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Robots as Tools to Help Children with ASD to Identify Emotions

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We are aware about the deficits related to children with Autism Spectrum Disorders (ASD). To name the more prominent, children with ASD are characterized by changes in social communication and repetitive patterns of behaviours [1]. The changes in social communication are reflected mostly due to difficulties in responding to social stimuli, to imitate behaviours, and to recognize and understand mental states in themselves and in others [2-3]. These changes clearly influence the adaptation of the child with ASD to their natural contexts with implications for their cognitive, linguistic and emotional development [4].

There are several tools used by professionals who interact with children with ASD to develop the skills mentioned above but robotics have been gaining more and more relevance and curiosity in this context. Researchers have investigated the use of robotic technology to achieve specific therapeutic objectives for children with ASD, such as self-initiated interactions, turn-taking activities, imitation, emotion recognition, joint attention, and triadic interactions [5]. Research on human-robot interaction has demonstrated that robots improve the response level, involvement and interest in children with ASD and promote new social behaviours [6-15]. One important remark is that this kind of research does not intend to replace the work performed by professionals with children with ASD, but to provide a complementary tool. In Robotica-Autismo project, a humanoid robot with the capability of displaying facial expressions is intended to be used as a tool (Figure1) to promote social interaction, communication and mainly emotion labelling [7].

Some other research projects have dedicated their attention to the specific theme of emotional expression design in robots for human-robot interaction. However, only a limited number of projects focused specifically on the use of robots with children with ASD as promoters of the recognition of facial expressions and emotions. The conclusions of some of those projects indicated that children with ASD needed the facial expressions to be strong and marked so can they can be perceived as such [8]. In addition, different forms of robots could interact safely with children with ASD, but humanoid robots could help to a faster generalization of skills [5], verbal children showed more interest in the proposed task [10], and a better recognition of robot's facial expressions contributes to a more general social acceptance [12]. Unfortunately, skills generalization has rarely been observed outside of a controlled environment such as classrooms or clinics [5]. One of the exceptions is made in a study using a Lego Mind storm NXT robot where the transfer of the acquired skills in the school environment was repeated in real and functional family life's situations. In a preliminary study, the changes were verified in the children's behaviour: attention, eye contact, and the learning of academic and cognitive skills [16].

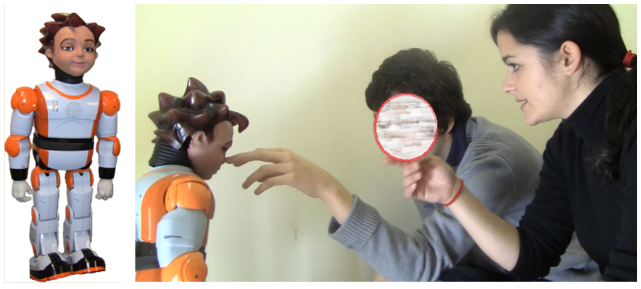

Figure 1: Session with a child with ASD interacting with ZECA (Zeno Engaging Children with Autism).

It is important to highlight that having as a final goal the improvement of social interaction even focusing on developing other skills at the same time; we should not forget that the core aim it is never to get a new "toy" for the child to play alone. The robot should always be a mediator of the interaction between the child and other person, being this game partner an adult or a child, also called triadic interactions.

In the nearest future, all robotcists and researchers in human-robot interaction interested in the topic of the use of robots with children with ASD should take into the account that we have in our hands a very powerful tool to help these children to develop a very wide range of skills. We should focus though in the generalization of skills, and moreover in the application of this technology to larger groups, so more concrete conclusions can be inferred.

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