Challenges Conducting Child-Robot Interaction Research in a Pediatric Inpatient Care Context

Sooyeon Jeong[1], Deirdre Logan[3,4,5], Matthew Goodwin[6], Suzanne Graca[2], Brianna O'Connell[2], Laurel Anderson[2], Honey Goodenough[3], Nicole Stenquist[3], Alex A. Ahmed[6], Duncan Smith-Freedman[3], Katherine Jamieson[3], Cynthia Breazeal[1], Peter Weinstock[3,4,5]

[1]MIT Media Lab, Cambridge, USA
[2]Boston Children's Hospital Child Life Services Department, Boston, USA
[3]Boston Children's Hospital Simulator Program (SIMPeds), Boston, USA
[4]Department of Anesthesia, Perioperative and Pain Medicine, Boston Children's Hospital, Boston, USA
[5]Harvard Medical School, Boston, USA
[6]Northeastern University, Boston, USA

Abstract. In this paper, we present challenges that arise when conducting child-robot interaction research in a pediatric inpatient care setting, and practical solutions for balancing scientific validity while prioritizing medical care for patients. In the Huggable project, we learned that our experimental setup needs to be minimally obtrusive, easy to deploy, and quick to remove in the event of a medical emergency. When administering questionnaires, we also learned that we needed to be sensitive to the physical and mental state of pediatric patients to reduce added burden and minimize incomplete study measures. In sum, being flexible and sensitive to dynamic changes in the pediatric care context is key to performing successful child-robot interaction research in this complex, real-world setting.

1 Introduction

Conducting child-robot interaction research in a pediatric inpatient care setting involves multiple layers of complexities. First, all children need to be treated with care and sensitivity. Second, the top priority in any circumstance should be medical care for patients. Third, children with medical conditions are often more sensitive to environmental changes and their physical and mental state can vary more suddenly and drastically than healthy children. In this paper, we briefly discuss an ongoing clinical research study conducted in a local pediatric hospital, present setting-specific challenges we encountered, and illustrate practical solutions for balancing scientific validity while prioritizing medical care for patients.

2 The Huggable Project

We are in the process of running a clinical research study at Boston Children's Hospital to evaluate the efficacy of a social robot in mitigating pain, anxiety, and stress in young patients in a pediatric care context [1]. To-date we have collected data from 30, 3-10 year old children admitted to Medical Surgical ICU, Oncology, and Post-surgical units. Our study procedures take place inside participants' hospital bed spaces. We record children with two video cameras and an Affectiva Q™ sensor, a wearable device that measures electrodermal activity (EDA) for sensing sympathetic nervous system arousal [2]. Before and after interaction with the Huggable robot [7], developmentally appropriate and validated questionnaires on anxiety [3], affect [4], and pain [5, 6] are administered. Huggable is a small teddy bear robot covered with bright blue fur that is able to move its head and arms to show expressive social and emotional behaviors. A certified Child Life Specialist in the hospital remotely operates Huggable during the interaction, and the child and robot engage in casual conversations and an I Spy game.

3 Challenges and Solutions

Given the setting where our research takes place, the majority of our study participants have their vital signs continuously monitored with medical devices during their hospital stay. Therefore, clinical staff often comes into the bed space for checkups and intervention while we are conducting the study. Most of the time, their visits are fairly brief and create valuable opportunities to observe how a robot could distract children from negatively perceived routines, e.g. dressing changes or vital checks. However, when such tasks require more attention from patients and/or their caregivers, the study needs to be paused and our experimental equipment instantly removed from the bed space to ensure privacy and provision of optimal medical care. In order to setup and retrieve equipment quickly, we installed all robot related devices on a wheeled tabletop. We also installed our video cameras such that curtains can block them when privacy is needed (note, the cameras only record video, not audio).

As the study progressed, we also encountered challenges administering surveys. At first, all pre- and post-questionnaires were administered at once. However, many of the children, who were already critically ill, became too fatigued and many of the post surveys were not completed. In order to resolve this issue, we divided pre-test and post-test surveys into two sections, and administered them at different times. Longer questionnaires were administered roughly 40 minutes before setting up the recording equipment in the child's bed space, and post-tests 40 minutes after the child-robot interaction ended. Shorter picture-based questionnaires were administered right before the robot entered participants' hospital rooms for interaction. After we separated the surveys into two parts, children appeared to be less overwhelmed and able to successfully finish all of our experimental procedures. In addition, for those patients with physical difficulties, such as mucositis that hinders vocal expression, we made flash cards with answers on them that children could point to instead of verbally answering.

4 Conclusion

In this paper, we briefly present challenges we faced when conducting a child-robot interaction study in a pediatric inpatient care context. Young patients admitted in pediatric hospitals are physically ill, faced with an unfamiliar and often-overwhelming environment, and can become very sensitive to sudden changes or events. While controlled settings and consistency in experimental procedures are central to ensuring a study's scientific validity, robotics researchers need to remember that the most important priority in hospital settings is care for patients. Being flexible and sensitive to patients' and clinical staffs' needs are key to enabling unobtrusive research in such dynamic environments, and for readying robots to live and work "in the wild."

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