Brain Imaging Study Demonstrates Digital Psychiatric Therapy "Re-Wires" the Brain, Resulting in Improved Attention in Children with ADHD

Study in Translational Psychiatry suggests promise of durable non-pharmacologic treatment

Beverly, MA August 15, 2018 - ATENTIV, LLC, pioneers in digital therapies for Attention Deficit/Hyperactivity Disorder (ADHD) and other cognitive disorders, today announced the publication of a recently completed brain imaging study using the ATENTIVmynd™ Technology platform. The study demonstrated physical evidence that the brain can be 'rewired' or 're-normalized' in children with Attention Deficit/Hyperactivity Disorder (ADHD) who were given digital psychiatric therapy. This rewiring was associated with an improvement in attention symptoms consistent with cumulative evidence from 7 prior clinical trials.

The study, entitled "*Brain-computer-interface intervention re-normalizes brain functional network topology in children with attention deficit/hyperactivity disorder*", is available online in the peer-reviewed journal *Translational Psychiatry* published by *Nature*. The study was funded by the National Medical Research Council in Singapore. The intervention was co-developed by the Institute for Infocomm Research, a research institute managed by the Agency for Science, Technology and Research in Singapore, and ATENTIV, LLC, a digital psychiatric therapeutic company, which has developed the intervention into a platform of ATENTIVmynd™ Games.

The brain imaging study, part of a larger randomized, controlled study of 172 children with ADHD, included 18 boys (mean age 9.00±1.50 years) who received the game intervention for 8 weeks, and a wait-list control arm of 11 boys (mean age 9.45±1.29 years) with ADHD who received no intervention. Resting state functional Magnetic Resonance Imaging (fMRI) images, along with clinical assessment of ADHD symptoms via the ADHD Rating Scale-IV (ADHD RS-IV), were obtained at baseline and at 8 weeks. Regions of the brain with correlated Brain Oxygen Level Dependent (BOLD) activity were utilized to assess functional connectivity networks (areas of the brain that work in concert).

The group receiving the game intervention had several positive statistically significant outcomes compared with the untreated group. They had reduced local processing (higher efficiency) within the salience/ventral attention (SVN) network (brain areas involved in detecting the importance of information). The reduced local processing in the SVN was correlated with fewer inattentive symptoms ($r = 0.39$, $p=0.038$). They had increased communication between the central executive network (brain areas involved in orientation to external stimuli) and the default mode network (brain areas involved in self-related processes including daydreaming and mind-wandering).

Jonathan Rubin, MD, MBA, Chief Medical Officer of ATENTIV, LLC, commented, "This study supports prior research that children with ADHD have brain networks regulating attention that work with reduced efficiency. After 8 weeks of the game intervention, abnormal brain networks regulating attention were re-wired, as seen by a change in brain network connections to a pattern that more closely resembles that of a developmentally normal brain. These findings add to the promising body of evidence from seven prior studies in over 300 children with ADHD using the ATENTIVmynd™ Game intervention which have demonstrated improvements in ADHD symptoms, reading, math and homework skills without the use of medication."

Scott Kollins, PhD, Professor of Psychiatry and Behavioral Sciences at Duke University School of Medicine and Director of the Duke ADHD Program, who was not involved in the research, stated, "This new imaging study provides provocative preliminary evidence that changes in attentional functioning in ADHD patients as a result of treatment with the ATENTIVmynd™ Game is mediated through neuroplastic processes. These findings are an important step toward better understanding the mechanisms underlying novel approaches to treating ADHD."

About ATENTIVmynd™ Games: ATENTIVmynd™ Games comprise a novel, non-pharmaceutical, digital cognitive training and therapy platform designed to provide sustained and measurable improvements in attention and inhibitory control for individuals when delivered in the clinic, school or home. The intervention product platform, ATENTIVmynd™ Games, is delivered via action adventure video games in which the player uses their brain waves, related to their attention state, to control the speed of an action character while the player is presented with multiple dynamic challenges that target, measure and teach the underlying cognitive skills of attention and inhibitory control. The system leverages a proprietary, non-invasive direct brain-to-computer interface to measure a user's unique 'cognitive signature' from brain waves related to their attention state. Initial product applications are designed to optimize attention skills in elementary and high school children and adults. The training is conducted in 20 minute sessions for 3-5 days per week over a period of 5-8 weeks for a total of 8 hours of gameplay.

About ADHD: Attention Deficit/Hyperactivity Disorder affects about 11% of children. The core observable symptoms are inattention, impulsivity and hyperactivity. It is a complex condition involving several interconnected brain regions, it effects all other executive functions, including memory, abstract reasoning, critical thinking and decision making. Causes of ADHD include both genetic and environmental components. Current treatment approaches for ADHD include medication, psychosocial interventions (behavioral therapy, parent training and academic accommodations), working memory training and neurofeedback.

About ATENTIV, LLC: ATENTIV, LLC is a digital psychiatric therapeutic company that develops and markets a platform of digital therapeutics and services targeted at the prevention and treatment of childhood developmental disorders, beginning with ADHD. (http://www.atentiv.com; www.attentiontherapeutics.com)

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