

Using Robots to Interview Children About Bullying: Lessons Learned from an Exploratory Study

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Abstract—This article describes the results of a study that compares disclosure occurrences of bullying from children (ages 8 to 12) to either a human or a social robot. Results from an orally administered questionnaire to 60 children, split evenly between human and robotic interviewers, revealed that few significant differences in reporting were encountered between interviewer types. Overall 9 of 60 (15%) of participants reported being bullied in the past month. Participants were significantly more likely to report that fellow students were teased about their looks to the robot interviewer in comparison to the human interviewer. In addition to the examination of these results, a discussion of lessons learned for future studies of this nature are provided.

I. INTRODUCTION

As the prevalence of bullying among children and efforts to mitigate occurrences of bullying rise, so does the need for effective mechanisms for children to report their experiences with bullying. This work examines self-reported incidents of bullying to a humanoid social robot interviewer in comparison to a human interviewer.

The study presented, explores the hypothesis that *Social robots may be more effective at eliciting details related to experiences with bullying from children between the ages of eight and twelve years old*. A ten-minute interaction with either a human or robot interviewer was conducted with 60 children in which each child was asked a series of questions about their experiences with bullying and subsequently completed a questionnaire that evaluated the person or robot that interviewed them.

For the majority of the questions posed, there was no significant differences observed in response to the human or robot interviewer. However, the overall incidence of bullying among the participants was low, with only nine participants reporting experiences with being bullied in the past month. Of the nine children who reported they had been bullied in the past month, seven reported he or she had been bullied while being interviewed by the Nao social robot.

As a result of this study we have identified several helpful tips or “lessons learned” that the general child Human-Robot Interaction (cHRI) community may find useful or that validates previous literature. The rest of the paper presents background literature in Section II. Section III presents our approach including the study design, the robot, the human interviewers, participants/recruitment, study environment, and

the parent questionnaire. The results of this research are presented in Section IV and the related discussion is presented in Section V. Our conclusions, recommendations, and future work are located in Section VI.

II. BACKGROUND

Bullying is an age-old problem among children in school environments [1]. In recent years bullying has gained the attention of mainstream media and several new national campaigns to provide relief to children who are victims of bullying have been launched. This topic area has been of considerable concern worldwide and is not relevant only in the United States. However, research has indicated that parents underestimate or are unaware of the widespread occurrence of bullying behaviors within schools [2]. This is further complicated by victims of bullying having significant difficulty in conveying their experiences to others (including parents and friends) depending on the characteristics the receiver of the information [3].

Though social robots have not been widely used to examine issues such as bullying; studies in child human-robot interaction (cHRI) have begun to generate a compendium of information related to successful cHRI. For example, Ros et al. offer a series of lessons learned while social robots were deployed with children in a hospital setting [4]. Relevant to this study are:

- Testing in a neutral space.
- Briefing children on potential problems the robot may encounter.
- Careful termination of the experiment.
- Adapting to the childrens increased sensitivity to technical failures.
- Handling unexpected responses from children.
- Employing graceful degradation for technical failures.
- Following basic social conventions.
- Use of credibility behaviors.

Additionally, Belpaeme et al. discuss three major areas which are challenging within child human-robot interactions. These areas include technical, evaluation, and expectations [5]. Technical challenges include tasks that may be difficult for the robot such as accurate perception of speech or visual stimuli. It may also include the ability to provide verbal responses in a timely manner. Similarly, evaluation challenges involve ensuring the accuracy and relevance to theoretical underpinnings of self-report measures. It may also include determining other more objective measures that apply to children during evaluations. The establishment of accurate

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expectations is also critical to ensure those interacting with the robot have a reasonable concept of its capabilities. The more human-like the robot appears and behaves, the higher the expectations children and adults have on what the robot should be able to perform and how it should respond.

III. APPROACH

The overall objective of this research was to investigate the use of robots as intermediaries to gather sensitive information from children. This study sought to compare the effectiveness of robot interviewers compared to human interviewers in gathering information about the children's experiences with bullying to determine whether the children were more likely to reveal their own experiences with bullying to robots than they were to humans. Prior research reveals that children are reluctant to report their bullying victimization to adults because they are afraid that they will get in trouble with the adult, the bully will find out about their reporting, or they do not want to be viewed as a "tattle-tale." These findings in the literature led to the hypothesis that, *children would feel less threatened and more comfortable sharing information with a robot interviewer than a human interviewer.*

A. Study Design

The study was designed in a between-participants approach, with one set of participants who experienced the robot as an interviewer and the other interacted with a human interviewer. The entire process was reviewed and approved by the Mississippi State University Office of Research Compliance (IRB). The interaction flow began with the participants' parents consenting to their child's participation and the participants themselves provided his or her assent to engage in the activities associated with the study. At this time, the parents were provided a questionnaire to complete for them to discuss their knowledge and understanding of concepts related to bullying in general using hypothetical scenarios. After providing assent, the participant was then led by a researcher into the study environment and was introduced to either a human or robot interviewer. The researcher then left the room while the interviewer (human or robot) asked the child three warm-up questions not directly related to the study (basic information about self), 20 closed-form (yes/no or agree/disagree) questions related to bullying, and three open-ended questions about their experiences with bullying. As this study was primarily a verbal administration of a questionnaire, the use specific interviewing techniques were not employed. Our ongoing research explores the use of more open-ended forensic interview techniques based on the National Child Advocacy Center (NCAC) training protocols. The human and robot interviewers maintained neutral expressions throughout the interaction in order to be as similar as possible. Human interviewers engaged in eye-gaze fixations and head nods to indicate understanding, while the robot employed face tracking throughout the interview to indicate engagement. The entire interaction lasted for approximately 20 minutes.

The warm-up questions asked were:

- 1) Where do you go to school?
- 2) How old are you?
- 3) What grade are you in?

The yes/no questions asked were:

- 1) Have you been bullied at school in the past month?
- 2) Have you told anyone that you were bullied in the past month?
- 3) Have you told a friend that you were bullied in the past month?
- 4) Have you told your parent that you were bullied in the past month?
- 5) Have you told your teacher or another adult at school that you were bullied in the past month?
- 6) Have you seen bullying in the classrooms at your school?
- 7) Have you seen bullying in the hallways at your school?
- 8) Have you seen bullying in the restrooms at your school?
- 9) Have you seen bullying in the lunchroom or cafeteria at your school?
- 10) Have you seen bullying outside the school building?
- 11) Do students at your school get teased about how they look?
- 12) Do students at your school get teased about their clothing?
- 13) Do students at your school get teased for the color of their skin?
- 14) If you told a teacher about bullying, would they help stop the bullying?
- 15) Is there an adult at your school you can talk to if you have a problem?

The agree/disagree questions asked were:

- 1) Bullying is sometimes fun to do.
- 2) If you are afraid to fight, you will not have many friends.
- 3) If you fight a lot, everyone will look up to you.
- 4) It feels good when you hit someone.
- 5) I have bullied someone at school in the past month.

The open-ended questions asked were:

- 1) Can you tell us about a time when you saw someone bullied at your school?
- 2) Can you tell us about a time that you were bullied?
- 3) Have you been bullied at places other than school? If so, please tell me about it.

The child was able to ask the interviewer to repeat questions that were unclear, but the interviewer offered no additional information or prompting to the child in either condition. In the robot condition the robot was operated

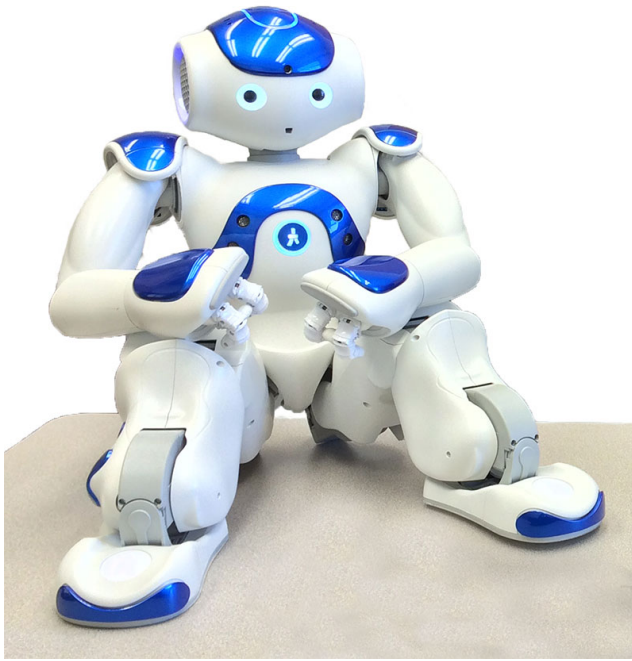


Fig. 1. The blue Nao robot used in the study.

using a Wizard-of-Oz technique [6]. Once the child finished answering the interviewers questions, the researcher returned to the room and asked the child to complete a survey that included demographics and an evaluation of the interviewer (either robot or human). The evaluation of the interviewer included the following questions with response choices of yes, no, or don't know:

- 1) Was the interviewer nice?
- 2) Did you trust the interviewer?
- 3) Was the interviewer helpful?
- 4) Did the interviewer make you feel uncomfortable?
- 5) Did you understand the interviewer?
- 6) Did you like the interviewer?
- 7) Did the interviewer make you upset?

Upon completion, the child was told the study was complete and given a prize and payment for their participation. Children in both conditions were then invited to watch the Nao robot perform dances and other movements before leaving the study so that all children would be able to have experiences and interactions with the robot.

Before beginning the study as part of the informed consent and assent process participants were told that all interactions would be audio and video recorded. Participants and their guardians were given the option to restrict the use of these recordings to analyses only or to allow for broader publication.

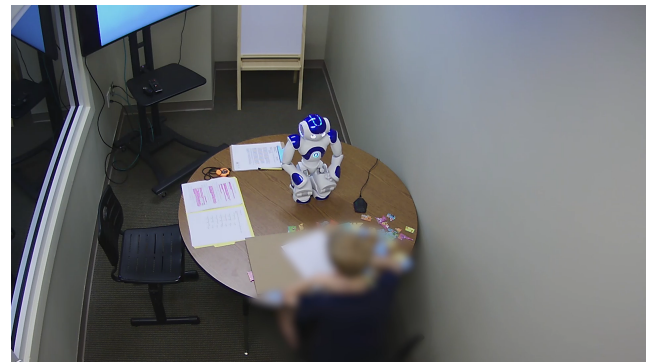


Fig. 2. The study environment from an overhead viewpoint - participant blurred for privacy.

B. The Robot

A blue Nao¹ v5 humanoid robot was used in the robot condition (See Figure 1). The Nao robot conveyed a social presence through its form-factor and behaviors. The standard Nao text-to-speech engine was used to ask the participant questions. The robot maintained its crouched resting position throughout the interview, while also exhibiting face tracking in many of the interactions (due to operator error the robot did not track faces for all participants). The face-tracking use demonstrated engagement with the participants.

The robot was controlled via a web interface using a NAOqi JavaScript API. The robot operator was able to step through the list of questions, repeat questions, and inform the child of their possible answer choices through this interface. The interface also provided the capability for more customized responses, though this feature was not used in this study.

C. The Human Interviewers

Two human interviewers were used throughout the study with their availability determining which interviewer would be part of the study each day. Both interviewers were male, one in his early 20s and the other in his late 20s. Neither interviewer was trained as a child psychologist, but both had prior experience working with children in this age range and were trained using the same study protocol. Though this study primarily involved yes/no questions, human interviewers maintained a calm and neutral demeanor, allowing children appropriate amounts of time to respond to each item. Human interviewers restricted their verbal utterances to the same set available to the robot. No significant differences were found between the two human interviewers.

D. Participants and Recruitment

Participants were recruited from an independent database of local area children ages 8 to 12 who signed up to receive notifications for participation in upcoming studies. This recruitment database is part of a larger project investigating the use of social robots to gather sensitive information from children. The database was advertised via flyers at a

¹<https://www.aldebaran.com/en>

variety of local businesses and social locations, as well as online through social media postings and advertisements. The parents of the children enrolled in the database were contacted, provided the details for this specific study and were given the option to enroll in the study. For this study participants were given \$10 USD for enrolling in the study, as well as a prize from a box of small toys.

The age range was shaped by the project's later phases which focus on forensic interview protocols [7], [8]. Based on the NCAC protocols [7], [8], the latency age group was selected, which encompasses ages 6-11 years old. It was decided based on challenges and findings discovered from [9], that the younger children (ages 6-7) would be excluded and children who are 12 years old often fall in the same grade as the 11 year olds so they were included in the study.

E. Study Environment

The study was conducted in a space dedicated to conducting interviews with children. The space consists of a waiting area, an office area, a robot operator control/observation room, and an interaction room. The robot operator control/observation room and the interaction room are separated by a wall with a large one-way glass window (See Figure 2). The interaction room is equipped with four built-in high definition overhead cameras, table and ceiling microphones, and data connectivity between the robot operator room and the interaction room. This configuration allows the robot operator as well as observers to have a live view of what is occurring in the interaction room. The study site is designed based on a forensic interview setup for information gathering [7], [8].

F. Parent Questionnaire

In addition to interviewing children, we asked their parent or guardian to complete a survey concerning attitudes toward hypothetical bullying that could affect their child. The questionnaire asked the parents or guardians both how they would respond to reports of bullying from their child and how their child should respond to such incidents when observed.

IV. RESULTS

The results from the study found a significant difference for the responses to a single item of the interview when comparing a human and robot interviewer (See Table I). When children were asked *Do students at your school get teased about how they look?* by the robot, 20 of 30 responded affirmatively, while only 10 of 30 did so in the human condition ($\chi^2(1, n = 60) = 3.27, p = .010$).

Additionally, of the children who reported being bullied within the past month, 7 were in the robot condition and 2 were in the human interviewer condition. However, this result is not significant ($\chi^2(1, n = 60) = 6.67, p = .071$), and should be approached with some caution as 6 of those reporting bullying were female (reports of bullying can vary by gender). The small sample size did not provide enough statistical power to be significant but will be the focus of future research efforts in this area.

An analysis of post-interview evaluations of the interviewer did not find significant differences between the human and robot interviewer in areas of niceness, trust, helpfulness, discomfort, ability to be understood, liking, or causing the participant to be upset.

V. DISCUSSION

Though participants demonstrated significant differences on one item when compared between human and robot interviewers, the majority of items, including a report of being bullied within the past month at school were not significantly different. This may be due to a sample selection bias. Across the entire sample, only 15% of children reported being bullied within the past month at school. A meta-analysis of 80 studies concerning the prevalence of traditional bullying estimated the average rate to be 35% [10]. It is possible that the sample used in this study was biased towards children who do not experience bullying on a regular basis. This could be a result of factors such as parents who are highly motivated to be involved in their children's lives. Since the children participating in this study were only able to do so with the assistance of a parent driving them to the study, it is reasonable that any moderating or mediating factors of bullying that are associated with parenting factors could potentially affect the outcome of the study. Future work may involve conducting similar studies in a school environment, where a more diverse landscape of parenting styles can be considered.

The study also only compared responses to a human or robot verbally administering the survey. As both of these mediums have a social nature, future work may benefit from incorporating comparisons to paper, computer, or less anthropomorphic robot administration of the survey.

In addition to the main findings, there are also several lessons to be learned from this study which serve to inform the design of future cHRI studies. These range from specific concerns about defining the construct being studied to ensuring time is spent establishing rapport between the child and either the robot or human serving as the interviewer.

A. Defining Bullying

During the study, all of the children were provided with a definition of bullying. However, previous research has found that even when given a definition, children still have a difficult time deciding whether an incident is considered bullying [11]. It seems likely that parents may also have these challenges based on their own experiences and perceptions. To mitigate any confusion, in future studies, a definition of bullying with examples will be given to the participants parent(s). By providing a definition with examples, parents may be able to better recognize and report bullying incidents [12]. In addition to providing parents with a definition of bullying, a question will also be added to the parent questionnaire about whether their child has ever been bullied. Previously, parents were only asked about hypothetical situations involving victimization, bullying, and being a bystander. However, to understand more about the childrens reporting,

TABLE I
SELECTED ITEM RESPONSES BY CONDITION.

Question	Human Yes	Human No	Robot Yes	Robot No
Been bullied at school in the past month	2 3.3%	28 46.7%	7 11.7%	23 38.3%
Seen bullying in the classrooms	18 30.5%	12 20.3%	14 23.7%	15 25.4%
Seen bullying in the hallways	9 15.0%	21 35.0%	11 18.3%	19 31.7%
Seen bullying in the restrooms	4 6.7%	26 43.3%	8 13.3%	19 31.7%
Seen bullying in the lunchroom	11 18.3%	19 31.7%	11 18.3%	10 16.7%
Seen bullying outside the school building	14 23.3%	16 26.7%	17 28.3%	13 21.7%
Students at school are teased about how they look	10 16.7%	20 33.3%	20 33.3%	10 16.7%
Students at school are teased about their clothing	8 13.3%	22 36.7%	14 23.3%	16 26.7%
Students at school are teased about the color of their skin	5 8.3%	25 41.7%	12 20.0%	18 30.0%

it is imperative to understand what parents know about their childrens behaviors and experiences.

B. Duration and Establishing Rapport

Bullying is a sensitive topic that children may be uncomfortable discussing. When asked about bullying victimization, reports of victimization were higher among students than their parents realized, many of whom had little to no knowledge that incidences of bullying had occurred at school [2]. Some children may be reluctant to discuss their experiences, even with people they are familiar with. Therefore, it is important that interviewers establish rapport with the participants [13]. Given the short time frame for the interviews, less than twenty minutes, participants need to be put at ease. Children are most likely to report bullying behavior to someone they know such as parents, teachers, or friends [3]. A short period of conversation before the start of the interview can allow the children to become familiar with the interviewer (human or robot) and more comfortable during the study [11], [14]. Future studies will include a rapport building exercise such as an activity with the interviewer, whether human or robot that is not directly related to the study. This will help to overcome any possible novelty effects with a new technology, like a robot, and provide an opportunity for the children to become more comfortable with the interviewer (human or robot).

C. Cognitive State and Abilities

The interview format and environment are also key considerations in conjunction with the participant's ability to respond the interview questions. Children have different

levels of development, depending on their age, experiences, and personality [11]. Before beginning interviews, it is advantageous to learn more about the child's cognitive abilities, as this can affect their participation in a research study. The bullying study included closed ended questions with answers such as yes/no and agree/disagree, and a few open ended questions. The accuracy of recalling events may be impacted by the format of the questions. While research has found that children have accurate recall comparable to adults, it can be negatively impacted by specific questions [15]. Children may also feel compelled to answer a closed ended question because of the availability of answer choices, even if they are unsure of their response [16]. The inclusion of more open ended questions may reduce this issue and increase the information children are willing to report. However, the study will also need to take into account how long the interview should take place. Children may have difficulty staying focused if the interview is too long [17]. It is common to keep interviews in this age range, 8 to 12, to a time-frame of less than 30 minutes [7], [8]. All interviews should take place in a secure environment that ensures confidentiality.

VI. FUTURE WORK

The insights gathered from this study have been used to inform the design of subsequent research focused on gathering sensitive information from children via social robots. As a part of this effort, we are currently conducting studies using forensic interview techniques with less constrained dialogues and a longer interaction duration with children in the same age range. In addition to the incorporation our observations from this study, we are simultaneously working

to expand the robot's use of sensors and the development of an interactive hybrid architecture and toolkit that includes supervised autonomy during interviews with children.

VII. CONCLUSION

As technology becomes a possible line of defense for the prevention of harmful behaviors like bullying, it is important that cHRI researchers investigate the areas in which social robots may be helpful. Though this work did not find many significant differences between a child's willingness to report bullying to a human in comparison to a robot, it sets the stage for future investigations which can more carefully examine this area of inquiry. While we hypothesized that children would be more likely to report bullying to a robot, the overall incidence of bullying was quite low within our sample (15%). In order to contribute to the larger cHRI community this article has provided a discussion of potential issues and lessons learned while conducting this study of children reporting their experiences with bullying to a social robot compared to a human interviewer.

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