



# Chapter 43

## Virtual and Augmented Reality Mirrors for Mental Health Treatment: Analysis and Future Directions


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### ABSTRACT

*Virtual and Augmented Reality are technologies widely used in a variety of areas, including the medical sector. On the other hand, regular mirrors have been traditionally used as tools to aid in mental health treatment for a variety of diseases and disorders. Although it is possible to build Virtual and Augmented Reality experiences based on mirror metaphors, there are very few contributions of this kind in the medical sector. In this chapter, the great benefits that regular mirrors have brought for mental health treatment are addressed. In addition, a review on the state of the art in mirror-based Virtual and Augmented Reality applications is given, highlighting the potential benefits that these enhanced mirrors could bring for the mental health treatment.*

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## INTRODUCTION

A regular mirror can be defined as a special kind of object usually flat and made of polished metal or reflective glass that is capable of reflecting light in such a way that it provides a faithful representation of the objects reflected on it. Mirrors have a natural attraction for human beings since they allow people to see themselves in a third-person view, which is not the one we usually have of our own body, and have been referred to provide uncanny experiences (Rochat & Zahavi, 2011).

Although the daily use of mirrors is commonly associated with cosmetics and superficial activities, they have been used in medical therapy for a long time in order to treat several medical conditions, many of them related to mental health. Pain relief (such as in phantom limb pain (Desmond, O'Neill, De Paor, McDarby, & MacLachlan, 2006)), rehabilitation (such as motor rehabilitation or the treatment of patients with cerebral palsy), psychological disorders (such as body dysmorphic disorder or anorexia nervosa) and neurological disorders (such as asomatognosia or mirror agnosia) are some of the areas where Mirror Therapy (MT) has been used in the past, to name a few.

One characteristic of regular mirrors is that they are constrained to reflect a real image of the environment where they are located (although some optical distortion can be applied using curved mirrors) and are thus limited by the physical space and vision angle that the specific set-up offers. Therefore, their potential uses are rather restricted to a set of certain conditions. However, the use of Information Technologies (IT), such as Virtual Reality (VR) or Augmented Reality (AR) can radically change the way mirrors are used in medical therapy, extending their use to other medical problems such as phobias, autism spectrum disorders (ASD) or even neurodegenerative diseases. VR and AR can be presented with many different set-ups, using different display devices and exploiting different interaction paradigms and metaphors. One of these paradigms is the mirror metaphor, by which a VR or AR system is designed to behave like a mirror, regardless of whether it is implemented using an actual mirror or not.

This chapter has three major goals. The first one is to clearly define and classify the different mirror-based IT solutions that are based on either VR or AR. As these enhanced mirrors are relatively new, the literature offers different terminologies for similar proposals, which can be confusing. The chapter will try to clarify the different options and methods that can supply mirror-like images using IT solutions. The second goal is to review the works that already exploit the use of VR and AR mirrors for mental health treatment, reviewing the state of the art. Since the technology is relatively new and the research area of this particular review is restricted to mental health applications, the number of works is relatively small. Nevertheless, they are enough to demonstrate the benefits of this technology and show its potential. Last, but not least, the chapter aims to discuss the possible benefits of these technologies for the treatment of other mental health illnesses, disorders, syndromes, problems and conditions, which are currently not explored with IT solutions. The chapter will try to identify opportunities, strengths, weaknesses and future research lines, so that readers and practitioners get a clearer picture about these devices.

This chapter is organized as follows. In a first place, a short review is given regarding to the use of regular mirrors in mental therapy. In this regard, several illnesses and mental disorders are addressed. Afterwards, the use and potential of VR and AR in mental therapy is discussed. First, the VR and AR mirror metaphors are given, and then a review on the state of the art is provided. The review also covers a few applications of enhanced mirrors to other (mind-related) medical fields, since the number of applications of this technology for mental health is still small. Finally, some conclusions and further directions are outlined.

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