

Robots in Diverse Contexts: Effects of Robots Tasks on Expected Personality

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ABSTRACT

The purpose of this study is to examine people's expectations and preferences for a robot's personality based on the tasks the robot is performing. We conducted an interview followed by a survey. In the semi-structured interview, we classified four categories of tasks expected to be completed by robots: social, office, service, and physical. Based on these results, we conducted a survey of 381 participants to examine which types of personality people expect robots to display depending on the task the robot performs. Depending on the tasks, the personalities of extraversion, conscientiousness, and openness showed significantly different values. The results imply that robots' personal traits need to be designed differently based on different task types. With our study's results, robot designers can better develop the social and emotional aspects of robots. Such improvements would result in better communication between users and robots, and in the users' perceptions of their needs being satisfied.

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1 INTRODUCTION

Understanding the interactions between robots and people is becoming important as people increasingly perceive robots as social agents, not just as tools [2]. People tend to personify objects, and they talk with computer-based agents much like they do so with humans [3]. Personality, which is the pattern of collective character and mental traits, makes a considerable impact in human social interactions [4]. In this context, we argue that emotionally capable robots are needed. Certain personalities are considered better suited for particular tasks human perform [4]. Our study applies these findings to robots. Most studies have focused only on few types of robot tasks, and few have investigated the correlation between personality and task of robots. Therefore, we posit the following research question: *How does type of tasks affect a person's expectations of the personality of the robot performing the task?*

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2 PRELIMINARY STUDY

2.1 Method

To categorize tasks of robot, we conducted a qualitative approach with in-depth semi-structured interviews. A total of 16 participants (9 male and 7 female) participated, ranging in age from 20 to 60 years old. Total of 20 questions were about specific task types people expect robots to perform. The analysis of the recorded data was performed using grounded theory analysis and bottom-up approach. Based on the recorded audio interview transcripts, interview quotes were gathered and transcribed into sticky notes with simple keywords. An affinity diagram was constructed by identifying the keywords and clustering similar items in groups. Each keyword was grouped with the type of tasks.

2.2 Result

In our analyses of the interview results, we observed four categories of robot tasks: 1) social tasks (conversation, entertainment, and sexual relationship), 2) Office tasks (professional and simple), 3) Service tasks (guide, serve, and sales) 4) physical tasks (household chore, physical labor, and security)

3 MAIN STUDY

3.1 Method

We recruited 381 participants from Amazon Mechanical Turk, comprising a national panel. The average age was 30.95 years (female = 32.3947, male = 30.0219, SD age = 9.89; 40.2% women). We asked participants which types of personality people expect depending on the task the robot performs. A 10-item short version of the Big Five Personality (openness, conscientiousness, extraversion, agreeableness, and neuroticism) was applied in the survey questions [1]. Question differs depending on task types. (e.g. *Question: Choose the personality you expect from a robot when you "talk" in a daily conversation.*) For each option, participants answered with five Likert scale.

Table 1. Multivariate-ANOVA.

| Variable | S.S. | M.S. | F-Value | Pr(>F) |
|-------------------|--------|-------|---------|----------|
| extraversion | 191.52 | 63.84 | 115.4 | 0.000*** |
| agreeableness | 2.99 | 0.99 | 2.28 | 0.077 |
| conscientiousness | 9.6 | 3.19 | 6.35 | 0.000*** |
| neuroticism | 0.98 | 0.32 | 0.7 | 0.551 |
| openness | 16.34 | 5.45 | 16.26 | 0.000*** |

S.D. = Standard Deviation, S.E. = Standard Error

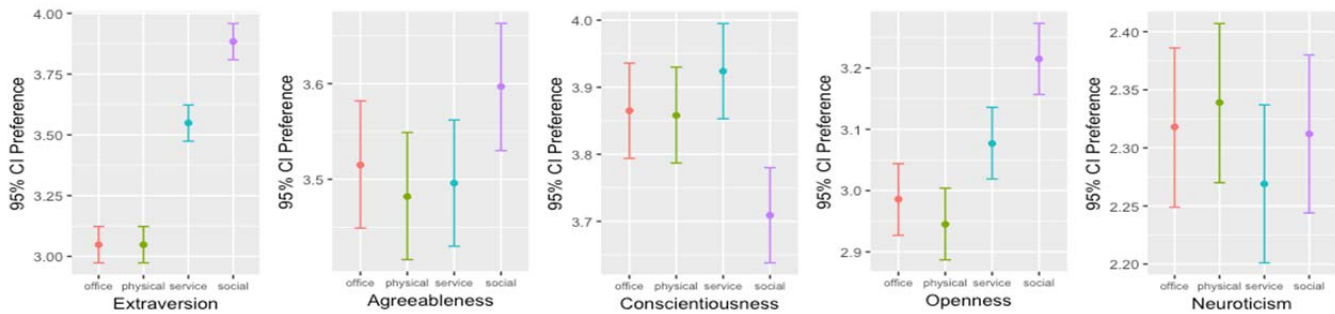


Figure 1. Correlation between tasks and personality preferences

Extraversion, conscientiousness, and openness showed significantly different values depending on the task type

3.1 Result

We used multivariate ANOVA to testify the relationship between robot personality and task types. As shown in Table 1, significant differences were examined with Pillai-Traces Test, and results showed that the preferred personality was significantly dependent on the categories of tasks that robots had performed, $F(15, 4554) = 24.131$, $p < .001$; Pillai's Trace Test = .221. For the relationship between independent variables and dependent variables, Roy's largest root-based multivariate ANOVA analysis showed that all other dependent variables (the five personality categories) except neuroticism are correlated with the independent variables (type of tasks).

4 Implications and Future Works

Interactions between robots and humans are currently limited because robots do not have inherent personalities. To make robots perform tasks effectively, it is crucial to keep testing and refining robot personalities. Our study findings could help robot designers make interactive robots by modeling personality with voice, appearance, and gesture. The study delivers a more satisfying user experience and offers broader viewpoints and possible combinations of personalities and tasks. The overall results suggest that robots' personalities matter, especially the "degree" of personality should differ depending on the tasks the robots perform. People expect robots' emotional capabilities to be similar to those of social tasks, but not for office or physical tasks. Low scores of neuroticism demonstrate that people expect

robots to be positive, stable, and calm. Overall low scores of conscientiousness imply that people do not expect robots to be diligent and meticulous except when performing service tasks. Positive robots and creativity are better for social tasks than for physical tasks. People want robots to display critical thinking when performing service tasks. Our focus for ongoing work is on measuring perceptions of people using direct robot interactions. By conducting the experiment, we can revisit the fundamental question whether there is a difference between people's perceptions toward HHI (Human-Human interaction) and HRI (Human Robot Interaction). In the long term, we plan to conduct an experiment with robot prototypes through combinations of certain personalities and tasks based on our findings.

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