This Generation and their Screens:

The Innovation of Virtual Reality Therapy

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Abstract

The majority of individuals who struggle with a mental illness in the United States remain untreated. There is a great need for accessible and affordable treatment, and technology may be the answer. Being a therapist requires creativity and imagination, and that creativity combined with virtual reality technology is a solution that allows for accessible treatment. Thus far, virtual reality technology has been used to provide vestibular input, which is used for the treatment of vertigo, as well as to treat patients with autism or those who struggle with specific phobias. There are already proven successes, and there is so much more opportunity for this method of treatment to flourish. This technology, in conjunction with an imaginative approach to therapy, can become the best, most affordable solution to decreasing the number of individuals struggling with accessible healthcare for mental illness.

Key Words: Virtual Reality Therapy, Imagination, Vestibular Input, Treatment

The vast majority of individuals have been impacted by the technological advancements of the 21st century. These advancements have placed a TV in practically every room, and a smartphone in the hands of most children. This advancement in technology has pushed for improvements in a number of other fields to keep up with the ever-changing society. There are imaginative people thinking of new uses for technology every day. Psychology and the treatment of mental health are no exception to this imagination. These advancements open new doors for treating mental illnesses that have never been considered before.

1 in 5 Adults in the United States experience mental illness (National Alliance on Mental Illness, 2019). There are few individuals who have not been touched by some form of mental illness, whether they have one themselves, or they know someone impacted. Every day there are new diagnoses of ADHD, anxiety, and depression, as well as less common illnesses, such as dissociative identity disorder or schizophrenia. Mental illness is all around us, and yet, there is still so much that needs to be done to treat it.

Despite the initial heartbreak of the continually growing number of individuals impacted by mental illness, the more heartbreaking statistic is that 60% of mental illnesses remain untreated (Medscape, 2015). This was the case in 2011, with the number of cases growing every day. This gross lack of treatment is caused by any number of problems, from lack of money to lack of time. Society is ever changing, so why shouldn't treatment keep up with it?

The need for more accessible and cheaper therapy is apparent in today's society. This need has led to creative therapists searching for the best possible solutions. The most recent, and potentially best solution, has come down to virtual reality therapy (VRT). This virtual reality technology can present itself in many ways, from projections, to handheld devices, to apps on a phone, all of which can be used in various locations. By synthesizing psychology and

technology, one is able to reimagine the use of virtual reality technology as a means of healing a large number of untreated mental illnesses. This treatment has the capability of becoming the most effective and primary treatment for those with mental health problems.

In order to properly understand using VRT as a solution to untreated mental illness, one must consider the reasons why it is not being treated. Mental illness treatment is often neglected, and it comes down to how an individual will deal with the problem. According to a variety of doctors writing for Health Services Research, the primary reasons stem from how a patient responds to a diagnosis. Often the patient will not believe they have a problem, or believe that the problem they have will get better by itself, or that they can handle it on their own. (Kessler, Berglund, Bruce, Koch, Laska, Leaf, & Wang, 2001, p. 991) These reasons are almost never the case, and result in worse symptoms and an even higher number of mental illness cases. While some individuals deny their diagnosis, others accept it, but lack the time or money to pursue proper treatment. These issues show an evident need to use imagination when it comes to therapeutic treatment.

Mental health is not limited to a particular demographic. It equally impacts all races, religions, and socioeconomic classes. Just as germs don't care if you don't have time to get sick, mental illness does not care if you do not have the resources to treat it. Small cities, impoverished areas, and rural towns are often not fortunate enough to have a general physician, let alone a therapist, not to mention those who have access to therapy, but simply cannot afford it. Dr. Joyce E. Mauk, chief executive officer and medical director of the Child Study Center in Fort Worth, notes how treatment and medication can be expensive but "the side effect of untreated mental illness is devastating and costly," (Mauk, 2015, page 2). The cost of not coming

up with a more affordable and accessible technology could greatly outweigh the cost of treatment if something is not done soon.

This demand for better access to treatment had resulted in the exploration of the use of technology, more specifically, virtual reality technology. This exploration raises the questions, what is virtual reality technology, and where did it come from? Because yes, the technology is more than last year's hot button Christmas gift. The most common form of this technology is the goggles. These goggles range from $20 to almost $500, and can connect to the average smartphone to provide a virtual reality experience. While the popularity of these goggles is recent, and the use of them for therapy is even more recent, they have actually been around for quite a while. Season 1, episode 6 of *Shameless*, a popular Showtime television show, featured virtual reality technology used for therapy prior to the explosion of the idea (2013). Shila Jackson, played by Joan Cusack, has agoraphobia, a fear of going outside without means of escape. She is shown in her home with virtual reality goggles on, simulating a real-world situation, as she is afraid to actually go outside. This episode aired in 2013, and introduced the idea of using virtual reality technology as a real possibility. While often things of this nature were written off as simply TV magic, research and information was already being put in to make this televised ideal a reality.

This reality is seen most commonly in the form of Google Cardboard. These Google goggles are quite literally pieces of cardboard that hold an individuals' phone against their face and allow them to use the vast number of virtual reality apps on their phone, without even using their hands (Pearla & Hebbalaguppe, 2017, p. 4). This simple piece of cardboard has stimulated the development of applications, ranging from games to educational materials, and the

opportunities are endless. With a little imagination and the right devices, an individual could be wherever their heart desires. The virtual reality frames are leading to the development of applications with a number of purposes, including therapy.

Applications used for therapy are not limited to just virtual reality. From a young age, people are exposed to therapeutic applications, from things like white noise machines as a baby, to a smart watch reminding patients to breathe when their heart rate is too fast. While needing to fall asleep or relax aren't necessarily mental illnesses, they are just as present, if not even more so, than mental illness, so why not treat both? Besides, those problems are often times side effects of mental illnesses. The majority of applications are free and accessible practically 24 hours a day, solving the problems of cost and inconvenience, not to mention how often new apps are being created. By combining the already therapeutic apps with the augmented reality phenomenon, there is potential for quite a bit of healing.

These virtual reality therapy apps can lead an individual to face their fears, or help a child get a good night's sleep. Some examples of these apps include *Arachnophobia*, for fear of spiders, *Richie's Plank Experience*, for the fear of heights, and *Limelight*, for the fear of public speaking (Levski, 2018, p. 7-9). Besides the more specific treatments, there are apps that will help individuals calm down, whether they are nervous about a test, having a panic attack, or experiencing extreme anxiety. Instead of having to imagine facing a spider head on, or actively searching out a spider to confront, one is displayed at the touch of a button. In addition to *Arachnophobia*, there are apps that are designed specifically to allow an individual to calm down. *Deep* is an app that places the user in a "serene underwater world" (Levski, 2018, p. 9), while *Guided Meditation VR* allows the user to relax and recharge by taking their pick from "a

choice of peaceful environments from around the world" ranging from a "lush rainforest to a Japanese temple," (Levski, 2018, p. 9). This need for relaxation is covered from day to night. An app was created for sleep, called *Relax Soothe Sleep: The Nap App*, designed specifically to help children with sleep disorders (Levski, 2018, p 10.). The app guides the child through the best methods to prepare for a good night's sleep, and allows the parent to track the progress. This technology is not limited to just adults, but is open to children as well, and in some cases is intended for both. There is so much opportunity out there for virtual reality therapy, available in the pockets of practically every man, woman, and child. With this much possibility simply in the technological sense, imagine what could be done when combining this technology with the education and creativity of a therapist.

VRT has been used a number of times and has already proven successful. The greatest benefit to the flexibility of the technology, is the ability to treat a wide variety of problems. There are therapeutic facilities and organizations in place that seek to treat an individual's specific problems. These include hospitals using VR to combat construction, VR used as a means of education (such as providing instructional procedures for adults with Autism Spectrum Disorder), and VR technology as a reward to coincide traditional therapeutic methods. In addition, the therapy has proven beneficial in facing fears, from spiders to driving. The idea of facing fears was taken on by an organization called Bravemind, which seeks to aid veterans who have experienced trauma. This technology has been around for years and continues to be refined.

This reformation takes place through Bravemind, a virtual reality-based organization focused on PTSD. This organization has undergone significant changes over the years, in terms of both accessibility and affordability. In terms of the mechanism itself, the organization was

able to go from a $25,000 head mounted display that was incredibly heavy, to that of an $800

lightweight headset (Waldrop, 2019, p. 2). This revolution has made this treatment available to

many more individuals, with the benefits being just as impactful. One of the first uses of the old

heavy VR machine involved a woman who witnessed and ran from the falling of the Twin

Towers. This woman was deeply traumatized, but through the help of Bravemind, she was able

to uncover and process a repressed memory, reliving the moment of the falling towers, with the

comfort of knowing that ultimately, she is in control (Waldrop, 2019, p. 4). She had memories

repressed deep in her brain, and was able to face and recover them with the use of VRT.

Bravemind introduced the idea that tricking the brain is the name of the game. "Presence"

is a psychological phenomenon, mostly simply stated as an illusion. Essentially, it is the name

for when someone feels like they are in an environment, when they are not. The technology itself

provides position sensors that "shift the synthetic images in a way that the computer calculates

from the 3D geometry of the scene," (Waldrop, 2019, p. 3). The brain is already expecting the

images it is seeing to shift in a manner that responds to their physical moments, therefore causing

the brain to interpret the scene as if it were real. While the technology itself is fascinating, what

is even more shocking is the result. Through studies, Bravemind was able to prove that brain

activity was improved through the use of this therapy. The hyperactivity typically seen in an

individual with PTSD's amygdala and hippocampus were calmed, as well as a restoration of

normal frontal-lobe activity, which is often inhibited, accounting for the "emotional numbing and

social withdrawal" typically seen in patients. (Waldrop, 2019, p. 5). This technology has proved

successful to patients for years, but Bravemind workers are striving to do more. They are looking

to incorporate a virtual coach, who will help guide and personalize the treatment to allow for

more effective methodology (Waldrop, 2019, p. 7). As wonderful as technology is, human interaction is still key.

This human interaction went hand in hand with exposure therapy, perhaps the most common and most effective means of therapy today. Exposure therapy forces someone, with the guidance of their therapist, to face their fears, their compulsions, or their behaviors. By exposing themselves to their fears, they are healing. VR technology is taking this a bit further, exposing individuals from the comfort of their home. This becomes especially important when it comes to anxiety. Anxiety comes in many forms, from temporary feelings of anxiety to one of the anxiety disorders. VRT has been used to treat these as well, through exposure therapy, with a kick. A study published in the *Brazilian Journal of Psychiatry* in 2018 analyzed the use of VRT to treat women who had anxieties about driving. Through the study they observed 13 women who were exposed to VRT 8 times. After the study was complete, there was a "decrease in the frequency of distorted thoughts and state anxiety scores, as well as a slight improvement in the quality of life" (Costa, Carvalho, Ribeiro, & Nardi, 2018, p. 192). The fear of driving is just one instance in which multiple people were helped, with the convenience and the safety of knowing they were in control. There are thousands upon thousands of phobias in existence, each of which has the potential to be cured with the assistance of virtual reality exposure therapy (VRET). These fears are so vast, that the treatment requires a creative, imaginative look, such as VRET. Besides the hundreds of individuals who experience diagnosed phobias, consider the lesser anxieties that can be aided with the use of VRT.

These anxieties were taken into consideration by Loma Linda University's Children's Hospital. The hospital was undergoing construction while children were still active patients living in the facility. The hospital staff enlisted the help of virtual reality exposure therapy to

soothe the children. The simulation placed the child on the construction site, allowing them to

see exactly what was happening, and understand the process the hospital was undergoing

(Ferenc, 2017, p. 7). This proved to be beneficial, both in intended and unintended ways. Not

only were the children able to see that there was nothing to worry about, but they were educated

about the process of construction as well. This new methodology has the freedom and flexibility

to meet the needs of every situation, fear soothing and education included. While Loma Linda

University didn't necessarily intend for the therapy to be used for educational purposes, others

sure have.

Individuals from the Taylor and Francis group considered the use of virtual reality to help

treat autism, specifically through education. A study was done to analyze how well the use of VR

technology would be able to teach an individual with Autism Spectrum Disorder to perform a

task. Much of occupational therapy sessions are spent helping individuals perform a variety of

tasks, some of which simply cannot be recreated. This can be time-consuming and frustrating,

especially for parents of children who don't understand that the therapist is really required to

assist their child in the learning of new tasks. This problem is solved by an online reality. The

study found that the use of VR yielded positive results, and the individuals participating even

indicated that it was the preferred method of training, as it was more interesting (Fitzgerald, Yap,

Ashton, Moore, Furlonger, Anderson, & English, 2018, p. 199). The idea of putting VR

alongside traditional therapy, and the engagement it had with the patient, has caught the attention

of therapists who specifically treat vertigo.

Vertigo is "symptoms of body balance disorders of vestibular origins," (Bergeron, Lortie,

Guitton, 2015, page 1), or more simply, an extreme lack of balance or problems with balance.

Those who experience vertigo often feel so dizzy that they are unable to even lift their head in

the most extreme cases. The Hindawi Publishing Corporation published a study about the use of

virtual reality technology for treating vertigo or other balance related disorders. They reimagined

the traditional treatment, using VR to teach motor skills that can be applied to the real world, as

well as providing a setting that allows for feedback on motor performance (Bergeron, Lortie,

Guitton, 2015, page 1). After their study, participants found the symptoms of vertigo going from

"moderate to mild" (Bergeron, Lortie, Guitton, 2015, page 5), which is a step in the right

direction. The study concluded that the use of technology is successful, but urged more research

and methods to refine and make the technology even better.

This same kind of research has led to new programming, some of which allows a child to

remain engaged with the therapeutic process. One specific treatment for Attention Deficit

Hyperactivity Disorder (ADHD) is neurofeedback, or electroencephalography (EEG)

biofeedback. This is essentially an individual's brain sending electrical signals, representing the

"state of arousal of the brain," (Wang & Reid, 2011, p. 4). Those with ADHD have different

signals than a traditional child, and this method of therapy encourages those children to regulate

his or her own signals to more closely match those of a typical child in their age group. This is

where the virtual reality comes in. While the virtual reality simulation may not be doing the

treating itself, it is used as a reward. In this case, the reward is a dinosaur egg being hatched

when the child is able to successfully regulate. Therapy involved reinforcement and reward so

much that a therapist will ask their child what they are "working for" or earning. While nearly

every child loves stickers and candy, the possibility of using something more exciting to entice

the children could greatly reduce the number of reluctant kids when it comes to going to therapy.

In addition, the EEG experience is somewhat uncomfortable, and can even be scary. By

rethinking the use of VR, this once scary task becomes an enjoyable game. What child doesn't

want to go play games with the added bonus of being able to better control their bodies? These methods are already producing incredible results, but as with any good development, more is being uncovered every day.

There is new research going into how virtual reality can be used better every day. The more common virtual reality is, the more potential it has to help, therefore requiring quite a bit of adaptability, as well as individuality. A group of doctors in the United Kingdom have taken this idea of accommodation, and applied it to what they are calling telepresence exposure therapy (Roberts, Fairchild, Campion, & Garcia, 2017, p 123). This telepresence method is pushing to connect the therapist in the client setting to the patient in their home, providing the optimal experience for both individuals. The program seeks to "communicate both visual and spatial aspects of non-verbal communication," (Roberts, Fairchild, Campion, & Garcia, 2019, p 128). Essentially, they want to be able to give cues and expressions that cannot be relayed on a phone call. Their ultimate goal is to allow interactions to occur among the individuals using a "real time free viewpoint video with large projection displays," (Roberts, Fairchild, Campion, & Garcia, 2019, p 128). In other words, the program will use projects that showcase each individual's movement and expression, captured on surrounding cameras. At this time, they have yet to build a model that will include the "balance of visual, spatial, and temporal interaction," (Roberts, Fairchild, Campion, & Garcia, 2019, p 129), or in layman's terms, do everything they want it to. The models they have made thus far include some, but not all, features. Researchers will keep working to give the maximum accessibility to both the patient and the therapist. The goal of using virtual reality therapy, other than to heal people, is to allow more access to individuals. This is certainly the case if someone can participate in therapy from their home.

This accessibility is not only limited to mental illness. This technology can be used to understand and treat a variety of problems, including visual impairment disorders. A group of researchers from the UK are using virtual reality technology to simulate how visual impairments change how someone sees. This visual impairment simulator for auditing and design (VISAD) has as close to the real effects as possible without being absolutely certain about how the impairments change the view (Stewart & McCrindle, 2017, p. 158). By using this technology, it allows individuals in early stages to see what is going to happen to their vision, but it also allows designers to "visualize their projects from the perspectives of visually impaired people… providing accessible and inclusive design," (Stewart & McCrindle, 2017, p. 157). It is this kind of imagination and creativity that is sought by both therapists and software makers, that come to a peak when combining the two together.

Most people will agree that VRT is more accessible and affordable treatment and therefore can lead to a decrease in the number of individuals with an untreated mental illness. That being said, many will argue that it is not the best method, due to potential ethical dilemmas and technological inconsistencies. These are considered by *Virtual Reality: Recent Advances in Virtual Rehabilitation System Design*, a book published in 2017. The specific concerns addressed are those in regards to the standardization of the technology and ensuring that the individual chooses the right one for their needs (Powell, Rizzo, Sharkey, & Merrick, p. 10). For example, a full body virtual reality machine may be best for an office setting, which has the potential to afford it, while an individual app or headset may be best at home. That being considered, the individual piece could then encourage a person to reach out to a therapist in order to have access

to the more thorough treatment in an office, ultimately reducing the amount of untreated people in the long run. Thus, the technology is the key to providing more access.

While VR is the key, as with every other form of technology, it's only great when it works. There are of course limitations, including user error and response, that go along with new forms of technology. It is for that exact reason that there is also a push to train therapists to use this technology. This training would ensure that the therapist's imagination and treatment methods are applied in the best possible way, but also ensures that there is a smooth use of the technology. On the other hand, an individual may get motion sickness or begin to feel out of control due to the unknowns involved in simulation. While these are possibilities, there is almost no form of therapy that works for everyone. Just because some people could have adverse reactions does not mean that the large majority of individuals will not benefit from this method.

Beside the technological difficulties that could go along with VR therapy, there are also possible ethical dilemmas. Dr. Brenda K. Wiederhold, President of the Virtual Reality Medical Center, tells of Talkspace, an organization that provides online and anonymous counseling services. Initially, the organization provided absolute anonymity, until a therapist was unable to report dangerous information due to this policy (Wiederhold, 2017, p. 2). While the policies are now cleared up, it shows the potential for problems when doing things online. By using virtual reality technology, there are possible threats to personal privacy, as well as social risks due to the blurred lines between what is real and what is fake (Spiegel, 2018, p. 1538). This innovative methodology is not operating outside of these risks. Things like blurred lines and privacy are even greater reasons why there is such an emphasis on training of the therapists. In order for this technology to be accessible and affordable, and ultimately reduce the number of untreated mental illnesses, therapists will be trained so they can properly relay the information to their patients.

The Innovation of Virtual Reality Therapy

   Over time, the number of individuals experiencing some sort of mental illness or other life altering problems such as processing disorders, visual impairments, or debilitating fears has increased dramatically. In this day and age, it seems that more often than not a person will struggle with a mental illness. This challenge has brought out the most imaginative and forward-thinking solutions for all parties involved. In an attempt to reduce this number, researchers and psychologists across the world have taken the virtual reality technology and combined it with the therapy already at work. These methods of therapy have revolutionized the possibilities for generations to come. As mental illness grows, the field of medicine grows stronger, causing only better methods to arise. Daniel Freeman, a clinical psychologist at the University of Oxford, believes that "VR technology could provide the equivalent of the world's best therapists in people's living room," (2019, p. 3). With these recent advancements, there is no telling what is to come. Imagine a world where the best, most revolutionary treatment would be at the touch of a button, in the convenience of every home.

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