

Asking for Help from A Gendered Robot

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Background

- Gender effects are present and well-studied in human-human interactions, especially within assistance-seeking scenarios:
- When presented with a potential helper, men are more likely to seek help from a woman than another man. Additionally, women are more likely than men to seek help in general (Nadler, Maler, & Friedman, 1984).
 - Mixed-gender groups working on collaborative computer-based tasks exhibit less collaborative behavior (Collazos, Guerrero, Llana, & Oetzel, 2002) and lower performance (Underwood, McCaffrey, & Underwood, 1990) than same-sex groups.

- Some gender effects have also been found in human-robot interactions:
- In one study, participants were found to use more complex language when describing topics in stereotypically female domains to a female gendered robot than to a male gendered robot (Carpenter et al., 2009)
 - People generally ascribe more positive evaluations of attractiveness, interestingness, and trustworthiness to an other-gendered robot than a same-gendered robot (Park et al., 2011, Siegel et al., 2009).

How do gender effects influence collaboration and willingness to effectively work together in human-robot teams?

- H1** Female participants will ask more questions of the robot than men will, regardless of the robot's gender.
- H2** Both male and female participants will ask more questions of an opposite-gendered robot than of a same-gendered robot.

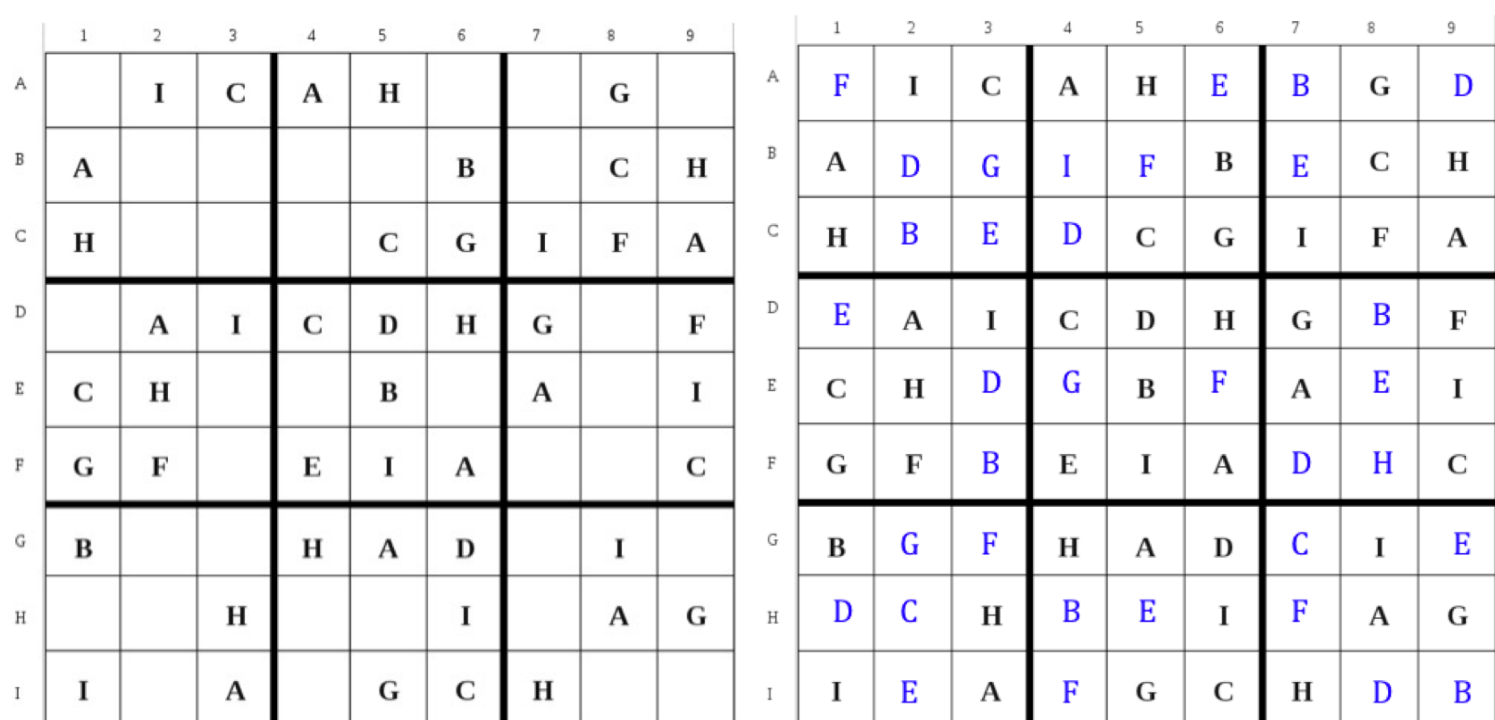
Methods

- We performed a 2x2 study on robot and participant gender that involved participants solving puzzles with the assistance of a gendered robot.
- Gender was attributed to the robot via a name/pronoun cue and a voice cue. There was no difference in appearance between gender conditions.



Keepon, the robot participants interacted with in the experiment.

- A collaborative robot partner was located on the table next to the participant that could help with the puzzle. Participants could query the robot by asking it questions about the puzzle. An experimenter remotely controlled the robot from a different room, answering participant questions from a dictionary of pre-programmed responses.

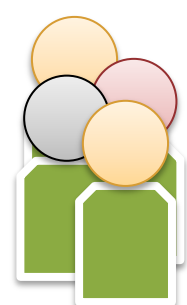


Participants solved a Sudoku puzzle variant with the numbers 1-9 replaced by the letters A-I.

- Participants were given four increasingly difficult puzzles with an allotted duration for each. The experimenter administered a brief survey after each puzzle.
- To encourage interaction with the robot, participants were allotted a shorter time period than necessary to complete the puzzles.

Robot Responses to Participant Queries
I think so
I don't think so
There is/are [number] minutes remaining
I think there is a [letter] in square [coordinates]
I don't know how to answer that

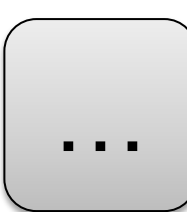
Results and Discussion



48 college students participated in the study. Participants were equally distributed across four binary participant/robot gender pairings (M/M, M/F, F/M, F/F). No differences were found between conditions regarding puzzle performance.



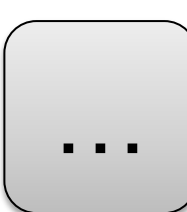
Male participants initiated more interactions with the robot than female participants. This is contrary to previous research in psychology that has found men less willing to ask for help in human-human interactions.



Female participants rated robots as being more likeable than male participants. When considered alongside metrics concerning the quantity and type of queries made, this may be explained as males treating the robot more like a tool or 'answer key' rather than as a collaborator – *using* the robot rather than *interacting* with it.

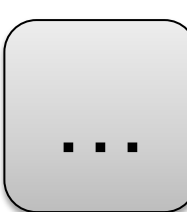


Participants were not more likely to ask for help from a robot assigned the opposite gender, despite having rated these experiences as being more comfortable than same-gendered human-robot interactions.



Participants were more likely to underestimate the amount of queries they had made to an opposite-gendered robot more severely than for a same-gendered robot.

Participant Gender	Robot Gender	Mean Difference: (Estimated – Actual) # of Queries
Female	Female	-2.958
	Male	-4.25
Male	Female	-5.333
	Male	1.083



Participants generally rated the male robot more highly than the female robot for the survey question “I would prefer working with [robot name] over a human partner for this task.” It remains unclear in which ways the female robot was perceived as less desirable to work with. There were no significant effects of robot gender on its likeability or proficiency at solving the puzzle.

Conclusions

Overall, these results indicate that **human-robot interactions can be significantly affected by fairly subtle gender cues**, and that these effects may not be reliably predictable from studies of human-human interactions. Because **our results more closely mirrored those from other kinds of human-robot interactions than those of human-human collaborations**, we suspect that a task with expanded opportunity for collaboration, which was requested by many participants, may foster interactions which more closely match psychological results. However, the required range of possible interactions would make it difficult to ensure standardization or even similarity of participant experience.

References

Carpenter J. et. al. (2009). Gender representation and humanoid robots designed for domestic use. *International Journal of Social Robotics*, 1(3), 261-265.

Collazos, C., Guerrero, L. A., Llana, M., & Oetzel, J. (2002). Gender: An influence factor in the collaborative work process. *Proceedings of the 4th International Conference on New Educational Environment (ICNEE 2002)*, 7-10.

Nadler, A., Maler, S., & Friedman, A. (1984). Effects of helper's sex, subjects' androgyny, and self-evaluation on male's and female's willingness to seek and receive help. *Sex Roles*, 10(5-6), 327-339.

Park, E. et al. (2011). The effects of robot's body gesture and gender in human-robot interaction. In *Proc. 2011 International Conference on Internet and Multimedia Systems and Applications*. Washington, DC, USA.

Siegel, M. et al. (2009). Persuasive robotics: The influence of robot gender on human behavior. In *Intelligent robots and systems (IROS) 2009*. (p. 2563 -2568). doi: 10.1109/IROS.2009.5354116

Underwood, G., McCaffrey, M., & Underwood, J. (1990). Gender differences in a cooperative computer-based language task. *Educational Research*, 32(1), 44-49.