Appearance, Behaviour, and Emotion: How Preschool Children Integrate Anthropomorphic Cues to Exercise Agency And Build Trust in Robots

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Introduction

- The **sense of agency** refers to the subjective experience of controlling one's own actions and the external environment [1]. Within HCI, agency has long been recognised as crucial, given users' strong preference for maintaining a sense of control over technological systems [2]. As social robots become increasingly embedded in children's everyday environments, a primary challenge for HCI lies in understanding not merely how children respond to artificial social agents, but how they proactively exercise agency during these interactions.
- Previous research suggests that robots' **anthropomorphic cues** may elicit children's agency, facilitating meaningful and critical interactions [3]. The current research, therefore, **investigates how distinct forms of anthropomorphism, children's age, and agent type interactively shape children's sense of agency during robot interactions (*RQ*). Trust is conceptualised as an expression of agency**, reflected through children's authorship of decisions and anticipation of outcomes.

Research Aims

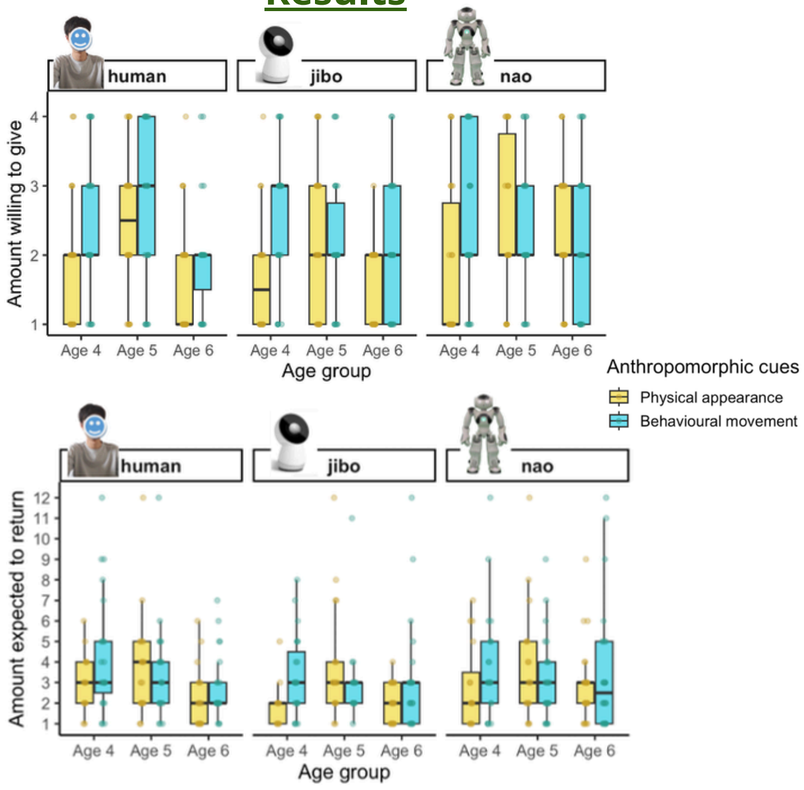
- Identify how different anthropomorphic cues contribute to children's trust and agency, clarifying the separate and combined roles of physical appearance, behavioural movements, and emotional expressiveness
- Verify children's capacity to maintain agency and critical, proactive judgement in HCI, showing that their strategical trust in robots is neither fearful nor indiscriminate.
- Inform the design of interactive technologies by highlighting how behavioural and emotional anthropomorphism can be intentionally leveraged to support children's agency, promote meaningful engagement, and mitigate potential harms.

Study 1

Design

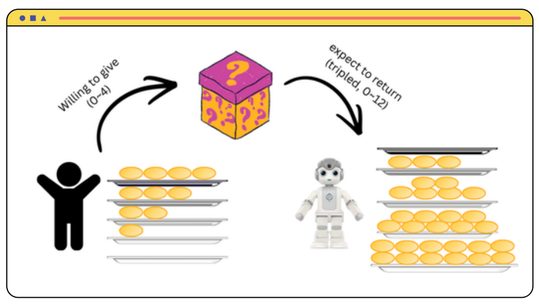
- Participants: 180 children aged 4-6 (90 female, M = 5.65, SD = .33)
- Agents: Human/ JIBO/ NAO
- Anthropomorphic cues: Physical vs. Behavioural
- Goal: Compare children's trust toward human and various robots that differ in physical and behavioural anthropomorphism.
- Analysis: Generalised linear mixed models (GLMMs)/ Generalised linear models (GLMs)

Results



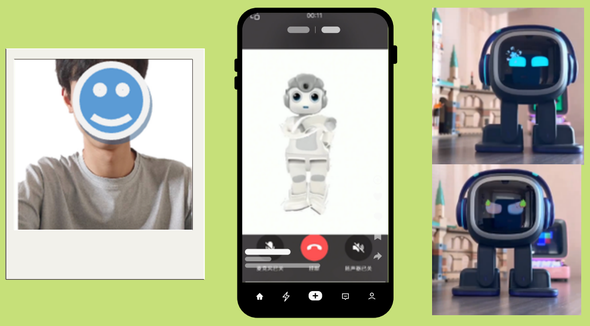
- Children showed stronger agency with humans and physically anthropomorphic robots.
- Behavioural cues supported agency more effectively than appearance, especially at age 4.

Trust Game



Rule: decide how many of four gold coins to give to the agent, knowing that the coins would be tripled and that the agent might return some, all, or none.
Measure: Children's sense of agency was measured through (1) willingness to give coins, (2) total coins given, and (3) the expected number of coins returned.

Anthropomorphic cues



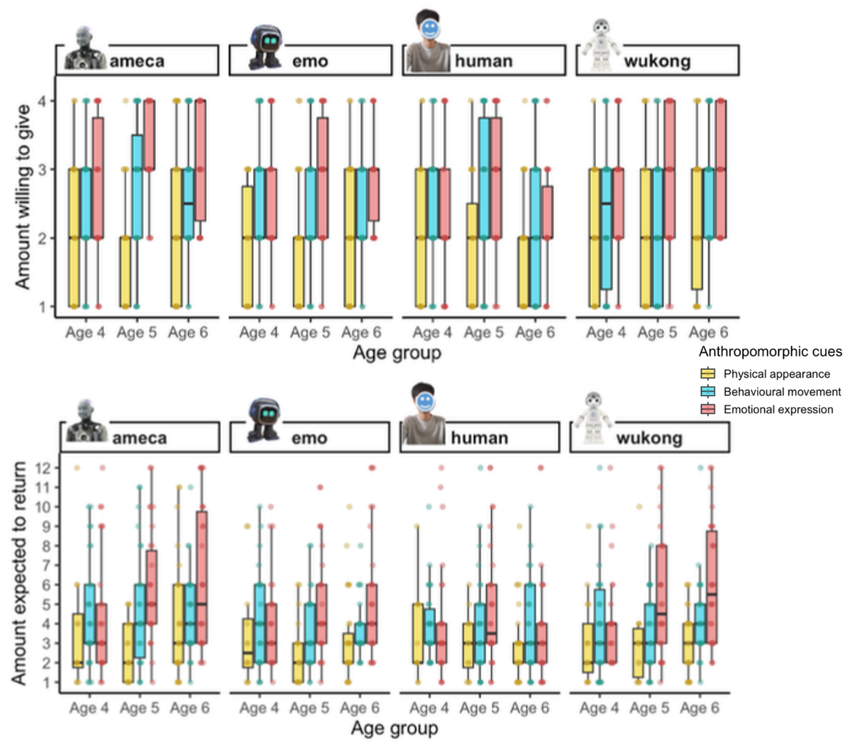
Static Pic (Physical) | Video Call (Behavioural) | Facial Expression (Emotional)

Study 2

Design

- Participants: 271 children aged 4-6 (131 female, M = 5.42, SD = .72)
- Agents: Human/Emo/Wukong/Ameca
- (Robots in S1 cannot express emotions)
- Anthropomorphic cues: Physical vs. Behavioural vs. Emotional
- Goal: Compare children's trust toward human and various robots that differ in physical, behavioural, and emotional anthropomorphism.
- Analysis: Generalised linear mixed models (GLMMs)/ Generalised linear models (GLMs)

Results



- Agency increased with age, peaking at 6 years.
- Behavioural and emotional cues enhanced agency beyond appearance, with emotion showing the strongest effect.

Discussion

- **Agency increases with age and anthropomorphism.** Results showed that older children (age 6) displayed stronger agency than younger children (ages 4–5), investing more coins and expecting greater reciprocity. Children trusted more anthropomorphic robots more than less anthropomorphic ones, with trust **peaking when appearance, behaviour, and emotional expressiveness were combined**. Behavioural and emotional cues exerted a stronger influence than appearance alone, highlighting the primacy of actions and emotional responsiveness over visual design.
- These findings suggest children's interactions with robots are underpinned by agentive reasoning rather than passive acceptance, highlighting the central importance of behavioural and emotional anthropomorphism as scaffolds that enhance children's agency and enable context-sensitive, independent judgement.

Acknowledgements

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References

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