

Social Robots to Support Child and Family Care

A Dutch Use Case

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ABSTRACT

Child and family care professionals in the Netherlands are facing challenges including high workloads. Technological support could be beneficial in this context, e.g. for education, motivation and guidance of the children. For example, the Dutch Child and Family Center explores the possibilities of social robot assistance in their regular care pathways. To study the use of social robots in this broad context, we started by drafting three example scenarios based on the expertise of child care professionals. During an *exploration phase*, we are identifying key design and application requirements through focus groups with child care professionals and parents. Later stages of our research, the *testing phase*, will focus on testing these requirements via scenario-based design and child-robot interaction experiments in real-world contexts to further shape the application of social robots in various child and family care settings.

CCS CONCEPTS

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

KEYWORDS

Social robots; Child-robot interaction; Trust; Child care; Family care

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1 INTRODUCTION

The child and family care system in The Netherlands is facing many challenges. Financial cuts and the transfer from national to regional supervision has led to long waiting lists, bureaucratic confusion, and substantial differences between regions in treatment availability and financing [16]. Similar child and youth care issues may occur elsewhere in the world, stressing the need to investigate ways to innovate and advance youth and child care practices.

Social robots show promising results in child health care and education contexts (e.g., [2], [5]). For example, using a social robot as an interaction tool keeps the child more engaged in the therapy and/or education session and can assist the child in being more self-disciplined and self-aware [9]. Additionally, social robots are suited for the implementation of AI, where substantial progress has been booked in the last years [1]. Examples are automatic speech recognition, face recognition, the registration of emotions in facial expressions, recognizing gesture patterns, and providing feedback and explanations. These communication aspects contribute to the enrichment of the the child-robot interaction and personalization of the treatment (e.g., [3]). Consequentially, since the social robot will in this way be able to better understand the child, it might stimulate trust and bonding in the child-robot relationship, which is essential for a successful therapeutic treatment (e.g., [17]).

Although research on social robots in child health care and education shows promising results, little research has been done in the actual field, the ecological validity is generally low, and there is a lack of long-term studies [2, 5, 13]. To narrow the knowledge gap on these aspects, we started a 5-year project to investigate social child-robot interaction and the possibilities of social robots in the Dutch child healthcare system focusing on physical and mental health as well as family care.

Our research project consists of two main phases, namely an *exploration phase* and a *testing phase*. In the exploration phase, we adopted a bottom-up, participatory design approach by including important stakeholders directly from the beginning of the research and design process. This will not only help to identify and define robot support opportunities with the context-dependent robot-interaction requirements and designs, but it will also stimulate involvement and engagement of all relevant stakeholders. In the testing phase, we will systematically test requirements and designs determined in the exploration phase. This paper focuses on the user requirements found in focus groups with stakeholders (i.e. part of

the exploration phase). This research was approved by the Ethics Review Board of our university.

2 DESIGN SPACE: EXAMPLE SCENARIOS

To help defining our design space, three example scenarios where social robots can be used to enrich child care treatments were drawn up by the researchers and two child care representatives from the Dutch Child and Family Center.

Example scenario 1: Social Robot to Break the Ice. Physical treatment as well as mental therapy can be stressful for a child. In this case, a social robot could assist in reducing the stress level and/or help make the connection between the child and the therapist. This is especially relevant since it often occurs that children do not fully understand their own emotions yet, or are not able to verbally express those, depending on their developmental stage [15]. Currently, therapists regularly use toys or drawings to help reduce tension and help children in expressing themselves [11]. We aim to explore how a social robot could fulfil this role effectively and autonomously. For example, when dealing with complicated situations such as domestic violence, a social robot can be used in the conversation with the child, where the robot asks questions to the child. This creates a safe environment where the child does not need to talk to an adult directly. In this way, the social robot is a neutral, supportive tool of the professional.

Example scenario 2: Social Robot as Training Tool. Besides one-on-one treatments, child and family care institutions in the Netherlands offer several (group) training sessions. An example is "Rots en Water training" [12], a psycho-physical training helping children develop social competences, heightening resilience and preventing bullying and some cases of sexual violence. The social robot can assist the children in doing various exercises, increasing the children's level of engagement and involvement in the educational process.

Example scenario 3: Social Robot for Standardized Tests. Child care professionals suffer from high workload [19]. A social robot could reduce this workload by helping with administrative tasks such as administering standardized tests with the child (e.g., van Wiechen [6], WISC [10]). Besides reducing the workload by automatizing, it will also help with keeping the child more engaged during these kind of assessments.

3 EXPLORATION PHASE

To gain insights in the requirements for social robots in various child care settings, we chose a qualitative method to identify a wide range of ideas and thoughts about the deployment of social robots in child care. A focus group is an appropriate research method, since discussion and exchange of ideas lead to this broad spectrum [8]. We therefore organized four focus groups with main stakeholders, which included card sorting [4] and group discussions.

3.1 Method

Participants. We included two types of stakeholders for the focus groups, namely child care professionals and parents. We organized two focus groups per participant group i.e. four focus groups in total. 12 child care professionals in total participated (i.e. 6 per focus group), and 6 parents (i.e. 3 per focus group). Unfortunately, due

to COVID, one parent had to cancel and was interviewed later. Therefore, 5 parents participated in the focus groups. The child care professionals all had a different job title and expertise, but are all working at the same child and family health care provider (i.e. the Dutch Child and Family Center). All participating professionals were female, with an age range between 25 and 60 years old. The parents were recruited through the Dutch Child and Family Center and therefore all clients of the center as well. Four participants were female and two were male, with ages ranging between 30 and 60 years old.

Procedure. In order to create an informal atmosphere, coffee, tea and some cookies were present in the room. Informed consent forms were handed out and the participants had time to read them thoroughly and ask questions. Three house rules were set up, namely 1. participants should respect each other, 2. they should let each other finish, and 3. everything discussed during the focus group is confidential. The focus groups had a semi-structured interview approach with 10 structured questions, covering topics such as possible child care improvements, positive and negative effects of social robots in child care, and related ethical aspects. During the focus groups, discussion was encouraged by asking participants their ideas and thoughts and to respond to each other's opinions. Furthermore, participants made use of post-its at the first, the third and the fourth question using an open card sorting method [4], where the participants were asked to sort and label their answers themselves. The post-its were used to give the participants some time to think about the question individually, after which a discussion was launched to talk about the given answers. This made the focus groups more interactive for the participants, while leaving room for individual answers as well. An example of the card sorting method in our focus groups can be found in Figure 1.

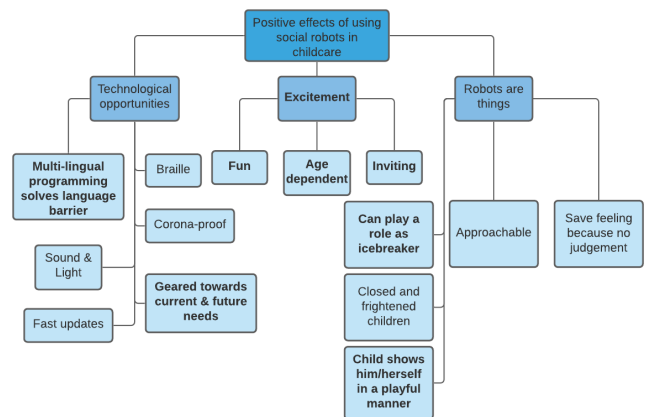


Figure 1: An example of a card sorting result in a focus group with parents.

The focus groups took 1.5 hours on average. All focus groups were recorded, transcribed, and coded by three different researchers according to the structural coding approach [14]. The focus groups were carried out in Dutch. A full transcript is available upon request.

3.2 Preliminary Results

For our research, we adapt an iterative human-centered design process. First results from focus groups can be found in Table 1, including an explanation of the user requirements, expected outcomes and the corresponding participant group. After designing the robot interaction behavior based on the requirements, the expected outcomes can be measured in future experiments. As can be concluded from this table, RQ01-RQ05 were mentioned by both participant groups and all are functional requirements about the robot's behavior and design.

Child Care Professional's Perspective. RQ06-RQ12 were all mentioned by child care professionals, where RQ06-RQ11 are functional requirements as well. RQ12 however has to do with appropriate information provision and support, which can be provided by an appointed professional and/or by the robot itself.

Parent's Perspective. RQ13 and RQ14 were additionally mentioned by parents, where RQ13 is a functional requirement about the robot's behavior (i.e. playful), and RQ14 regards appropriate information provision (for the parents and children) and time for the user to get used to the incorporation of social robots in child care. This can be provided by the child care professional, support staff and/or the robot itself.

3.3 Summary and Outlook

Based on focus groups with child care professionals and parents, several requirements were defined for social robots in child and family care situations. In summary, both child care 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 [9]. Furthermore, both groups expressed the need for a certain amount of personalization to take place, to make the child-robot interaction appropriate for the child and the treatment, for example by incorporating AI techniques such as emotion recognition and expression [1, 3]. Lastly, the social robot must be safe to use, not only regarding design, but also regarding data storage and privacy.

The child care professionals additionally stated that the social robot must enable flexible usage (for the child as well as the therapist) and reduce the workload instead of increasing it by complementing the professionals' activities. 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 [7].

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.

For future research, we plan to carry out similar focus groups with child care professionals and parents, to ask consecutive questions and incorporate and enrich the previously discussed scenarios. The end goal of this exploration phase is to provide user requirements for the social robot for the use in child care, along with the specific use cases in which these requirements and corresponding behaviors should be included.

4 TESTING PHASE

In the testing phase, these requirements and behaviors will be systematically tested in real-world scenarios in the Child and Family Center. In health care communication settings, it is especially important that the child feels comfortable enough to share all necessary information with the caregiver, in order to provide the appropriate and most effective care possible (e.g., [17]). When looking at child-robot communication in the health care field, it is therefore 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. [18, 20]). In the testing phase, the main research questions will therefore be: How is the child-robot communication the most effective in a youth care setting in creating a context of trust and safety, where the child feels comfortable enough to be open and honest? Some example subquestions are: When, why, and how is the interaction effective? Which factors are related to this effectiveness (e.g., age, sex, socio-economic or cultural background)? When and how will a social robot contribute to lowering the threshold for a child in the interaction with the professional? How can a social robot facilitate a child to tell the truth?

5 DISCUSSION

Previous research shows promising results of the use of social robots in child care and education practices (e.g., [2, 5]), which were also highlighted in our focus groups. However, the feedback from child care professionals and parents also point to some requirements that first need to be addressed before social robots can be safely deployed in higher-risk child care practices. Professionals preferred more administrative tasks for the robot to be carried out and were reluctant to use the robot in more sensitive contexts. This was mostly due to the professionals' views of robots as incapable of understanding the child's emotions, an essential capacity for successful treatment, which was their main reason for having doubts about the application of social robots in their current work practices. Parents have expressed similar concerns about the use of robots in child care practices. However, both parents and child care professionals have indicated that they are unaware of the current technological advancements of social robots. If social robots would be able to correctly recognize emotions and respond adequately, they believed such robots could be a useful tool for various therapeutic applications. This highlights the importance of correct information provision about the current technological advancements and the potential benefits and drawback of social robot applications in child care practices.

Additionally, the necessity of personalizing the treatment strategies was discussed. According to professionals and parents, all children are different, and therefore a one-size-fits-all approach is not desirable if even possible in child care settings. Using social robots in treatment strategies requires such robot's ability to differentiate between children and adapt its behavior accordingly. This is also relevant for expressing, recognizing and responding to emotions. Moreover, some children might have a negative emotion towards the social robot, which could have a negative effect on the

Nr.	Requirement	Outcome	Professional perspective	Parent perspective
RQ01	The social robot must enrich the conversation with positive reflections (e.g., feedback), "small talk" speech acts and games	The child enjoys working with the social robot	x	x
RQ02	Physical characteristics must be compliant with the specific demands of the therapeutic environment and setting	The child feels comfortable with the robot (e.g., not afraid) and is not be able to break it	x	x
RQ03	Personalization: The social robot should adapt its behavior according to a child's characteristics (e.g., age, gender) and momentary state (e.g., emotion, fatigue)	The child feels seen and taken seriously. This increases trust and bonding	x	x
RQ04	The social robot must be safe to use (regarding system quality and data storage)	The stakeholders trust the system capacities	x	x
RQ05	The social robots' activities must complement child care professionals' activities	Reduces professional's workload, giving room for human and personal contact	x	x
RQ06	The social robot must, if appropriate, ask triage questions to the child	Reduces professional's workload without reducing the information collection, giving room for human/personal contact	x	
RQ07	The social robot must, if appropriate, provide a distracting conversation or activity	Helps breaking the ice in the professional-child interaction	x	
RQ08	The social robot must be able to deal adequately with sensitive personal information (including intimacy and trustfulness issues) in the conversation with the child	The child trusts the robot	x	
RQ09	The social robot must be able to interact with the child in a social group setting with caregiver and/or parent	The social robot can be used in various therapeutic settings	x	
RQ10	The social robot must be under control of the child care professional	The social robot improves the therapy given by the professional and the professional feels comfortable using it	x	
RQ11	Adjustable: The social robot must enable flexible usage and activity choice	The social robot is used only when appropriate	x	
RQ12	Technological support for the social robot and information about its capacities must be provided to the professional	The professional feels comfortable in using the social robot and knows how to best deploy it	x	
RQ13	The social robot must be playful	The child enjoys interacting with the social robot		x
RQ14	The social robot must give the user time and information to get used to working with the robot	The user feels comfortable in using the social robot		x

Table 1: An overview of the user requirements, outcomes and corresponding participant group, derived from focus groups.

treatment. It would be useful if a social robot could estimate this autonomously and change its behavior strategies accordingly.

Overall, this research identified essential requirements for social robots in various child and family care settings. Future work will include other co-design methods with stakeholders (e.g., child care professionals, parents, teachers, children) and testing these requirements and designs in systematic experiments and in current practices of child care institutions (in vivo).

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