

## **Computer-Mediated Exposure Therapy for Auditory Sensitivity in Autism Spectrum Disorder**

**Background:** Many individuals diagnosed with Autism Spectrum Disorder (ASD) experience extreme sensitivity to sound. Efforts have been made to manage this condition, but there is wide room for improvement. One approach - exposure therapy – has been shown to help several individuals diagnosed with ASD manage their sound sensitivities. A computer-mediated version of this approach would be cost-effective and could be widely proliferated. The work we present here appears to be the first to adapt a computer-based exposure approach for individuals with auditory sensitivities and ASD. Our approach is customizable, free, and easy to use, and it could be relevant to many individuals suffering from sensory hypersensitivities.

**Objectives:** Our goal was to create computer-mediated exposure therapies for individuals with ASD diagnoses, using free, open-sourced software. Our approach was specifically designed to accommodate individuals of all ages and intellectual abilities. While we focused specifically on auditory sensitivity, our overall approach could potentially be used to address other sensory challenges.

**Methods:** Three individuals diagnosed with ASD were enrolled in our study. All participants had issues with auditory sensitivity and their families identified one specific category of sound that caused them particular distress. Different games were created for each participant using “Scratch” – an open-sourced software for building customizable games and visualizations. We used a participatory-design approach and actively solicited advice from the caregivers of our participants. After the design phase, we uploaded exemplars of each participant’s aversive sound into each program. We programmed these target sounds to coincide with positive, rewarding events on the screen, and they were set to occur for 2-3 seconds every 10-15 seconds. Exposure sessions ranged from 5-10 minutes and were conducted every other day for up to two weeks. Target sounds increased in volume from session to session, and spanned the full dynamic range of the laptop speakers.

**Results:** Two out of three participants completed all experimental sessions and eventually tolerated the target sounds at the maximum volume. The other participant was withdrawn prematurely because his parents could not manage the specific time demands of the experiment. The two participants that completed the study both tolerated, and even enjoyed, the intervention; they both asked to interact with our software program, even on days when they were not scheduled to do the experiment. Both participants also showed objective improvements in their auditory sensitivity, as assessed by their ability to listen to the target sounds on the computer. A one- and two-month follow-up session was conducted with one participant, and he continued to tolerate the sounds even when played at their maximum volume.

**Conclusions:** While further experiments are needed to confirm the therapeutic efficacy of this approach, these case studies suggest that exposure-based treatments for auditory sensitivity can be effectively embedded into multimedia software and easily used at home by non-experts. Future work should be done to disseminate this knowledge and to help individuals design their own programs, perhaps through the creation of a community-driven effort to build new desensitization games and media that support sensory needs.