Chapter 3
Assistive Technologies and Design for People With Autism Spectrum Disorders:
A Selective Overview

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ABSTRACT

This chapter has the aim to provide a concise overview of which assistive technology tools can be used to implement interventions for people with autism spectrum disorders and what developers and designers must take into account when they want to approach to the development of these technologies. Four areas of intervention have been identified: (1) treatment of phobias, (2) social interactions, (3) academic skills, (4) job performance. Ten contributions have been reviewed for a total of 216 participants. Positive results and limits of various studies have been identified. In each session a specific technology will be analyzed, and some general guidelines will be provided. Some suggestions will be emphasized for future research.

INTRODUCTION

Autism is a disorder characterized by behavioral and physical symptoms. There is not a unanimous consensus concerning the etiopathogenesis currently unknown. Autism onset in the developmental age, during the first three years of life (ICD-10). Autism is described as an atypical condition of neurological development, depending on genetic predisposition and environmental factors. There are multiple dimensions of autism and the characteristics of the various individuals are clinically heterogenous, so the disorder is considered within a 'spectrum'. But generally speaking, the Autism Spectrum Disorders (ASD) concern a severe and generalized impairment of two macro areas of development: one related to communication skills and social interactions and the other related to the sphere of interests and activities. The various symptoms of the ASD are grouped in these two domains both in the fifth edition of the *American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders* (DSM-5)

and in the *International Classification of Disorders-10* (ICD-10). The seriousness of the deficits must be such as to compromise various important areas of a person's life (family, education, school/work, social sphere). The difficulties are pervasive and are observable in all the contexts. Therefore, knowing the different areas affected by autism, it is possible understand in which fields to intervene and which the most appropriate tools are to guarantee to the person and his family the achievement of goals to improve their lives.

According to the Centers for Disease Control and Prevention (CDC), a constant tendency toward the increase of cases of autism of around 10% is evident: in the U.S.A., the prevalence increases from a child every 59 in 2014 to a child every 54 in 2016 (Maenner, Yeargin-Allsopp, Van Naarden Braun, Christensen & Schieve, 2016); furthermore the disorder is three times more common in males than females (Loomes, Hull & Mandy, 2017).

The aim of the chapter is to examine the use of some Assistive Technologies (ATs). In particular applications, Virtual Reality (VR), Augmented Reality (AR), and robots, were listed to provide a selective overview on the empirical evidences available between 2014 to 2020, selected in the electronic databases such as PubMed, Scopus, ResearchGate. The evaluated studies allow to understand how these technologies can be used in rehabilitative interventions for autism in the following areas: (a) treatment of phobias, (b) improvement of social interactions, (c) strengthening of academic skills, (d) job performance. The studies concern AT-based programmes for people with autism, in particular children and young adults.

Another goal is to provide some suggestions to whom intended to approach the development of 'autism-friendly' technologies. The technology that aims at the social inclusion of people with ASD should be thought so as to simulate everyday situations that represent a challenge for those who are involved. In the planning of interfaces and scenarios of VR, the designers should take into account, for instance, the hypersensitivity of children with ASD to tactile, verbal and visual stimuli (Takahashi et al., 2014). Additionally the use of a methodology considering clear utterances, insertion of descriptive button, use of a simple layout in the interactive interfaces process it should be acknowledged. To exhaustively tackle features and needs of children with ASD specifics guidelines for each technology-aided setup or device are mandatory and highly recommended. Towards a desirable increase of life quality and expectancy, AT could be the new starting point for implementation of treatments aimed at guaranteeing the autonomy to the autistic individual and at improving the various cognitive domains in which they are impaired.

So the chapter is aimed at caregivers, professional (such as doctors, therapists, psychomotor therapists, educators, teachers) and the entire social network inside the community. However, a valid contribution to the implementation of the interventions for people with autism using various technologies can be given by developers and designers.

1. BACKGROUND

The term AT 'means any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability' (Acts, 1998). The goal of the ATs is to provide to people with development delays tools to increase independence and self-determination. The intervention with ATs for people with ASD considers the use of strategies that allow the self-management of environmental events (Stasolla & Passaro, 2020). Also considering the literature, the treatment with the employment of a computer

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