Desktop Games & Apps Executive Summary

Autism spectrum disorder (ASD) is a developmental disability affecting about 1 out of 59 children (Baio, 2018), and is commonly characterized by difficulties with communication, social interaction, perspective taking, and emotional regulation (Baio, 2014; Centers for Disease Control and Prevention, 2016). Children with ASD usually have difficulty understanding other people's emotions or participating socially with others (Sticher, Laffey, Galyen, & Herzog, 2014). It has been reported that many people with ASD have an affinity for computers and video games, which can increase their motivation for engaging in programs in this format (Ferguson, Gillis, & Sevlever, 2013). The following paper is a summary of a literature review on desktop games and iPad applications (apps) that target social participation for children with ASD, and can be downloaded for clinical and home settings. Our search returned 168 studies, and of these, 10 were found to use games or applications that are available for download.

**iPad Apps**

While there has been great development in iPad apps for children with ASD since the iPad was released eight years ago, few apps have been investigated in the literature. Our literature search found four apps that target social skills in children with ASD. *FindMe (Autism)* is a free app designed for children aged 2-6 years (Fletcher-Watson et al., 2016). Players progress through two levels where they must identify characters in a scene. The first level focuses on simply pointing to the character, while the second level increases difficulty by including objects intended to distract the player. The player must help his character use eye-gaze and head-turn to find a target item, and then point to indicate the target item. It has been observed to improve social communication skills, concentration, and focus in children with ASD. *CopyMe* is a free app for children aged 8-10 years (Harrold et al., 2014). This game requires the player to observe a photo of a human face making a facial expression and attempt to copy it using the built-in camera on the iPad. The authors found that using the app improves emotion and facial recognition skills. The third app we reviewed is called *A Sunny Day*, developed by Yan (2011). It is a free app that combines real life situations and mini games to teach the user daily skills, such as getting dressed or brushing teeth. It has been found to improve social skills and daily skills in children with ASD. Lastly, *TOBY* is an app researched by Moore and colleagues (2013).  It can be used for any child under 16 years old due to its graded difficulty. It uses 330 various activities to help children with ASD practice visual and auditory understanding, receptive and expressive language, social skills, and imitation. It uses three fundamental task types: solo (tasks in which the computer can measure the response directly and can deliver reinforcement and prompting to the child to find a given stimulus picture from a set of pictures), partner (tasks which involve the parent, where the system presents the stimuli and the parents recognizes the child's response and prompts as guided by the system), and

natural environment tasks (completed off the iPad, and instructions are provided). It has been found to develop social skills, cognitive skills, communication skills, and sensory discrimination.

## Desktop Games

Desktop games are an alternative resource for children. Our review revealed five games, all which have been found to be successful at improving social skills in children with ASD. The *Let's Face It! Program* developed by Tanaka and colleagues (2010) is a free program that can be used both at the clinic and at home for children aged 8-15 years. It includes seven computer games to improve facial recognition by improving eye gaze, facial memory, facial matching, face identity, and facial expression. It has been found to improve face processing skills of children. Likewise, *FaceSay* is a similar program that can be used both at the clinic and at home for children aged 6-15 years (Hopkins et al., 2011). It uses graded difficulty that help children learn specific social skills such as eye gaze, holistic facial processing, and discrimination of facial expressions. The authors found that providing children with ASD opportunities to practice eye gaze, expression matching, and face recognition in *FaceSay's* interactive environment improved their social skills. Likewise, children with high-functioning ASD demonstrated improvements in facial recognition, emotion recognition, and social interaction in natural environments. *Teach Town*, researched by Whalen and colleagues (2006), is a clinic/school-based program for children aged 18 months to 15 years with severe ASD. It has four different programs that all have graded difficulty to help develop social and emotional skills, as well as adaptive, cognitive, and communicative skills.

## Conclusion

The eight games discussed in this summary have been found to improve social participation in children with ASD. However, when using the Quality Assessment Tool by Effective Public Health Practice Project, all of the studies we reviewed obtained a weak score. Therefore, this review is limited by the fact that the research is not strong. However, these apps and games are favourable over those which are not reviewed by the evidence. The iPad apps in general seem to be more cost-effective and easier for home use, while the desktop games require a higher financial investment and would be better utilized in a clinic or school setting. We hope that in the future, more evidence-based desktop games and iPad apps are developed so that stakeholders have a greater selection of games to choose from for supporting children with ASD.

*Unfortunately, upon the completion of this review, some of the games listed above are no longer available for download. To find games that work on similar skill sets, please visit http://asdtechnology.osot.ubc.ca

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