Chapter 4
Virtual Reality Therapeutic Environments in Autism Spectrum Disorder (ASD) and Alzheimer’s: Treatment, Diagnosis, and Refinement

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ABSTRACT
This chapter is devoted to observing and analyzing the role of virtual reality environments in the therapeutic treatment, analysis, and ongoing treatment planning of autistic spectrum disorders (ASD), Alzheimer’s, and dementia. Using live real-world examples of the above activities in action and a literature review, the chapter will examine the level of empirical data and pre-existing qualitative and quantitative research to support these ongoing approaches. Critical analysis will also be made of the current level of empirical research available highlighting areas that should be focused on for future research.

INTRODUCTION
This researcher has been working in the field of virtual reality and digital interaction with both Google, the Chartered Institute of Marketing (LinkedIn, 2018) and the immersive VR agency Oncor Digital (Fair, 2015). Primarily with an approach focused on applied user psychology and marketing communications, the foci of the last decades’ immersion in this field has nevertheless created links with many producers of Virtual Reality (VR) and Augmented Reality (AR) content across a wide range of other applications. These span entertainment, educational and promotional applications, all of which have significant realised and unrealised potential as fledgling VR/AR technology establishes itself as a mainstream technology. However, perhaps, the most affecting application of VR is in the field of healthcare – specifically mental healthcare. A great many aspects of mental health have been approached with VR treatments

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and diagnostics. However, although much anecdotal evidence of benefits has been shared in online and offline media, perhaps because of the widely (and therefore thinly) dispersed activities, there has been a distinct lack of collected empirical research data in these fields. (Mikropoulos & Natsis, 2011). Although not an academic researcher, this author’s two decades in the field of marketing (where arguably 70% of activities are research, testing, measuring, recording and adapting to qualitative and quantitative analysis of research – Jain, 1989) has generated a strong interest in capturing reliable and comparable data which can be usefully applied across the ongoing and collective progression of VR in all of its applications – particularly healthcare where the sharing of information has always been a lynchpin of the disciplines’ development. (Walker et al., 2005). Similarly, the rapid progressions of the field of offline and online marketing media consumption, from primarily text and image based media through to audio, video and most recently immersive/interactive communications, has seen technological, behavioural and even sociological parallels that span all areas of human behaviour (Napoli, 2011) – not least healthcare. Finally, coming from an ongoing perspective based around psychology and sociology (stemming from regular study and application of consumer psychology) have highlighted the strong bidirectional link between media consumption/interaction and the psychological (even psychophysiological) condition of the participant (Shrum, 2009). It is the bidirectional and interactive nature of VR communication that provides the three specific foci for this chapter on its application to mental healthcare – namely not only treatment, but observation and recording of progress, and the resultant diagnostic potential of live and ongoing observation to continuously assess progress and accordingly adapt treatment plans. This chapter will examine precedents for these abilities across Autistic Spectrum Disorders (ASDs) and Alzheimer’s/Dementia.

ASD Virtual Environment Therapy

A recurrent issue in both lower and higher functioning Autistic Spectrum Disorders (ASD), most notably in younger sufferers, are the difficulties created by the breaking of routines (Schaff et al., 2011). This is frequently an issue when coming into new and unfamiliar environments where ASD sufferers can be particularly prone to incidences of sensory overload and extreme resultant discomfort – but perhaps the most life restricting aspect of this is the avoidance behaviours which can result, restricting mobility, social interaction and even employment prospects in later life (Gustafsson & Papiński, 2004). Craig French Hendry (2018), a colleague working in the field of commercial and industrial immersive 360 walkthrough technology, was aware of this issue through a family connection with ASD. As a means of helping to prepare, and therefore alleviate, sufferers’ symptoms, Hendry volunteered his services to a number of entertainment, historic and educational venues near his home base in Perth, Australia (Hendry, 2018). These services included capturing these areas using a combined infrared ranging and photogrammetry scanner. The output from this device is freely accessible via a cloud based online distribution network, viewable on devices from basic smartphones, tablets and computers through to VR Head Mounted Display (VR-HMD). To varying degrees, Hendry (2018) felt that, within a familiar home environment, and with the ability to pull out whenever the participant required, this approach would allow ASD sufferers and their carers to virtually ‘pre-visit’ the planned destination, familiarising themselves with the features and layouts of this new environment and beginning to form a more familiar pattern of awareness of the space. Although even a full VR walkthrough can only prepare the proposed visitor for a small section