3. www.uberestimate.com. [Online]. [cited 2019 January 5. Available from: http://uberestimate.com/about-uber/.

4. www.webopedia.com. [Online]. [cited 2019 January 5. Available from: https://www.webopedia.com/TERM/W/Wii.html.

5. www.techopedia.com. [Online]. [cited 2019 January 5. Available from: https://www.techopedia.com/definition/10695/kinect.

6. www.engadget.com. [Online].; 2010 [cited 2019 January 5. Available from: https://www.engadget.com/2010/03/11/playstation-move-everything-you-ever-wanted-to-know/.

7. Annema JH, Verstraete M, Abeele VVDS, Geerts D. Videogames in therapy: a therapist's perspective. Fun and Games. 2010 September;: p. 15-17.

8. Levine RE. The Influence of the Arts-and-Crafts Movement on the Professional Status of Occupational Therapy. The American Journal of Occupational Therapy. 1987; 41(4).

9. Emiliani P. Assistive technology (AT) versus mainstream technology (MST): The research perspective. Technology and Disability. 2006; 18(1): p. 19-29.

10. Nygard L, Rosenberg L. How attention to everyday technology could contribute to modern occupational therapy: A focus group study. British Journal of Occupational Therapy. 2016; 79(8): p. 467-474.

11. American Occupational Therapy Association. Occupational Therapy Practice Framework: Domain and Process 3rd edition. American Journal of Occupational Therapy. 2014; 68(1).

12. Glegg S, Levac D, Sveistrup H, H C, Finestone H, DePaul V, et al. Integrating motor learning and virtual reality into practice: a knowledge translation challenge.

In 10th International Conference on Disability, Virtual Reality and Associated Technologies ; 2014; Gothenburg, Sweden.

13. Staiano S, Flynn R. Therapeutic uses of active videogames: A systematic review. Games for Health Journal: Research, Development and Clinical Applications. 2014; 3(6).

14. Alankus G, Lazar A, May M, Kelleher C. Towards customizable games for stroke rehabilitation. In Conference on Human Factors in Computing Systems, CHI '10; 2010; Atlanta. p. 2113-2122.

15. Hoffman H, Doctor J, Patterson D. Virtual reality as an adjunctive pain control during burn wound care in adolescent patients. Pain. 2000;(85): p. 305-309.

16. Sandlund M, Waterworth E, Hager C. Using motion interactive games to promote physical activity and enhance motor performance in children with cerebral palsy. Developmental Neurorehabilitation. 2011; 14: p. 15-21.

17. Glegg S, Holsti L, Velikonja B, Ansley C, Brum D, Sartor D. Factors influencing therapists' adoption of virtual reality for brain injury rehabilitation. Journal of Cyberpsychology, Behaviour and Social Networks. 2012; 16(5): p. 385-401.

18. Putnam C, Cheng J, Seymour G. Therapist Perspectives: Wii active videogames use in inpatient settings with people who have had a brain injury. Games for health journal: Research, Development, and Clinical Applications. 2014; 3(6): p. 351-362.

19. Tatla SK, Shirzad N, Lohse KR, Virji-Babul N, Hoens AM, Holsti L, et al. Therapists' perceptions of social media and video game technologies in upper limb rehabilitation. JMIR Serious Games. 2015 January-June; 3(1).

20. Wasserman S, de Villiers L, Bryer A. Community based care of stroke patients in a rural African setting. South African Medical Journal. 2009 August; 99(8): p. 579-583.

21. Mayosi B, Lawn J, Niekerk AV, Bradshaw D, Karim S, Coovadia H. Health in South Africa: changes and challenges since 2009. The Lancet. 2015; 380(9858): p. 5-19.

22. Law M, Cooper B, Strong S, Stewart D, Rigby P, Letts L. The Person-Environment-Occupation Model: A transactive approach to occupational performance. Canadian Journal of Occupational Therapy. 1996; 63(1): p. 9-23.

23. Kielhofner G. Model of Human Occupation: Therory and Application. 3rd ed. Julet

T, editor. Baltimore, Maryland: Lippincott Williams and Wilkins; 2002.

24. Sumsion T. Client centred practice in occupational therapy Edinburgh: Churchill Livingstone; 1999.

25. Llorens L. Activity analysis: Agreement between participants and observers on perceived factors in occupation components. Occupational Therapy Journal of Research. 1993; 13(3): p. 198-211.

26. Yerxa EJ. An introduction to occupational science, a foundation for occupational therapy in the 21st century. 1990; 6(4): p. 1-17.

27. Csikszentmihalyi M. Beyond boredom and anxiety: The experience of play in work and games San Francisco : Jossey-Bass; 1975.

28. Davy J. www.otasa.org.za. [Online].; 2003 [cited 2017 July 15. Available from: https://otasa.org.za/history/.

29. Larsson E, Larsson Lund M, Nillson I. Older people's health-related ICT use in Sweden. Gerontechnology. 2013; 12(1): p. 36-43.

30. Larsson E, Nilsson I, Larsson Lund M. Participation in social-internet based activities: Five seniors' intervention processes. Scandinavian Journal of Occupational Therapy. 2014; 20(6): p. 471-480.

31. Hawley M. Speech recognition as an input to electronic assistive technology. British Journal of Occupational Therapy. 2002; 65(1): p. 15-20.

32. Verdonck M, McCormack C, Chard G. Irish occupational therapists' views of electronic assistive technology. British Journal of Occupational Therapy. 2011; 74(4): p. 185-190.

33. Hills C, Ryan S, Smith D, Warren-Forward H. The impact of 'Generation Y'occupationla therapy students on practice education. Australian Occupational Therapy Journal. 2012; 59: p. 163-163.

34. Oblinger D, Oblinger J. Educating the net generation Washington DC: EDUCAUSE ; 2005.

35. Twenge J. Generation me: Why today's young Americans are more confident, assertive, entitled -- and more miserable than ever before New York: Free Press ; 2006.

36. Nimon S. Generation Y and higher education: The other Y2K. Journal of Institutional Research. 2007; 13(1): p. 24-41.

37. Tapscott D. Grown up digital: How the Net Generation is changing your world New York: McGraw Hill Professional ; 2009.

38. Hills C, Boshoff K, Gilbert-Hunt S, Ryan S, Smith D. The future in their hands: the perceptions of practice educators on the strengths and challenges of 'Generation Y' occupational therapy students. The Open Journal of Occupational Therapy. 2015; 3(4): p. 1-16.

39. Kashani R, Burwash S, Hamilton A. To be or not to be on Facebook: That is the question. Occupational Therapy Now. 2010; 12(6): p. 19-22.

40. Boudreau M. Is there a generation gap in occupational therapy? Occupational Therapy Now. 2009; 11(2): p. 16-18.

41. Pollanen S. Craft as context in therapeutic change. The Indian Journal of Occupational therapy. ; 41(2): p. 43-47.

42. Kleinman B, Stalcup A. The effect of graded craft activities on visuomotor integration in an inpatient child psychiatry population. American Journal of Occupational Therapy. 1991; 45(4): p. 324-330.

43. Mullersdorf M, Ivarsson AB. What, why, how - creative activities in occupational therapy in Sweden. Occupational Therapy International. 2016; 23: p. 369-378.

44. Reynolds F. Cognitive behavioural counseling of unsolved grief through the therapeutic adjunct of tapestry making. The arts in psychotherapy. 1999; 26: p. 165-171.

45. Howie L, Coulter M, Feldman S. Crafting the self: older persons' narratives of occupational identity. American Journal of Occupational Therapy. 2004; 58(4): p. 446-254.

46. Anderson Sviden G, Borell L. Experiences of being occupied - some elderly people's positive experiences of occupationa at community-based activity centres. Scandinavian Journal of Occupational Therapy. 1998; 5: p. 133-139.

47. La Cour K, Josephsson S, Tishelman C, Nygard L. Experiences of engagement in creative activity at a palliative care facility. Palliative and and Supporting Care. 2007; 5: p. 241 - 250.

48. Nilsson I, Nygard L. Geriatric rehabilitation: elderly clients' experiences of a pre-discharge occupational therapy group programme. Scandinavian Journal of Occupational Therapy. 2003; 64(3): p. 121-128.

49. Reynolds F, Prior S. 'A lifestyle coat hanger'- a phenomenonological study of the meaning of artwork for women coping with chronic illness and disability. Disability and rehabilitation. 2003; 25(14): p. 785-794.

50. La Cour K, Josephsson S, Luborsky M. Creating connections to life during life-threatening illness: creative activity experienced by elderly people and occupational therapists. Scandinavian Journal of Occupational Therapy. 2005; 12: p. 98-109.

51. Timmons A, MacDonald E. 'Alchemy and magic': the experience of using clay for people with chronic illness and disability. British Journal of Occupational Therapy. 2008; 71(3): p. 86-94.

52. Perrin T. Don't despise the fluffy bunny: a reflection from practice. British Journal of Occupational Therapy. 2001; 64(3): p. 129-134.

53. Perruzza N, Kinsella E. Creative arts occupations in therapeutic practice: a review of the literature. British Journal of Occupational Therapy. 2010; 73(6): p. 261-268.

54. Harris E. The meanings of craft to an occupational therapist. Australian Occupational Therapy Journal. 2008; 55(2): p. 133-142.

55. Mullersdorf M, Ivarsson A. Use of creative activities in occupational therapy practice in Sweden. Occupational Therapy International. 2012; 19: p. 127-134.

56. Woolley M, Sabiescu A, Waelde C, Cummings C, Modest W, Konniger S, et al. The use of craft skills in new contexts. Renewal, Innovation and Change: Heritage and European Society ; 2015.

57. Reilly M. Occupational therapy can be one of the greatest ideas of 20th century medicine. 1961 Eleanor Clarke Slagle Lecture. American Journal of Occupational Therapy. 1962; 16: p. 1-9.

58. Hooper B, Wood W. The philosophy of occupational therapy: A framework for practice. In Boyt Schell B, Gillen G, Scaffa M, editors. Willard and Spackman's Occupational Therapy 12th edition. Philadelphia: Lippincott Williams and Wilkins ; 2014. p. 35-46.

59. Turner A, Foster M, Johnson SE. Occupational therapy and physical dysfunction: Principles, skills and practice. 5th ed.: Churchill Livingstone; 2002.

60. Schultheis M, Himelstein J, Rizzo A. Virtual reality and neuropsychology: upgrading the current tools. J. Head Trauma Rehabilitation. 2002;(17): p. 378-394.

61. Riva G, Davide F, Ijsselsteijn W. Being There: Concepts, effects and measurements of user presence in synthetic environments. In Emerging Communication: Studies on New Technologies and Practices in Communication. 2003; 5.

62. Schultheis M, Rizzo A. The application of virtual reality technology in rehabilitation. Rehabilitation Psychology. 2001;(46): p. 296-311.

63. Levac D, Galvin J. When is Virtual Reality "Therapy"? Archives of Physical Medicine and Rehabilitation. 2013; 94(4): p. 795-798.

64. Johansson C. The future is now for occupational therapy. OT Week. 1999;: p. 8-9.

65. Liu L. Virtual reality and occupational therapy. OT Now. 2005;: p. 24-25.

66. Biocca F, Levy M. Communication in the age of virtual reality. viii ed. Hillsdale, NJ: Lawrence Erlbaum Associates ; 1995.

67. Steuer J. Defining virtual reality: Dimensions determining telepresence. Journal of communication. 1992;(42): p. 73-93.

68. Gao Z, Chen S. Are field based-exergames useful in preventing childhood obesity? A systematic review. Obesity Review. 2014; 15: p. 676-691.

69. Gao Z, Podlog L, Huang C. Associations among children's situational motivation, physical activity participation, and enjoyment in an active dance video game. Journal of Sport and Health Science. 2013; 2: p. 122-128.

70. www.theESA.com. [Online].; 2015 [cited 2018 January 30. Available from: http://www.theesa.com/wp-content/uploads/2015/04/ESA-Essential-Facts-2015.pdf.

71. Kuo A. A transactional view: occupation as a means to create experiences that matter. Journal of Occupational Science. 2011; 18(2): p. 131-138.

72. Tham K, Kielhofner G. Impact of the social environment on occupational

experience and performance among persons with unilateral neglect. American Journal of Occupational Therapy. 2003; 57(4): p. 403-413.

73. Foran AC. Learning from expereince: shared constructs in virtual reality and occupational therapy. International Journal of Therapy and Rehabilitation. 2011; 18(7): p. 362-369.

74. Rebeiro KL, Miller Polgar J. Enabling occupational performance: Optimal experiences in therapy. Canadian Journal of Occupational Therapy. 1999; 6(1): p. 14-22.

75. Hachey R, Mercier C. The impact of rehabilitation services on the quality of life of chronic mental patients. Occupational therapy in mental health. 1993; 12(2): p. 1-26.

76. Larson R. Flow and writing. Optimal Experience: Psychological studies of flow in consciousness. In M Csikszentmihalyi M, Csikszentmihaly L, editors.. New York: Cambridge University Press ; 1985.

77. Allison M, Carlisle Duncan M. Women, work and flow. In Csikzsentmihalyi M, Csikszentmihalyi I, editors. Optimal experience: psychological studies of flow in consciousness. New York: Cambridge University Press; 1988.

78. Han S. The relationship between life satsifaction and flow in elderly Korean immigrants. In Csikszentmihalyi M, Csikszentmihalyi I, editors. Optimal experience: Psychological studies of flow in consciousness. New York : Cambridge University Press; 1988. p. 138-149.

79. Csikentmihalyi M, Csikszentmihaly I. Optimal experience: Psychological studies of flow in consciousness New York: Cambridge University Press ; 1988.

80. Baumgartner T, Valko K, Esslen M. Neural correlate of spatial presence in an arousing and non-interactive virtual reality: AN EEG and psycho-physiology study. Cyberpsychology Behaviour and Social Networking. 2006; 9(1): p. 30-45.

81. Whiteford D, Townsend E. A participatory occupational justice framework: population-based processes of practice. In Kronenberg F, Pollard N, Sakellarious D, editors. Occupational therapy without borders: learning from the spirit of survivors.: Edinburgh: Elsevier Churchill Livingstone ; 2011. p. 65-84.

82. Lupton D, Seymour W. Technology, selfhood and physical disability. Social

Science and Medicine. 2000; 50(12): p. 1851-1862.

83. Reid D. Virtual reality and the person-environment experience. Cyberpsychology Behaviour and Social Networking. 2002; 5(6): p. 559-565.

84. Gamberini L, Marchetti F, Martino F. Designing a serious game for young users: The case of happy farm. Studies in health technology and informatics. 2009; 144: p. 77-81.

85. Grimshaw J, Shirran L, Thmoas R, Mowatt G, Fraser C, Bero L. Changing provider behavior: an overview of systematic reviews of interventions. Medical Care. 2001; 39: p. 2-45.

86. Bonnechere B, Jansen B, Omelina L, Van Sint Jan S. The use of commercial video games in rehabilitation: a systematic review. International Jpurnal of Rehabilitation Research. 2016; 39(4): p. 277-290.

87. Jutai J, Rigby P, Shone Stickel M. Psychosocial impact of electronic aids to daily living. Assistive Technology. 2000; 12(2): p. 123-31.

88. Harmer J, Bakheit A. The benefits of environmental control systems as perceived by disabled users and their carers. British Journal of Occupational Therapy. 1999; 62(9): p. 394-398.

89. Verdonck M, Ryan S. Mainstream technology as an occupational therapy tool: technophobe or technogeek? British Journal of Occupational Therapy. 2008; 71(6): p. 253-256.

90. Malinowsky C, Rosenberg L, Nygard L. An approach to facilitate healthcare professionals' readiness to support technology use in everyday life for persons with dementia. Scandinavian Journal of Occupational Therapy. 2014b; 21(3): p. 199-209.

91. Upton D, Stephens DWB. Occupational therapists' attitudes, knowledge, and implemetation of evidence-based practice: A systematic review of published research. British Journal of Occupational Therapy. 2014; 77(1): p. 24-38.

92. Scherer M. Living in the state of stuck: how technology impacts on the lives of people with disabilities. 3rd ed. Cambridge : MA: Brookline Books; 2000.

93. Munoz-Neira C, Lopez O, Riveros R. The technology-activities of daily living questionnaire: A version with a technology-related subscale. Dementia and

Geriatric Cognitive Disorders. 2012; 33(6): p. 361-371.

94. Orton M. Factors that may be considered by occupational therapists during the assessment of cleints for assistive technology and whether it permeates through to the eventual prescription. Journal of Assistive Technology. 2008; 2(1): p. 11-22.

95. Smith R. The role of occupational therapy in a developmental technology model. American Journal of Occupational Therapy. 2000; 54(3): p. 339-340.

96. Sackett D, Rosenberg W, Gray J, Haynes R, Richardson W. Evidence based medicine: What it is and what it isn't. ; 312: p. 71-72.

97. Sackett D, Richardson W, Rosenberg W, Haynes R. Evidence-based medicine: How to practice and teach EBM Edinburgh: Churchill Livingstone; 1997.

98. Bennett S, Bennett JW. The process of evidence based practice in occupational practice. Australian Occupational Therapy Journal. 2000; 47: p. 171-180.

99. Higgs J. Developing clinical reasoning competencies. Physiotherapy. 1992; 78: p. 575-581.

100. Unsworth C. Clinical reasoning in occupational therapy. In Unsworth C. Cognitive and perceptual dysfunction: A clinical reasoning approach to evaluation and intervention. Philadelphia : FA Davis ; 1999. p. 43-73.

101. Canadian Association of Occupational Therapy. Joint position paper on evidence-based occupational therapy. Canadian Journal of Occupational Therapy. 1999; 66: p. 267-269.

102. Johnston M, Ottenbacher K, Reichardt C. Strong quasi-experimental designs for research on the effectiveness of rehabilitation. American Journal of Physical and Medical Rehabilitation. 1995; 74: p. 383-392.

103. Dubouloz C, Egan M, Vallerand J, Von Zweck C. Occupational therapists' perceptions of evidence-based practice. American Journal of Occupational therapy. 1999; 53(5): p. 445-453.

104. Gustafsson L, McKenna K. Treatment approaches for clients with a stroke affected upper limb: Are we following evidence based practice? Australian Occupational Therapy Journal. 2003; 50(4): p. 205-215.

105. Tickle-Degnen L. Organizing, evaluating and using evidence in occupational

therapy practice. American Journal of Occupational Therapy. 1999; 53: p. 537-539.

106. Sackett D, Richardson W, Rosenberg W, Haynes R. Evidence based medicine: How to practice and teach EBM. 2nd ed. Edinburgh : Churchill Livingstone ; 2000.

107. Glegg S, Holsti L, Velikonja B, Ansley C, Brum D, Sartor D. Factors influencing therapists' adoption of virtual reality for brain injury rehabilitation. Journal of Cyberpsychology, Behaviour and Social Networks. 2012;(16).

108. McCluskey A. Increasing the use of research evidence by occupational therapists. Penrith South : University of Western Sydney ; 2004.

109. Putnam C, Cheng J. Therapist-Centred Requirements: a multi-method approach of requirmenet gathering to support rehabilitation gaming. IEEE. 2014.

110. Weiss P, Sveistrup H, Rand D. Video capture virtual reality: a decade of rehabilitation assessment and intervention. Physical Therapy Reviews. 2009; 14: p. 307-321.

111. McGaugh J. Emotional arousal and memory consolidation. Behavioral Sciences. 2018; 19: p. 55-60.

112. Betker A, Desai A, Nett C. Game based exercises for dynamic short-sitting balance rehabilitation of people with chronic spinal cord and traumatic brain injuries. Physical Therapy. 2007;(87): p. 1389-1398.

113. Naumes J. Use of Technology in Occupational Therapy Rehabilitation from an Elderly Perspective. Health Care. ; 13: p. 79-90.

114. Verdonck M, McCormack C, CHard G. Irish occupational therapists' views of electronic assistive technology. British Journal of Occupational Therapy. 2011; 74(4): p. 185-190.

115. Creswell J. Reserach Design, Qualitative, Quantitative, and Mixed Methods Approaches. 3rd ed.: SAGE; 2009.

116. Baxter P, Jack S. Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. The Qualitative Report. 2008; 13(4): p. 542-559.

117. Palinkas L, Horwitz S, Green C, Wisdom J, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in mixed method

implementation research. Administration and Policy in Mnetal Health and Mental Health Sevices Research. 2015 September; 42(5): p. 533-544.

118. DiCicco-Bloom B, Crabtree B. The qualitative research interview. Medical Education. 2006; 40(4): p. 314-321.

119. Guba E. Criteria for assessing the trustworthiness of naturalistic inquiries. Educational Resources Information Center Annual Review Paper. 1981; 29(75): p. 75-91.

120. Henning E, Rensburg W, B S. Finding your way in qualitative research. First ed.: Van Schaik Publishers; 2004.

121. Cavanagh S. Content analysis: concepts, methods and applications. Nurse Researcher. 1997; 4: p. 5-16.

122. Elo S, Kyngas H. The qualitative content analysis process. Journal of Advanced Nursing. 2007; 62(1).

123. Harwood T, Garry T. An overview of content analysis. The Marketing Review. 2003; 3: p. 479-498.

124. www.statssa.gov.za. [Online]. [cited 2018 January. Available from: http://www.statssa.gov.za/?page_id=993&id=city-of-johannesburg-municipality.

125. Levac DE, Galvin J. When is Virtual Reality "Therapy"? Archives of Physical Medicine and Rehabilitation. 2013;(94): p. 795-8.

126. Levac D, Rivard L, Missiuna C. Defining the active ingredients of interactive computer play interventions for children with neuro-motor impairments: a scoping review. Reserach in Developmental Disabilities. 2012; 33: p. 214-223.

127. Freeme JD. A proposal for an undergraduate stroke rehabilitation curriculum appropriate for South African occupational therapy. SAJOT. 2014 April; 44(1).

128. Goh D, Ang R, Tan H. Strategies for designing effective psychotherapeutic gaming interventions for children and adolescents. Computers in Human Behaviour. 2008; 24: p. 2217-2235.

129. Jung Y, Stewart J, Yeh S. Tailoring Virtual Reality Technology for Stroke Rehabilitation: A Human Factors Design. In CHI2006 Conference ; 2006; Montreal, Quebec, Canada.

APPENDICES

Appendix A: Ethical clearance

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Ms Karessa Govender

CLEARANCE CERTIFICATE	**M121042**
PROJECT	The Use of Virtual Reality and Gaming by Occupational Therapists in Gauteng
INVESTIGATORS	Ms Karessa Govender.
DEPARTMENT	Department of Occupational Therapy
DATE CONSIDERED	26/10/2012
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 26/10/2012 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Dr D Basu

DECLARATION OF INVESTIGATOR(S)
To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

Appendix B: Background information questionnaire

THE USE OF THERAPEUTIC GAMING BY OCCUPATIONAL THERAPISTS AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

Please complete the following questionnaire and email your response to the following email address: karessa.govender@gmail.com or hand in to Karessa Govender at CHBAH OT.

SECTION A: DEMOGRAPHICS

Highest qualification: _____

Year of undergraduate qualification: _____

Years of experience as an occupational therapist: _____

SECTION B: USE OF THERAPEUTIC GAMING

1. Which field/s of occupational therapy are you currently involved in or have been in the past 6 months?

_____

2. Which therapeutic gaming products are you currently making use of for rehabilitation purposes?

_____

3. How long have you been using therapeutic gaming technology as rehabilitation tool/s?

_____

4. Which conditions do you commonly treat with therapeutic gaming?

_____

_____

_____

5. Which impairments and activities of daily living do you commonly treat using therapeutic gaming?

_____

_____

_____

6. On average how many sessions per week do you use therapeutic gaming as a rehabilitation tool?

_____

7. On average how long, as a percentage, do you use therapeutic gaming in a session?

_____

8. How do you determine the overall effectiveness of therapeutic gaming? If there is a specific measure that you use, please indicate below.

_____

9. Which frame of reference/theoretical frameworks do you use the most in your daily practice?

_____

_____

10. Have you received any training on how to use Virtual reality/gaming as rehabilitation tools in your undergraduate or postgraduate studies, or in courses? If yes, please elaborate on the nature of training.

_____

_____

11. Have you read any literature viz. journal articles, textbooks on how to use therapeutic gaming? Please indicate the name and author of the article, name and edition of textbook.

_____

_____

Appendix C: Semi-structured interview guide

THE USE OF THERAPEUTIC GAMING BY OCCUPATIONAL THERAPISTS AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

OBJECTIVE 1 – FACTORS MOTIVATING AND LIMITING THE USE OF GAMING BY OTs

1. How did you become aware of the use of therapeutic gaming for rehabilitation?
2. What motivated you to start using therapeutic gaming as a rehabilitation tool?
3. What factors do you consider when choosing rehabilitation tools in general? You have mentioned that you use (indicate product) in the questionnaire, how did you go about choosing this as a rehabilitation tool?
4. What factors do you believe are motivating/limiting the use of therapeutic gaming by OTs in Gauteng and South Africa?
5. What factors do you believe are motivating/limiting the use of therapeutic gaming at CHBAH OT?

OBJECTIVE 2 – CONDITIONS COMMONLY TREATED AND THE PROCESSES INVOLVED IN TREATING THESE PATIENTS EFFECTIVELY

1. You have mentioned in the questionnaire that you use VR/gaming for the treatment of these conditions (indicate conditions).

Can you please elaborate on the planning you put into selection of the specific game/activity?

TRIGGER QUESTIONS

- What factors do you consider when choosing a specific game/program for your client?
- How long do you spend on planning the activity? (activity analysis)
- Briefly explain the steps you undertake in activity analysis in relation to a pt you may have treated using therapeutic gaming?
- Briefly explain how you go about grading using therapeutic gaming?
- Do use therapeutic gaming as a preparatory/adjunctive, enabling or purposeful activity or does it constitute the main part of your treatment session?

OBJECTIVE 3 – PERCEPTION OF OTs REGARDING THE EFFECTIVENESS OF GAMING AND POTENTIAL OF GAMING IN OT

1. How do you determine that therapeutic gaming is effective at CHBAH OT?
2. What tools/techniques do you use to monitor improvement after your typical therapy sessions?

3. What tools/techniques do you use to monitor improvement after using therapeutic gaming?
4. What do you believe is the future of therapeutic gaming in CHBAH/Gauteng/South Africa?
5. Why do you feel VR/gaming should be, or shouldn't be introduced into the UG curriculum of OT?
6. What tools/resources are available locally and internationally to assist you in developing your effective use of VR and gaming?

OBJECTIVE 4 – THE ROLE OF THE OT WHEN USING GAMING IN REHABILITATION

1. What role does VR/gaming play in an OT's practice philosophy?

TRIGGER QUESTIONS

1. What do you understand by the philosophy of OT?
2. How would your application of VR/gaming differ from that of a physiotherapist or if the patient were to use it independently?

OBJECTIVE 5 – THE FRAMES OF REFERENCE USED AS JUSTIFICATION WHEN APPLYING GAMING TO REHABILITATION PROTOCOLS

1. You have mentioned that you use this specific frame of reference/theoretical framework as a basis for your intervention when using VR/gaming. Please elaborate on how use this FOR using a pt as an example

Please explain how VR and gaming fits into this framework/FOR? (if it does not fit into this framework please explain which theoretical underpinning it is supported by)

TRIGGER QUESTIONS:

1. Explain the main concepts regarding this framework. Explain the main concepts of VR and gaming, now relate the two.
2. If it is difficult to explain what you do, why not use one of your patients as an example – compare how you traditionally would treat them, and then how VR/gaming is an adaptation of your traditional techniques

Appendix D: Information letter to head of department and ethics committee

Chief Executive officer of Chris Hani Baragwanath Academic Hospital

Head of Department: Occupational Therapy

INFORMATION LETTER: RESEARCH STUDY AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

Dear sir/madam/s

My name is Karessa Govender. I am a postgraduate student at Wits and am currently completing a Master's Degree in Occupational Therapy. Part of the degree involves a research study. The title of the study is: The use of therapeutic gaming by occupational therapists at Chris Hani Baragwanath Academic Hospital.

Introduction

The purpose of this study is to explore and understand the use of virtual reality technology and gaming by occupational therapists.

The study will be carried out through one-on-one interviews with occupational therapists working at Chris Hani Baragwanath Academic Hospital. Information collected will be used to determine the factors motivating occupational therapists to use VR and gaming, conditions commonly treated with VR and gaming, the perceived effectiveness of VR and gaming by occupational therapists, the role of the OT when using VR and gaming and the frames of reference used when applying VR and gaming. The interview will take approximately 45 minutes to complete.

Procedure of study

I would like to invite occupational therapists working at Chris Hani Baragwanath Academic Hospital to participate in this study, as they have exposure and experience with the use of VR and gaming as rehabilitation tools.

If you agree that the occupational therapists working at Chris Hani Baragwanath Academic Hospital are given permission to participate, please sign the attached informed consent form and

fax it back to 032 5332204 or you can scan and email it back to my email address: karessa.govender@gmail.com.

Once I have received your informed consent form, I will contact the occupational therapists to arrange the interviews. The date and time will be organized taking their availability into consideration and ensuring convenience for both of us. When they arrive for the interview, they will be asked to complete a questionnaire which will take approximately 5 minutes. The interview will take approximately 45 minutes, and we will discuss how they are using virtual reality technology and gaming within the occupational therapy department at Chris Hani Baragwanath Academic hospital.

Participation to this study is voluntary and the occupational therapists are entitled to refuse participation or withdraw from the study at any point without bearing any consequences. Confidentiality will be maintained as no names will be indicated in the study, and no names will be used from the recording. All identifying information will be removed and instead of using any names, a code will be allocated to the occupational therapists' information. If you would like to receive feedback from the study, I will do so upon your request.

Contact details

For further information / reporting of study related to adverse events please contact the Wits Occupational Therapy department on 011 717 3701.For any problems related to ethics please contact Prof. Cleaton-Jones, the chairperson of the Human Research Ethics Committee at Wits on 011 717 1234.

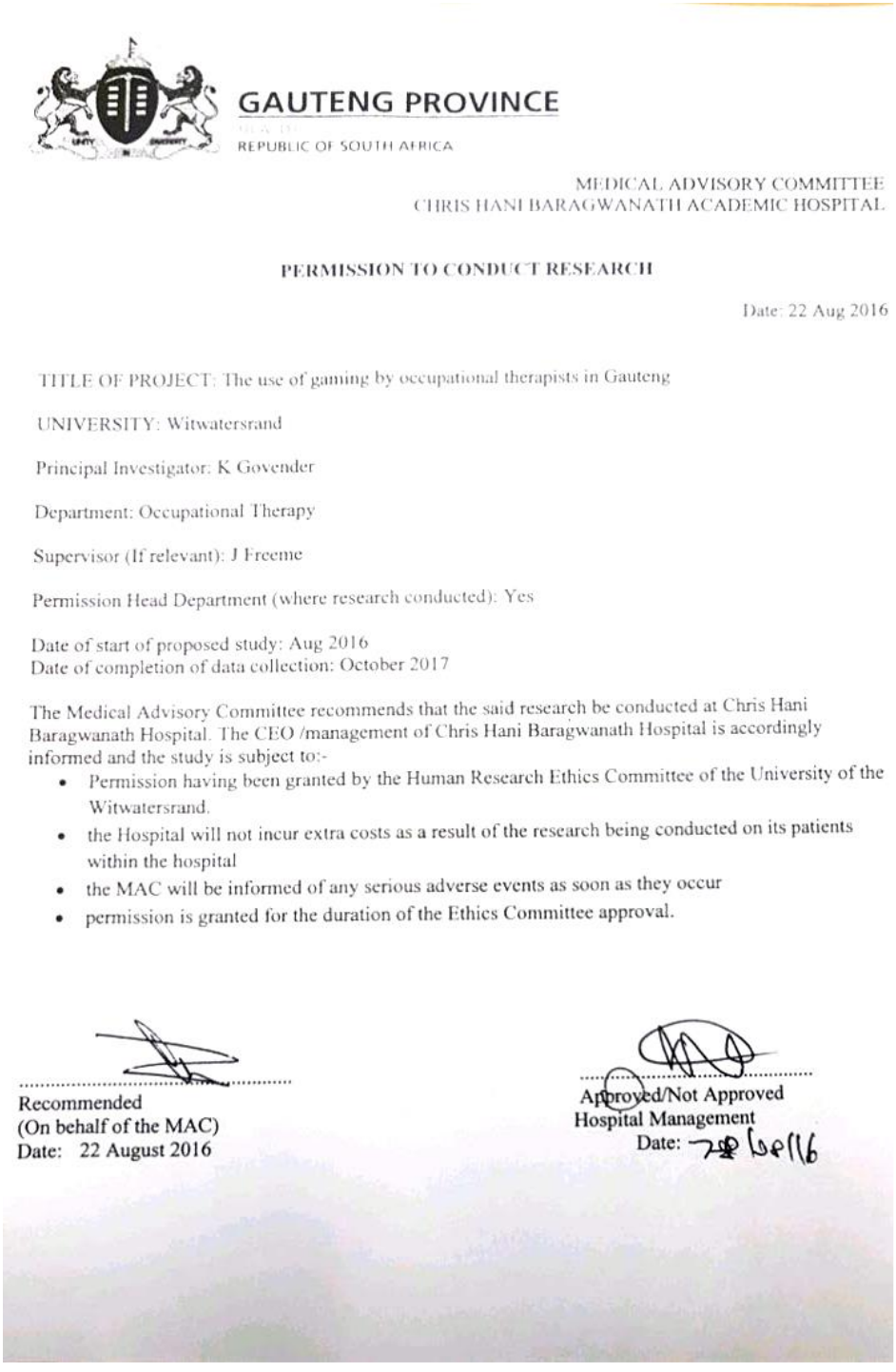
Thank you.

Kind regards,

_____

Ms Karessa Govender
Occupational Therapist
karessa.govender@gmail.com
(C) 084 524 8450.

Appendix E: Permission to perform research



GAUTENG PROVINCE
REPUBLIC OF SOUTH AFRICA

MEDICAL ADVISORY COMMITTEE
CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

PERMISSION TO CONDUCT RESEARCH

Date: 22 Aug 2016

TITLE OF PROJECT: The use of gaming by occupational therapists in Gauteng

UNIVERSITY: Witwatersrand

Principal Investigator: K Govender

Department: Occupational Therapy

Supervisor (If relevant): J Freeme

Permission Head Department (where research conducted): Yes

Date of start of proposed study: Aug 2016
Date of completion of data collection: October 2017

The Medical Advisory Committee recommends that the said research be conducted at Chris Hani Baragwanath Hospital. The CEO /management of Chris Hani Baragwanath Hospital is accordingly informed and the study is subject to:-

- Permission having been granted by the Human Research Ethics Committee of the University of the Witwatersrand.
- the Hospital will not incur extra costs as a result of the research being conducted on its patients within the hospital
- the MAC will be informed of any serious adverse events as soon as they occur
- permission is granted for the duration of the Ethics Committee approval.

.....
Recommended
(On behalf of the MAC)
Date: 22 August 2016

.....
Approved/Not Approved
Hospital Management
Date: 29 Sept 16

Appendix F: Information letter to participants

Hi,

My name is KaressaGovender. I am a postgraduate student at Wits and am currently completing a Master's Degree in Occupational Therapy. Part of the degree involves a research study. The title of the study is: The use of therapeutic gaming by occupational therapists at Chris Hani Baragwanath Academic Hospital.

Introduction

The purpose of this study is to explore and understand the use of Virtual reality technology and gaming by occupational therapists.

The study will be carried out through one-on-one interviews. Information collected will be used to determine the factors motivating occupational therapists to use VR and gaming, conditions commonly treated with VR and gaming, the perceived effectiveness of VR and gaming by OTs, the role of the OT when using VR and gaming and the frames of reference used when applying VR and gaming. The interview will take approximately 45 minutes to complete.

Procedure of study

I would like to invite you to participate in this study, as you have exposure and experience with the use of VR and gaming as rehabilitation tools.

If you are willing to participate, please sign the attached informed consent form and fax it back to 032 5332204 or you can scan and email it back to my email address: karessa.govender@gmail.com.

Once I have received your informed consent form, I will contact you to arrange the interview. The date and time will be organized taking your availability into consideration and ensuring convenience for both of us. When you arrive for the interview, you will be asked to complete a questionnaire which will take approximately 5 minutes. The interview will take approximately 45 minutes, and we will discuss how you are using virtual reality technology and gaming within your department.

Participation to this study is voluntary and you are entitled to refuse participation or withdraw from the study at any point without bearing any consequences. Confidentiality will be maintained as no names will be indicated in the study, and no names will be used from the recording. All identifying information will be removed and instead of using your name, a code will be allocated to your information.If you would like to receive feedback from the study, I will do so upon your request.

Contact details

For further information / reporting of study related to adverse events please contact the Wits Occupational Therapy department on 011 717 3701.For any problems related to ethics please contact Prof.Cleaton-Jones, the chairperson of the Human Research Ethics Committee at Wits on 011 717 1234.

Thank you.

Kind regards,

_____

Ms KaressaGovender
Occupational Therapist
karessa.govender@gmail.com
(C) 084 524 8450.

Appendix G: Informed Consent Form for interview

I, _____ (full name) hereby consent to be a participant in the focus group: **THE USE OF THERAPEUTIC GAMING BY OCCUPATIONAL THERAPISTS AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL.**

I consent to the researcher:

- using the results found in the study (excluding my name)

I am aware that my participation in the study is voluntary and that I may withdraw at any stage.

Signed_____

Date_____ Place_____

Appendix H: Informed Consent Form for audio recording

I, _____ (full name) hereby consent to be a participant in the focus group: **THE USE OF THERAPEUTIC GAMING BY OCCUPATIONAL THERAPISTS AT CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL**

I consent to the researcher:

- Audio taping the interview

I understand that the audio recording will be transcribed and the recording will be stored until the research is completed. Once the research is complete the recording will be destroyed.

Signed_____

Date_____ Place_____