# Child's Bonding and Self-Disclosing with a Robot in Family Care

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## ABSTRACT

This extended research abstract for the Doctoral Consortium at IDC 2021 describes a 5-year PhD project, started November 2019, on self-disclosure in child-robot interaction in the field of child and family care. The research design embraces a bottom-up participatory design approach including all stakeholders, based on qualitative as well as quantitative methods. This PhD research is guided by Dr. M.M.A. de Graaf and Prof. dr. ir. J.F.M. Masthoff.

## CCS CONCEPTS

• **Computer systems organization → Robotics**; • **Human-centered computing → Field studies**.

## KEYWORDS

child robot interaction, social robots, co-design, child health care, family care, youth services

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## 1 INTRODUCTION AND RELATED WORK

Although social robots are barely being used in current child and family care organizations, they may help these organizations to perform their society-beneficial work in the near future. For example, the Dutch Child and Family Center is assisting children and families with various mental and physical health-related services. These services include for example assisting parents with mild intellectual disabilities and coaching children at school, but also measuring children's development and providing vaccinations. However, budget cuts as well as transferals of national responsibilities to local organizations result in high workloads (e.g., administrative tasks) amongst childcare professionals. These big challenges warrant child and family care institutions to explore innovations and advancements for their care practices. One potential way to deal with these challenges is the application of social robots in their care practices. Research has shown that using a social robot as an interaction tool can keep the child more engaged and motivated during therapy sessions [6]. Also, using a social robot can increase self-discipline and self-awareness in the child over therapy sessions [12]. Social robots can therefore be beneficial in child (mental and physical) therapy and education. Even though studies show promising results in these contexts (e.g., [2], [9], [17]), longitudinal studies as well as research in real-world settings are lacking. This causes shortcomings in ecological validity and lacking knowledge on long-term effects.

For our application domain it is crucial that the child-robot interaction is accessible and trustworthy for children involved in mental care. A robot that makes contact easily and, subsequently, enters into dialogues that accommodate appropriate *self-disclosures* could support the care processes. Some initial research on child-robot self-disclosures has been conducted, but well-grounded design guidelines and proven solutions have hardly been provided [5, 14]. As a next step, we aim to study evolving child-robot self-disclosures in the broad child and family care domain, addressing the values, requirements and needs of stakeholders involved (e.g., by means of a requirement analysis).

### 1.1 Research questions and approach

My main research questions are: How can a social robot help in facilitating child's self-disclosure in child-professional conversations? How should a robot deal with this sensitive information? What is an appropriate trust-balance between the child and the robot and how should this balance be maintained?

To study these questions, the project consists of an *exploration phase* and a *testing phase* (which may be partially performed in parallel). In the exploration phase, we adopt an iterative bottom-up, participatory design approach by including stakeholders and end-users from the beginning of the research and design process. Their valuable insights will help us in defining the supporting care applications of the social robot as well as context-dependent user requirements and interaction designs. Additionally, early involvement of stakeholders (e.g., childcare professionals, parents) and end-users (i.e. children) will stimulate their engagement which facilitates the research process and increases the successful implementation of the social robot in childcare practices. Based on the findings gathered in the exploration phase, the testing phase will systematically test requirements and designs.

At the start of our exploration phase, together with two childcare professionals, we sketched three design scenarios. Our main design scenario described a social robot that serves as an icebreaker tool for child-professional conversations. Physical treatment (e.g., vaccinations [18]) as well as mental therapy [15] can be stressful for a child. A social robot has the potential to reduce the child's stress level (e.g., [3], [15]) and facilitate the connection between child and therapist ([11], [16]). This is especially relevant since children often do not yet fully understand their own emotions or find themselves unable to verbally express those, depending on the child's developmental stage [19]. Currently, therapists regularly


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use toys or drawings to reduce tension and facilitate children in expressing themselves [13]. For this specific case, we aim to explore how a social robot could fulfil this mediator role effectively and autonomously.

In such health care communication settings, it is important that the child feels comfortable enough to share all necessary information with the caregiver (e.g., [20]). More specifically, it is essential to create a context of trust and safety, facilitating a bond between child and robot. Trust and bonding in child-robot interaction have been studied recently, showing that the robot's presence and communication strategies have different effects in diverging contexts in general and for different types of children (e.g. [21, 22]). For design scenarios, when dealing with sensitive or complicated situations such as domestic violence cases, a social robot can mingle in the conversation between child and care professional by asking questions to the child. Initial studies show that sharing experiences with a robot, instead of talking directly to an adult, has the potential to create a safe environment for the child [16]. A social robot with which you share experiences, is also able to stimulate self-disclosure [4]. Facilitating self-disclosure is a perfect way of monitoring child's well-being, supporting prevention and the initiation of intervention when needed. However, ethical considerations should be well-addressed in the design of the self-disclosure interactions.

### 1.2 Collaborations

We are collaborating with different organizations to study and apply the outcomes into the real-world practices. First of all, we collaborate with the Dutch Child and Family Center (CJG, Centrum voor Jeugd en Gezin [1]), starting to explore the application of social robots for low-risk situations (e.g., mass vaccination days). More generally, the childcare professionals have expressed a need for (a) more knowledge on the risks and opportunities of social robots in their healthcare practices and (b) scientific and empirical grounded requirements and implementation strategies. The focus is on physical and mental health as well as family care. The overall goal of this collaboration is to improve the current child and family care practices by means of social robots, by defining appropriate context-dependent (interaction) designs and systematically test them in the long-term. Second, we started a collaboration with Levvel[2], which is also a regional Child and Family Center. Levvel, together with RobotWise and Garage2020, is investigating the possibilities of Robot-Assisted Therapy (RAT). In this case, the child will bring a social robot home to support the therapy. The overall goal is to develop such RATs together with childcare professionals, which will be later on applied to Levvel's current practices.

## 2 METHODS

We are currently mainly working on the exploration phase. In our collaboration with CJG, we performed four focus groups with childcare professionals and parents, as well as a co-design workshop with children, to include all major stakeholders. The end goal of the exploration phase is to provide user requirements for the social robot for the use in childcare, along with the specific use cases in which these requirements and corresponding behaviors should be included. Furthermore, regarding our collaboration with Levvel, we will develop different kinds of RAT based on outcomes of focus groups with childcare professionals, parents and robot suppliers. We also plan similar co-design with children workshops in this context. In the testing phase, we systematically test requirements, user stories, value stories, and designs derived from the focus groups in real-world scenarios (e.g., at the childcare institutions, at schools, and in our university lab). For example, we already tested the effects and perceptions of a social robot in a waiting room at vaccinations, compared to a tablet. Also our developed RATs will be tested in real-world scenarios (i.e. therapy provided by Levvel).

[1]https://cjgcapelleaandenijssel.nl/
[2]https://www.levvel.nl/


**Figure 1: A picture of the robot co-design with children workshop.**

## 3 PRELIMINARY RESULTS AND FUTURE PLANS

Based on *focus groups with childcare professionals and parents*, several requirements were defined for social robots (see Neerincx et al. [16]). Both childcare professionals and parents stated that the social robot must complement the professionals' activities (and never replace the professional). Also, the use of the robot should be enjoyable for the child, and the design needs to be appropriate. This could increase engagement of the child in the therapy sessions [12]. Furthermore, both groups expressed the need for personalization, to make the child-robot interaction appropriate for the child and the treatment, e.g. by automatic emotion recognition and expression [1, 7]. Lastly, the social robot must be safe to use, concerning the design, data storage and privacy. The childcare professionals additionally stated that the social robot must enable flexible usage (for the child as well as the therapist) and reduce the workload. Also, they expressed a need for technological support and information about the capacities of the robot. This highlights the importance of including the therapists' view while studying social robots in this context [10]. The parents additionally stated that the user of the robot will need time and information about the robot to adapt to the social robot, and that the robot should display playful behavior.

First impressions from the *co-design workshop with children* showed the benefits of creative methods that give them several ways of expression [8]. The children enjoyed the drawing, writing and theatre play activities. Scenarios that came up include (among others) using a social robot in the waiting room to provide information and distraction, a social robot to talk to for children with special needs (e.g., ADHD, dyslexia), and a social robot as mediator in child-professional conversations.

Preliminary results from *the application of a social robot in a waiting room* showed that the children seemed to be more positively engaged when interacting with the robot (higher motivation to play a game, higher interaction volume, more smiling during the health check, more gesture and/or verbal expressive behaviors, less mobile phone distraction), compared to a tablet. Further, their individual characteristics (like age and personality) and the social context (e.g., parent's presence) affected children's engagement (e.g., higher for young children) and parent's involvement (e.g., higher with the tablet group, resulting in a higher percentage of answered questions during the health check). Here, we identified an interesting trade-off: the current robot supports child engagement (distracting from the stressful vaccination), but hinders the collaboration between parent and child.

*In conclusion*, for social robots to be successfully deployed in child and family care situations, the interaction needs to be tailored to the child (and family) (e.g., [17]). This can be done by various personalization techniques, such as face and emotion recognition. Face recognition is a relatively simple technique that will make the child feel more comfortable immediately, especially with repeated visits to the therapy center. The robot can this way be a familiar actor, increasing feelings of safety and trust. This increase of trust also facilitates self-disclosure, giving the robot as well as the childcare professional more opportunities for getting information from the child about his or her well-being. However, before implementing all this, several ethical concerns need to be evaluated. For example, a child may tell something personal (confidential) to the robot, which can require an intervention from the childcare professional (e.g., domestic violence). Here is a value tension between privacy and safety, which has to be dealt with appropriately, and there are trust relationships involved that might be damaged.

Our *future plans* include the iterative improvement of co-design methods, to refine the user requirements, needs, scenarios, and use cases (exploration phase). We will gradually shift to the testing phase, where we will systematically test the outcomes of our exploration in real-world settings. In the upcoming year, we plan to organize co-design workshops for children at schools, focus groups with other stakeholders for the development of RATs, and test the effects of a social robot on self-disclosure in low-risk settings (e.g, vaccinations, schools, waiting rooms).

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