

Chapter 83

A Hybrid System to Support the Psychological Intervention for Children With Autism: A Proposal Based on Knowledge Modeling and Intelligent Technologies

Vladimir Robles-Bykbaev

Universidad Politécnica Salesiana, Ecuador

Javier Cornejo-Reyes

Universidad Politécnica Salesiana, Ecuador

Jorge Galán-Mena

Universidad Politécnica Salesiana, Ecuador

Diego Quisi-Peralta

Universidad Politécnica Salesiana, Ecuador

Martín López-Nores

University of Vigo, Spain

José Pazos-Arias

University of Vigo, Spain

Yaroslava Robles-Bykbaev

Universidad Politécnica Salesiana, Ecuador

Diego Lima-Juma

Universidad Politécnica Salesiana, Ecuador

Verónica Cevallos León-Wong

Universidad Politécnica Salesiana, Ecuador

ABSTRACT

The World Health Organization (WHO) claims that 1 in 160 children present an Autism Spectrum Disorder (ASD). However, the real estimation in low- and middle-income countries can be higher and currently is so far unknown. In many Latin American countries, it is essential to develop intelligent tools that can provide support during the psychological diagnosis and intervention of children with ASD. To this aim, this article presents an approach that models the most relevant elements of rehabilitation/ educational activities for children with ASD and discuss how to support them through robotic assis-

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tants, mobile applications and Multi-Sensory Stimulation Environments (MSEE). The authors tested the proposed system in four different real scenarios: the perception of 47 children without ASD concerning the robotic assistant, the feasibility of using ontology-based reasoning to select therapeutic activities, the opinion of 9 experts on ASD regarding the MSSE and the perception of 36 children with ASD about the robotic assistant.

INTRODUCTION

Nowadays the Autism Spectrum Disorder (ASD) is considered one of the most significant public health concerns worldwide. This disorder encompasses a group of developmental disabilities (DD) such as lack of social skills, behavior abnormality, and both verbal and nonverbal communication (Shin, Min, Rayz and Matson, 2017). The ASD starts in childhood and persists into adolescence and adulthood. The conditions characterizing this disorder appear in children during the first five years of life. Some of the most common concomitant conditions in a person with ASD include epilepsy, depression, anxiety and attention deficit hyperactivity disorder (ADHD) (WHO, 2017). The WHO estimates 1 in 160 children present ASD (WHO, 2017), whereas the Centers for Disease Control and Prevention (CDC) of the USA claim 14.7 per 1,000 children presented ASD in 2010 (Shin, Min, Rayz and Matson, 2017). The way of understanding autism has changed radically since Kanner's findings in the 70's and the parallel descriptions of Hans Asperger (Mulas et al., 2010). Considering that its clinical expression is highly variable, the latest version of the Diagnostic Statistic Manual (American Psychiatric Association, 2014) provides new conceptualizations of autism, to adjust the diagnosis to the particular characteristics of individuals. In this line, a person with ASD is diagnosed considering the main traits of the spectrum, but also describing his/her performance in different areas such as cognition, language and the seriousness level of the main symptoms.

Children with ASD present difficulties to adjust their behavior to social situations, which frequently leads them to remain excluded from their peer group. In serious cases of autism, children may show impairments to even recognize simple conventional behavior such as associating objects with specific places or different types of behavior needed to execute simple tasks, such as using silverware correctly. Visual tools have shown to effectively enhance the development of communication and social skills, by helping the child with ASD to understand and integrate conventional information and develop social skills that may allow them to be more tolerated and accepted within the peer group.

Deficits in conventional language and communication are associated with poor social skills in this population; this demands a progressive intervention in which the child can be introduced to basic social patterns and eventually enhance his/her relationship with other significant human being. These interventions are aimed to get the child to be better tolerated and accepted by his/her peer group, by helping him/her to integrate social skills through stories presented in a visual manner. In addition, children with ASD usually present a preference to interact with objects rather than with humans, which may cause withdraws during the therapeutic work. In this scenario, it is needed the assistance of mediators, which nowadays can be represented by robotic devices. The implementation of artifacts of this kind would reduce the anxiety that children with ASD commonly present towards the interaction with adults or peers, allowing the interventions to be more progressive and respectful with the child's particular characteristics and needs.

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