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# Effects of Gendered Voices on Personality Perceptions of Conversational User Interfaces

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## ABSTRACT

Female voices have been associated with warmth and friendliness, male voices with competence and professionalism, and non-binary voices have been often found creepy [19]. We tested if these associations hold in the context of conversational agents and designed an experimental Alexa skill with female, male and gender-neutral voices. The results confirmed slightly higher appreciation for female voices in casual interactions, male voices in professional and stressful interactions, and generally low acceptance of the gender-neutral voice compared to the binary voices. The low ratings of the gender-neutral voice were surprising, as half of the participants expressed their ideal agent as being non-binary, signaling a cultural shift in user expectations (at least in theory).

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## KEYWORDS

Intelligent personal assistants; Conversational agents; Conversational user interfaces; Personality; Human information interaction; Gender stereotypes; Gendered voice design

We suggest capitalizing on this self-expressed interest in non-binary voices and associated agent personalities and investing more into the design of voices that challenge gender and socio-cultural stereotypes.

## INTRODUCTION

Conversational user interfaces (CUI) that support voice modality offer multiple benefits to their users, including support for hands- and vision-free interactions that enable users to focus their attention on parallel tasks. Use of voice to support user interactions carries an additional benefit – agents can express human-like personality traits that in turn leads to anthropomorphizing, increasing trust and engagement with users [2,11,24]. Female voices are often associated with helpful and approachable personalities, while male voices are perceived as professional and calm[1,4,10,12,16,22]. The expressions of these gendered personalities in CUI might appeal to users, but also they reinforce undesirable cultural stereotypes. For example, most of these conversational assistants, including Apple Siri, Google Assistant, Amazon Alexa and Microsoft Cortana are programmed with a default female voice that have been criticized for perpetuating an image of a female servant or a secretary [3].

In the current climate of increasing social awareness and changes of gender stereotypes, we explored whether users' perceptions of CUI voices are influenced by stereotypical interactions and collected users' thoughts about the voice and personality of their ideal CUI.

## BACKGROUND & MOTIVATION

Research illustrates user preference for interacting with agents that display human-like personalities [14], as these agents have been shown to make interactions feel more natural [17,18]. The personalities of CUIs are largely derived from gender cues, including the agent's name (Siri or Alexa), the choice of the agent's voice, and the responses that the system outputs [20,23].

The vocal characteristics of CUIs are designed to mimic those of the human voice, with average pitch values ranging from 120Hz for male voices to 210Hz for female voices [7,13]. Deeper voices attributed to males are perceived as more competent, persuasive, confident, trustworthy [1,4,12,16,22], and less emotionally expressive [10], whereas, softer voices attributed to females are perceived as warm, maternal, friendly, and helpful [10,19,20]. Users remark that voices devoid of clear gender markers are “strange, dislikable, dishonest and unintelligent”, which Nass cross-culturally ties to the fact that the, “human brain is developed to like female voices”[19]. Recent research has shown that most leading consumer CUIs come with a default female voice [23], and that users often associate this technology with female gender [5,8,20].

However, the literature reflects a growing critique of CUI that reinforce gender stereotypes of women as assistants [3] with “little trust and authority” [19]. In this research study, we explored whether users are ready to challenge their stereotypical expectations around gender and accept female, male and non-binary voices during various interaction settings.

## RESEARCH STUDY

We conducted a study to examine the following questions:

- 1). What personality traits do users associate with male, female, and gender-neutral sounding CUI?
- 2). Do different interaction settings affect user perceptions and preferences for CUI voices?
- 3). What personality traits and voices do users want in their ideal CUI?

An experimental Amazon Alexa skill was developed with a male voice (130 Hz frequency), gender neutral voice (160 Hz, based on prior recommendations [6]), and a standard female Alexa voice (190 Hz). The skill was pre-programmed to support short interactions on stressful topics (i.e., COVID-19, taxes, work) and non-stressful topics (i.e., meditation, vacation, movies). Interactions aimed at gauging the experimental agent's personality were interjected after stressful and non-stressful tasks. The agent's responses to personality questions were designed to project highly warm/highly competent, highly warm/low competent, and low warmth/highly competent personalities [9]. For example, when a user asked, "What should I be for Halloween?", the agent offered a supportive (highly warm) but also informative (highly competent) response: "You'll look great in any costume, but I think emoji costumes are fun. Dress in yellow and use paper plates...It's simple". Similarly, the response to the utterance "Am I a good person?" offered emotional support (high warmth) but did not directly address the question (low on competence) (Skill's response: Well, I like you).

The experiment was guided by an online form that instructed participants on the utterances, and collected participants' ratings of the skill's performance, perceived personality, and voice. The form also collected comments about the participants' reactions to the experimental skill, their general thoughts about CUI, and the participants' demographics. A total of 108 participants (66% female, 72% primary English speakers) were split into groups to interact with female, male or gender neutral experimental CUIs.

The majority of the participants perceived all three experimental agents as extraverted (based on the Big Five personality inventory [21]), agreeable (with the female Alexa scoring highest in this dimension), highly conscientious (especially the gender-neutral agent), and open (especially the male agent). The male agent scored high on neuroticism by most of the participants, compared to the female and gender-neutral agents who scored low in this dimension (indicating that they were perceived as more resilient).

The participants' comments on Alexa indicated that they perceived the female-voiced agent to be warmer, friendlier, and more empathetic compared to male and gender-neutral agents. The comments about the male-voiced agent defined it as competent/professional and having an unemotional nature (and sometimes boring). The comments about the gender-neutral voiced agent indicated it was perceived as calm and soothing, but also unhappy and even displaying a creepy personality.

We did not find statistically significant differences in user ratings of the male, female and gender neutral-voiced agents' performance in stressful, non-stressful and personality-revealing interaction contexts. The mean scores showed slightly higher preference for female and gender-neutral voiced responses for non-stressful tasks, while male voiced responses received higher scores during stressful interactions. Analysis of the participants' comments strengthened the differences in ratings and

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mentioned a preference for the male agent's [called Matthew in the study] unemotional voice for stressful tasks (i.e., "Matthew sounds like someone I called to get technical information"). At the same time, the male-voiced responses to personality questions received the lowest scores on manifestations of warmth and competence, while the female agent received the highest scores, and the gender-neutral voice was scored in between.

The participants described their ideal agent as extraverted, agreeable, conscientious, neurotic and open. The male-voiced agent came closest to the ideal agent on extraversion, neuroticism, and openness dimensions, the gender-neutral agent on the conscientiousness dimension, and the female-voiced agent on agreeableness dimensions. The participants wanted their ideal agent to balance warmth and friendliness with competence. About half of the participants expressed their general preference for non-binary voice, while the other half thought that the voice should depend on the interaction context. Despite this "theoretical" preference by some participants for the gender-neutral voice, it scored the lowest overall during the study, compared to the female and male voiced agents.

## CONTRIBUTION TO WORKSHOP

Overall, the participants want their CUI agent to be friendly and knowledgeable, and they have a slightly higher appreciation for male voice in stressful situations and female voice in non-stressful situations. The gender-neutral voice was the least liked in any interactions, though half of the participants expressed general preference for their ideal agent to be non-binary. The dissonance between the real and desired voice preferences might signal users' awareness of social aspirations applied to technological "personalities". We would like to open up a conversation around: a) a possibility of designing a user-friendly gender-neutral CUI voice; b) a possibility of changing cultural gendered stereotypes by using unexpected voices in stereotypical interactions: female responses for stressful "professional" tasks, and male-sounding responses when care and warmth is expected. We think it would be socially responsible for the CUI designers to challenge user expectations and dated cultural norms, even if this translates into some initial discomfort and surprise with unexpected CUI voices and personas.

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