



HAL
open science

Social Engagement of Children with Autism during Interaction with a Robot

Adriana Tapus, Andreea Peca, Amir Aly, Cristina Pop, Lavinia Jisa,
Sebastian Pinteau, Alina Rusu, Daniel David

► **To cite this version:**

Adriana Tapus, Andreea Peca, Amir Aly, Cristina Pop, Lavinia Jisa, et al.. Social Engagement of Children with Autism during Interaction with a Robot. The International Conference on Innovative Research in Autism (IRIA), May 2012, Tours, France. hal-01158354

HAL Id: hal-01158354

<https://hal.science/hal-01158354>

Submitted on 1 Jun 2015

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Social Engagement of Children with Autism during Interaction with a Robot

Adriana Tapus

Cognitive Robotics Lab
ENSTA-ParisTech, France
adriana.tapus@ensta-paristech.fr

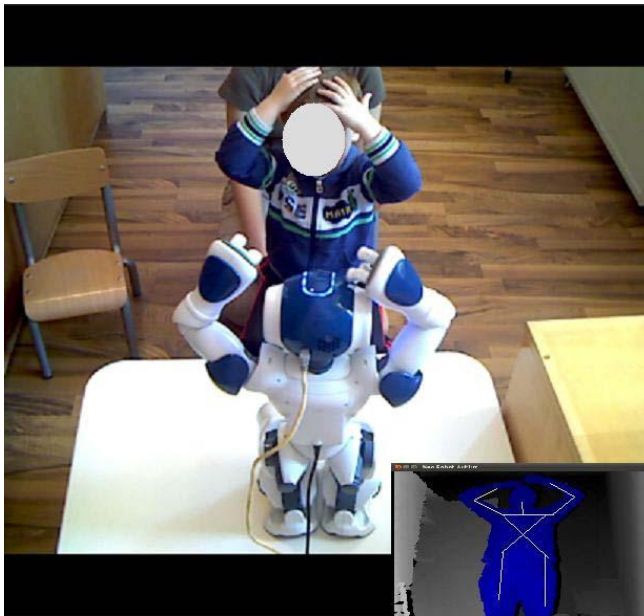
**Andreea Peca, Amir Aly, Cristina Pop, Lavinia Jisa, Sebastian Pinteau,
Alina Rusu, and Daniel David**

1. Introduction

Imitation plays an important role in development, being one of the precursors of social cognition. Even though some children with autism imitate spontaneously and other children with autism can learn to imitate, the dynamics of imitation is affected in the large majority of cases. Existing studies from the literature suggest that robots can be used to teach children with autism basic interaction skills like imitation.

Based on these findings, in this study, we investigate if children with autism show more social engagement when interacting with an imitative robot (Fig 1) compared to a human partner in a motor imitation task.

2. Method



A single-subject ABAC design with replication across 4 participants was employed. The independent variable was the type of interaction agent: robot versus human person. The dependent variables measured were: frequency of free initiations (without prompt), frequency of total initiations (with and without prompt) and imitations, duration of attention to the partner (robot/person), duration of smile, and frequency of gaze shifting between the two partners (robot-therapist/human person-therapist).

Fig 1: Child #2 interacting with the robot

3. Results

The results confirm only partially the experimental hypothesis. The Mann -Whitney test was used to analyze the difference between each pair of conditions. Child #1 and Child

#2 showed more attention and positive affect in the interaction with Nao robot. In the case of the initiations and imitations variable, the robot was superior for Child #1 and Child #3. The robot proved to be a better facilitator of shared attention only for Child #1 (Fig 2). No significant results were found for free initiations. However, these results are not conclusive, because of the small number of participants used in the study, but are promising for the future directions of this work.

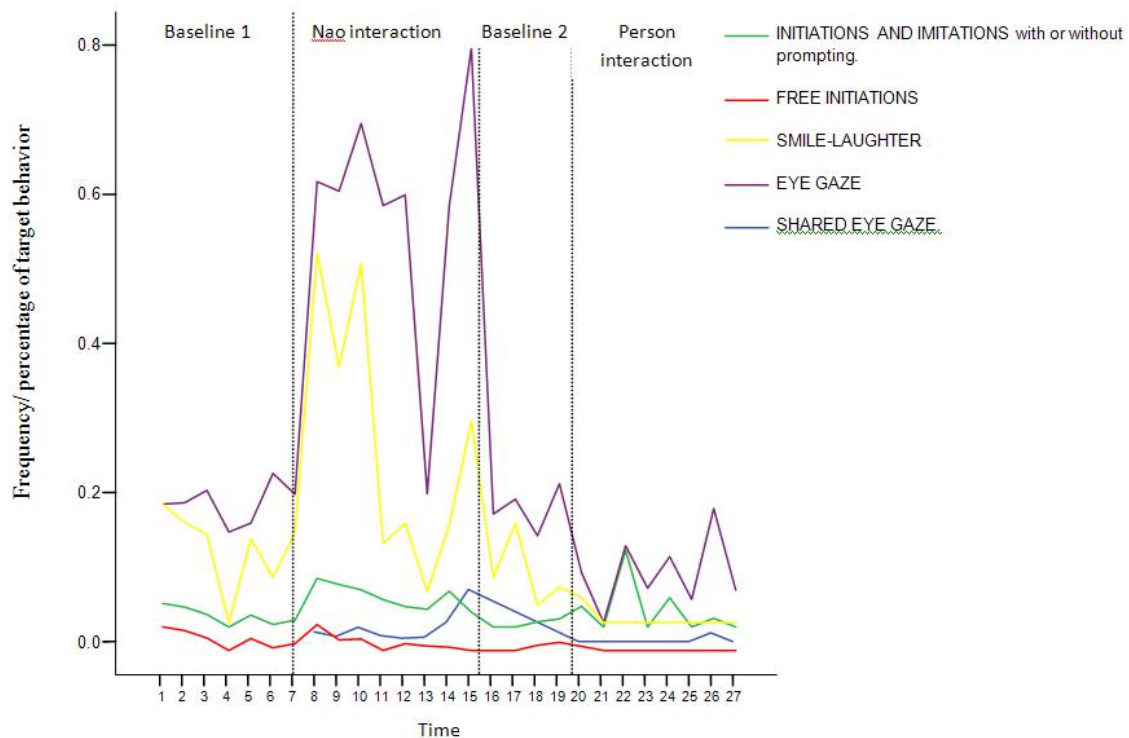


Fig 2: Results Child #1

4. Conclusion

We consider that the major benefit of this study stands in the steps taken towards adapting standard single- subject paradigms into human-robot interaction. This kind of study represents a small step in advancing the engineering field towards the goal of actually providing a tool for clinicians and therapists.

References

- [1] Peca, A., Tapus, A., Aly, A., Pop, C., Jisa, L., Pintea, S., Rusu, A., and David, D., "**Exploratory Study: Children's with Autism Awareness of Being Imitated by Nao Robot**", Proceedings of the 1st International Conference on Innovative Technologies for Autism Spectrum Disorders. ASD: Tools, Trends and Testimonials (ITASD), Spain, 2012.
- [2] A. Aly and A. Tapus, "**Gestures Imitation with a Mobile Robot in the Context of Human Robot Interaction for Children with Autism**", Proceedings of the 3rd Workshop for Young Researchers on Human-Friendly robotics (HFR), Germany, 2010.
- [3] A. Aly, "**Human Posture Recognition and Gesture Imitation with a Humanoid Robot**", Université Paris 6 (UPMC), Université de Sorbonne, France, 2011.