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## Autism



### Evidence-Based Social-Emotional Therapy Using Augmented and Virtual Reality on Google Glass to Improve Employability and Job Skills in Adults with Autism



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Dr. Ned T. Sahin

About 50,000 individuals with autism spectrum disorder (ASD) reach adult working age each year, and over 80% of them are classified as unemployed. This includes a vast number who are college-educated and very talented. Today millions of adults with ASD are unemployed or underemployed in the United States.

Essential funding and services necessary for people with ASD to thrive and survive "age out" around age 23, resulting in an overall lack of resources for adults with ASD. An important way to support these individuals is to provide them with the tools to manage their symptoms and learn key social-emotional skills that can help them obtain meaningful employment. This is essential, as the most protective factor against lifetime negative mental health outcomes is being employed.

The Autism Research Program (ARP) recognizes the critical need for helping individuals with ASD obtain employment and has made it an Area of Interest for the program. The ARP awarded a Fiscal Year (FY) 2016 Idea Development Award to Brain Power, LLC, and Dr. Ned T. Sahin (Principal Investigator) to encode principles of neuroscience and behavioral sciences into augmented reality and virtual reality software for head-mounted display computers like Google Glass. The software is designed to aid in the successful transition of individuals with ASD into employment.

Dr. Sahin and his team developed augmented reality and virtual reality software technology ("Empowered Brain") aimed at improving the symptoms of social interaction disorders such as ASD. With Empowered Brain, individuals look through a computer screen (e.g., Google Glass) which incorporates virtual reality displays to provide the user with experiences that will help them cope with real life situations. The user receives in-game rewards for completing social-emotional learning tasks, which aid in improving their social behaviors with teachers and peers, such as their ability to remain attentive.

The technology proved both feasible and efficacious in improving symptoms of ASD, including social withdrawal, irritability, and hyperactivity in students with ASD. A middle school teacher who incorporated the technology in his classroom reported that, with daily use of the technology, students' attention was significantly increased, and the technology even helped in the development of student-teacher relationships, both very important skills for transitioning to employment.

With ARP support, the team has developed software modules to teach job-related skills of particular use in the ASD population. The new technology allows wearers to be safely digitally immersed in work environments through Google Glass to aid in transition to adulthood. This allows individuals with ASD to experience and prepare for different workplaces and helps them determine whether a job could be appropriate for them. The technology also has the capacity for remote digital job coaching that could be utilized while the individual is at work. The team has conducted a series of studies, including feasibility and usability studies for the new software modules. Fifteen adults were provided a 1-hour training session to use the technology. The study determined that 85% of the adults in the study were able to demonstrate proficiency with all components of the technology.

Brain Power has used the FY16 ARP award not just to conduct studies, but also to successfully produce tangible output in terms of science-based apps and to bring them into the real world with school districts as customers. For instance, the team has been working with Newton Public Schools, one of the largest public school districts in Massachusetts, to implement the technology in their job placement effort known as Transition Planning Program. Additionally, several public school districts throughout Massachusetts, as well as in other states (e.g., Texas and Pennsylvania), have procured Brain Power's AR/VR social-emotional learning apps suite. In this way, the tangible benefit resulting from the ARP funding has been extended to a broad range of students with ASD already, and the benefit from ARP will continue to compound rapidly in the future.

The Empowered Brain system has had great success. This 2016 award marked the first ARP award to a company, rather than a research university, in recognition that Dr. Sahin and his Brain Power team offered a unique approach and the promise of a tangible, real-world outcome. As a result of the grant, the software/hardware was put into tangible practice that benefited young adults struggling with employability. The investigators have published ten peer-reviewed articles on use of the technology and its capacity to aid in developing social and behavioral skills for individuals with ASD. The Empowered Brain system has also received news coverage by media outlets such as NPR, PBS, CNN, Wired, Tech Crunch, New York Times, and others. With this exciting technology, ASD individuals can better prepare for transitions to adulthood by obtaining jobs that are better suited for them. A meaningful job is a major step in establishing success and independence for adults with ASD as well as assuring positive mental health outcomes.

Part of Empowered Brain's great success may be due to the fact that Brain Power is also an employer of individuals on the ASD spectrum. The opinions of individuals with ASD are incorporated while designing prototypes. Through their autism employment program Brain Power prioritizes hiring individuals with ASD. They have promoted some company interns with ASD to full-time employment. Other interns with ASD have graduated to full-time employment elsewhere based on the skills they gained through the company's mentorship. Brain Power is a company where individuals on the ASD spectrum feel accepted and where the focus is on talent, not social deficiencies. With the Empowered Brain technology, Brain Power hopes to champion more individuals with ASD who are searching for employment, and permit their talents to shine.

#### Publications:

Vahabzadeh A, Keshav NU, Abdus-Sabur R, Huey K, Liu R, and Sahin NT. 2018. Improved socio-emotional and behavioral functioning in students with autism following school-based Smartglasses intervention: Multi-stage feasibility and controlled efficacy study. *Behav Sci* 8(10):85.

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Keshav NU, Vogt-Lowell K, Vahabzadeh A, and Sahin NT. 2019. Digital attention-related augmented-reality game: Significant correlation between student game performance and validated clinical measures of attention-deficit/hyperactivity disorder (ADHD). *Children* 6(6):72.

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Salisbury JP, Keshav NU, Sossong AD, and Sahin NT. 2018. Concussion assessment with Smartglasses: Validation study of balance measurement toward a lightweight, multimodal, field-ready platform. *JMIR Mhealth Uhealth* 6(1):e15.

Sahin NT, Abdus-Sabur R, Keshav NU, Liu R, Salisbury JP, and Vahabzadeh A. 2018. Case study of a digital augmented reality intervention for autism in school classrooms: Associated with improved social communication, cognition, and motivation as rated by educators and parents. *Front Educ* 3:57.

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**Link:**

**Public and Technical Abstracts: Can Virtual Reality Pre-exposure to Realistic Workplaces and Interactions Improve Job Placement, Anxiety, and Performance in Transitioning Adults with ASD?**

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