

Connecting Technology To Improve Cognitive Control In Children With ADHD In The Home

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ABSTRACT

Being able to focus effectively on a task is a constant challenge for children with ADHD. Parents, carers and healthcare professionals are looking for research-driven tools to improve behaviours (attention and relaxation) while building independent coping skills in the home.

Connecting wearable headsets to mobile-centric video platforms to access game therapy solutions could provide children with access to connected therapeutics to improve their attention in the home.

Author Keywords

Autism; Attention deficit hyperactivity disorder (ADHD); neurofeedback; electroencephalogram (EEG); headset; video content platform

INTRODUCTION

Recent studies demonstrate that > 5% school-going children suffer from attention deficit behaviours that make everyday activities a challenge (1). Cognitive control is the ability to adapt and regulate such behaviour to current demands by attending to task-relevant information over distractions that interfere with meeting a goal (2). Cognitive training techniques, designed to target attention or working memory, are gaining popularity as non-pharmaceutical options for ADHD and ASD. Neurofeedback is a known tool in the medical research field that uses feedback from the brains electrical activity (electroencephalogram, EEG) to self-regulate and retrain how your brain functions by reconditioning brain patterns. This can be used to improve behaviours such as attention and relaxation.

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Wearable technologies are penetrating more areas of our daily lives (3) so it is hardly surprising that new technologies are not only wearable, but also connected to other devices and machines. Smart assistive solutions require key features that create customised, user-centric technologies to meet the needs of the child with attention-deficit behaviours.

Here, we describe how the integration of brain wearables (EEG headsets), video platforms and engaging video content with neurofeedback software can provide customised brain fitness tools for the parent, carer or healthcare professional to monitor and improve the behaviour of a child with the condition of ADHD.

METHODS AND RESULTS

1. We tested our assumption in this space by conducting early user concept surveys on 150+ parents, carers etc. of children with ADHD (See figure 1 for survey summary).



Figure 1. Survey summary

Our survey (figure 1) demonstrated that children would: (i) wear EEG headsets, (ii) use video games as an ideal and fun preferred medium of engagement and that (iii) scientific rigour and relevant video content is crucial to improved behaviour and consistent engagement.

2. Proposed solution:

Children use EEG headset with Cortechs neurofeedback software, video platform from Videobot and engaging Kavaleer animation to create customised, neurofeedback game therapy. Brainwaves are recorded in real-time as child participates in game or video session; brain activity is timestamped and stored on web server by Cortechs for later observation offline by healthcare professional or parent who can evaluate improvement in brain function across sessions .

3. Connected technology:

a) Neurofeedback technology integrated into game.

Cortechs builds neurofeedback paradigms into the game mechanics to prompt attention and reward children for sustained attentive behaviour within game. Cortechs software (apk) syncs by Bluetooth with EEG headset (Figure 2) to allow real-time, reliable & measurable brainwave readouts compatible with Android applications and acts as a plug-in to API for games and game engines. Paradigms used are based on scientific research demonstrated to improve attention.



Figure 2. Cortechs APK and EEG headset

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Cortechs software also captures and stores time-stamped EEG brainwave data to be accessible online by others.

b) Video content sent and accessed by video platform.

Videobots VBOT platform will be configured to push and synchronise game containing custom-designed animation (Kavaleer) to web, smartphone and tablet interfaces (figure 3) based on attention and relaxation thresholds set by Cortechs software. It can be responsive to display video clips in a configurable mosaic player depending on viewers age groups, level of brain activity, content type, playback devices and location of retrieval. It acts as an always-on video interface that can support pre-set video narratives and story paths (content designed by Kavaleer and thresholds set by Cortechs) that rewards engagement and sustained attention or relaxation within the game session.



Figure 3. VBOT platform interface and Kavaleer animation on smartphone

CONCLUSION

We believe that our proposal warrants further development to allow connected technology to translate into connected therapeutics for children with autism and ADHD .

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