

Trying to be Helpful: Social Challenges for Smart Robots

Cristen Torrey, Susan R. Fussell and Sara Kiesler

Human Computer Interaction Institute

Carnegie Mellon University

5000 Forbes Avenue, Pittsburgh, PA 15213

ctorrey, sfussell, kiesler @cs.cmu.edu

ABSTRACT

Research on robotic helpers emphasizes their potential to improve human performance, but little attention has been given to the effects of robotic helpers on the social and psychological well-being of help recipients. Interactions with human helpers are not always positive and can threaten help recipients' confidence, independence, sense of identity, and task enjoyment. In a similar way, recipients of robotic assistance may find that the benefits of receiving help are paired with negative social and psychological outcomes. In this paper, we review factors that may influence how help is perceived by help recipients. We then describe the challenge for robotic helpers and the contribution language may make to successful helping interactions. We conclude by outlining our current research agenda for empirically exploring these issues.

Author Keywords

Human-robot interaction, social robots, assistive robotics, adaptive dialogue, help seeking.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

There are many technologies that could be considered robotic helpers. In this paper, we focus on robotic technology that interacts verbally with a human help recipient. This technology might be an embodied robot (whether humanoid or not) that models and coaches physical therapy exercises. It might be a memory aid device that reminds older adults of their medication schedules. It might be a smart home that gives energy consumption advice to homeowners. In this paper, we use the example of a cooking advisor robot that provides information about cooking to people. The robot gives advice in a kitchen—offering recipe ideas, cooking tips, safety warnings, and general instruction.

A robotic helper must, first, infer the goals of the help recipient. Second, it must decide that help is beneficial. Finally, it must deliver the help. A great deal of current research has focused on the first two very difficult steps—inferring a person's goals and recognizing the progress the person has made toward these goals. Comparatively little research has examined how to deliver the appropriate help. A cooking advisor robot might warn by saying, "Hey!

Don't you dare use that milk. It's expired." Or it might say, "The low-fat milk expired last Tuesday." There are a hundred other ways a robot might give this warning; some of these interactions may feel encouraging, others neutral, and still others may feel like a reprimand. This paper explores how a robot with awareness of human activity can interact with people in positive ways.

As we investigate how a robot might offer help, we expand our focus from the instrumental benefit a help recipient might receive to take a closer look at the psychological and social outcomes of receiving help. Robotic helpers may benefit human performance, but performance is not always a help recipient's first priority. Receiving help can be so threatening that people hide their struggles in order to avoid it. An offer of help might even be refused. In the remainder of the paper, we review the social and psychological costs of receiving help. Next, we explore the implications for the design of robotic helpers. Finally, we outline our research on the role of mitigating language in successful helping interactions.

THE SOCIAL COSTS OF RECEIVING HELP

Studies of human interaction describe several costs associated with receiving help. Help recipients may be concerned they will lose credit for a successful outcome, which can be particularly damaging if they are highly invested in the task [2]. Accepting help means that recipients can no longer feel completely responsible for the product of their activity. To protect their ownership of an activity, people may prefer to struggle with a problem rather than seek help.

Help recipients also may fear the perception that they are incompetent and dependent on others [7]. Accepting help may require people to modify their self-perceptions, perhaps to wonder if they are as capable as they had thought. Other people's perceptions of the help recipient are also important. Being seen receiving help has the potential for negative social judgments from bystanders.

Becoming indebted to a help-giver can be an additional source of vulnerability for a help recipient. When there is no opportunity to reciprocate, people are less likely to seek help [5, 12]. Receiving help is more comfortable when the help recipient believes there will be an opportunity to help the other in turn.

Some helping interactions are more difficult for help recipients than others. Next, we review potentially influential characteristics of the situation, the help recipient, and the help giver.

Influence of Task Centrality

People may react strongly to receiving help for some tasks but not for others. Some tasks or goals are central to people's self-concept or personal identity [8]. Such tasks have more relevance than others to how people would like to represent themselves. So the subjective experience of being helped will likely depend a great deal on how a person sees himself or herself in relation to the task. Suppose a potential help recipient is a retired chef whose memory is beginning to decline, and the robotic helper continues to remind the chef about the quantities of spices in her favorite dish. The help recipient may find the help to be particularly threatening because she is proud of her familiarity with her favorite dish. If, at the other extreme, the robotic helper reminded the retired chef about the day the trash needed to be taken to the curb, this advice is not likely to have the same negative effects.

Influence of Recipient Characteristics

Characteristics of help recipients can influence their reactions to help. Personality characteristics, such as introversion, may account for a certain amount of resistance to receiving help because receiving help involves social interaction and, in some cases, help conveys expectations of reciprocation or a continuing relationship. The sense of self-esteem is also thought to be related to people's reaction to help; self-esteem refers to people's beliefs about their competence and value. Because asking for help conflicts with their enhanced self-image, those with higher self-esteem tend to be less likely to ask for help [17]. It seems likely there are other individual differences that may influence perceptions of help. Some people have a strong sense of self-efficacy and prefer to struggle with a problem rather than seek help; others seek help at the first opportunity. Some people have a robust curiosity for new information and appreciate when other people offer a new fact; other people find this behavior insulting. Further research is needed to understand if there are consistent personality differences in reactions to help.

Influence of Help Giver Characteristics

Different help givers also can elicit different reactions from help recipients. One factor is the similarity of the help giver to the help recipient. Help givers who are similar to help recipients can be more threatening than those who are dissimilar because of the opportunity the recipient has to compare himself or herself with the help giver, and find a negative result [9]. This finding is the result of laboratory experiments, where participants are strangers to one another. When the help giver and help recipient are friends, similarity is likely to facilitate help seeking interactions [15]. When people have ongoing interactions with one

another, they appear to be less concerned about the negative comparison that a help-seeking episode would produce.

In summary, reactions to help can be mixed. Even when help is valuable and supports the help recipient's goal, receiving help can have negative consequences. The help recipient may feel embarrassed about needing help and may feel indebted to the helper. These reactions are primarily the result of how the help is perceived by the help recipient, but there are also characteristics of the task situation and the help giver that influence the outcome.

SOCIAL CHALLENGES FOR SMART ROBOTS

Our review of related research reveals the potential for negative consequences when people receive help from a robot, but these consequences are not a foregone conclusion. It is conceivable that help given by robots is simply not comparable to help given by human helpers. First, receiving help from a robot might not preclude the recipient from taking full responsibility for the activity. After all, why give a robot any credit at all? Second, people may not feel evaluated by robots when receiving help. When a robot offers help, the robot is not thinking, "Wow! He's not very good at this." And finally, help from robots should not obligate the receiver because assistance from a robot does not come at a great cost. The robot may be ready and willing to help at all times; its sole existence may be to provide help. In theory, humans may not feel the need for reciprocity with robots at all. In short, if robotic helpers are viewed as fundamentally different from human helpers, it would greatly increase their value.

There remains cause to be skeptical about the chances that robotic helpers (especially those that use language) will be perceived radically differently from human helpers. Research in human-robot interaction (and human-computer interaction) consistently demonstrates a willingness on the part of humans to interact with machines much as though they were other people (for discussion of this theory see [13]). Even when a robot's use of social cues is quite minimal, these cues can influence interaction with humans (e.g. [14] shows effects of manipulating a robot's gender). Quite a challenge exists for the design of robotic helpers. As the intelligence of robotic helpers increases, there are more reasons for help recipients to be wary of their help.

Whether help from robots will be perceived as evaluative, obligating, or insulting is an empirical question, and one that our current research attempts to answer. In addition to knowing whether robotic helpers can incite negative outcomes, we would like to explore whether robotic helpers can generate positive outcomes as well. In the next section, we discuss how humans use language sensitively in order to create positive helping experiences. How help is offered can have a great impact on how it is received.

THE ROLE OF MITIGATING LANGUAGE

According to politeness theory, giving help is a face-threatening action; it threatens an individual's autonomy or

self-esteem [1]. Politeness theory suggests that people use indirect language when making requests in order to mitigate some of these threats. So instead of offering help by telling someone directly to “take the tea kettle off the stove,” a polite request might take another form, “I think you might want to take the tea kettle off the stove” or “Do I hear something boiling?” People use mitigating language like this every day; politeness theory proposes that this kind of indirect language avoids the type of commanding language that would threaten the listener’s autonomy.

Laboratory studies by Nadler and colleagues also suggest that receiving help is a threat to self-esteem [10]. According to this model, “self-supporting” language can positively influence a help recipient’s reaction. For example, a help giver might support self-esteem by reminding the help recipient that a lot of people have similar difficulties. This strategy is common in tutorial contexts, where tutors point out where everyone struggles the first time (for other examples of tutorial strategies for correction see [4]). Supportive help can also take a more learning-oriented approach, where the goal is to make sure the help recipient will know how to do it the next time. In this way, supportive help avoids creating dependency, which can be very uncomfortable for help recipients.

While offering good help can be delicate, it is not impossible, and there are people who are sensitive and effective help givers. Our current research seeks to understand the skills and conversational features of good human help givers, and then to compare the effects of these strategies in the context of human-robot dialogue.

CURRENT RESEARCH

Our current agenda investigates two related questions. First, how do human help givers offer help successfully? And second, what are the effects of these strategies in the context of human-robot interaction?

In order to address the first question, we collected observational data of help-giving interactions by organizing “cupcake nights” at a university dormitory. Participants baked cupcakes in the kitchen area of their dormitory at their own pace. A baking expert facilitated the event, answering questions and helping as necessary. Over the course of three sessions with different baking experts, we noticed interesting differences in conversational style related to the age difference between the help giver and the help recipients. To have more control over the situation, we continued the cupcake baking set-up in a laboratory environment, where we recruited specific age groups to participate as helpers and bakers.

In our data, we found several conversational features that appear to mitigate some of the negative effects of offering help. There are markers of politeness, as predicted by politeness theory, when baking experts ask, “Do you think it would help if you sprayed the tin with cooking spray?” Baking experts sometimes offer explanations within their

instructions, and they sometimes appeal to an external authority by saying, for example, that their mother did it this way or that they read this in a magazine. This seems to distance the baking expert from appearing to make a judgment about the help recipient.

We are currently reenacting a subset of the helping episodes. In one set of videos, we are using a human actor to play the role of the helper. In another set of videos, we are using a robot to play the role of the helper. We will show these clips to participants who will rate the clips on a number of social and psychological dimensions. This video survey will investigate the effects of these conversational features on participants’ perceptions, and it will compare the effects of a robotic helper and a human helper.

CONCLUSION

Help giving conversations are an interesting class of interaction. They are a type of interaction that is frequently handled poorly by humans, with resulting negative social consequences. Therefore, it would not be appropriate to blindly mimic humans in the design of robotic helpers. Because of the social delicacy that offering help requires, a robotic helper’s non-humanness might actually be an advantage. Instead of mimicking humans, robotic helpers might actually emphasize their machine-like qualities. In doing so, it may be possible to avoid giving offense to help recipients. But if this cannot be avoided, robotic helpers need to be highly sophisticated purveyors of the social niceties of help giving.

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