

Use of Immersive Technology in treatment of Neurodegenerative Diseases

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Introduction: Data analytics and Machine Learning services have opened up new avenues for software solutions. Healthcare is a complex industry; training medical providers and treating patients can often be a challenging process. Many healthcare professionals learn from existing mechanism like online resources, personal training and books. However, these methods often do not take into account and future unforeseen circumstances that a patient can exhibit. Preparing Healthcare professionals for these kinds of scenarios is extremely challenging.

Implementing new immersive technology into patient care

Immersive technologies will be able to leverage predictive analysis and procedurally generate virtual simulations that healthcare professionals can use. The nature of immersive technologies will result in a better learning environment and allow users to train as long as they would like on procedurally generated simulations which are all unique to patient-specific scenarios. Currently, health care stimulation involves pre-built, scripted scenarios that users will train on. Data used in these simulations are manually added and configured for the particular training simulation and is incapable of presenting difficult and random situations that may arise during a session. Healthcare professionals will usually train on past patient cases and gather information regarding symptoms from existing medical records. New training simulations are often manually created and do not offer new scenarios when diagnosing patients. This limitation does not prepare healthcare professional for various unforeseen circumstances that very often present themselves during real-world scenarios. Healthcare training will commonly involve live lectures and many frequent face-to-face appointments with the trainer. Passing one's experience onto someone else within the medical field can be extremely challenging due to how extensive the information can be. No efficient and optimized software solutions are being employed to create a more effective training session. Immersive technology provides a unique solution to treating and caring for patients with complex Neurodegenerative Diseases. Immersive technologies coupled with machine learning services may be used to procedurally generate 3D simulations for use in Virtual/Augmented Reality Health Care. By data mining patient information, diagnostic data for the simulation will be extracted to generate unique training sessions tailed on a per user per patient basis. This is optimized to take into account the random nature of symptoms that can appear for certain diseases and will be used to train healthcare professionals in better diagnosing patients that could exhibit a wide range of symptoms for a particular diagnosis. By leveraging a cloud-hosted machine learning system, immersive technologies will be able to data-mine patient case files and generate new training scenarios. Predictive analysis is also used to predict patient diagnosis based on given symptoms and other patient data. This information will be used to further train healthcare professionals by providing text-based scenarios without the use of a direct use of simulation technology. Using Machine Learning services to data mine information collected from past Electronic Medical Records and input records from simulation sessions. Predictive Analysis will generate patient symptoms and correct diagnosis blueprint.

Immersive technologies coupled with analytical algorithms may be used to dynamically update virtual simulations meta-data to generate new and unique simulations that Healthcare professionals can use for training. These immersive simulations will be generated according to one of the many blueprints that the Machine Learning service continues to generate as more data is processed. Other than for the reason of training healthcare professionals, another example of how the process can help the medical field is in exploring new treatments that can have a positive effect on individual patients. Since certain patients can have symptoms that are completely unrelated to the diagnosis, a healthcare provider can input these symptoms and patient information into the machine learning service, which will then predict the appropriate diagnosis couple of a percentage of certainty. This information may help the healthcare provider in providing better treatment based on the data processed by this Healthcare virtual, machine-learning system.

Application in treatment of neurodegenerative diseases

As technology advances so does the average lifespan of humans; which entails a burden to patients, but also to our healthcare system. Many neurodegenerative diseases involve patients with compromised synaptic activity resulting in undesirable cognitive and behavioral dysfunctions. This study suggests that combining neuroscience with technology presents unique mechanisms for neurocognitive potentiation. The use of immersive technologies offers patients with neurodegenerative diseases a multitude of unique opportunities as a non-pharmacological non-invasive, neuromodulation. This effort must involve multidisciplinary teams comprising, at minimum, clinicians, research scientists, and biotechnologists, and software engineers; all working towards developing viable value-adding modalities with therapeutic benefit. Immersive technologies emulate the physical world by its novel approach in offering patients with opportunities to exercise neuroplasticity with cognitive training. Immersive technologies, such as virtual and augmented reality, offer patients a unique opportunity to engage neurological pathways via digitally simulated mixed reality – combining both physical and simulated worlds. The notion of combining neuroscience and technology in management of neurodegenerative diseases is not meant as a curative method. It is meant to be an adjunct therapy; neither a replacement nor substitution for evidence-based pharmacotherapy or behavioral therapy. The primary function is to complement existing treatment plans which aim to reduce rate neurodegeneration in patients while offering a novel, alternate perception.

Conclusion: Integration of immersive technology into individual plan of care holds significant potential in patient health outcome and overall quality of life. This study proposes the development of an interdisciplinary, patient-centered approach to integrate disruptive technologies into patients' plan of care. All in all, the main idea is to provide extrasensory stimulation for patients in order to alleviate burden of disease and symptoms, while potentially slowing progression of degeneration. Otherwise patients will continue to incur greater levels diminishing cognition, feelings of hopelessness and further isolation. Future research should focus on user interface personalization that is patient-centered and customized to fit the particular needs of individual patients.

Biography: Ramy Mitwalli is a Doctor of Medicine Candidate at the Poznan University of Medical Sciences, Poland. Prior to matriculation in medical school, Ramy attended the University of South Florida where he earned a Bachelor of Science in Biomedical Sciences. Ramy also holds three masters degrees: 1) Master of Science in Neuropharmacology, Georgetown University; 2) Master of Business Administration (Healthcare Management), Florida International University; 3) Master of Science in Entrepreneurship in Applied Technologies, University of South Florida. He is a member of the American Association for the Advancement of Science (AAAS) and

American College of Healthcare Executives (ACHE). Diana Mitwalli is a licensed psychotherapist and social worker, with specialized training in Marriage and Family Therapy/Counseling. Diana also holds a Clinical Neuropsychology Researcher position at the Department of Neurology, University of South Florida Morsani College of Medicine. She attended the University of South Florida where she earned a Bachelor of Arts in Psychology. Diana later attended Argosy University where she earned a Master of Arts in Marriage and Family Therapy. She is a member of the American Counseling Association (ACA).