

Chapter 7

Use of Robots With Play-Based Interventions in the Education of Children With Autism Spectrum Disorder

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ABSTRACT

Autism spectrum disorder (ASD) is a common developmental disorder involved in childhood neurodevelopmental disorders whose symptoms begin in early childhood. In recent years, interest in the use of technology in early diagnosis and training of ASD has been increasing day by day. For this purpose, socially interactive robots are used as tools to teach skills to children with ASD, play games with them, and reveal some desired behaviors. They also create interesting, engaging, and meaningful interaction situations that encourage children to interact with themselves. The aim of the child-robot interaction sessions is to enable children with ASD to overcome their shortcomings and understand the world better. In this context, robots can be considered as tools that will support the development of social skills of children with ASD and can be very useful for this purpose. To this end, this chapter includes studies on the use of play-based robot interventions in the education of children with ASD.

INTRODUCTION

Autism Spectrum Disorder (ASD) is a developmental disorder involved in childhood neurodevelopmental disorders, whose symptoms begin in early childhood and manifest themselves with inadequacy in two areas. First; it is indicated as significant deficiencies in the social-communicative field. This occurs in the form of difficulties in establishing and maintaining relationships, difficulties in initiating and maintaining interaction, inability to establish eye contact, and inability to express emotions. Second, it is a disorder with limited-repetitive behaviours. That is; it can be defined as stereotypes, repetitive and

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restricted motor movements, persistence in sameness, strict adherence to routines, limited and intense interests, more or less sensory arousal (American Psychiatric Association, 2013).

ASD differs significantly in terms of severity of symptoms, age of onset and its relationships with other disorders (e.g., mental retardation, a certain language delay, epilepsy). Also, symptoms of ASD exhibit significant changes among children and even within a child over time (National Research Council, 2001). However, the quality of life of individuals with ASD can be considerably improved through early intervention. Many therapeutic approaches have been tried over the years. But, because of the nature of the disorder and the great variation in symptoms, a single approach cannot be specified as the best, because a practice that is effective in one child may not be effective in others. Therefore, in recent years, interest in the use of technology in early diagnosis and training of ASD has been increasing day by day (Cabibihan *et al.*, 2013).

As individuals with ASD often interact well with computers and use them in an exploratory and creative way, humanoid robots can be used as therapeutic support for children with ASD (Dautenhahn & Billard, 2002). In addition, the promising role of robots in maintaining the cognitive, emotional and social development of children with neurodevelopmental disorders through play-based activities has been proved by many studies in this field (Pennazio, 2017; Robins & Dautenhahn, 2014). The effectiveness of using humanoid robots in educational and therapeutic areas has been evaluated in experimental contexts, mostly in play-based rehabilitation interventions. In these interventions, robots have important roles and offer several benefits in the therapy of children with ASD. They are designed to perform a large number of different roles in ASD interventions, even in the same session. As shown in Figure 1, through a set of games and engaging activities, robots interact to teach skills to children with ASD, identify, encourage specific desired behaviour, and provide positive feedback for the correct behaviour displayed (Cabibihan *et al.*, 2013).

BACKGROUND

While the use of robots in industrial work is widely observed, their use for intervention purposes is hardly encountered. Since the 19th century, various types of robots have been used in order to do the things what human beings do. Regardless of the areas in which they are used, they benefit society. The health sector is one of the areas that benefit the most from robotic technology today (Saleh *et al.*, 2014). But, in the field of education, robots are first used to teach language, science and technology, and take on the roles of teachers, tools and friends during learning activities (Mubin *et al.*, 2013). Although the use of robots for children with ASD is a fairly new field of study, the first use of a robot as a remedial tool for children was carried out by Weir and Emanuel in 1976 with a seven-year-old boy with ASD (Pennisi *et al.*, 2016).

In recent past, the fact that the increasing interest in the use of robots for educational purposes for children with ASD has caused researches being carried out by various institutions and universities around the world to develop different types of robots and to organise experiments with them.. Different types of robots have been developed, varying in appearance, behaviour and the activities they can do (Cabibihan *et al.*, 2013). However, although robots have taken their place in the field of science, they are not yet common in real life (Çelik, 2015).

The use of robot-assisted therapies whose main target group is individuals diagnosed with ASD is one of the most increasing topics in the field of research. Therefore, since the last fifteen years, many

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