Robotics Reading Group
@ Instituto Superior Técnico

Session #3
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Maha Elgarf
Natalia Calvo

Paper

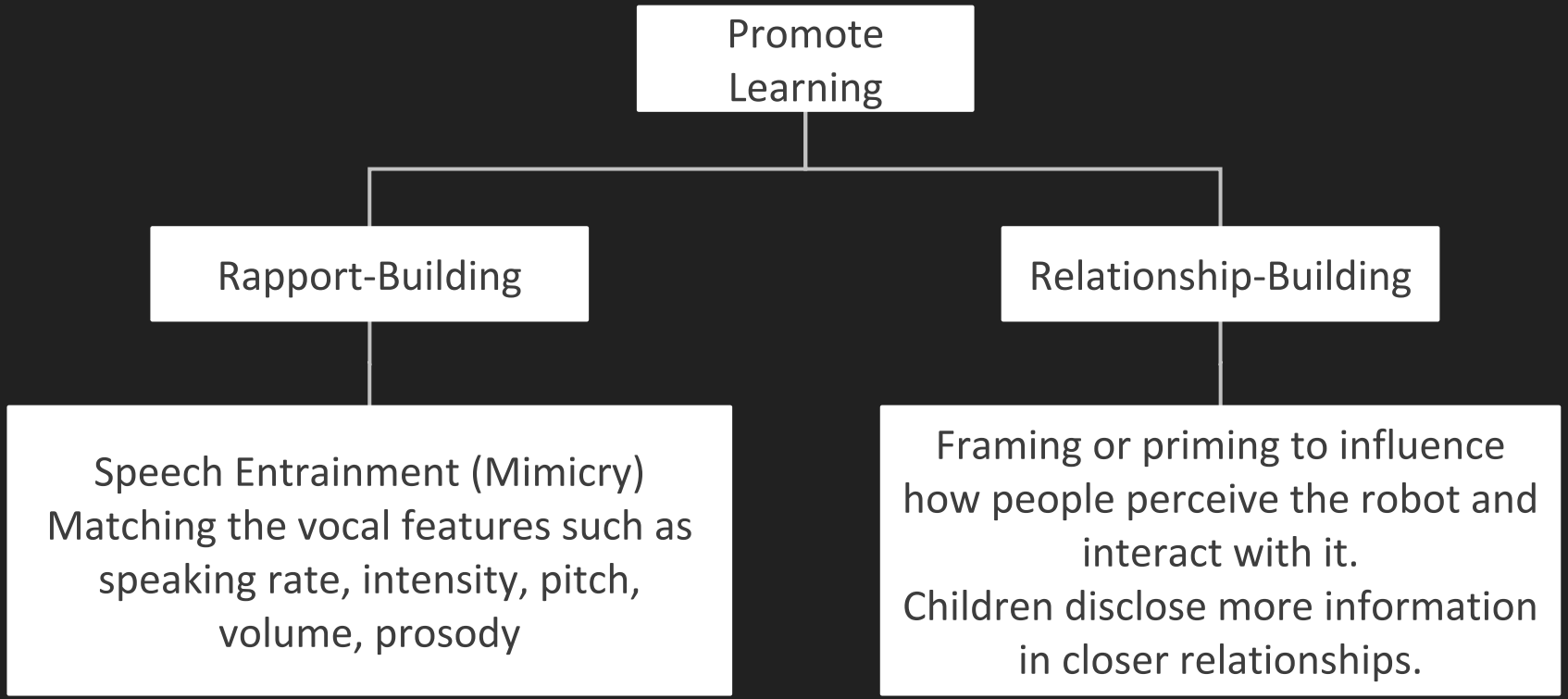
Jacqueline Kory-Westlund and Cynthia Breazeal. 2019.
Exploring the Effects of a Social Robot's Speech Entrainment and Backstory on Young Children's Emotion, Rapport, Relationship, and Learning.
Frontiers in Robotics and AI.
https://doi.org/10.3389/frobt.2019.00054

What is this paper about?

Social Robots can engage children in learning activities and improve learning outcomes: **personalization of behavior (verbal and non-verbal) and appealing appearance and personality.**

"A social robot that entrained its speech and behavior to individual children and provided an appropriate backstory about its abilities could increase children's rapport, positive relationship, acceptance, engagement, and learning with the robot during a single session."

Background

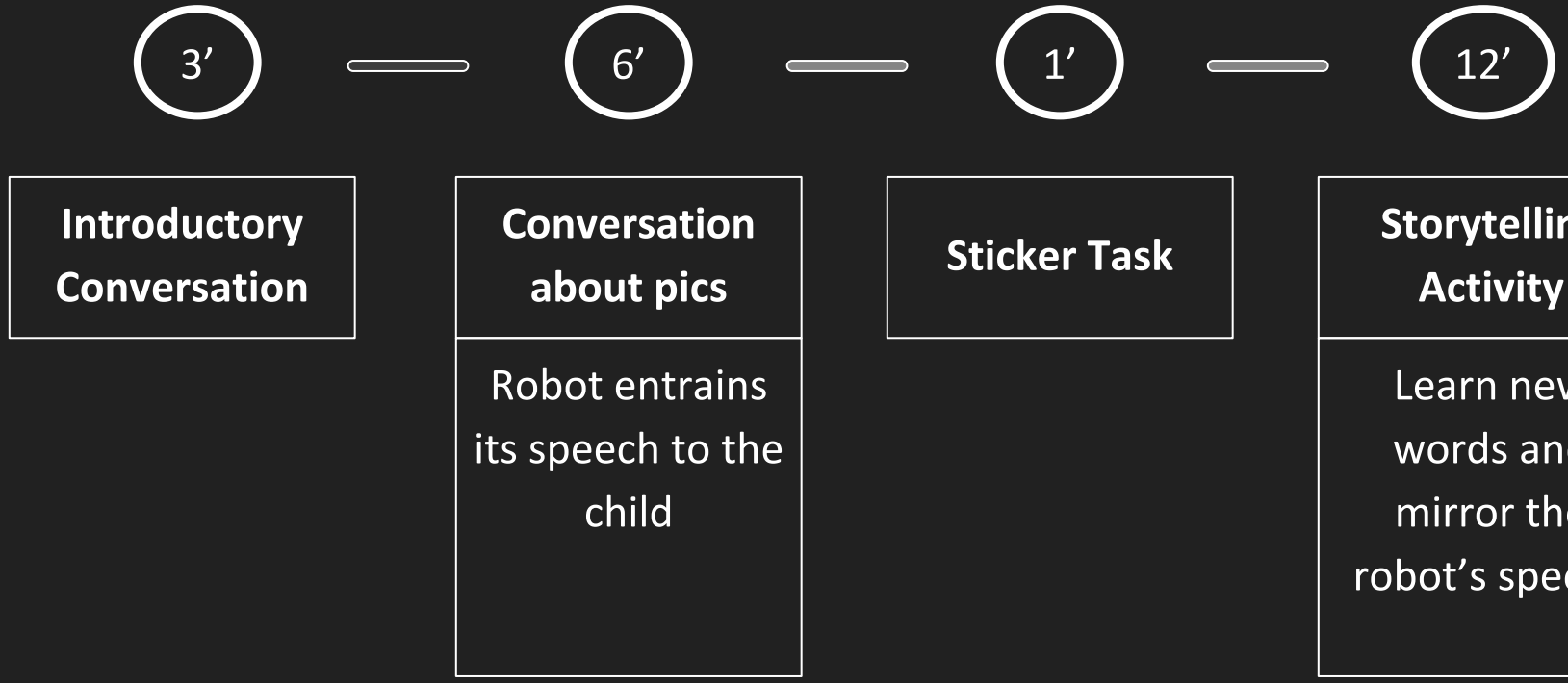

Promote Learning
Rapport-Building
Relationship-Building
Speech Entrainment (Mimicry)
Matching the vocal features such as speaking rate, intensity, pitch, volume, prosody
Framing or priming to influence how people perceive the robot and interact with it.
Children disclose more information in closer relationships.

Methodology

Between Subjects: 2(Entrainment vs No entrainment) X 2(Backstory vs No Backstory)

(E): The robot's speech was entrained based on each child speaking rate, pitch, volume and exuberance.
(B): The experimenter explained that the robot was not good at hearing and needed practice. Reinforced by the robot later.

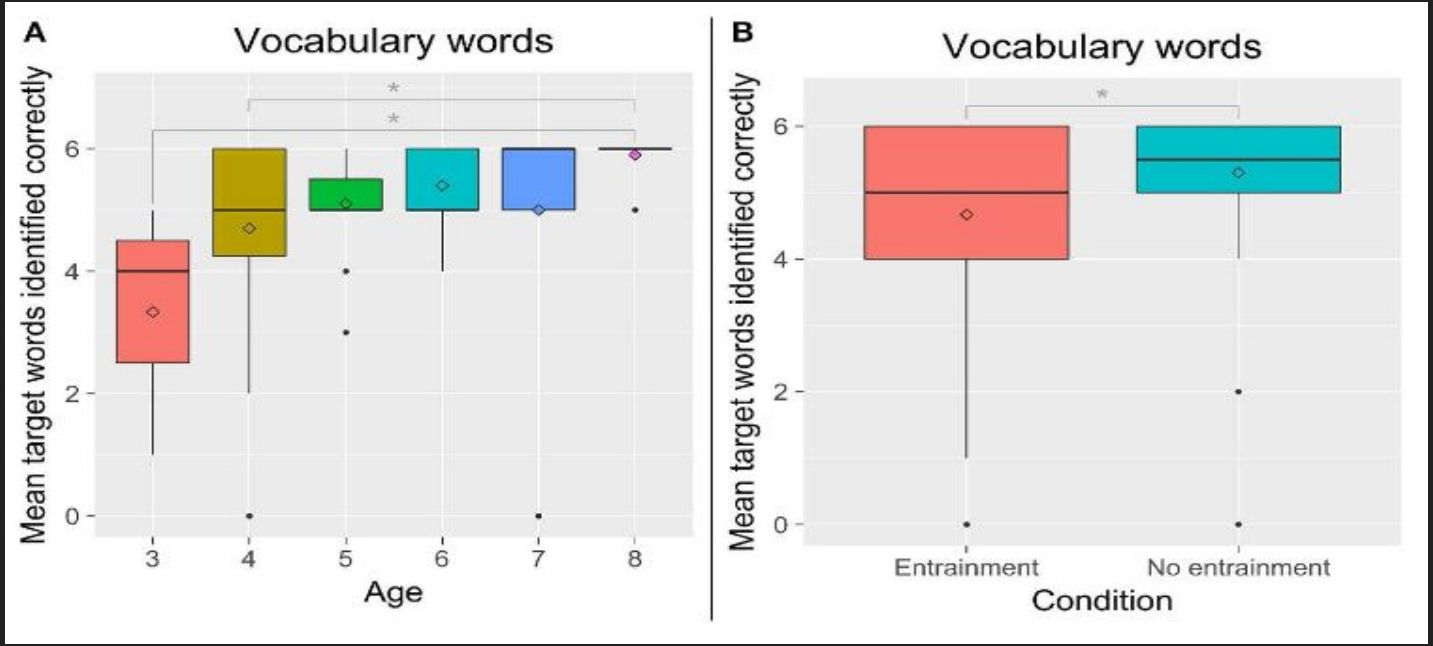
Procedure


3’
6’
1’
12’
Introductory Conversation
Conversation about pics
Robot entrains its speech to the child
Sticker Task
Storytelling Activity
Learn new words and mirror the robot’s speech

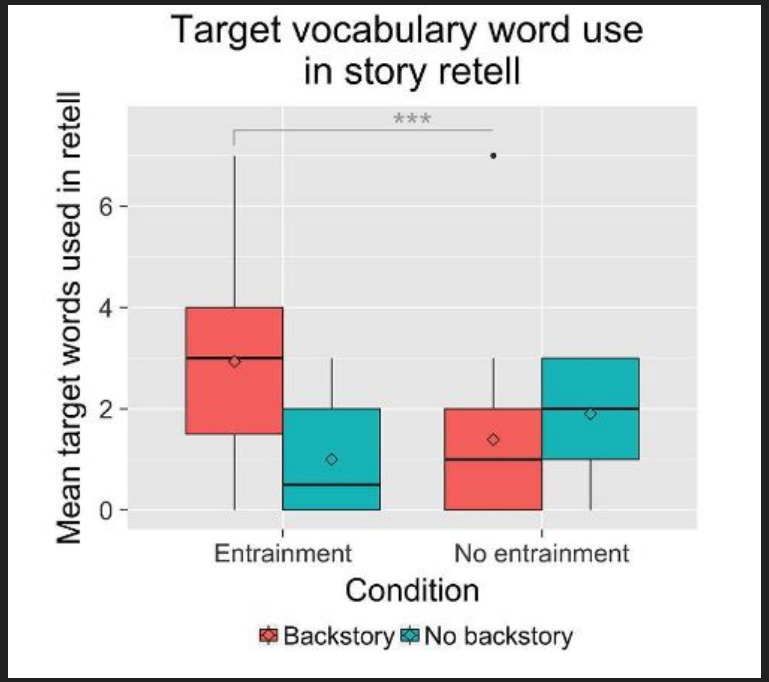
Speech Entrainment

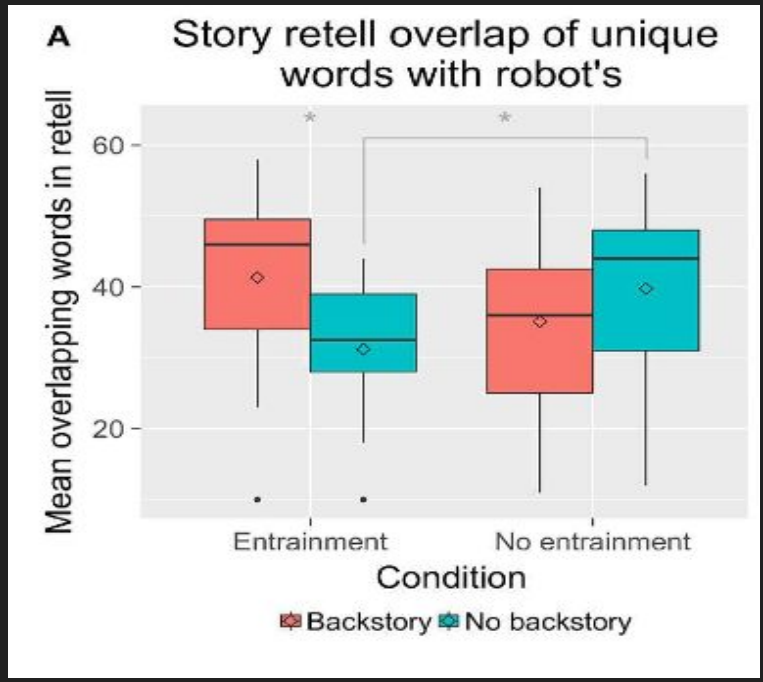
- The speaking rate and pitch and the robot's voice were **automatically** adjusted to be similar to the child.
- The robot's volume and exuberante were **manually** adapted by the teleoperator.
- Different animations for the robot: more excited and bigger animations for more exuberant/louder children; quieter, slower, animations for less exuberant/quieter children.

H1: Children would learn more as a result of the robot's entrainment or from an increased relationship.

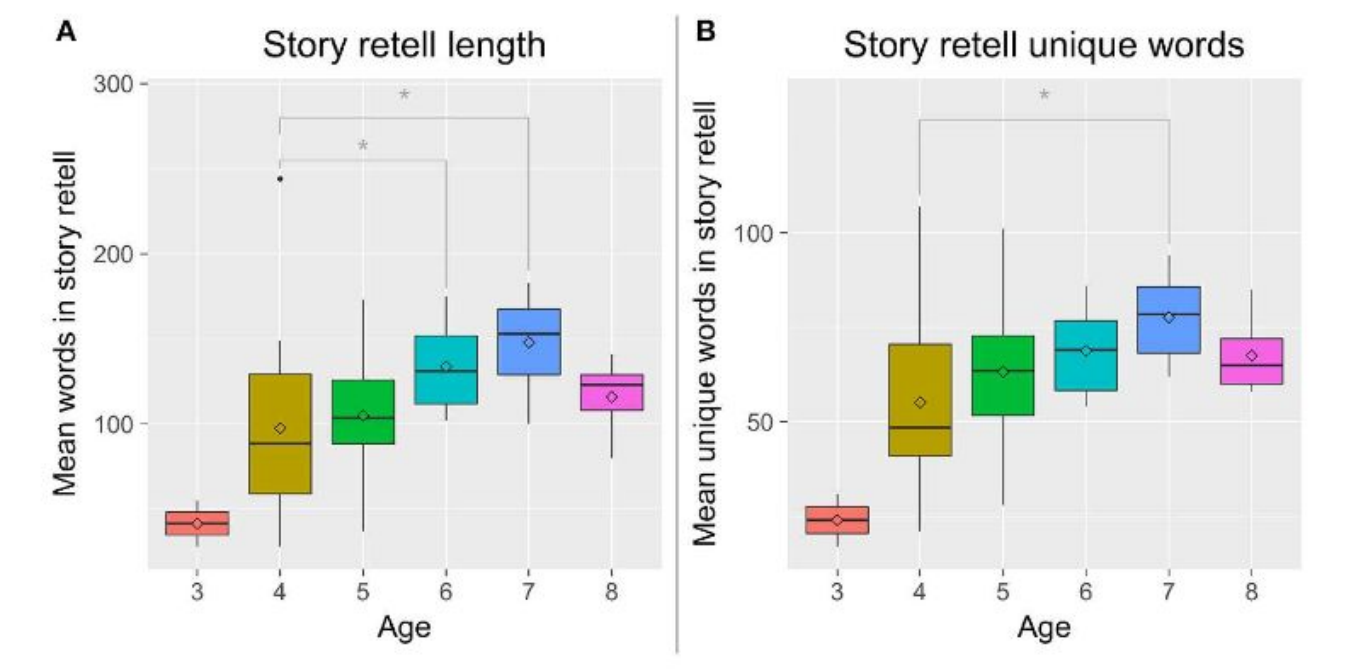


H2: Children who learned the target vocabulary words would also use them in their story retells.

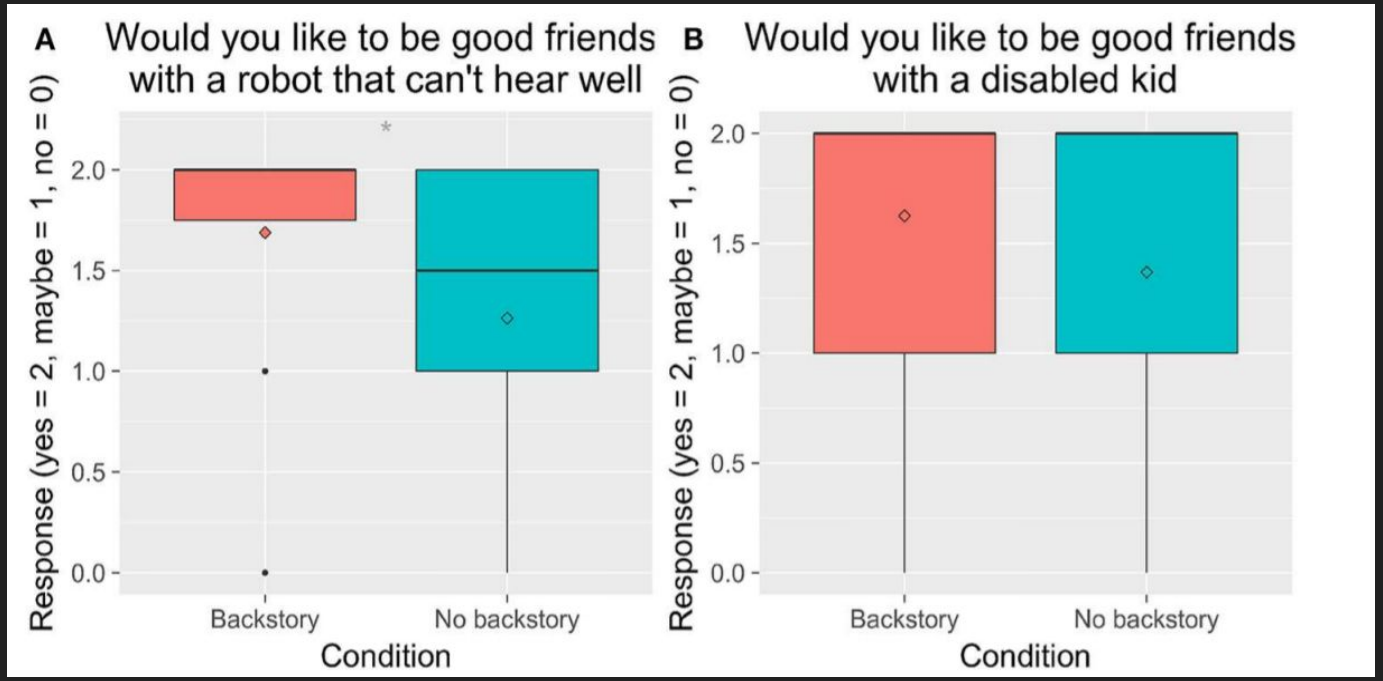




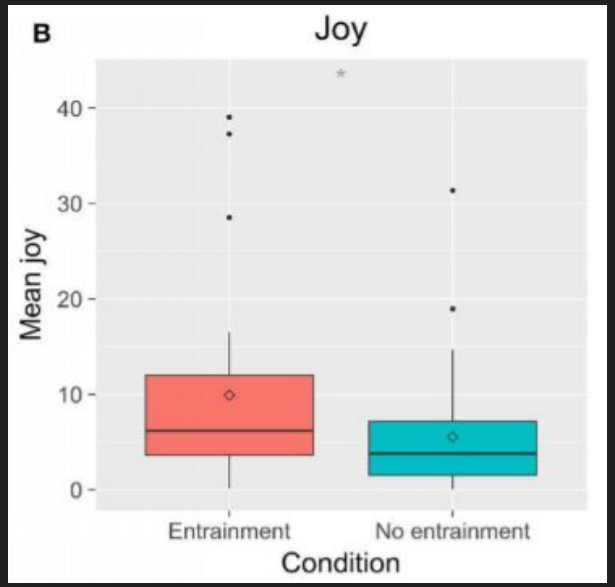
H3: The entrainment and backstory would lead to differences in children's mirroring of the robot's story in their retells.

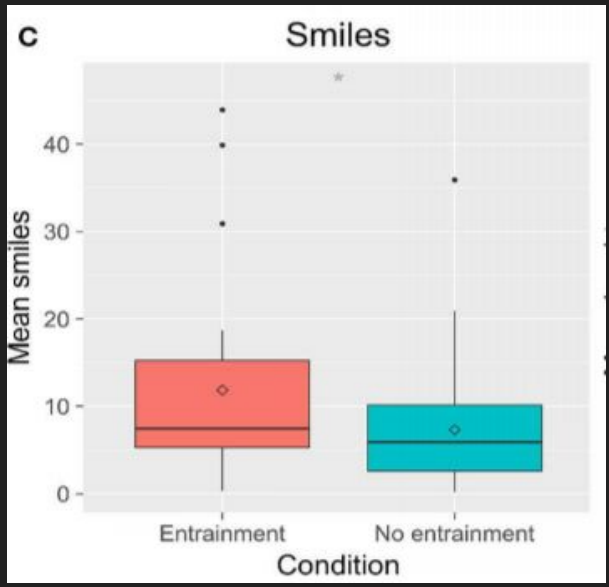


H4: A robot with an appropriate backstory about its abilities would lead to greater acceptance by children of the robot

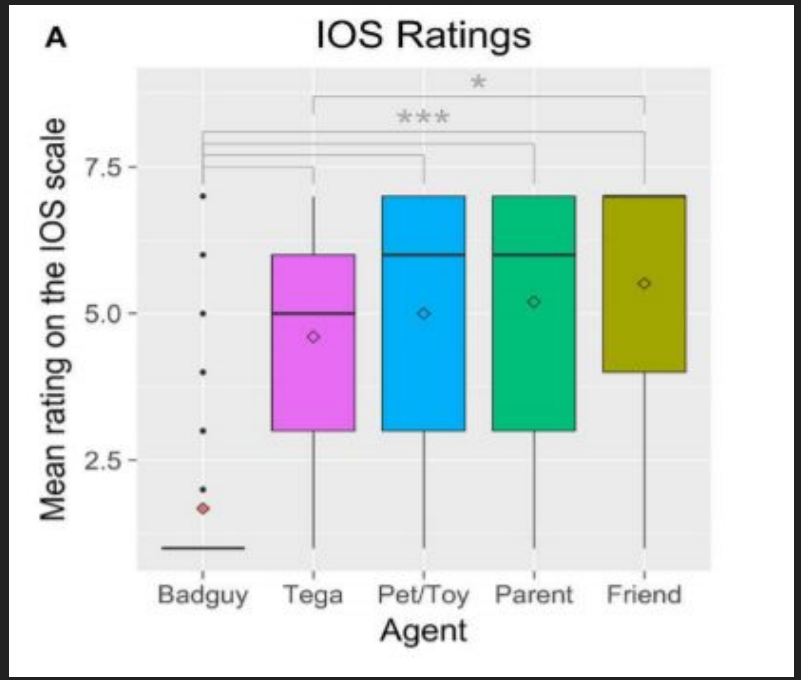


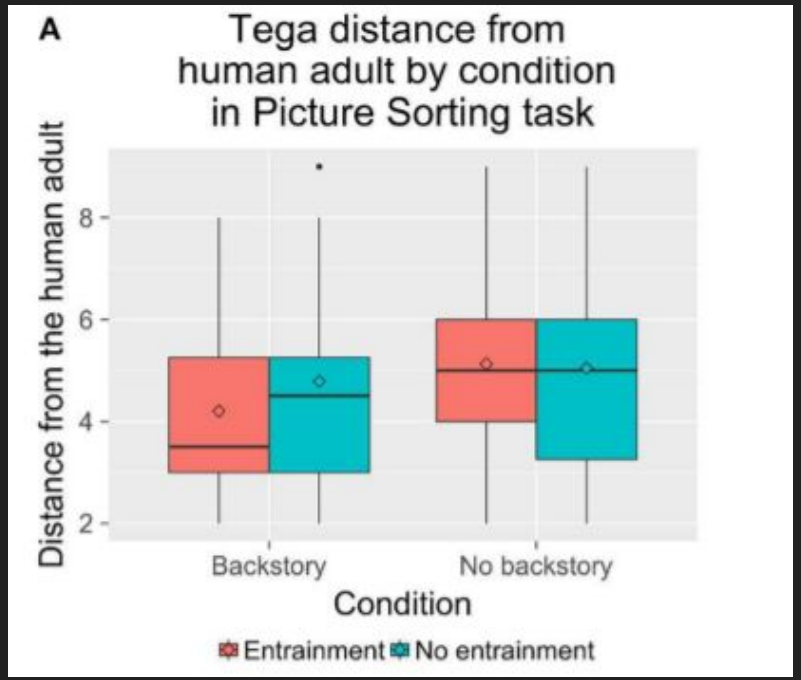
H5: Both entrainment and backstory would lead children to treat the robot as a greater social other by laughing and smiling more



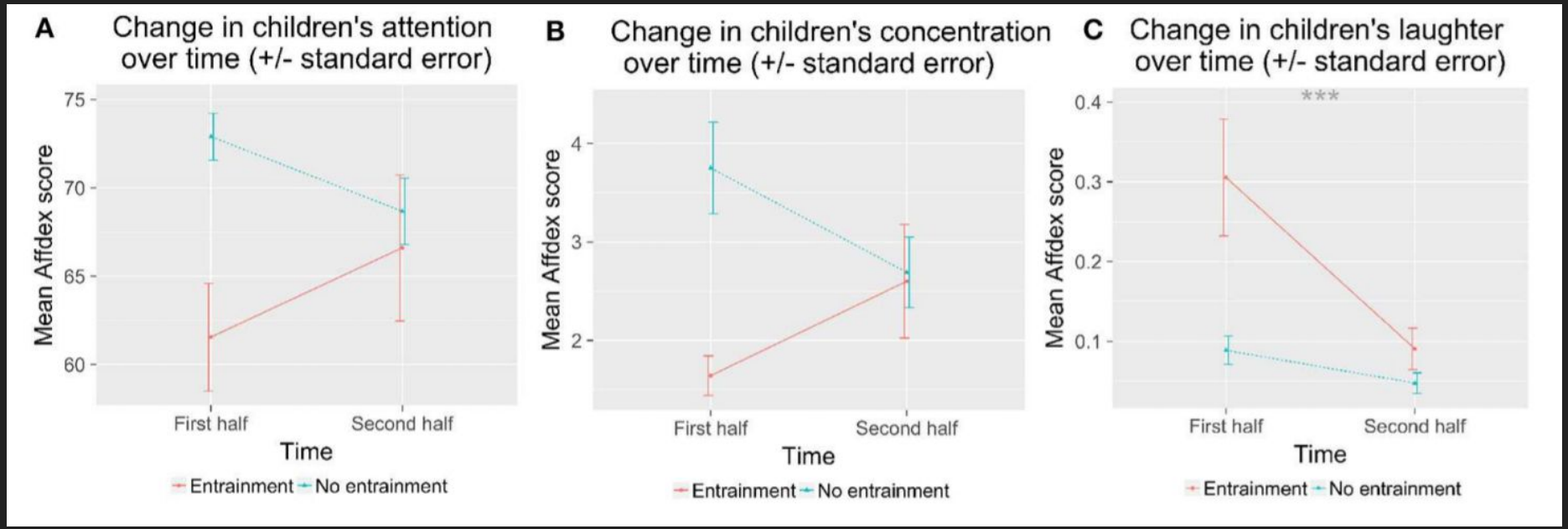


H6.a: Children would show greater rapport, mirroring, and helping behaviors with a robot that entrained to them and told the backstory





H6.b: children's positive emotions would increase—or at least decrease less—over the course of the session



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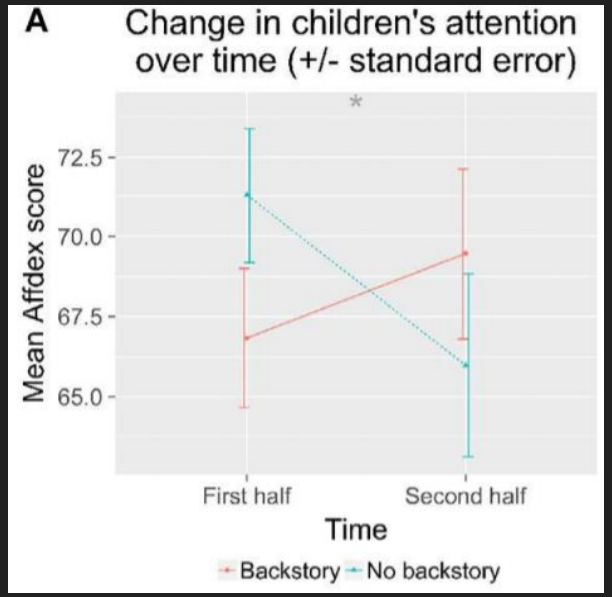
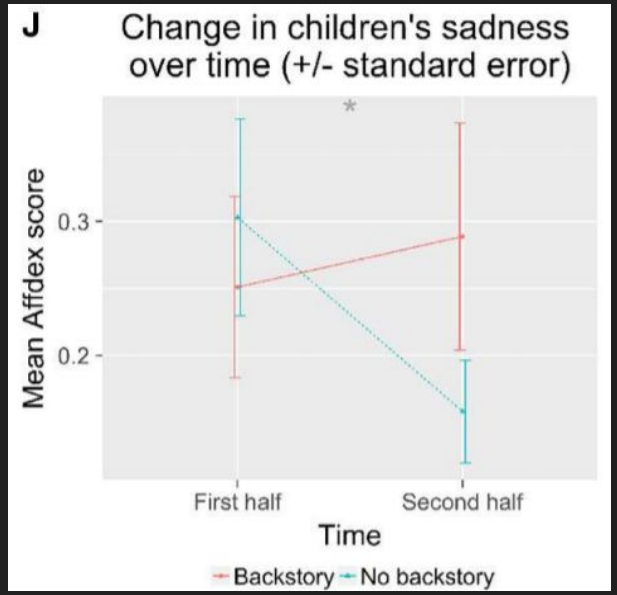
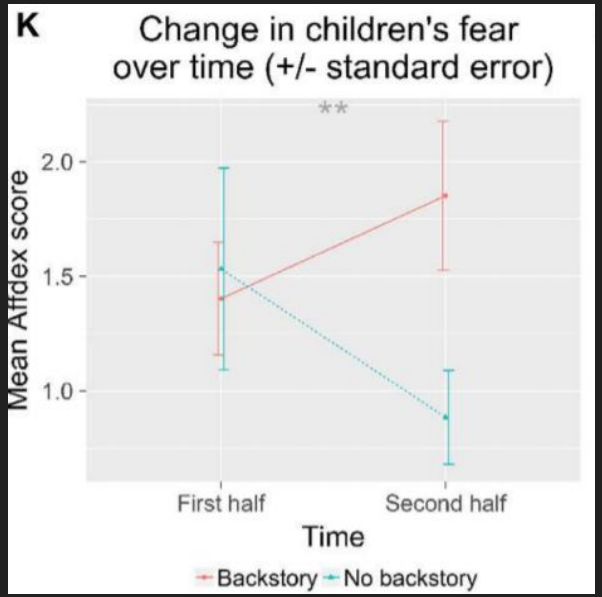
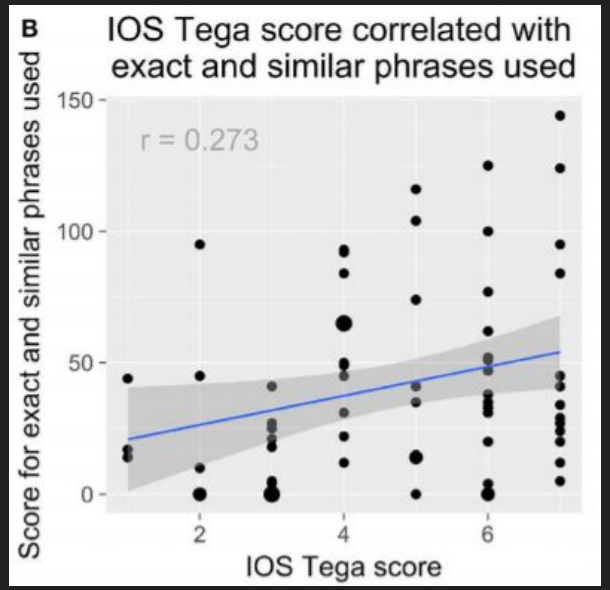
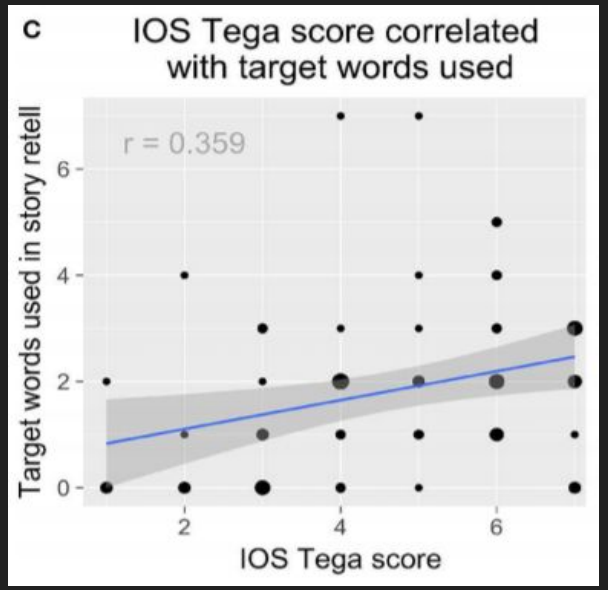


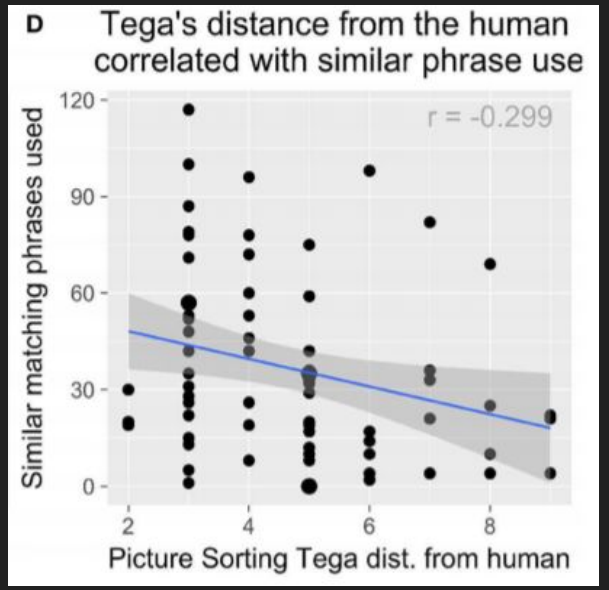




H7: Children who reported a closer relationship to the robot would also show more mirroring behaviors.







Limitations

- Children’s individual differences.
- Missing affect data.
- Entrainment problems in case of a quiet or a shy child.
- Robot’s embodiment.
- Learning tends to happen over time.

Conclusion

- The robot’s relationship-building behaviors affected children’s learning performance and their perception of the robot as a social agent.
- The social design of the robot impacts children’s behavior and learning performance.
- The robot’s story, use of relationship behaviors and expressivity are all important factors in a robot’s social design.

Activity

- Entrainment bias: come up with ideas to guarantee the robustness of the system.
- The backstory influenced the acceptance of a robot with disability but was not significant for a child with disability. Discuss why is that. Come up with similar ideas to fight bullying.
- Behaviour synchronisation suggests higher engagement which suggests better learning. However, this was not the case in this paper. What do you think the reason is?