

‘Do you trust me with your secret if I wear the clothes you made for me’? Kids knitting clothes for SARs and choosing one to share a secret wish

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Abstract

Recent studies in child-robot interaction indicate a propensity for children to trust robots with humanoid characteristics, fostering social relationships that enhance interaction quality. Trust is fundamental in Human-Robot Interaction (HRI) and can be affected by parameters such as the robot’s appearance, texture, or performed activity. In the current paper, we investigate whether children’s trust in a SAR, specifically the Nao robot, increases after they design and dress it with handmade clothes using the felting technique. Children had the chance to interact with robots both naked and dressed in and without their creations and share a secret wish with one of them. Behavioral observations and wish content analysis provided insights into children’s emotional engagement and trust preferences. Most children chose to confide in the robot wearing their crafted outfit, using wish statements that reflect aspirational desires, contrasting with immediate wants expressed to the ‘naked’ robot. This study underscores the role of co-design and initial interaction quality in fostering trust and emotional engagement between children and SARs, highlighting avenues for enhancing HRI outcomes.

Keywords

Social Robots, Trust, Children, Secret Wish, Making Clothes

1. Introduction

Trust is a critical aspect in human-human and human-robot interaction (HRI) and it defines both the quality and the quantity of an interaction. In recent years, there has been growing research interest in the use of Socially Assistive Robots (SAR) to support children in a variety of applications from educational activities to healthcare. Studies in children-robot interaction have shown that children tend to trust robots and social agents with humanoid characteristics [1]. Several examples of HRI studies demonstrate that robots can develop social relationships with children, enhancing trust and interaction [2]. Kindergarten kids are equally likely to trust both an adult and a social robot when it comes to sharing their secrets [3]. SARs’ physical embodiment plays a significant role in fostering a trusting relationship between humans and robots [4], contributing also to the development of comfort [5]. Additionally, the SARs’ embodiment affects both the amount, and the quality of information disclosed by humans interacting with them [6]. A study with adult participants has shown that people often develop a connection and trust with a SAR, leading them to share sensitive information [7]. Moreover, humans can grow an attachment to a SAR even from a short, but meaningful interaction, while based on the context of the interaction humans have different design requirements [8]. The appearance and texture of robots significantly influence HRI, as these elements shape users’ perceptions. Specifically, the appearance of the robot determines people’s first impression of it, while at the same time implying the

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existence of intelligence and emotion, as documented in the research of Coeckelbergh et al. [9]. At the same time, behaviors like touching a robot can lead to more self-disclosures [10]. The sense of touch has been also shown to play a critical and specific role in the formation and quality of social relationships for children, and it is enhanced through technologies that allow robots to simulate physical touch, improving the sense of intimacy and trust [11]. The design of social robots is significantly influenced by children's perceptions, leading to the development of more interactive and engaging designs [12]. Textiles play a central role as they offer flexibility and breathability, making them ideal for building robots that mimic human clothing and interact with thermal, electrical, and hygroscopic stimuli [13]. At the same time, techniques such as origami and kirigami are incorporated to enhance the anisotropy and kinematics of robots [14, 15]. The research community recognizes the importance of including children in design, as they offer unique perspectives that enrich robot development and function [16].

2. Current Position & Methodology

In the present study, we propose that making clothes for the SAR Nao will lead the kids to trust the robot wearing their clothes more. To investigate this, ten kids aged between 7 and 10 years old in small groups made clothes to dress Nao using the Felting technique. This process is based on the compression of fibres using either wet or dry techniques, with needle felting being a popular dry method [17]. The result of needle felting is a recyclable material that can be modified without complex treatments and is suitable for application to natural, synthetic, and mixed fibres. The technique is well suited for making clothing for robots as the new textiles have been produced and used in many different sectors due to their lightness and durability, as well as the fact that they could include various types of micro and nanotechnologies and incorporate conductive materials [13]. The kids were introduced to a 'naked' NAO robot which together with the researcher showed them how to knit clothes, as shown in Figure 1. The robot apart from the researcher's assistant, also served as a fitting model for the clothes, as shown in Figure 1, second, and third picture. Nao asked the kids to make some clothes for their friends and when they were done, the researcher accompanied the kids one by one to a separate room where 3 NAOs were waiting for them, one 'naked' similar to the one they were interacting while making the clothes, one wearing the piece of clothing that each kid made and one wearing a 'control' garment, made by the researchers, as shown in Figure 1, last picture. The children were instructed to write a secret wish on a piece of paper and give it to the robot they trusted most. After a brief interaction with the 3 robots, where they expressed gratitude to the children for making the clothes, the robots informed the children that they could share their secret wish with one of them. The robots assured the children that the unchosen robots would not feel sad, thus allowing the children to freely choose which robot to confide in. Another researcher was hidden on the opposite side of the room, systematically recording observations of the children's behavior as captured by the cameras in the Nao robot's eyes. The whole procedure was conducted in the Greek language.

3. Initial Experimental Findings

Based on the research findings presented in the introduction, regarding the effect of touch and co-design in children's trust, we were expecting that kids will choose to disclose their secret wish to the robot that was wearing the clothes they made. Conversely, due to the potential influence of familiarity established through a brief yet meaningful interaction with the 'naked' robot, which demonstrated competence and intelligence, we also aimed to investigate whether the children would prefer this robot over the one dressed in the clothes they provided. The analysis involved quantifying the children's preferred robot, examining the content of each child's secret wish in relation to their chosen robot [18], and evaluating the behavioral observations recorded during their interactions with the three robots. Most children (6 out of 10) chose to share their secret wish with the robot that was wearing the outfit they made, 3 out of 10 the 'naked' and one, the robot dressed in the researchers' outfit. Following Roberts' [18] recommendations on disclosure context analysis, we noticed that children choosing the robot dressed



Figure 1: From left to right: One group of kids making the clothes, Kids with the researchers help are fitting the clothes to the 'naked' Nao that also performed as the researchers' assistant, one by one kids are witnessing robots' conversation before choosing with which one to share their secret wish.

in their outfit were mostly writing their wishes using the 'wish' grammatical form in both present or future tense i.e. 'I wish to become a perfect soccer player', 'I wish to buy a mini motocross to play with my friends or with the Nao', 'I wish that Nao could be my best friend'. On the contrary, children choosing the 'naked' Nao were mostly using the 'want' grammar form, i.e. 'I want a vanilla chocolate ice-cream', 'I want to be the best soccer player'. Interestingly, the third child who chose the 'naked' robot was debating between the 'naked' and the one wearing his outfit, by constantly changing his mind, leaving the note to the one and then again changing to the other, while his wish was 'Don't conquer planet earth'. The kid who chose the control dressed robot chose the 'want' grammar, mentioning 'Nao, I want you to tell your friends to form a soccer team'. There were no differences between gender and age and the choice between 'want' and 'wish'. The mentioned examples of the kids' wishes were translated by a Greek associate professor of linguistics, specialized in children's linguistics.

4. Discussion

The primary objective of this position paper is to examine the trust that children can develop towards a SAR and their propensity to disclose a secret wish. This investigation is based on initial results from an experimental study in which children used the felting knitting technique to create clothes for the NAO robot. The referred experimental design and findings are part of a larger project where children participating evaluated their trust and attitudes towards SAR before and after conducting the felting activity, while interviews were also conducted to indicate more insights regarding children's choices

and feelings regarding the robots. The grammatical analysis of the children's secret wishes provided further insight into their trust and emotional engagement with the robots. Children who chose the robot wearing their outfits predominantly used the 'wish' grammatical form, often associated with hopeful or aspirational desires. In contrast, those who chose the 'naked' robot mainly used the 'want' grammatical form, indicating more immediate and tangible desires. This distinction in language use might reflect different levels of emotional connection and trust, with the 'wish' form suggesting a deeper, more personal bond that needs further exploration. Moreover, the behavioral observations, systematically recorded by a hidden researcher, revealed nuances in children's interactions with the robots. For instance, the child who was undecided between the 'naked' robot and the one wearing their outfit exhibited a unique behavioral pattern, constantly switching their decision, which might indicate an internal conflict or a struggle to balance familiarity with a personal connection. In conclusion, in this paper, we intend to underscore the complex interplay of personalization, initial interaction, and perceived competence in establishing trust between children and social assistive robots. It suggests that incorporating elements of co-design and ensuring meaningful initial interactions can significantly enhance children's trust and emotional engagement with robots.

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