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Similarity-attraction theory perspective
on service employees and service robots' interactions

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Abstract

Building on the similarity-attraction theory and congruity theory, this research explores how a service robot's ethnic appearance (i.e., congruent vs. incongruent with mainstream ethnicity) and accent (i.e., non-standard vs. standard) influence employees' expected enjoyable interactions and expected service robot helping behavior, leading positive word-of-mouth to work with robots. We tested hypotheses using a scenario-based 2 × 2 between-subjects experimental design with Chinese restaurant employees (Study 1) and UK hotel employees (Study 2). Both studies reveal that the congruity of robots' appearance with the mainstream population leads to employees' expected enjoyable interaction and service robot helping behavior. Enjoyable interaction has positive effects on employees' word-of-mouth. The moderating effect of service robot accents was supported by the Chinese sample, but not by the UK sample. This research contributes to a deeper understanding of human-robot interactions and highlights the importance of involving employees' perceptions of appearance and functional features when designing service robots.

Keywords: Service robots; similarity-attraction theory; enjoyable interaction; helping behaviour; positive word-of-mouth

从相似吸引理论视角看服务员工与服务机器人之间的互动

摘要

本研究根据相似吸引理论和一致性理论，探讨了服务机器人外貌（即，与主流族群一致或不一致）和口音（即，不标准或标准）对员工愉快互动和机器人帮助行为的期望，以及上述期望对与机器人互动口碑的影响。我们通过两个 2 × 2 情景实验对假设进行了检验，研究对象分别为中国餐饮业员工（研究 1）和英国酒店业员工（研究 2）。两项研究均表明，当服务机器人外貌与主流族群一致时会能够增进员工对愉快互动和服务机器人帮助行为的预期。愉快互动对员工的正面口碑具有显著正向影响。服务机器人口音的调节效应在中国样本中得到了验证，但在英国样本中未能得到支持。本研究为深入理解人机交互提供了新的视角，并强调在设计服务机器人时，考虑员工对外观和功能特征的感知对其接受度和互动效果的重要性。

关键词：服务机器人；相似吸引理论；愉快互动；帮助行为；正面口碑

Introduction

Service robots are seen to perform various tasks in hospitality and tourism jobs worldwide (Mukherjee et al., 2023; Wang & Uysal, 2024), which has also drawn a surge in research interest (Belanche et al., 2023; Ivanov & Webster, 2021; Shin, 2022). While most service robot research has been conceptualized from customers' perspectives (Dong et al., 2025; Forgas-Coll et al., 2023; H. Song et al., 2022; Wang & Papastathopoulos, 2023; Wang et al., 2025), some studies are making the initial explorations of hospitality employees' attitudes toward service robots (He et al., 2025; Parvez et al., 2022; Y. Song et al., 2022; Yu et al., 2022). However, in investigating service robots with hospitality employees, studies have found that employees generally possess negative concerns regarding service robots, such as robot-induced unemployment (Parvez et al., 2022), self-esteem threat, and burnout (He et al., 2025), and turnover intention toward the hospitality industry due to risk awareness generated by service robots (Yu et al., 2022). Although Paluch et al. (2022) and Y. Song et al. (2022) have taken the lead in identifying the positive sides of employee-robot collaboration, knowledge gaps exist on how service robots should be better designed and improved to win employees' support and foster employee-robot collaboration (Le et al., 2023).

Integrating the similarity-attraction theory and the congruity theory (Byrne et al., 1971; Montoya & Horton, 2013; Osgood & Tannenbaum,1955), this study aims to contribute new knowledge to foster employee-robot collaboration. The similarity-attraction theory suggests that people tend to favor or get attracted to people or objects that are similar to them (Byrne et al., 1971;

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Montoya & Horton, 2013). This theory has been widely applied in human resources management and organizational behavior literature, including how similarity attraction could influence recruiting processes and team collaborations (Montoya & Horton, 2013; Pendergrass, 2002). Congruity theory is closely related to similarity-attraction theory, describing how people's perceptions and prototypes influence their behaviors and outcomes in social interactions. It suggests that groups are positively evaluated when their characteristics are consistent with their typical social roles (Osgood & Tannenbaum, 1955). Interestingly, researchers noted that such propositions could also apply to human-robot interactions (Pitardi et al., 2023). Congruity theory focuses on how the fit or alignment between individuals' prototypes and their perceptions of others influences their behaviors and outcomes in social interactions (Osgood &, Tannenbaum,1955). Although initially proposed in the psychology disciplines for the perception of people (e.g. customers and employees), recent attempts have been observed to apply this theory to the study of service robot design (Liu & Wang, 2025; Ma et al., 2024).

Although teaming service robots and employees are necessary, constrained by the current robot technologies, limited attempts have been made to determine how similarities (and differences) between robots' features, such as appearance, gender, voice, and accent could influence service employees' perceptions and behavioral intentions when interacting with service robots. A review of the literature also suggests that studies exploring service robots' appearance and accent tend to focus predominately on customers' perceptions (Buhalis & Moldavska, 2022; Cai et al., 2022; Li et al., 2024; Song et al., 2023).

To address the research gaps, this study proposes and examines how the ethnic appearance of a service robot (congruence vs. incongruence) influences expected enjoyable interaction with the service robot in a service team, expected service robot helping behavior as a colleague, and

resulting employees' positive word-of-mouth to work with service robots, based on the similarity attraction theory. We further investigate whether the accent of the robot (non-standard accent vs. standard accent) moderates these proposed relationships. Such a study is meaningful and has the potential to make essential contributions. By bridging similarity-attraction theory with congruity theory, the research offers a meaningful and insightful explanation of the process of human-robot interactions building on robots' features and employee prototypes. Extending the existing literature also provides a novel framework for understanding the psychological mechanism underpinning effective human-robot collaborations. Such innovation advances the discourse on employee-robot interactions and their practical implications within the hospitality industry.

Second, by focusing on human-robot interactions, this study adds new evidence to employee-robot interactions, addressing the literature gap, as previous research has predominately focused on how certain features of robots may influence customers' perceptions and behavioral outcomes. The study can enhance our understanding of human employees' helping behavior to robots, providing deeper insights into the dynamics of employee-robot interactions. The findings could also offer practical implications for service robot developers when designing robots suitable for the hospitality industry, considering service employees' perspectives. Last, following Byrne et al. (1971) on the importance of cross-cultural validation for similarity-attraction relationships and the role of culture and values played in the two theories study tests hypotheses cross- both in China and the UK. This approach enhances the cross-cultural validity and the generalizability of the research findings.

Literature Review

Theoretical foundations

Byrne et al. (1971) tested the relationship between attitude similarity and attraction using cultural data from the U.S., India, Japan, and Mexico, confirming that the effect of attitude similarity on attraction exists in various cultural regions. Following the issue of the similarity-attraction relationship, Wetzel and Insko (1982) conducted six experiments to test similarity to self, similarity to one's ideals, and self-to-ideal similarity, concluding that "people are attracted to others who fulfil their ideals" (p. 271) and that "people are also attracted to others similar to themselves as long as they are allowed to assume that the similar other is similar to their ideal-self" (p. 271). Montoya and Horton (2013) further summarised the similarity effect into two approaches: the reinforcement model and information processing. In the reinforcement model, driven by the fundamental tendency to host a consistent and logical view of the world, people prefer stimuli that are consistent and can reinforce the logic of their world, causing attraction among people with similar values and beliefs (Byrne & Griffitt, 1973; Montoya & Horton, 2013). In information processing, the similarity effect is explained based on the valence assessed to the attribute of the information, the weight evaluated by the importance of the information, and how much attention individuals allocate to the information (Ajzen, 1974; Montoya & Horton, 2013).

On the other hand, scholars have noticed the congruity effect of various cues (e.g., products, service environments, and individuals) on customers' perceptions and behavior. In terms of congruity of products' multisensory cues, high congruity is more likely to enhance consumers' product evaluation (Krishna et al., 2010) and preference for products (Helmefalk, 2016). The congruity between staff member ethnicity and the theme of an ethnic restaurant has also been shown to increase customers' purchase intention greatly (Song et al., 2019). In terms of congruity of product and retail environment, high congruity also results in positive outcomes for retailers

(Spangenberg et al., 2006). Besides these studies, the congruity theory of Osgood and Tannenbaum (1955) also emphasizes congruence between objects and individuals. More specifically, they argued that when a person's belief is consistent with their belief around an object, they are more likely to have positive attitudes toward an object. For example, a person is more likely to develop a higher positive attitude toward the product when the person's self-image is consistent with the product image (Hung & Petrick, 2012).

Previous research has used similarity-attraction and congruity theories to examine how the appearance, ethnicity, and voice/accent of AI agents influence user behavior and interaction (see Table 1). Specifically, studies have explored how attributes—appearance, voice characteristics, and ethnicity—shape human-AI agent interaction and behavioral intention, highlighting the role of similarity-attraction in these dynamics (Alawi et al., 2023; Aly & Tapus, 2016; E Norberg et al., 2023; Obremski et al., 2022). Additionally, congruity theory has been applied to anthropomorphic features, such as appearance and accent, that activate the "human" schema, fostering a sense of congruence or similarity between users and robots (Alabed et al., 2022; Ma et al., 2024). Both similarity-attraction theory and congruity theory have been supported across various contexts (Alawi et al., 2023; E Norberg et al., 2023; Obremski et al., 2022; Alabed et al., 2022). Furthermore, similarity-attraction theory has been applied to investigate service robot capabilities such as consumption enjoyment and perceived control and consumers' feelings of comfort (Gelbrich et al., 2023; Pitardi et al., 2023), demonstrating the relevance of these theories in understanding consumer interactions with robots. However, the application of these frameworks in the service industry, particularly in examining the impact of a service robot's ethnic appearance and accent on enjoyable interactions, helping behavior, and subsequent positive word-of-mouth from employees' perspectives, remains unexplored.

(Insert Table 1 here)

Ethnic appearance and accent of service robot

It is widely acknowledged that appearance and voice play crucial roles in shaping people's impressions and influencing human interactions, and service robots are no exception (Huang & Sénécal, 2023; Li et al., 2024; Liu et al., 2022; Torre et al., 2020). When interacting with robots, people tend to approach anthropomorphized and racialized robots, and their interactions with robots are shaped by how they perceive the ethnic appearance of robots (i.e., white, Asian, black, etc.) (Sparrow, 2020). Robot appearances have been discussed in the hospitality industry, including machine-, human-, and mascot-like robot appearances (Shin & Jeong, 2020; Song et al., 2023; Zhang et al., 2021) and perceptions of warm and competent robot appearances (Liu et al., 2022). People's expectations of robots and their behavior toward them are also shaped by their appearance (Haring et al., 2016). However, researchers have argued that people have different expectations of human-like robots than of machine-like or mascot-like robots (Song et al., 2023; Sparrow, 2020). Accordingly, researchers have found that people's interactions with human-like robots are influenced by the ethnic appearance of the robot, regardless of whether they consciously perceive it in racial terms (Bartneck et al., 2018).

The standard national British accent, known as "Queen's English" or "BBC English", is perceived as prestigious and educated (Rumsey, 2023), while non-standard accents (i.e., other urban, working-class, and regional accents) are not seen as indicative of education or high social status (Levon et al., 2021). Similarly, Mandarin is the standard national accent used in China's public sectors, while non-standard Mandarin with regional or local accents is considered weird (Diao, 2017). People cannot suppress their inherent responses to speech, regardless of its origin.

When engaging with robotic voices, individuals rely on familiar social norms to determine suitable behavior during interaction and communication (Edwards et al., 2019). Robots with accents have been studied in robot industry development (Edwards et al., 2019; Torre et al., 2020). In the hospitality industry, many studies have discussed how robots recognize customers' accents or voices (Buhalis & Moldavska, 2022; Cai et al., 2022; Leung, 2022). Few studies, however, have examined the influence of service robots' accents on interactions with hospitality employees.

In multi-racial societies, ethnicity significantly influences people's attitudes, beliefs, and behaviors. If robots lack ethnic characteristics, they may struggle to replicate critical aspects of human interactions, limiting their effectiveness in certain roles, especially when ethnicity is central to the context (Barfield, 2024; Bartneck et al., 2018). Existing research on the ethnic appearance and accent of robots has mainly focused on science, technology, and social studies (Ahlqvist & Wennmark, 2023; Makatchev et al., 2013; Torre et al., 2020; Trovato et al., 2015; Sparrow, 2020), with few studies found in the service industry. Thus, aiming for ethnic diversity in robotics research and design is crucial to mitigate ethnic bias, promote inclusivity, and enhance comfort, thereby making service robots more effective in diverse cultural contexts (Barfield, 2023a).

Furthermore, Lu et al. (2021) have investigated the influence of service robots' varying levels (low to high) related to human likeness (i.e., appearance and voice) on customers' positive word-of-mouth intentions. Nevertheless, the impact of ethnic appearance (congruence vs. incongruence) and accent (non-standard vs. standard) of service robots in the hospitality context has received limited attention. Furthermore, whether the service robot's ethnic appearance and accent affect interaction and helping behavior with hospitality employees remains unexplored, and even fewer studies have compared the differences between Eastern and Western countries, such as China and the UK.

Ethnic appearance of service robot: congruence vs. incongruence

Robots' appearance significantly impacts how people perceive and interact with them (Haring et al., 2016; Song et al., 2023). Robots are perceived differently based on users' nationality, and the congruence of the ethnic background between robots and users plays a vital role in shaping these perceptions (Trovato et al., 2013). Specifically, when human-like robots possess an ethnic background that aligns with that of the people they interact with, they tend to be perceived as more convincing and trustworthy. It is crucial to note that this perception varies depending on the ethnic appearance and accents prevalent in different regions (Trovato et al., 2015). Individuals tend to associate with others who share congruent (similar) beliefs and behaviors (Lee & Jeong, 2014), and this inclination toward similarity extends to various aspects such as race, ethnicity, and behavior (Makatchev et al., 2013). Robot appearance plays a key role in evoking people's enjoyable emotions and could influence human-robot affective interaction (Hwang et al., 2013). Potinteu et al. (2023) further noted that the appearance of robots influences helping behavior.

Previous research has revealed the presence of congruence effects in human relationships with service robots, indicating that individuals tend to perceive ethnically congruent agents as more persuasive and trustworthy (Makatchev *et al*., 2013). Given these findings, it is reasonable to posit that similar congruence effects would also manifest in the domain of human-robot interaction. According to the congruity theory, when people hold congruent (similar) perceptions about objects, they are more likely to exhibit enjoyable perspectives and behaviors (Lee & Jeong, 2014). Considering the ethnic appearance of the robot as the object, hotel employees may have congruent expectations regarding enjoyable interactions and robots' helping behavior when service robots share a similar ethnic appearance. Therefore, we propose the following hypothesis:

H1: Congruity of appearance between the mainstream population and the robots leads more to employees' expected enjoyable interaction with the service robot in a service team than incongruity of appearance.

H2: Congruity of appearance between the mainstream population and the robots leads more to employees' expected service robot helping behavior as a colleague than incongruity of appearance.

Moderating effects of the service robot's accent

Similarity-attraction theory and the concept of social identity are theoretically related (Hogg et al., 1995), as people tend to categorize others as either similar in-group members or different out-group members, and robots are no exception (Barfield, 2023b). Within robotics, researchers tend to classify robots into racial and ethnic categories. Users are likely to evaluate robots more positively if they perceive them as part of their own "in-group" and in a more negative way if they do not (Barfield, 2023b). When users see a robot with an ethnicity similar to theirs, as cued via appearance, the robot is perceived as more enjoyable than one presenting a different ethnic identity. This is because social identity is supported and maintained by in-group membership and enables in-group behavior (Coeckelbergh, 2021), as is also the case among employees in organizations attempting to attract better worker outcomes (Ely et al. 2012).

A robot's accent and appearance play an important role in shaping the expected behavior during human-robot interaction (Torre & White, 2021). A robot's voice could affect users' perception of the robot (e.g., appearance) and their interaction with the robot (e.g., helping behavior and enjoyable interaction) (Kühne et al., 2020). When a robot speaks with an accent that is congruent with the image of the service provider (e.g., a restaurant serving ethnic cuisine),

people are more likely to develop a positive attitude toward the robot. On the other hand, researchers have also suggested that the language of lower-status groups is often spoken with non-standard accents, and this is often evaluated negatively by customers and may affect these people's in-group identity (Bhatia, 2018). For instance, there is a well-established link between accent and class in the UK, with non-standard accents being viewed negatively and stigmatized (Coupland & Bishop, 2007; Donnelly et al., 2019). In China, non-standard accents are often devalued and stereotyped (e.g., unfashionable or snobbish), leading to their marginalization in social settings (Zhao & Liu, 2021). The contradictory role of the accent (non-standard vs. standard) represents a significant gap in the existing hospitality literature on robot design. Thus, the following hypotheses are proposed:

H3: Robot accent moderates the effect of appearance on employees' enjoyable interaction. More specifically, when the robot with a mainstream ethnic look speaks a standard accent, employees have a higher level of enjoyable interaction than the robot with a mainstream ethnic look speaking a non-standard accent.

H4: Robot accent moderates the effect of appearance on employees' helping behavior. More specifically, when the robot with a mainstream ethnic look speaks a standard accent, employees have a higher level of helping behavior than the robot with a mainstream ethnic look speaking a non-standard accent.

Employees' expected enjoyable interaction, service robot helping behavior, and word-of-mouth regarding working with service robots

Employees, as independent individuals within the organization, are most likely to maintain organizational citizenship behavior (OCB) when their motivations to help and build positive relationships with colleagues are fulfilled (Finkelstein, 2006). Offering voluntary help to colleagues can naturally result in positive word-of-mouth with them (Zhang et al., 2022), and this applies equally to employee-robot collaboration in the hospitality industry. According to Paluch et al. (2022), the ideal employee-robot collaboration involves service robots that make hospitality employees feel valued and create an enjoyable and helpful work environment. This mutual benefit encourages employees to collaborate with service robots willingly. In such settings, employees can envision enjoyable interactions with service robots, perceiving the robots as helpful colleagues (Le et al., 2023; Paluch et al., 2022). Employees who experience these positive dynamics are more likely to work with service robots and are motivated to spread positive WOM about the advantages of such collaborations. Therefore, we propose:

H5: Employees' expected enjoyable interaction with the service robot in a service team influences their positive word-of-mouth regarding working with service robots.

H6: Employees' expected service robot helping behavior as a colleague influences their positive word-of-mouth regarding working with service robots.

The comprehensive literature on the ethnic appearance of service robots, expected enjoyable interaction, expected service robot helping behavior, positive word-of-mouth, and the moderating effect of the service robot's accent helped produce the research model in Figure 1.

(Insert Figure 1 here)

Research method

Using the experimental design approach, we conducted two separate 2 (ethnic appearance of the service robot: congruent with mainstream ethnicity vs. incongruent with mainstream ethnicity) x 2 (accent of the service robot: non-standard vs. standard accent) online experiments. To validate the results, we created online experiments from China and the UK in two sectors, namely restaurant and hotel. China is a more mature market for adopting service robots in the hospitality industry than other countries in the world (Santiago et al., 2024), such as the UK. Furthermore, in the hospitality industry, most robots are implemented in the restaurant sector (Crump, 2022). Therefore, we wanted to test whether the results of this study would be consistent in other sectors, such as hotels. In this study, the first experiment used a restaurant specializing in regional cuisine in China as the context, while the second experiment focused on a local hotel setting in the UK. Details of the scenario descriptions are shown in Appendix 1. This study used existing measures from previous studies. Enjoyable interaction and word-of-mouth were tested in the service and retail sectors in the USA and UK, whereas helping behavior was studied in the hotel industry in China. This study, focusing on the restaurant and hotel sectors in the UK and China, also aims to validate these measurements in a cross-cultural context. In this study, enjoyable interaction was measured by six items (Gremler & Gwinner, 2000), helping behavior was measured by three (Ma et al., 2013), and word-of-mouth was measured by three (Keeling et al., 2013). Factor loading and Cronbach's alpha values are presented in Appendix 2. The questionnaire used in Study 1 was in Chinese. Four scholars who have Chinese as their mother tongue, and English as their work language, used back translation techniques to finalize the questionnaire of Study 1 from English to Chinese (Brislin, 1970). The questionnaire used in Study 2 was in English.

We tested our theory across different cultural contexts (i.e., China and the UK) and hospitality settings (i.e., restaurants and hotels). Tourism scholars have similarly applied this approach to examine their theorizing across different countries and industries (Li & Wan, 2025), demonstrating the generalizability across diverse settings. This contributes to the cultural and ethnic validity of robots, and the broad applicability of our research findings.

Ethics approval was obtained from a UK university where one of the authors worked. To determine the minimum sample size for both studies, we used G*Power to calculate the sample size. Based on the proposed analysis (e.g. ANCOVA), a "medium" effect size ($f = 0.25$), an α err prob of 0.05, a power of 0.95, four groups, and three measurements, G*Power results show that the total sample size for each study is 96 (G*Power, 2024). Many existing studies have successfully used online platforms or professional data collection firms to collect data (Kim et al., 2023; Song et al., 2023). Therefore, we followed previous literature to adopt a similar data collection method. We asked professional data collection firms in China and the UK to survey real employees in the restaurant and hotel sectors. To reduce social desirability bias, we implemented an online survey rather than a face-to-face survey (Heerwegh, 2009) to enhance the sense of privacy of respondents, and to allow them to answer survey questions without feeling the presence of the survey administrator.

For instance, in Study 1, Wenjuanxing, a popular Chinese marketing research firm, created and sent the link to members working in the restaurant sector in China to collect data in October 2023. We collected a total of 196 valid responses, with the cell size ranging from 46 to 52. For both studies, when participants clicked the survey link, each was randomly allocated to one of the scenarios. As shown in Table 2, 81.6% of the participants were between 18 and 30, more than half

(54.6%) were female, 79.6% had a vocational degree, 92.9% were full-time workers, 34.7% earned

3,000-4,999 RMB per month, and 37.8% had at least some experience working with service robots.

(Insert Table 2 here)

In Study 2, we created the survey link through Qualtrics, using the Prolific data collection

platform to help recruit existing hotel staff members in the UK to participate in Study 2 in January

2024. Altogether, 213 valid responses were gathered. The cell size was 51 to 56. As shown in Table

3, the largest age group was 31-40 (with 28.2% of participants), 55.4% were female, 40.8% had a

college degree, 59.6% worked in full-time contexts, and 29.6% earned £20,001-30,000 per year.

For data analysis, we used ANCOVA in SPSS to test H1-H4 and PROCESS in SPSS to test H5

and H6. Details are presented in the results section.

(Insert Table 3 here)

Results

Results of Study 1

The manipulation check was successful. Participants in the congruent ethnic appearance condition

significantly agreed to "The robot has a Chinese appearance" more than those in the ethnic

incongruity condition ($M_{congruent\ appearance}$ = 6.75; $M_{incongruent\ appearance}$ = 1.33, t (194) = -71.673, p

< .001). Additionally, participants in the condition of congruence with a local setting significantly

rated the question "The robot speaks with a non-standard accent from the region that the restaurant

cuisine originated" higher than those in the condition of incongruence with a local setting ($M_{non\text{-}}$

standard = 6.70; M $_{standard}$ = 1.41, t (194) = 63.514, p < .001). Regarding the realism of the scenario, Chinese participants agreed that the situation described in the scenario was true to daily life (M = 4.92, SD = 1.596).

To test H1-H4, we conducted an ANCOVA using independent variables of ethnic appearance and non-standard accent, dependent variables of enjoyable interaction, and helping behavior, and control variables of age, gender, educational level, job status, personal income, and experience of working with service robots in the workplace. Regarding the control variable, the experience of working with service robots affected employees' enjoyable interaction, and income influenced employees' perceived helping behavior from robots. The results show that the ethnic appearance of service robots significantly influenced participants' enjoyable interactions. More specifically, participants in the congruent ethnic appearance condition rated the level of enjoyable interaction significantly higher than those in the incongruent ethnic appearance condition (M$_{congruent\ appearance}$ = 5.38, M$_{incongruent\ appearance}$ = 4.92, F [1, 186] = 10.163, p < .005). The results show that Chinese-looking robots in China lead to more enjoyable interactions than Caucasian-looking robots. Thus, H1 was supported.

Similarly, the ethnic appearance of service robots also influenced participants' helping behavior. Participants in the congruent ethnic appearance condition exhibited a higher level of helping behavior (M$_{congruent\ appearance}$ = 5.79, M$_{incongruent\ appearance}$ = 5.83, F [1, 186] = 4.302, p < .05) than those in the incongruent ethnic appearance condition. Thus, H2 was supported.

We observed an interaction effect between ethnic appearance and accent on enjoyable interaction (F [1, 186] = 9.410, p < .005), supporting H3. More specifically, when Caucasian-looking robots are used, speaking with a non-standard accent leads to a higher level of enjoyable interaction than speaking with standard Mandarin (M$_{incongruent\ appearance\ –\ non-standard\ accent}$ = 5.20,

$M_{\text{incongruent appearance – standard accent}} = 4.65$, $F [1, 186] = 6.969$, $p < .01$). When a Chinese-looking service robot was provided, it did not matter whether the robot spoke with a non-standard or standard Mandarin ($M_{\text{congruent appearance – non-standard accent}} = 5.21$, $M_{\text{congruent appearance – standard accent}} = 5.55$, $F [1, 186] = 2.967$, ns) (see Figure 2).

(Insert Figure 2 here)

Additionally, we observed an interaction effect between ethnic appearance and accent on helping behavior ($F [1, 186] = 8.239$, $p < .01$). Thus, H4 was supported. More specifically, when Caucasian-looking robots were provided, speaking with a non-standard accent from the region that the cuisine originated from led to a higher level of helping behavior than speaking in standard Mandarin ($M_{\text{incongruent appearance – non-standard accent}} = 5.93$, $M_{\text{incongruent appearance – standard accent}} = 5.54$, $F [1, 186] = 6.053$, $p < .05$). When Chinese-looking robots were provided, it did not matter whether the robot spoke with a non-standard or standard Mandarin ($M_{\text{congruent appearance – non-standard accent}} = 5.84$, $M_{\text{congruent appearance – standard accent}} = 6.08$, $F [1, 186] = 2.632$, ns) (see Figure 3 and Table 4).

(Insert Figure 3 here)

(Insert Table 4 here)

PROCESS analysis was implemented to test H5 and H6 using the same control variables. In addition to testing the relationship between enjoyable interaction and word-of-mouth and the relationship between helping behavior and word-of-mouth, we also tested whether enjoyable interaction and helping behavior could be mediators. The results show that enjoyable interaction ($t = 14.795$, $p < .001$, LLCI: .808; ULCI: 1.057) had a positive relationship with word-of-mouth, supporting H5. However, there is no significant relationship between helping behavior and word-of-mouth ($t = -.519$, $p = .604$, LLCI: -.207; ULCI: .121), rejecting H6. Additionally, enjoyable

interaction was a successful mediator to the relationship between robot appearance and word-of-mouth (effect: .431, LLCI: .174; ULCI: .706); however, helping behavior was not a successful mediator (effect: -.004, LLCI: -.033; ULCI: .021). All control variables (e.g., age, gender, education, job status, income, and experience working with service robots) did not influence word-of-mouth.

Results of Study 2

The manipulation checks confirmed that subjects in the incongruent ethnic appearance condition significantly agreed to "The robot has a non-Caucasian appearance" more than those in the congruent ethnic appearance condition ($M_{incongruent\ appearance} = 6.03$, $M_{congruent\ appearance} = 1.27$, $t(211) = -21.437$, $p < .001$). Moreover, participants in the non-standard accent condition significantly rated "The robot, working in this local hotel, has a non-standard accent" higher than those in the standard accent condition ($M_{non\text{-}standard\ accent} = 6.10$, $M_{standard\ accent} = 2.11$, $t(211) = 14.552$, $p < .001$).

As shown in Table 5, the results of hypothesis testing show that participants in the congruent ethnic appearance condition had a higher enjoyable interaction than those in the incongruent ethnic appearance condition ($M_{congruent\ appearance} = 3.331$, $M_{incongruent\ appearance} = 2.96$, $F[1, 204] = 5.203$; $p < .05$). More specifically, the UK participants in the Caucasian-looking robot condition were more likely to expect enjoyable interactions with the service robot in the service team. Therefore, H1 was accepted. Similarly, participants in the congruent ethnic appearance condition exhibited a higher level of helping behavior than those in the incongruent ethnic appearance condition ($M_{congruent\ appearance} = 4.22$, $M_{incongruent\ appearance} = 3.85$, $F[1, 204] = 5.131$, $p < .05$). More specifically, the UK participants in the Caucasian-looking robot conditions were more

likely to expect a higher level of service robot employee helping behavior. Thus, H2 was supported. Surprisingly, there were no interaction effects. Thus, H3 and H4 were rejected.

(Insert Table 5 here)

We executed PROCESS analysis to test H5 and H6. Additionally, we tested whether enjoyable interaction and helping behavior could be mediators. The results show that enjoyable interaction ($t = 7.631$, $p < .001$, LLCI: .431; ULCI: .731) had a positive relationship with word-of-mouth, supporting H5. However, there is no significant relationship between helping behavior and word-of-mouth ($t = -.700$, $p = .488$, LLCI: -.205; ULCI: .098), rejecting H6. Additionally, enjoyable interaction was a successful mediator in mediating the relationship between robot appearance and word-of-mouth (effect: .197, LLCI: .010; ULCI: .408); however, helping behavior was not a successful mediator (effect: .012, LLCI: -.027; ULCI: .087). All control variables (e.g., age, gender, education, job status, income, and experience of working with service robots) did not influence word-of-mouth. To sum up, Table 6 presents the results of hypothesis testing.

(Insert Table 6 here)

Conclusion and Discussions

Conclusion

Building on the similarity-attraction theory, this study investigated how the congruence of robots' appearance and accent affects expected enjoyment, service robots' helping behavior, and how such interactions would influence positive word-of-mouth. Our findings for both the UK and Chinese samples suggest that the congruity of robots' appearance between the mainstream population and service robots leads to employees' expected enjoyable interaction and service robot helping

behavior more than incongruity of appearance. The moderating effect of service robot accents was supported in the Chinese sample, while unsupported in the UK sample. In both studies, the employees' expected enjoyable interaction with the robot positively influences positive word-of-mouth; however, employees' expected service robot helping behavior as a colleague in both studies doesn't affect word-of-mouth. Such findings carry essential theoretical and practical implications, discussed in detail below.

Theoretical implications

This study offers valuable theoretical implications. First, it extends the similarity attraction theory by investigating its application in interpersonal and human-robot interactions, specifically exploring how this theory influences employees' positive word-of-mouth regarding working with a robot colleague. It is worth noting that existing studies predominantly focus on gender similarity within human-robot interactions (Cruz-Maya & Tapus, 2017; Zhang et al., 2023). However, research on the impact of ethnic appearance (congruent vs. incongruent with mainstream ethnicity) on enjoyable teamwork interaction with robots, helping behavior as colleagues, and employees' positive word-of-mouth regarding working with robots is limited. This study aims to fill this knowledge gap and provide insights into these unexplored aspects of employee-robot interactions as colleagues.

Second, we incorporated the congruity theory (Osgood & Tannenbaum, 1955) and social identity theory (Coeckelbergh, 2021) to strengthen the model through the integration of enjoyable interaction and helping behavior, as well as examine the moderating effect of the service robot's accent. When designing human-like robots, relevant stakeholders must have a comprehensive understanding of how ethnic appearance and accent influence the choice of behavior (Ahlqvist &

Wennmark, 2023). Giving human-like robots ethnic cues, such as appearance and accent, may be valuable in facilitating human-robot interactions in a multicultural environment.

Third, enjoyable interaction with a service robot plays an important role in developing a personal connection with the robot (Huang et al., 2021). Still, previous studies have mainly focused on examining enjoyable interaction in the context of the employee-customer relationship (Park & Hyun, 2021). While human-helping behavior toward robots has been discussed, future studies should shift their focus to investigating robot-helping behavior toward human colleagues to gain deeper insights into the dynamics of human-robot interaction (Potinteu, et al., 2023). Interestingly, our finding revealed that robots' helping behavior did not affect positive word-of-mouth in both studies. This may be attributed to the reliance of service robots on preprogrammed settings and their lack of empathic intelligence currently (Lv et al., 2024), which limits their ability to navigate the complexities of helping behavior in workplace settings, thereby hindering their capacity to generate positive word-of-mouth. Therefore, our study contributes theoretically by broadening the scope of research to encompass enjoyable interactions within the employee-robot colleague dynamic, thereby extending previous research that has primarily focused only on human interpersonal behavior in the workplace.

Lastly, our findings support the moderating effect of the service robot's accent on the relationship between robot appearance and enjoyment level of interaction in Study 1. Standard accent and congruent appearance led to more enjoyable interaction and helping behavior. The prestigious status of the standard accent is attributed to its association with powerful and prestigious groups, while the non-standard accent is considered less potent and lacks group identity (Bhatia, 2018). The findings are consistent with previous studies in China (Zhao & Liu, 2021),

indicating that non-standard accents are frequently stigmatized, devalued, and marginalized in social contexts.

Surprisingly, the moderating effect of Study 2 was rejected. A possible explanation might be that robot hotels are not yet common in the UK, unlike the more mature service robot market in China (Santiago et al., 2024). Consequently, UK hotel employees may not be familiar with service robots' behaviors and interactions. This research explores how robot accents from different languages can be generalized to incorporate more personalization into human-robot interaction and confirms that standard accent leads to a more favorable perception of robot design in China. Our research contributes to the development of a human-robot experience that can accommodate and adapt to the ethnic diversity present in work environments.

Practical implications

Service robot designers are encouraged to consider the appearance design of robots based on where the robots will be adopted. For example, when designing service robots for chain restaurants featuring traditional Chinese cuisine in China, they may add Hanfu (a traditional Chinese dress that originated in the Han dynasty; Liu et al., 2024) to enhance the robots' ethnic appearance, making Chinese employees feel the service robots look like their local work buddies. Meanwhile, robot designers should extend deeper consideration into robots' functional design and social communication, improving their feasibility of hosting enjoyable interactions with human hospitality employees by contributing to helping behaviors in a service team context. For example, to design service robots for Chinese restaurants featuring Peking Duck in Beijing, designers may add Qing court dress (Ko, 1997) and set the robots' Chinese speaking with a Beijing accent (Dong & Blommaert, 2009). Although service robot design has been studied from the customer

perspective (Klüber & Onnasch, 2022; Ko et al., 2023; Li et al., 2023; Wirtz et al., 2018), employees' feelings should also be considered in the design stage that improves employee-robot collaboration during hospitality service encounters (Le et al., 2023; Paluch et al., 2022; Y. Song et al., 2022). By doing so, hospitality employees would appreciate the existence of service robots and consider them as effective helpers rather than treating on-the-job collaboration with robots as "extra work."

When selecting service robots for service encounters, hospitality managers and owners should choose robots with ethnic appearances that are congruent with their employees. For example, an owner of a Shanghainese restaurant in China should adopt a robot with a Chinese appearance, thus supporting employees to develop similarity-attraction relationships with robots (Wetzel & Insko, 1982). Doing so could also help foster more positive expectations about the prospects of collaborating with robots in a service team. Having Chinese employees collaborate with Chinese-looking service robots in the same service encounter can also deliver a consistent ethnic service brand experience to customers (Alabed et al., 2022; Wang & Lang, 2019). Hospitality managers and owners may also consider adding local cultural features to the ethnic appearance of the service robots, especially those that match the cuisine and regional culture of the brand. For example, managers and owners of barbecue restaurants in Texas may implement service robots with cowboy appearances. Working with robots that look like cowboys, from the Texan employees' perspective, would make them mentally feel close when interacting and collaborating with robots at work.

For hospitality human resource managers, internal promotion and training for frontline employees are needed in the implementation stage for employee-robot collaboration among properties and organizations under a firm. To create successful internal promotion and training

related to employee-robot collaboration, hospitality human resource managers can utilize internal employees' positive word-of-mouth through opinion leaders and expect enjoyable interaction with and helping behavior from service robots. Those internal opinion leaders can be effective endorsers within hospitality organizations to relieve concerns and worries toward employee-robot collaboration, thus promoting positive thinking regarding the benefits that service robots can contribute to a service team.

Finally, although this paper uses the hospitality industry as the context for Studies 1 and 2, the implications apply to other service industry sectors. Viglia et al. (2022) summarized the sectoral focus of papers published by *The Service Industries Journal* from 1981 to 2020. They found that hospitality and travel covered 20%, followed by financial services (16%), retail (10%), IT services (8%), healthcare (4%), and education (2%). Most other sectors in the service industry are also labor-intensive workplaces, where managers and owners intend to adopt service robots to replace human employees due to increasing labor costs, labor shortage, and quiet quitting (Ng & Stanton, 2023). Meanwhile, these service sectors all face the challenge of creating employee-robot collaboration in the workplace (Le et al., 2023; Mukherjee et al., 2023). Because of the similar workplace features and shared challenges, the insights of emphasizing ethnic appearance and accent in service robot design to foster employee-robot collaboration, although found in this study from the hospitality industry, can be utilized in other service industry sectors.

Limitations and future studies

While this meaningful study contributes valuable implications, there are some limitations worth addressing in future research. First, following the similarity-attraction theory, this study tried to test ethnic appearance and accent. However, in determining similarities (Montoya & Horton, 2013),

other tangible (e.g., height and weight) and intangible (e.g., voice tone, beliefs, and value systems) characteristics in need of testing became apparent. Future studies are encouraged to explore these other characteristics to enrich the knowledge of employee-robot collaborations. Second, this study did not consider robot functions or features—such as behavior, emotional intelligence, and adaptability—that differentiate robots from human employees and yet are still favorable to employees to contribute to the service team. Such valuable differences in robot design that improve employee-robot interactions are worth exploring in future research.

Third, the conceptualization of ethnic appearance congruence is based on the scenario when most service team employees are of the same ethnic group. However, hospitality service teams in international cities might be diverse, consisting of employees from different ethnicities. In such cases, future studies may investigate how service robots' ethnic characteristics may be designed and utilized to foster employee training about the value of diversity and inclusion within service teams. Finally, we used online platforms or professional data collection firms to collect employee data, it should be noted that these participants may be motivated to do research via online platforms or professional data collection firms, which is different from those who are not passionate about research. Therefore, future research could do face-to-face data collection in the venues of hotels and restaurants. Fourth, while this study utilizes similarity attraction and congruity theories, other theories could provide valuable insights to capture the nuances of human-robot interactions. Future research should further investigate these understudied mechanisms to provide a more comprehensive understanding of human-robot dynamics. Finally, although we used an online survey to reduce social desirability bias, additional remedies could be used to address the issue of social desirability in the data collection process. For example, a "social desirability" scale

could be included in the online survey to test the relationships between social desirability and other constructs in the framework (Nederhof, 1985).

Appendix 1: Scenario Description

Study 1:

Assume that you are an employee of a restaurant specializing in regional cuisine (e.g., Sichuanese cuisine, Shanghainese cuisine, Cantonese cuisine, etc.) in China and you interact with a human-looking service robot to deliver service to customers, such as greeting customers, helping customers order meals, delivering food to customers, processing payments, etc.

The service robot working alongside you has an Asian (*Caucasian*) appearance. The service robot can say, "Welcome!", "How are you?", "Please order your meal.", "Enjoy your meal!", "Have a nice day!", etc. with (without) a standard Mandarin.

Study 2:

Assume that you are an employee of a local hotel in the UK and you interact with a human-looking service robot to deliver the service to customers, such as greeting customers, handling check-in and check-out procedures, managing customer queues, etc.

The service robot working alongside you has a Caucasian (*Asian*) appearance. The service robot can say, "Welcome!", "How are you?", "Please show your hotel booking reference.", "Enjoy your stay!", "Have a nice day!", etc. with (*without*) a standard national British accent.

Appendix 2: Measurement

Construct and item	Study 1 N = 196		Study 2 N = 213	
	Factor loading	Cronbach alpha	Factor loading	Cronbach alpha
Enjoyable Interaction with Service Robots		.878		.882
I feel that I enjoy interacting with the service robots.	.801		.826	
I feel that the service robots create a feeling of "warmth."	.823		.834	
I feel that the service robots relate well to me.	.834		.847	
I feel that I have a harmonious relationship with the service robots.	.788		.842	
I feel that the service robots look to have a good sense of humor.	.701		.662	
I feel that I am comfortable interacting with the service robot.	.837		.747	
Service Robots' Helping Behavior		.707		.733
The service robots go out of their way to help new coworkers	.807		.829	
The service robots pass along notices and news to human employees	.822		.777	
The service robots help human employees when their workload is heavy.	.758		.818	
Positive Word of Mouth for the Human-Robot Workplace		.805		.901
I am attracted to working in this workplace mixing human employees with service robots	.789		.918	
I would recommend this human-robot workplace to other hospitality job applicants	.881		.934	
I am proud to work in this human-robot workplace	.874		.891	

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