

## **From typical neurocognitive development to neurorehabilitation of autistic children using mobile toy robots**

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### **Abstract**

Typical neurocognitive development is based on multimodal interactions. One way to study multimodal interactions is to analyze how children learn language. The studies we conducted aim to understand the development of cognitive non verbal tasks including -attention, action/gesture imitation, haptic and visual perception tasks -and their relationship with the development of verbal tasks in children aged 5 to 6 years old. The above considerations relevant to the natural and neuronal environments were taken into account for the neurorehabilitation of autistic children using artificial environments rendered possible through the use of mobile toy robots. Autism which is a complex neurocognitive disorder is characterized by troubles in communication as well as deficits in the cognitive treatment of emotions. We designed four studies whose aim was to quantitatively and qualitatively evaluate the multimodal interaction between autistic children and a mobile toy robot during free spontaneous game play. A range of cognitive non verbal criteria including eye contact, touch, manipulation, and posture were analyzed, firstly in a dyadic interaction and secondly in a triadic interaction. The dyadic interaction of autistic children and a mobile toy robot suggests that the mobile toy robot in an ecological situation such as free, spontaneous game play could be used as a neural mediator in order to reduce skill impairment witnessed in autistic children. The analysis of the triadic interaction involving an autistic child, the robot and a therapist concludes that once the robot-child interaction has been established, the child can use the robot as a mediator to express positive emotion and play with a person. Therefore robot therapy could conceivably have a high potential to improve the condition of brain activity in autistic children.