

Video game promotes better attention skills in some children with sensory processing dysfunction

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After four weeks of playing a video game, seven of the 20 children with sensory processing dysfunction who also met criteria for attention deficit hyperactivity disorder showed a marked improvement in attention. Credit: Akili Interactive Labs

A video game under development as a medical device boosts attention in some children with sensory processing dysfunction, or SPD, a condition

that can make the sound of a vacuum, or contact with a clothing tag intolerable for young sufferers.

In a study publishing April 5, 2017, in *PLOS ONE*, researchers at UC San Francisco measured the impact of a "digital intervention" on attention among 38 children with the disorder and compared them with 25 typically developing counterparts, matched by age and gender.

The researchers found that 20 of the children with sensory processing dysfunction also met criteria for attention deficit hyperactivity disorder (ADHD), using parent reports. These children exhibited reduced midline frontal theta activity, a neural measure of attention revealed through the examination of [brain wave patterns](#).

After playing the video game for four weeks, this group of children showed improvements in attention. Seven of the 20 (one third) showed such marked improvements that they no longer met research criteria for ADHD. Significantly, parent-reported improvements were noted nine months after the intervention.

'First Step in Personalizing Care'

"To varying degrees, all children with sensory processing dysfunction struggle to properly modulate [sensory information](#)," said senior author Elysa Marco, MD, director of the UCSF Sensory Neurodevelopment and Autism Program, and associate professor in the UCSF departments of neurology, psychiatry and pediatrics.

"A subset of children with sensory processing dysfunction show challenges involving cognitive control, which includes sustained attention, selective attention and goal management. These challenges act as an additional impediment in their daily lives and suggest an important avenue for treatment," she said. "This is our first step in personalizing

care for these children and we're excited to be approaching it with cognitive training."

Sensory processing dysfunction affects 5 percent of all children, according to the American Occupational Therapy Association, and is considerably more prevalent among those with autism and ADHD. The condition can cause extreme sensitivity to some stimuli, such as loud noise or bright lighting, and poor sensitivity to others, leading to inappropriate behavior like "crashing into walls" or overly aggressive hugging. Occupational therapy is sometimes recommended to help children regulate [sensory input](#) and make them more comfortable and focused.

Game Design Engages Young Players

The study participants, whose ages ranged from 8 to 11, were instructed to play the video game that uses a digital platform called Project: EVO. The platform is designed to feel like a consumer product with a high-level interface and engaging visual and auditory feedback. The core technology is based on patent-pending neuroscience designed to strengthen the brain's ability to process and prioritize thoughts and external stimuli. It was originally discovered in the lab of Adam Gazzaley, MD, PhD, of UCSF.

The platform uses proprietary algorithms to automatically assess a child's ability level, adjusting the difficulty of the tasks as they become more proficient. Users navigate a character through winding paths, avoiding walls and obstacles, while responding selectively to colored targets.

The researchers found that after playing the [video game](#) for 25 minutes, five days a week for four weeks, children with sensory processing dysfunction and inattention showed improvements in attention, according to both parent reports and an increase in midline frontal theta

activity. While previous research has shown how the brain of children with sensory processing dysfunction is structurally different from their typically developing counterparts, the new study shows that some children have measurable functional differences that can be improved with this intervention.

"These findings are also important to consider from the perspective that one size doesn't fit all, as there were selective benefits of this intervention for some of these children compared to their counterparts without attentional deficiencies," said lead author Joaquin A. Anguera, PhD, director of the clinical program in the Neuroscape center and assistant professor in the UCSF departments of neurology and psychiatry.

"Moreover, this study highlights the importance of conducting individual assessments from multiple perspectives – parental reports, attention testing and neuroimaging – to have a robust understanding of why this approach was beneficial in the first place."

Alternative to Medication

Marco said that the intervention may prove to be an appealing alternative to medication for the subset of children with sensory processing dysfunction and inattention.

"We believe that all children with sensory processing dysfunction should be assessed for attention challenges. We expect that about 40 percent will have deficits in this important neurodevelopment domain and could benefit from cognitive training," she said.

If the technology is approved as a medical device by the Food and Drug Administration, it may be available through a child's medical provider and eventually covered by health insurance companies, said Anguera.

The technology is also being studied in an ongoing large-scale clinical trial for children with ADHD. It follows the results of a study last year that found it could be used effectively to identify [children](#) with [attention disorders](#), as well as a more recent study using the same platform to treat older adults with depression.

Provided by University of California, San Francisco

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