*GestureTek Health ("GT Health") **/gesturetekhealth.com/** invented, pioneered and is the market leader in the world of immersive gesture control technology for healthcare and rehabilitation. The company's awarding winning portfolio of health-related products includes five different types of state-of-the-art systems, already being sold globally in hospitals and clinics, which offer unique patient and clinician benefits that have been proven through numerous studies over the past 20 years. Canadian-based GT Health and its UK-based operating company, IIP Health Limited, are in a phase of growth and new product development that will secure continued market leadership and make GT Health the go-to market expert for healthcare practitioners and beyond.*

BACKGROUND & HISTORY

GestureTek Inc. is a Canadian-based world leader in interactive gesture-controlled technology. The company, co-founded in 1986 by Vincent John Vincent, invented video gesture control technology that was part of the origins of the field of virtual reality ("VR"). This pioneering team created myriads of virtual worlds used in human-computer interface technology, and went on to invent and patent the array of video gesture control technologies that exist today. Since then the company has moved application of this technology across multiple sectors, including healthcare, digital signage/displays, educational tools, consumer console games and mobile applications.

GestureTek has invented video gesture control in its many forms and has applied this technology, and the over 45 patents covering it, into an array of products that have been sold around the world, and have been licensed to fortune 500 companies. As examples, GestureTek has licensed its patents and technology to companies like Sony for the EyeToy on the Playstation console; Microsoft for XBOX console for gesture cameras like the Live camera and the Kinect; Hasbro for the Ion Education Gaming System; and onto over 100 Million mobile phone devices around the world.

Some of our other well-known customers include:

GestureTek Health began as a division within GestureTek Inc. when the company first started developing applications specific to health, disability and rehabilitation in the mid-1990s. The company now sells five different systems using GestureTek Inc.'s award-winning and patent-protected technologies geared towards the rehabilitation and disability markets, which have been successfully tested, proven and commercialized across the Americas, and parts of Asia and EMEA. To date, 750+ units have been sold to hospitals and clinics. GT Health, along with its UK-based operating company, is in a phase of growth and seeking to develop relationships and partnerships that will support its global expansion.

Some awards granted to GestureTek for their technology inventions include:

2015 Digital Signage Apex Gold Award in Art & Entertainment

2015 Digital Signage Apex Silver Award in Hospitality

2014 Digital Signage Apex Gold Award for Art & Entertainment

2014 Digital Signage Apex Bronze Award for Art & Entertainment

2014 Third Prize Winner Infocomm awards for Entertainment based installations

2008 Winner MWC Award "top award in the world" for mobile phone technology

GT HEALTH PRODUCTS: USES & CONDITIONS

GT Health's portfolio of products aims to improve the lives of people with rehabilitation needs through unique and affordable VR based solutions that are designed to guide users through motivating treatments in a real-time setting. GT Health has five systems already being used for therapy related to a variety of health conditions. IREX, GT Health's flagship exercise system, makes exercise fun and has been proven in a multiple of studies to encourage patients to engage in therapy regimens for two to three times longer. IREX utilizes proprietary gesture recognition software that places a patient into a virtual world where they can exercise upper and lower extremities while parachuting, juggling, chasing sharks, playing volleyball, or participating in a number of other virtual reality environments.

There is simply no other rehabilitation product on the market that offers such a unique and engaging exercise experience as IREX. Unlike other VR products coming into the market, the IREX provides patients with full body immersion into engaging real-time "game-ified" simulations with no need for peripheral devices or body markers, while also allowing the clinician to control application parameters and dynamics; while tracking quantitatively measured progress. Additionally, IREX offers a unique third person view of themselves such as if they were looking in the mirror, unlike all other VR systems that utilize a first person view where they do not see themselves in the virtual environment.

IREX is currently used for upper and lower extremity exercise for injuries and illnesses such as:

- ✓ Soft tissue and joint injury
- ✓ Stroke
- ✓ Traumatic brain injury
- ✓ Neurodevelopmental
- ✓ Neurodegenerative disease such as multiple sclerosis, Alzheimer's and Parkinson's diseases
- ✓ Spinal cord injuries
- ✓ Limb amputation

It has also been demonstrated to be effective at improving visual neglect syndrome as well as improving visual attention and spatial memory.

Features of the IREX important to clinicians include:

- ✓ Fully prescriptive exercise routine for uni or bilateral exercise, upper or lower extremities and complete control of range of motion
- ✓ Ease of use with no peripherals to hook up and virtually instant calibration
- ✓ Minimal set up time (<2 minutes) minimizes potential lost therapy time
- ✓ Instant data output of progress for analysis, goal setting and charting
- ✓ Reduced staffing cost due to ability of therapy assistants to conduct the session
- ✓ Provides options for treatment resistant populations such as brain injury, pediatrics and geriatrics

USER EXPERIENCE AND BENEFITS FOR HOSPITALS AND CLINICS

The IREX complements traditional therapy regimes for inpatient and outpatient treatment.

- ✓ **For the patient:** immersive VR empowers users by providing a fun and safe space where visualization, sound and graphic feedback motivate and instill hope.

M.P. from Indiana and mother of an autistic child who watched her son interact with the Cube at an Old Navy Store told us: "I hope that your company takes the world by storm and that everyone sees what I see."

- ✓ **For clinicians:** benefits include increased clinical efficiencies, unique high-tech and low cost effective therapy options with enhanced capacity to assess treatment effects. Improved therapeutic outcomes lead to reduced lengths of stay and readmission rates.

Dr. Ryan Ernst, neuropsychologist with Madonna Rehabilitation Hospital stated, "Our current understanding of the recovery of brain function after injury tells us, interestingly enough, that fun exercise equates to better outcomes. In two not so scientific words, that is what IREX is…fun exercise."

The real engagement factor is best demonstrated through live user experience examples here: ***http://www.gesturetekhealth.com/nw-videos.php.***

Use of the IREX not only increases the fun, engagement and treatment effectiveness for patients, but also translates into direct and indirect cost savings for hospitals and clinics that invest in the system. The IREX is a relatively inexpensive system because its price is much lower than many high tech rehabilitation systems that can top hundreds of thousands of dollars. Additionally, there are no after purchase costs associated with disposable items and tech support fees that are common with medical devices.

CLINICAL RESEARCH

Past research includes 45+ studies from reputable sources demonstrating the positive effects of use. Research and clinical studies involving the IREX have shown its promising potential in the treatment of neurological injury in particular. A fascinating study in 2005[1] demonstrated improved lower extremity function post-stroke, along with cortical reorganization in the primary motor cortex as demonstrated with fMRI. Here are some other examples of the demonstrated benefits with IREX use in brain injured populations from recent peer-reviewed research articles:

Increased mobility through improvement of lower limb function.

Daniel McEwen, MSc; Anne Taillon-Hobson, PT, MSc; Martin Bilodeau, PT, PhD;Heidi Sveistrup, PhD; Hillel Finestone, MD, FRCPC (2014). Improved lower limb function following stroke. *Stroke* 45: 1853-1855

Improved cognitive function and upper extremity motor performance.

Lee, K. H. (2015). Effects of a virtual reality-based exercise program on functional recovery in stroke patients: part 1. *Journal of physical therapy science*, *27*(6), 1637.

Improved attention and concentration in patients with brain tumor.

Yang, S., Chun, M. H., & Son, Y. R. (2014). Effect of Virtual Reality on Cognitive Dysfunction in Patients With Brain Tumor. *Annals of rehabilitation medicine*, *38*(6), 726-733.

Improved aspects of unilateral spatial neglect.

Kim, Y. M., Chun, M. H., Yun, G. J., Song, Y. J., & Young, H. E. (2011). The effect of virtual reality training on unilateral spatial neglect in stroke patients.*Annals of rehabilitation medicine*, *35*(3), 309-315.

Improved visual attention.

Kim, B. R., Chun, M. H., Kim, L. S., & Park, J. Y. (2011). Effect of virtual reality on cognition in stroke patients. *Annals of rehabilitation medicine*, *35*(4), 450-459.

THE NEUROSCIENCE BEHIND IREX FOR BRAIN INJURY REHABILITATION

Studies from the late 20th century provided refutable evidence for the dynamic nature of brain structure and function.[2,3,4] Conclusions from these studies changed our way of thinking in regard to the brain's ability to adapt to injury. We now realize structural and functional map alterations do occur in the brain post-injury – this is referred to as "neuroplasticity". This literally means that the brain is malleable like plastic and is programmed to change automatically in response to injury, as well as to high task demand. So for tasks the brain has to perform often, the brain changes its structure and function to become more efficient at performing the task.

Science also has revealed conditions by which neuroplasticity occurs with greater magnitude. Focus attention, motivation and repetition, or "massed practice," are three of these conditions that have been woven into the IREX program. By enhancing these conditions, a greater degree of neuroplastic change is possible and therefore, a more optimal outcome of functional restoration.

Focused Attention: ***Neuroplasticity does not occur unless attention is present*.**

"Willed attention can redraw the contours of the mind, and is do doing, can rewire the circuits of the brain, for it is attention that makes neuroplasticity possible.- Dr. Mike Merzenich

In 1993 Merzenich demonstrated passive participation does not lead to lasting cortical changes[5]. When stimuli *identical* to those that created neuroplastic change in the attending brain were delivered to the nonattending brain, there was no induction of cortical plasticity. In other words, if a person is passively engaged in an exercise, little to no brain change actually occurs. IREX creates an immersive experience for the participant, yielding increased focused attention and engagement to the task. Through many different exercises boasting various virtual environments, the therapy session continually introduces novelty, variety and challenge, which happen to be the three pillars essential to neuroplastic change. Compare this to therapy as usual with a familiar therapist, in a static environment, while completing mundane exercises. This is especially important in neurorehabilitation as disruption of attentional systems is pervasive.

Massed Practice: ***The brain doesn't change easily*.**

Neuroplastic change does not happen with tasks that we do with low frequency. Early studies of massed practice based in rehabilitation indicated if a skill is practiced many, many times over, the brain will change to allow recovery of a non-functional arm or leg.[6,7,8] However, these conclusions were largely based on rat and monkey models and often times these animals are much faster than humans, performing tasks hundreds or even thousands of times during a session. A study of humans with stroke and traumatic brain injury undergoing rehabilitation indicated an average number of active repetitions per session was 26.44, or 1.29 per minute.[9]

Accordingly, a major effort of rehabilitation with peripheral or central nervous system injuries should be to increase the number of repetitions per session. This leads directly to improved outcomes. However, this means patients must work through many obstacles including frustration and pain. Virtual reality environments have been demonstrated to increase the amount of time a patient will actively engage in a session, and not only increase pain tolerance, but actually decrease the amount of pain experienced.[10,11] Increased time in active engagement and higher number of repetitions leads directly to better outcomes, and is inherent to the IREX's virtual reality exercise system.

Motivation: ***A frequently overlooked, yet immensely important aspect of rehabilitation.***

"Under conditions of interest, such as that of competition, the resulting movement may be much more efficiently carried out than in the dull, routine training in the laboratory" - Shepherd Ivory Franz (1874-1933)

Anyone would agree that it is important for a patient to be motivated to participate in rehabilitation. Yet, what rehabilitation tools can you think of that are designed to motivate? Research has demonstrated significant gains in performance of brain-injured patients, simply by setting goals for patients that serves to create an internal sense of competition.[12,13] IREX was developed to create competition and goal setting. When an individual is competitive and has goals, they are more motivated. Efforts in traditional rehabilitation fall far short of creating a competitive atmosphere. IREX is designed to track progress through producing scores based upon performance. Just as players are highly motivated to play video games in order to achieve higher scores, IREX creates a game-like environment that captures the same conditions of competition and challenge that hook players into wanting to engage more and for longer periods of time.

KEY HEALTHCARE CUSTOMERS

GT Health has a growing list of institutional clients that includes clinics and hospitals, such as Shriners Hospital for Children, Toronto Sick Kids, Miami Children's Hospital, Mayo Clinic, Madonna Rehabilitation Hospital, MarionJoy Rehabilitation Hospital, Driscoll Children's Hospital, Lehigh Valley Hospital, Trois-Rivières Hospital, Department of Health, State of Georgia, Next Generation Pediatrics, Children's Hospital of Eastern Ottawa, Texas A&M Hospital as well as distribution partners including Flaghouse and Rompa. An example client – Miami Children's Hospital ("MCH") – demonstrates how GT Health products can transform the dynamic of an entire healthcare facility. After experiencing the engagement factor and seeing the positive benefits of its first GT Health system, MCH set up a dedicated stimulation room and now houses more than 12 GT Health systems across its wards. The US Veterans Administration has also found GestureTek products beneficial for wounded soldiers with installations in several locations, a few of which include: James A Hailey Veterans Hospital, Veteran Medical Center in Temple, TX and Naval Medical Center in San Diego, CA.

FUTURE DIRECTION

GT Health and IIP Health Limited are currently developing the next generation of virtual reality products for the healthcare market. An updated version of the IREX will feature high resolution graphics and an advanced degree of sensitivity for tracking joint and limb movement, as well as eliminating the need for a green screen backdrop. In addition to its previously demonstrated utility for upper and lower limb rehabilitation, the new version of the IREX is planned to incorporate high agility training, exercises and measurement of cognitive function, standardized assessment of balance, a [14]mirror therapy-like exercise for amputees, integration with other peripheral devices such as robotic assisted technology, as well as interface with functional brain imaging devices such as functional near infrared spectroscopy (fNIRS) and quantitative electroencephalography (qEEG). Rehabilitation facilities will simply be incomplete without access to the IREX.

COMPETITION & FUTURE OF GT HEALTH

As inventor of the field and with proven commercialized products, GT Health has a head start in the market. In addition to the fact that no other company has an array of VR products so wide, there are no other market players who have a product comparable to GT Health's flagship IREX exercise system, which is already tried, tested and proven. GT Health houses a team of industry pioneers who have vision, experience and a strong foundation of relationships with academics, doctors, clinicians, clients and partners. A next generation of turnkey products will allow for wider use of its products in both institutional and retail markets, and for better measurement and tracking tools. Going forward the team will continue to create highly engaging products and functional applications through use of its clinician Focus Group, aiming to become the go-to market expert for healthcare practitioners and beyond.

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