A Study to Measure the Effect of Framing a Robot as a Social Agent or as a Machine on Children's Social Behavior

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***Abstract*—Framing or priming a situation can subtly influence how a person reacts to or thinks about the situation. In this paper, we describe a recent study and some preliminary results in which the framing of a robot is manipulated such that it is presented as a social agent or as a machine-like entity. We ask whether framing the robot in these ways influences young children's social behavior during an interaction with the robot, independent of any changes in the robot itself. Following the framing manipulation, children play a fifteen-minute game with the robot. Their behavior, such as the amount of conversation, mimicry of the robot, and various courteous, prosocial actions will be coded and compared across conditions.**

***Index Terms*—anthropomorphization, context, framing, priming, human-robot interaction, child-robot interaction, social robotics**

I. Introduction

When performing child-robot interaction studies to test a social robot's effectiveness as, e.g., a tutor in math or a companion in language learning, we may not give much thought to how the robot is introduced. However, children's first encounter with the robot may significantly influence their subsequent interactions. A robot's appearance, embodiment, and behavior can influence people's anthropomorphization [1], trust [2], and willingness to learn from a robot [3], respectively. Beyond these characteristics of the robot, however, we argue that subtle factors independent of the robot's morphology can also have significant effects.

This research is based on social cognition and social psychology literature on priming effects and first impressions [4]. For example, students rated an instructor as more considerate, sociable, and humorous if they were told beforehand that the lecturer was warm-hearted, versus cold-hearted [5]. Recent research has shown priming effects with robots as well. Stenzel and colleagues [6] found that people attributed more intentionality to a humanoid robot if they were told that it was an active, intelligent agent versus a mechatronic device merely following commands. Klapper and colleagues [7] performed a similar manipulation to examine how people's beliefs about an agent's animacy influenced their automatic, unconscious imitation of the other's actions. Coeckelbergh [8] suggested that by framing a robot by talking *to* it rather than *about* it, shifting from the impersonal third-person to the personal second-person, our perception shifts from "machine-like" to "social other." The language used to frame the robot partially constructs our relation with it. To this end, in this study, we examine how an adult's introduction of a robot affects a child's behavior.

II. Methods

A. Research Questions

How might the way a robot is introduced and framed by an adult affect how a child perceives and responds to the robot? Will subtle linguistic framing influence children's behavior and affect while playing with the robot?

B. Hypotheses

We expect that *Social* framing will move children to treat the robot more like a social other versus more like a technological game or a machine with the *Machine* framing, based on prior work on the linguistic framing of robots [6]–[8], as well as work suggesting that children follow the cues of adults to learn how to interact with new people and objects [9].

C. Participants

Twenty-two children aged 3–7 years ($M = 5.04$, $SD = 1.23$, $\min = 3.12$, $\max = 7.42$) were recruited from the Greater Boston Area for the study. All parents signed a consent form for their children and all children verbally assented to participate.

D. Procedure

The study followed a between-subjects design with two conditions (*Social* x *Machine*). This protocol is partially based on a pilot study performed with adults, described in [10].

Children were first asked questions by Experimenter 1 about what they thought about robots, such as the emotional, physical, and mental capabilities of robots. Then Experimenter 2 performed the framing manipulation. This allowed Experimenter 1, who teleoperated the robot during the robot interaction, to be blind to the framing condition. In the *Social* condition, the robot was introduced as a friend, with phrases using the second-person and inclusive language to refer to the robot, e.g., "You two are going to play a game together," and "Make sure you tell your new friend how to play, okay?" In the *Machine* condition, the robot was introduced as a robot rather than as a friend, and was referred to in the third-person, e.g., "You are going to play a game with it," and "The robot will give you directions on how to play."

The robot interaction began with the robot introducing itself and leading small talk (e.g. asking children their favorite color). Then, each child played a game with the robot that involved sorting a set of objects by color, size, and shape. The robot and child took turns—the robot sorted by one attribute, then the child was invited to sort by another, and so forth. The robot performed specific emotional expressions during the game, such as laughter and smiles, providing opportunities for mimicry of the robot's behavior by the child to occur.

During the robot's final turn in the game, Experimenter 2 returned and interrupted the robot's turn (following the methodology in [11]), saying, "It's time for me to put you away in your box!" The child was asked whether they thought the robot should be allowed to finish its turn or not, allowing us to see whether the framing had influenced the child to be courteous (allowing the robot to finish its turn), or whether the child would treat the robot as any other technological device, and leave without saying goodbye.

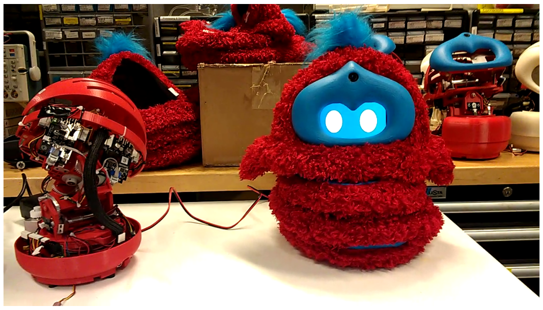

Fig. 1. The robot Tega was designed for interactions with young children.

After this, Experimenter 1 asked children follow-up questions to determine whether their thoughts and feelings about the robot had changed. We also asked parents to fill out a brief questionnaire pertaining to their child's social abilities and behavior to learn whether their behavior with the robot was characteristic of the child or not. Finally, we recorded audio and video of the interactions, along with all questionnaire responses.

E. Robot

We used the Android phone-based robot Tega (Figure 1), which was designed and built by the Personal Robots Group at the MIT Media Lab. The robot was teleoperated by an experimenter (primarily to deal with language understanding), who was trained by an expert on puppeteering the robot as a believable character. The teleoperator followed a script for triggering emotional body actions and facial expressions so these only occurred at determined times, as well as speech playback (recorded audio pitch-shifted to sound more child-like). The teleoperator attended to children's speech and their progress in the sorting game to determine which phrases to playback next.

III. Preliminary Results & Ongoing Data Analysis

No differences were found between conditions in children's responses to the pretest and posttest questionnaires. This may be because children's conscious evaluations of the robot were not influenced by the framing. We do, however, expect to see differences in children's behavior. To this end, video and language analysis is ongoing. We are coding behavior such as smiles, laughter, and mimicking the robot's actions; number of words spoken; number of questions asked; and use of pronouns or the robot's name to refer to the robot. We expect to find that in the *Social* condition, children will mimic more of the robot's emotional actions [4] than in the *Machine* condition. We also expect that *Social* children will speak and act in more social and courteous ways, such as asking more questions, narrating their own actions [12], using second-person pronouns or the robot's name (versus third-person) [8], allowing the robot to finish its turn and saying goodbye (versus just leaving) [13], and laughing more [14]. Furthermore, we expect that the framing may have stronger effects initially [4], and these effects may "wear off" over time as children react to the robot's social presence in the moment as it is encountered, rather than based on what they were told about the robot by the experimenter. To this end, we will divide the coding results into multiple interaction stages to compare children's behavior at the beginning, middle, and end of the interaction.

IV. Future Work

This study is one in a series investigating young children's sense-making of social robots. How do children construe social robots? What factors in their social environment—such as the framing of the interaction—affect how they perceive and respond to social robots? This study will give us insight into how the interaction context can influence children's thinking and responses independent of the robot's own morphology and behavior.

Follow-up work may examine other aspects of framing. For example, in this study, an adult stranger (the experimenter) performed the robot framing. How might the child's reactions change if the robot was introduced by the child's parent or an older sibling instead? Parental framing may lead to stronger effects, given children's trust in information from their parents [15]. We may also investigate whether framing has persistent effects that last into a second or third session with the robot. Although we expect that the framing will begin to "wear off" even within one session with the robot, we may see more dramatic differences over multiple encounters. We may also study whether social framing has greater effect during different tasks or for different levels of embodiment (e.g, versus a virtual agent).

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