Not in my house!:

Children playing an online game with robots show low trust and closeness with ingroup robots

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ABSTRACT

This paper presents preliminary research on whether children will accept a robot as part of their ingroup, and on how a robot's group membership affects trust, closeness, and social support. Trust is important in human-robot interactions because it affects if people will follow robots' advice. In this study, we randomly assigned 11- and 12-year-old participants to a condition such that participants were either on a team with the robot (ingroup) or were opponents of the robot (outgroup) for an online game. Thus far, we have eight participants in the ingroup condition. Our preliminary results showed that children had a low level of trust, closeness, and social support with the robot. Participants had a much more negative response than we anticipated. We speculate that there will be a more positive response with an in person setting rather than a remote one.

CCS CONCEPTS

Human-centered computing ~ Human computer interaction (HCI) ~ Empirical studies in HCI • Applied computing ~ Law, social and behavioral sciences ~ Psychology

KEYWORDS

Child-robot interaction, trust, group membership, social support, closeness

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1 INTRODUCTION

Robots are becoming a part of our daily lives (e.g., robotic vacuums), and children are being introduced to technology at a very young age. We anticipate that robots will become more prevalent, and this generation of children will work more closely with robots in adulthood than prior generations. As such, it is critical to understand how child-robot relationships develop to provide further insight into these relationships from a young age.

Trust is important in human-robot interaction, because it has a direct effect on if people will follow robots' suggestions [1]. Group membership is also critical to trust; people treat ingroup members (teammates) more positively than outgroup members [2, 3] and trust them more [4].

In this study, we examine if children will accept robots as part of their ingroup and how robots' group membership will affect trust, closeness, and social support. To do so, we recruited children ages 11 through 12. Participants watched a video with two humanoid Nao robots over a videoconference, played a game with the robots, and answered a survey. We conducted the study entirely online because of the COVID-19 pandemic restrictions. So far, we have eight participants in the ingroup condition and no participants in the outgroup condition. We will discuss our preliminary results from the first condition in relation to prior studies. We will also discuss some challenges we met for recruiting and running child participants during mandatory social distancing due to the COVID-19 pandemic.

2 BACKGROUND

According to *Computers Are Social Actors (CASA)* paradigm, people tend to treat computers and other media as if they are real people [5]. Children perceive robots as lifelike and social, and they treat computers as living things [6]. Therefore, we will draw from social psychology literature to learn more about how children interact with robots.

2.1 Trust

Scholars have defined trust as, "the willingness of a party to be vulnerable to the outcomes of another party based on the expectations that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" [7]. Trust determines the willingness of people to accept information from and follow suggestions of robots [1]. We must consider the trust of robots when designing social robots, to avoid problems like misuse, inappropriate use, and disuse [8]. Trust is a vast topic and covers many areas in research. Human-robot trust is a relatively new field, and child-robot trust is even a newer field [8, 9].

Research suggests that after an initial interaction with a robot, usually children feel that they trust that robot. A study investigated the trust of children playing a game with either a human or a robot. Participants three years of age were more inclined to trust both playing partners compared to other ages. Seven-year-olds placed more trust in the robot than in the human [10]. A study with Dutch children, ranging from ages 7 to 12, found that after playing a guessing game with a robot they felt they could trust the robot [9].

2.2 Ingroup/outgroup

In social psychology, participants tend to favor their ingroup (a group to which participants belong) over their outgroup (a group to which they do not belong), People usually display more trust, cooperation and show more positive attitudes towards ingroup members than to outgroup members [3], [4], [11]. These findings have been replicated with children [12], [13]. Further research indicates that ingroup favoritism remains regardless of whether the group member is a human or a robot [14].

As children age, their preference for ingroup members over outgroup members develops and grows. A study on children between 3 and 8 years of age found no significant change in outgroup preferences with age, whereas ingroup preference strongly increased with age [12], [13]. In a study with _____ youths, children 7 to 8 years old demonstrated strong ingroup preferences, whereas children 3 to 6 years old showed no preference to ingroup nor outgroup [12]. In a study with Chinese youths, children 5 years old showed more ingroup favoritism compared to younger children 3 to 4 years old[13].

2.3 Children

Some scholars have pointed out the benefits of child-robot relationships [15]. In this article we will explore the human aspect of trust between children and robots. Social robots can relieve young patients of stress and anxiety; robots can interact and play with the patient to build and maintain long-term social and emotional relationships [16]. It is highly beneficial to study the development of child relationships with ingroup and outgroup robots to provide new insights into this relatively new topic.

2.4 Current Study

In this study, we examine how robots's group membership related to children will affect how the children perceive robots. We specifically examine how group membership affects children's trust, closeness, and perceived social support with the robots. We hypothesize that by playing a game with *ingroup* robots, rather than *outgroup* robots, the children will display more (1) trust, (2) closeness, and (3) perceived social support with the robots. We report preliminary results and challenges of running the study during the pandemic.

3 METHOD

3.1 Design

This study used a between subject single factor experimental design: We randomly assigned participants to either the ingroup or outgroup condition such that participants were either on a team with the robots (ingroup) or opponents of the robots (outgroup).

3.2 Participants

We recruited children (N =8; two were female) through the local [anonymized] public school, specifically classes that were science based. The children's ages were of 11 and 12 years (M=10.4, SD =2.5).

3.3 Procedure

An experimenter conducted this study entirely online through zoom (a video conferencing tool). The experimenter emailed the assent and consent forms to the teacher. The parents/guardians consented prior to the study. The experimenter entered the zoom video call with the teacher and all eight children. Participants were in their own homes. Before the study began, the experimenter reviewed the assent/consent forms with the children and answered their questions. The experimenter explained to the children that this study was voluntary, data would be anonymized, and that they could withdraw from the study at any time. The experimenter refrained from answering questions about robots until the debriefing to avoid influencing their perceptions of the robots.

In the video, two Nao robots wearing clothing sat together on a desk with no other distractions present (Figure 1). In the video, the experimenter asked the robots introductory questions (e.g., "Can you introduce yourself to your teammate/opponent;" "Do you want to play a game"). The robot responded verbally (e.g., "Yes, I would love to").

Next, participants individually played a game with the robots, then individually completed a survey. Once all participants finished the questionnaire, they were debriefed. The experimenter answered participants' questions, explained the functionality of the robots, and told the children that the whole study was scripted (e.g., video and game).

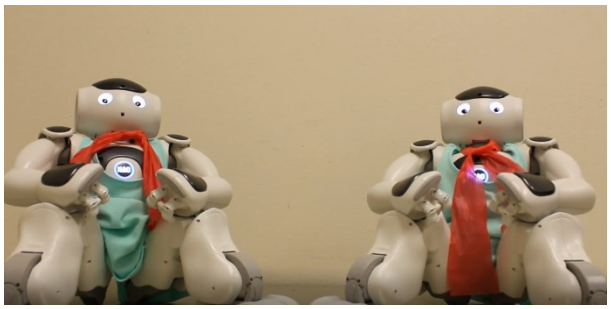

Figure 1. Screenshot from the video participants watched.

3.4 Game

Participants played an estimation game with the robots. Before the game began, they had a practice question (e.g. "How many barns do you think are painted red?"). Participants answered on a scale of 1 ("None") to 5 ("All"). Participants saw the robot's estimation, then could take these answers into consideration for their final answer. All the robots' responses were preprogrammed, and the "correct answers" were completely made up. The game lasted about ten minutes.

3.5 Measures

The survey included several open-ended and closed-ended questions that took 10 minutes. The items addressed children's trust, social support, and group membership related to the robots. Children saw several practice items (e.g., "I like spinach," "I like to swim") before starting the survey, to learn the item format and the answering scale. Once the children indicated that they fully understood the procedure, the researcher administered the questionnaire. The answering scale was a five-point Likert scale bar graph. Participants completed the below surveys, which were designed specifically for children. Children made all surveys on a Likert scale of 1 ("None") to 5 ("All")

The **Trust** scale measured trust of the robots (e.g., "I feel that Nao is trustworthy") [9].

The **Closeness** scale measured the closeness of the relationship (e.g., "Nao feels like a friend to me") [9].

The **Perceived Social Support** scale measured what participants felt about the robot's social support (e.g., "If I were in trouble Nao would cheer me up") [9].

4 PRELIMINARY RESULTS AND DISCUSSION

Because the results are preliminary, and we only have eight participants from one of the two conditions (the ingroup condition), we will present the results and discussion as follows:

First, we present descriptive statistics for the preliminary results of the eight participants and relate this to prior studies using the scales. Second, we will present qualitative findings about what it was like to run a study during the COVID-19 pandemic.

4.1 Descriptive statistics

On all three measures, children did not think well of the robots. Children had a low level of trust of (M=2.2, SD=0.8), closeness with (M=2.1, SD=1.0), and perceived social support from (M=2.5, SD=1.0) the robots. These surveys were rated on a Likert scale of 1 ("Does not apply at all") to 5 ("Applies completely").

These numbers are much lower than we had expected. In the previous study they found high levels of trust (M=4.60, SD=0.54), closeness (M=4.14, SD=0.69), and perceived social support (M=4.32, SD=0.59) [9]. One potential explanation for these low numbers is that participants respond more positively to robots in person than interacting with them virtually [2].

4.2 Qualitative findings

Children caught on much faster to the study game and survey than anticipated; of eight students only one asked a clarifying question, and he completed the study without trouble.

Research suggests that children understand what deception is after four years of age [17]; with age, children become better at lying [18], [19]. Because our study included children much older than four years of age, they understood the concept of deception. Several (e.g., four children) tried to guess the true purpose of this study. In this study, no participants guessed the exact purpose of the study.

Due to the pandemic, we ran this study through an online video conferencing tool (zoom). Using young children in child-robot interactions can be challenging because their responses at times are unpredictable. For example, in this study we thought that children would feel trust, closeness, and social support from the robot, like in past literature [9], but the opposite was true. It is important for children to be able to interact one-on-one with the robots, so they can have more close interaction and a sense of if they can trust the robots. In this study, our attempt to simulate social interaction and to present the robots as participants' teammates or opponents depending on the condition through online interaction did not seem successful. Future researchers should have the children interact one-on-one with the robot during the video call, instead of watching a video of the robots to include more direct interactivity. However because this study has only eight participants, we recommend collecting further data before drawing conclusions.

COVID-19 is altering how we perform research. Although many institutions are offering in-person teaching for certain classes [20], remote learning has become the new norm. Therefore, it's very important to learn about and overcome the challenges of performing research virtually.

5 CONCLUSION

In this study we recruited children 11 and 12 years of age through the local public-school system. Our study was entirely online. The children watched a short video of their teammate or opponent robot (depending on the condition), played a game with a robot, and answered a survey. Preliminary results showed that children did not trust, feel close with, or perceived social support with the robots. Children tried to guess the true purpose of the study and in the future researchers should be cautious and use convincing cover stories.

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