Chapter 4
Avatars, Humanoids, and the Changing Landscape of Assessment and Intervention for Individuals with Disabilities across the Lifespan

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ABSTRACT

In recent years, there has been a burgeoning field of research on the applications of virtual reality and robots for children, adolescents, and adults with a wide range of developmental disabilities. The influx of multidisciplinary collaborations among developmental psychologists and computer scientists, as well as the increasing accessibility of interactive technologies, has created a need to equip potential users with the information they need to make informed decisions about using virtual reality and robots. This chapter aims to 1) provide parents, professionals, and individuals with developmental disabilities with an overview of the literature on virtual reality and robot interventions in childhood, adolescence, and adulthood; and to 2) address overarching questions pertaining to utilizing virtual reality and robots. This chapter will shed light on the far-reaching potential for interactive technologies to transform therapeutic, educational, and assessment contexts, while also highlighting limitations and suggesting directions for future research.

BACKGROUND

In recent years, there has been an increasing body of research on the application of virtual reality and robots to children, adolescents, and adults with a wide range of developmental disabilities, including Attention Deficit Hyperactivity Disorder (ADHD); Autism Spectrum Disorders (ASD); Cerebral Palsy (CP) with and without Hemiplegia; Learning Disabilities (LD); Intellectual Disabilities (ID); and Down

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Syndrome (DS). Moreover, a wide range of applications extends to individuals with deafness, visual impairments, diverse physical and motor disabilities, and multiple disabilities. These innovative technologies demonstrate the potential to transform the therapeutic, educational, and assessment contexts for individuals with disabilities and are of increasing interest to parents, professionals, and individuals with disabilities.

This chapter will address two particular innovative technologies that are representative of the changing landscape of assessment and intervention for individuals with disabilities across the lifespan: virtual reality and robots. *Virtual reality,* or a *virtual environment,* is a three-dimensional computer-based world, in which users can interact with objects or "avatars" (i.e., figures that resemble humans). These environments can be modified to resemble a wide range of settings, including classrooms, offices, and cafes. Virtual reality affords users the opportunity to repeatedly practice relevant skills in a safe environment. The extent to which the user is embedded in the scene is also highly variable, since some users may be able to watch themselves interacting in the scene, whereas other users may be represented by an avatar within a scene. Moreover, depending on the particular configuration within a virtual environment, users may also be able to receive direct feedback on their performance or interact with real people also using the program. Virtual reality can be accessed through a wide range of mediums, including videogames, head-mounted displays, or desktop computers (Parsons & Mitchell, 2002). Entirely distinct from virtual reality technology are *Robots,* technologies that "can interact with humans and show aspects of human-style social intelligence". Robots can also assume a wide range of forms, from "humanoids" (i.e., robots that resemble humans), to animal-resembling figures (Dautenhahn & Werry, 2004, p. 2). *Robotic systems* are robots that do not resemble an interactive agent like a human or animal; rather they are interactive configurations that may consist of gripper systems, switches, and buttons with which a user can engage (Prazak, Kronreif, Hochgatterer, & Furst, 2004).

RATIONALE

The driving force behind coordinating the goals of individuals with disabilities with interactive technology is the unique capability of technology to attract and maintain the interests of the users. Researchers have demonstrated the potential for virtual reality to promote children's participation in education, communication, and play settings (Chantry & Dunford, 2010). For example, Reid (2002) employed a virtual reality, play-based intervention (Mandala® GestureXtreme™) in which three school children with CP engaged in applications such as virtual drums, paint, and volleyball. Following the intervention, children showed greater self-efficacy, motivation, and engagement in play. In another study, Kim et al. (2013) investigated the potential for Pleo™, a social dinosaur robot to improve social interaction among children with ASD. The authors ascribed the robot's greater efficacy in eliciting children's social behaviors from the excitement and interest children spontaneously expressed towards it. The enjoyment that children experience from engaging with interactive technologies has also been demonstrated in older individuals, even if the intended outcome of the interactive technology was not achieved (e.g., ASD symptoms; Austin, Abbott, & Cabris, 2008). These findings underscore the potential for virtual reality and robots to serve as a highly motivating context for assessment, education, and therapy for individuals with disabilities across the lifespan.

The merging of virtual reality and robots with the fields of intervention and assessment affords developmental psychology researchers and clinicians unique advantages that are not always present in