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Augmented Reality in Psychology: Its Advancement in Therapy for Simple Phobia

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Abstract

Consider the stone ages when technology was in its infancy, the only objects created back then were tools made of stone. It's astonishing how this tiny little spark has been nurtured throughout history to give us an entire array of technology that has advanced way beyond the ordinary handcrafted tools. The main focus of this paper, however, is on a fairly new discipline called augmented reality and its role in therapy. It starts by discussing what augmented reality is, followed by a briefing on simple phobia. The paper then intertwines the two concepts, describing experiments conducted using augmented reality for phobia treatment. Towards the end, it brushes over a few ethical considerations of in vivo approaches as well.

1 Introduction

What if I told you that we could examine the wreckage of the Titanic without having to dive to the bottom of the Atlantic Ocean? This is where augmented reality comes in. It provides a balanced blend of virtual objects in real life just like Azuma (an innovator in augmented reality) pointed out was depicted in the 1988 film "Who Framed Roger Rabbit?" (Azuma and environments, 1997). Along with media and entertainment, this innovation has also opened infinite doors in various scientific disciplines like research and medicine.

As technology evolves so does the need for humans to do the same. We accomplish this by overcoming things that keep us reigned in, things like fear. In 1939 Mowers put forward the conditioning theory which claimed that fear led to avoidance (cited in Öst et al., 1981, p.1). This concept is an apt description of how people acquire phobias.

2 Psychology behind phobias

The god of war Ares, in Greek mythology, had an extremely intimidating son named Phobos. He was known for two things – instilling fear in the enemies of the Greek warriors and for giving the term 'phobia' its origin (Bainaboina and Psychology, 2020).

A phobia hinders an individual's rational sense due to the debilitating fear of a particular object or situation. Innumerous phobias exist today but they all branch out from two major categories, namely simple and complex phobia. A pilot study held at a regional university in the United States mentioned four subtypes of simple phobia as recorded by the Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition. The four included animals, situational, natural environment, and bodily (blood/ injuries) (Salas et al., 2011). Complex phobia on the other hand constitutes agoraphobia and social phobia.

Although these fears may seem absurd and impractical to the more courageous majority of the population, The National Comorbidity Survey displayed a whopping 48.1% of respondents suffering from mild simple phobias while 21.9% were serious sufferers (Kessler et al., 2005).

Delving into the root causes of these irrational fears sometimes traces back to past traumatic events (Doctor et al., 2008). A good example of this is a plane crash survivor who no longer perceives an aircraft as an efficient mode of transport, rather a metallic tube of death skyrocketing through the air. Along with the obvious fear of flying, the survivor may also acquire other associative conditions like

claustrophobia. This phenomenon was observed by Beck and Emery as 'spreading phobias' (cited in Doctor et al., 2008)

3 Is augmented reality the solution?

Aulus C. Celsus was among the first to propose a link between phobias and medicine (Errera, 1962). Since then, thousands of references to a plethora of different phobias were made in medical context. One of the more recent ones includes Nomophobia or 'no mobile phone phobia'. It's a condition in which restlessness and anxiety arise when a person is unable to use a mobile phone (Kanmani et al., 2017). This may then lead to serious mental illnesses like depression or social phobia. Reversing its concept, however, helps eradicate these barriers. So instead of using technology as a shield from the real world, we use it as a pathway to cure!

One such example is augmented reality in exposure therapy. Augmented reality (AR) mimics the concept of virtual reality (VR) except that it doesn't rely solely on video frames, real images, and 3D graphics. Instead, it incorporates 3D computer elements and superimposes them over real life (Shuhaiber, 2004). Therefore, AR lies between a realm of a virtual and certain reality.

4 Modern methods that help with phobias

Exposure therapy is a process in which patients are clinically subjected to their fears. Unlike in VR where the user is teleported to a synthetic world, AR elicits a greater degree of realism by letting users see their hands and feet during the process (Juan et al., 2005). Fusing the real and unreal is usually achieved by a see-through head-mounted display (HMD) fitted with optical combiners (Azuma and environments, 1997).

In an experiment held by Juan and Botella, patients diagnosed with simple phobia were introduced to exposure therapy. Therapists first insinuated a single animal at a time, either a spider or cockroach. Next, they eased the patient's hand over to where the creature was passing, many jerked back at this. In the third step, the patients had to search for the spider/cockroach, similar to how they would look for it at home, and this was accomplished using a surprise box. The fourth and final part of the session included having to kill and throw the animal away! The results of this treatment proved to be very effective in diminishing fear when confronted with the animals (Juan et al., 2005).

A year later in 2006, Juan and Botella sought to overcome acrophobia as well. Again they used AR, but this time their focus was on non-phobic participants. Acrophobia is a fear of heights which the system simulated using a technique called immersive photography, Figure 1 (Juan et al., 2006). The procedure required for an HMD, camera, and tracker. Participants were guided to the top of a staircase and later asked to fill out a questionnaire based on the realism of their experience. Again the outcomes were successful.

Figure 1: Immersive photography

A couple of years later Juan persisted in her study and used AR to create an acrophobic scenario yet again. This time, however, a brown mat was used, with three markers, Figure 2. The assistance of video captured by the HMDs camera was used to create a hole at the very center of the mat and the floor blocks would fall away, sometimes pulling the user along. This is called the elevator effect (Juan et al., 2010)

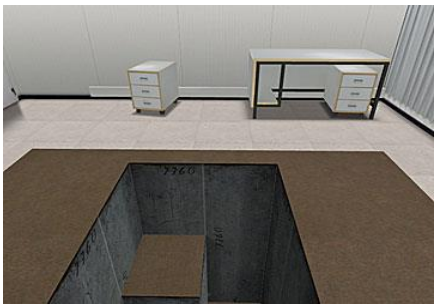

Figure 2: Creating a hole using markers

5 In vivo approach and its ethical issues

A more traditional version of exposure therapy is in vivo. Instead of small holographic animals, real-life creatures are used. In addition to safety concerns, this approach isn't very prevalent as therapists consider it a breach of ethical considerations. Exposing patients directly to their fears almost immediately spikes anxiety levels. Moreover many argue that the procedure is too cruel and insensitive towards the patient's discomforts (Wolitzky-Taylor et al., 2012). Table 1 highlights differences between AR and in vivo techniques.

Although AR seems like the ideal solution to treating phobias, it's still a fairly recent approach that needs more testing. It not only challenges the patient but therapists too as they need to re-train and habituate to the new AR systems.

	In vivo	Augmented Reality
Treatment elements	Therapists have no control over the animals.	Complete control by therapists. They choose the number, size, and movement of each animal (Juan et al., 2005)
Safety	There's no way to guarantee patients safety	The experience can be distracting and may lead to physical injuries if patients aren't instructed well (Joshi, 2019)
Refusal rate	In one study 27% were unwilling and 14% refused (Garcia-Palacios et al., 2007)	In the same study, only 3% were unwilling while none of the participants refused
Effectiveness	Very effective	Very effective
Organization time	Not time-effective	Less time organizing as all elements are virtual (Wechsler et al., 2019)
Averseness (Level of avoidance)	Highly aversive (Botella et al., 2016)	Less aversive (Botella et al., 2016)

Table 1: Comparison between AR and in vivo for treating simple phobia

6 Conclusion

One of the early introductions to AR was in a 1960's Star Trek movie. A device called a "tricorder 10" was used to scan a body for injuries (Berryman, 2012). It goes without saying that AR is truly a story of fiction turned into reality. Our capabilities as humans are increasing at a dumbfounding rate and it only seems to get better with time.

Although research and findings are still underway regarding AR for phobia treatment, the few experiments conducted did show positive results. Not everyone with a phobia seeks medical attention. And not all people can afford it. (Carmigniani et al., 2011). This leaves plenty of room for modification and refinements in regard to the approach. Until then, however, Marie Currie's words may offer a shred of motivation to phobics, she said: "Nothing in life is to befeared. It is only to be understood" (Sims Wyeth, 2014)

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