Facilitation of Customer Empathy: The Effect of Robot Apology on Customer Reaction Following a Service Failure

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Despite the rapid increase in the employment of robots, robot service failures are inevitable. Previous studies advocate human employees to provide service recovery rather than robots themselves. Few marketing studies have demonstrated how robot service recovery affects customer reactions. This study examined the effects of service recovery provided by robots (i.e., robot apology) on customer satisfaction and the underlying psychological mechanism. Based on two experimental scenarios, we argue that robot apology significantly influences customer satisfaction through the mediation of customer empathy after a service failure. In addition, the effect of robot apology is moderated by customers' sense of power. This research offers theoretical implications for robot service recovery and practical implications for firms employing service robots.

Keywords: service robots, robot apology, consumer empathy, sense of power, service failures

INTRODUCTION

Service robots have brought significant changes to the service industry. Wirtz et al. (2018) defined service robots as "system-based autonomous and adaptable interfaces that interact, communicate and deliver service to an organization's customers." Adopting service robots has been associated with benefits ranging from labor cost reduction, improved efficiency and service quality, and consumer experience enhancement to guarantee sanitation for COVID-19 (Lee, Kwag, & Ko, 2020; Mende et al., 2019; Seyitoˇglu & Ivanov, 2020).

Despite the extensive deployment of service robots, service failure caused by robots is inevitable (Honig & Oron-Gilad, 2018; Leo, 2020) and therefore erodes consumer satisfaction. Service companies must have an understanding of how to manage these incidents. While a few researchers have studied consumer reactions following a service failure caused by robots (Huang & Philp, 2021; Yam et al., 2021), our literature review suggests that little is known about how service recovery by robots affects consumer responses. Lv et al. (2022) called for scholarly attention on how AI should proactively recover after a service failure. In the present research, we seek to examine consumer perception of apologies provided by service robots in the case of a service failure.

The current study makes several contributions to the literature. First, it identifies the effect of robot apology on customer satisfaction with service recovery. Second, building on the literature on empathy, it

reveals the role of consumer empathy towards service robots in the underlying mechanism of the recovery effect of robot apology. Finally, the moderating role of the consumer sense of power is explored in the study. From a practical perspective, this research has implications for marketers to recover more effectively from robot service failure situations.

The remainder of the paper is organized as follows. We start with the theoretical grounding for our study and hypotheses. We then conduct two scenario-based experiments. This is followed by a discussion of the academic contributions of the findings, as well as the practical implications and recommendations for future studies.

LITERATURE REVIEW

Robot Apology

Service robots are utilized in various domains and play an increasingly important role in service delivery. However, due to the complex nature of the service industry, service robot is prone to service failure because of user inadaptability caused by changes in the communication interface (Um et al., 2020) or technical issues with the robot's hardware and software systems (Honig & Oron-Gilad, 2018). Service research has long established that service failure may affect customer satisfaction, trust, and loyalty which are detrimental to firm performance (Norvell et al., 2018). To retain customers, service organizations must provide successful service recovery efforts.

Previous service recovery research focused on the role of human staff in service recovery and the reaction of consumer response to these efforts. Different recovery strategies have been tested, and an apology is regarded as a commonly used and effective recovery strategy to appease consumers in the first step (Dens et al., 2015). According to Tedeschi and Norman (1985), providing an apology referred to "confessions of responsibility for negative events, which include some expression of remorse." An apology is an acknowledgment by the company of the consumer distress, which resembles psychological compensation (Davidow, 2003). By apologizing to the customer, the company accepts the responsibility for the service failure and shows regret for what happened (Liao, 2007). An apology is a reparative behavior to maintain a relationship with the victimized party following a negative incident (Leary, 2010). Extensive literature has examined the impact of apology on perceived sincerity (Gruber 2011), motivation attribution (Boshoff and Leong, 1998), credibility (Davidow, 2003), and customer satisfaction (Gelbrich & Roschk, 2011).

Previous research on human-robot interactions shows that robots are associated with standardization and maintain a customer consistent service experience but lack affective experience (Wirtz et al., 2018; Rafaeli et al., 2017). Robot apologies seem to be mechanical or artificial (Fan et al., 2016), and people perceive robot apologies as unappealing and not intelligent (Engelhardt et al., 2017). Honig & Oron-Gilad suggested solving robot service failure through human handover (Honig & Oron-Gilad, 2018). Belanche (2020) revealed that customers expect employees to shape up after a poor robot service encounter. In Ho et al. (2020), people perceive service recovery provided by a human to be more sincere than that offered by a service robot, leading to higher satisfaction.

However, recent studies in robot anthropomorphism suggested that meaningful social interactions between humans and service robots can occur by including social clues of human characteristics (such as appearance, behavior, and communication capabilities)(Murphy et al., 2019; Wirtz et al., 2018). For example, in hospitality, chatbots have been set to reply to consumers when there is a need. When humans communicate with non-human objects such as robots, these social clues can make it easier for people to perceive the human trait tendency in non-human entities and respond to them socially as interacting with humans (Nass & Moon, 2000). Thus, it is worthwhile to clarify how consumers react to service recovery provided by robots instead of by human employees when it comes to service recovery. Ho et al. (2020) showed that service recovery from the human staff and the service robot resulted in similar service evaluations. Choi (2021) found that humanoids can recover the service failure by themselves via sincere apology. Until now, the research on the effect of robot service recovery on consumer satisfaction is limited.

Due to service failure frequency and adverse subsequences, it is important to find cost-effective and easy-to-implement effective recovery methods to retain consumers (Ahmadi & Fakhimi, 2021). Previous studies have highlighted that apology is one of the most convenient and cost-saving approaches (Tzeng, 2004). When a robot fails in service delivery, Lv et al. (2022) argue that instead of human employee intervention, an empathy AI response may save some labor costs or calm down the customers in the first place.

Based on the discussion above, we propose that, same as an apology provided by human employees, an apology from service robots implies their understanding of what consumers have suffered, acknowledge the responsibility for the failure, and communicate effort for consumers following a service failure, which may improve consumer evaluation of the robot. Extensive studies have supported that consumers who receive an apology are more satisfied than those who receive no apology (Bradley & Sparks, 2009; Roschk & Kaiser, 2013; Wirtz & Mattila, 2004). Thus, the following hypotheses are put forth:

H1: *Following service recovery, service robot apology will enhance consumer satisfaction.*

Consumer Empathy With a Service Robot

Empathy reflects an emotional response derived from understanding the emotional state or situation (Lee et al., 2014; Verhaert & Poel, 2011). In essence, empathy is the ability to consider the feelings of others and is an important mechanism to promote forgiveness (Fehr et al., 2010). Giammarco & Vernon argued that developing empathy for the offender may relieve the victim's negative emotion or behavioral intention and trigger the forgiveness process (Giammarco & Vernon, 2014). Furthermore, empathy is not only specific to humans but is also present in other species (Paiva, 2017). As empathy is central in the research of human social relationships, it is evident that empathy is also a significant element in human-robot interaction. Thus, robot empathy ability has become an important direction in robot service research (Chen, 2012; Malinowska, 2021; Yalcin & DiPaola, 2018; Zhou et al., 2020). At the same time, consumer reaction to a robot that shows empathy has been investigated (Brave et al., 2015; Klein et al., 2002; Prendinger & Ishizuka, 2005). Liu and Sundar (2018) tested the effect of three types of empathic expression—sympathy, cognitive empathy, and affective empathy—on consumer perception of the service and the chatbot. De Kervenoael et al. (2020) showed that empathy from service robots has a positive and significant effect on the intention to use robots. Lv (2022) indicated that a high-empathy AI response can increase customer continuous usage intention in service recovery.

According to Cropanzano and Mitchell (2005), the interaction between human-robot depends on how each party represents the action of others. Besides the studies of robot empathy ability, the user empathy towards the robot might also be an essential attribute. Early studies focused on human empathy towards robot abuse (Bartneck et al., 2005; Brahnam & De Angeli, 2008; De Angeli et al., 2006). Rosenthal-von der Pütten et al. (2013) and Suzuki et al. (2015) indicated that participants empathized with the robot's pain similar to that of another human being and expressed empathic concern for the robot. Wen et al. (2018) suggested that feelings of empathy reduce the use of a robot in an environment where the robot may get hurt. Darling et al. (2015) investigated the role of empathy in human-robot interaction. They found that people with a high level of empathy hesitate longer to strike a robot.

Other researchers explored the effect of robot anthropomorphism on user empathy towards the robot. It has shown that users perceive the robot as more relevant when they share physical and behavioral similarities, such as body image, gender, personality, and emotions. This effect is amplified when these robots reflect the individual personal characteristics and identity (Huang & Philp, 2021). Riek et al. (2009) showed that a person has more empathy for a humanoid robot than a mechanical-looking robot. Milcent et al. (2022) argued that participants were slightly more empathetic when confronted with virtual agents with emotional facial expressions. Mahzoon et al. (2019) suggested that if the robot could successfully get people to recognize the implemented sociability, people would observe strong empathy with the robot.

To our best knowledge, limited studies have investigated consumer empathy in service robot research, especially when the service provided by the robot fails. In previous research in service recovery, consumer empathy occurs when firms acknowledge their wrongdoing (Eisenberg & Fabes, 1990). McCullough et al.

(1997) suggest that empathy is a primary mechanism for motivating forgiveness following an apology. Davis and Gold (2011) revealed that consumer perception of firm remorse increases the emotional empathy for the firm. According to the theory of Media Equation, the findings that describe how humans interact with other humans can be applied to human-robot interaction (Lei & Rau, 2021). Therefore, we suggest that by offering an apology following a service failure, the robot shows its willingness to take responsibility for the failure and concern for the consumers (Casidy & Shin, 2015; Xie & Peng, 2009), consumer attentiveness toward the robot will enhance.

H2: *Robot apology increases consumer empathy following a service failure.*

It has been long established that empathy relates positively to prosocial behaviors, which are actions intended to help others (Batson, 1987). Empathic customers are more likely to notice the good acts of others, as they tend to be more sensitive to the good thing rather than the bad things (Davis & Oathout, 1987; Pera et al., 2019). Following service failure, consumers with greater empathy tend to respond less to anger and are less likely to complain about such failures (Konstam, Chernoff, & Deveney, 2001; Stephens & Gwinner, 1998). Previous studies found that consumer empathy determines their willingness to forgive and maintain relationships with others (Fisher et al., 2008). Thus, we predict that through robot apology, customers would be aware of the robot's sincerity and be induced to feel empathy for the robot. Consumer attentiveness toward the robot they interact with can enhance mutual understanding (Gremler & Gwinner, 2000). It may contribute to a favorable assessment of robot performance and elevate customer satisfaction (Wieseke et al., 2012).

H3: *Consumer empathy mediates the relationship between robot apology and consumer satisfaction.*

Sense of Power

Power is a fundamental component in social systems and structures (Rucker, Galinsky, & Dubois, 2012). The differences in job position, social class distance, imbalances of supply and demand between buyers and sellers can bring about differences in the personal sense of power, which may affect one's perceptions, emotions, and behaviors (Galinsky et al., 2014; Hsu et al., 2015; Madzharov, Block, & Morrin, 2015; Rucker, Galinsky, & Dubois, 2012).

A sense of power is defined as one's perceived ability to influence another person or other people in social interactions (Anderson, John, & Keltner, 2012). According to the Agentic-communal theory of power, individuals with a high sense of power have fewer constraints in achieving their goals than those with a low sense of power (Rucker, Galinsky, & Dubois, 2012). They are seldom dependent on others and are likely to develop agentic orientation. They would not consider the feelings of others and may make decisions based on personal experiences (Dubois, Rucker, & Galinsky, 2016). In contrast, individuals with a low sense of power tend to rely on others for valuable resources and are more likely to cooperate with others to meet their needs. It leads to a tendency to develop communal orientations, which drives individuals to pay attention to their relationships with others and to consider the feelings of others when making decisions (Rucker, Galinsky, & Dubois, 2012). According to Buss(1981), agentic individuals are concerned with self-assertion and self-enhancement and might blame others when things go wrong. Conversely, communally oriented individuals are concerned about others and aim to maintain harmony with others.

Prior studies have pointed out that a low sense of power leads to high levels of empathy. Kraus, Côté, and Keltner (2010) found that individuals with lower economic status are more attentive to the external environment. The elevated rank and resources of upper-class individuals lead them to be relatively self-focused. Low-class Individuals scored higher on empathic accuracy tests than individuals with high economic status and were more accurate in judging the emotions of their peers. Through word search task and recall method to initiate one's sense of power, Galinsky et al. (2006) explored the effect of a sense of power on empathy. They found that those with a high sense of power were less able to select opinions and more likely to ignore others' views than those with a low sense of power. Van Kleef et al. (2008) also verified that participants with a higher sense of power experienced less distress and less compassion and

exhibited greater autonomic emotion regulation when confronted with another participant's suffering. Individuals with high power may experience fewer social constraints, pay less attention to their social environment, and have less motivation to respond to the emotions of others. Therefore, we predict that consumers with a high sense of power in service failure are more likely to ignore the robot apology than those with a low sense of power, leading to lower empathy with the robot.

H4: *Consumer sense of power attenuates the effects of apology on consumer empathy.*

Based on the above literature review and research hypothesis, the research model constructed in this paper is shown in Figure 1.

OVERVIEW OF STUDIES

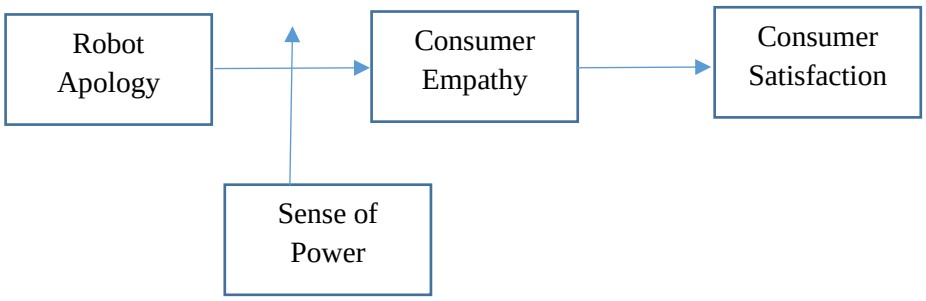
We conducted two lab experiments to test our hypotheses. Study 1 examines how service robot anthropomorphism affects consumer perceptions of empathy and dissatisfaction after service failures (testing Hypothesis 1, 2, and 3). Studies 2 examines the moderation effect of a sense of power on the relationship between consumer empathy and dissatisfaction (testing Hypothesis 4).

STUDY 1

Procedure

We recruited one hundred fifty-five participants (female= 78, Mage=26.14) from a popular online Chinese panel to participate in this study. The participants were randomly assigned to one of the two scenarios (apology or control) and the following survey questionnaire for data collection.

FIGURE 1
RESEARCH MODEL



The research scenario focuses on restaurant service (Appendix A). Participants were asked to imagine themselves in a restaurant scenario where a service failure occurred (adapted from Choi et al., 2021; Lv et al., 2022). Following the service failure, participants received either an apology or no apology. Adapting from Roschk and Kaiser (2013), in the apology condition, the service robot stated: "I am very sorry. Thank you for your tolerance and patience. I hope my mistake does not affect your mood. I wish you have a nice meal". In the control condition, the service robot stated: "Hope you enjoy the meal."

Participants were asked to indicate their satisfaction with the service experience in three seven-point Likert-type items ("I am satisfied with the service", "I am happy with the service", "I am pleased with the service," α= 0.874; adapted from Wan et al., 2011). Empathy was measured on the six items scale (e.g., "I would consider the problem from the standpoint of this service robot", "I can feel the sincerity of this service robot", "I can feel the difficulty of this service robot"; α=0.7), which was adapted from McCullough et al. (1997). Next, participants reported how familiar they were with robot service on a seven-point scale

(1 = not at all, 7 = very much, used as a control variable in subsequent analyses). Finally, participants indicated demographics before ending the procedure.

Results

Data Exclusion

An attention check question evaluated the quality of the responses. After completing the survey, participants were asked to recall the text describing the capacity of the robot to test whether they had read and understood these texts. Participants were asked: "Please recall the text displayed above. What mistake did the service robot make?" Those participants who answered the question incorrectly were eliminated from the analysis. Additionally, we checked scenario realism with the questions: "How easy was it for you to understand what happened in the scenario?" (1=not at all easy, 7= very easy). The results indicate that participants found the scenarios are easy to understand (M=5.21).

The Main Effects of Robot Apology

To test our H1, we analyzed the participant satisfaction using a one-way analysis of variance (ANOVA), which revealed a significant effect of robot apology, $F(1, 153) = 6.767$, $p = 0.01$. As predicted, participants were more satisfied in the apology group ($M = 4.40$) than those in the control group ($M = 3.79$). H1 is supported.

The Mediating Role of Empathy

To examine the proposed underlying mechanism of empathy, we first conducted a one-way ANOVA to assess the effect of robot apology on participant empathy. The analysis revealed that this effect was significant ($F(1, 153) = 12.646$, $p<0.00$). As expected, participants in the apology group elicited greater empathy ($M = 5.34$) than those in the control group ($M = 4.68$). H2 is supported.

Next, we conducted a mediation test (PROCESS Model 4; 5000 samples; Hayes, 2012) to examine the mediating role of empathy. The analysis confirmed a significant indirect effect of robot apology on participants' satisfaction through empathy (Effect = 0.4939, Boot SE =0.1202, 95% CI [0.2773, 0.7399], exclusive of zero). Thus, H3 is supported.

Discussion

Study 1 demonstrates that consumers are more satisfied when the service robot apologies after a service failure. This higher level of satisfaction is due to consumer empathy with the service robot. Following a service failure, a robot apology enhances consumer empathy and, in turn, satisfaction. The impact of robot apology on satisfaction is mediated by consumer empathy.

STUDY 2

Study 2 had two objectives. The first is to replicate the findings in Study 1 in a different service context (hotel). The second was to examine the moderation effect of a sense of power on the relationship between empathy and consumer dissatisfaction.

Procedure

A 2 (apology vs. control) * 2 (sense of power: high vs. low) between-subjects experiments were conducted to test the proposed hypothesis. Two hundred twenty-two participants (female= 153, Mage=25.43), recruited from a popular online panel, were randomly assigned to one of the two manipulated conditions (i.e., apology vs. control). At the same time, their sense of power was measured.

The research scenario focuses on the hotel check-in service scenario. Participants were asked to imagine themselves in a hotel check-in scenario where the robot served the wrong room key (Appendix B). Following the service failure, participants received either an apology or no apology from the robot. Same as study 1, in the apology condition, the service robot stated: "I'm very sorry. Thank you for your tolerance and patience. I hope my mistake does not affect your mood. Wish you have a pleasant journey". In the control condition, the service robot stated: "Wish you a pleasant journey." Participants indicated their

dissatisfaction, empathy, and scenario realism (same as Study 1). Additionally, participants rated sense of power using three seven-point Likert-type items ("In my relationships with others, I can get people to listen to what I say", "In my relationships with others, I can get others to do what I want", "In my relationships with others, I think I have a great deal of power"; adapted from Anderson and Galinsky, 2006). Participants in the two scenario reported similar levels of sense of power ($M_{apology}$ = 4.01, $M_{control}$ = 3.92, F(1, 220) = 0.158, p = 0.591). Next, participants reported how familiar they were with robot service on a seven-point scale (1 = not at all, 7 = very much, used as a control variable in subsequent analyses). Finally, participants indicated demographics before ending the procedure.

Results

Data Exclusion

An attention check question evaluated the quality of the responses as Study 1. Those participants who answered the question incorrectly were eliminated from the analysis. Additionally, we checked scenario realism with the questions: "How easy was it for you to understand what happened in the scenario?" (1=not at all easy, 7= very easy). The results indicate that participants found the scenarios are easy to understand (M=5.44).

The Main Effects of Robot Apology

We conducted a one-way ANOVA on participant satisfaction. The analysis revealed a significant effect of robot apology (F (1, 220) = 13.73, p < .001). As expected, providing apology increased participants' satisfaction ($M_{apology}$ = 5.13, $M_{control}$ = 4.24). H1 is supported.

The Mediating Role of Empathy

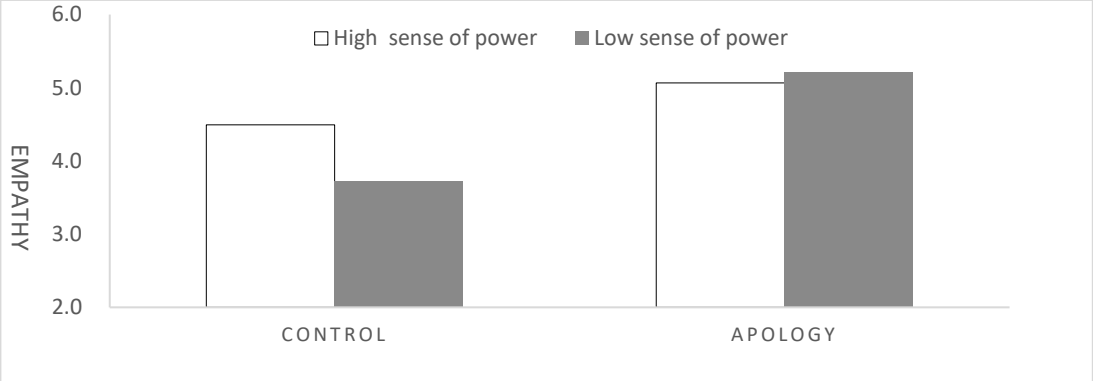
A one-way ANCOVA on empathy revealed a main effect of robot apology (F(1, 220) = 4.576, p<0.00). Participants who received an apology (M = 5.38) perceived more empathy than those who received no apology (M = 4.86). H2 is supported.

A mediation test (PROCESS Model 4; 5000 samples; Hayes, 2012) confirmed a significant indirect effect of robot apology on participants' satisfaction through empathy (Effect =0.3663, Boot SE =0.0939, 95% CI [0.1968, 0.5602], exclusive of zero). Thus, H3 is supported.

The Moderation Effect of a Sense of Power

According to our hypothesis, a sense of power moderates the effect of robot apology on consumer satisfaction by influencing consumer empathy. To test this possibility, we first conducted a simple two-way interaction analysis (PROCESS Model 1; 5000 samples; Hayes, 2012) to examine the conditional effect of apology on consumer empathy for high vs. low sense of power individuals (± 1 SD from the mean of a sense of power measures). Results of the simple slope tests are plotted in Figure 2. As visualized, for consumers with a high sense of power, the effect of apology on empathy was not significant (β= 0.2318, t=1.4260, p=0.1452). Meanwhile, apology significantly enhances empathy among consumers with a low sense of power (β=0.7985, t=5.036, p<0.001), thus supporting H4.

FIGURE 2
INTERACTIVE EFFECT OF ROBOT APOLOGY AND SENSE OF POWER ON CONSUMER SATISFACTION



Next, a moderated-mediation analysis (PROCESS Model 7; 5000 samples; Hayes, 2012) was conducted to test consumer sense of power on consumer satisfaction via consumer empathy, with robot apology as the independent variable, sense of power as the moderator, empathy as the mediator, and satisfaction as the dependent variable, controlling for familiarity with robot service. The index of moderated mediation was significant (Index =-0.1584, Boot SE =0.0636, 95% CI [-0.2887, -0.0385], exclusive of zero). More specifically, among participants with a low sense of power, empathy mediated the effect of apology on participant satisfaction (Effect =0.5526, Boot SE =0.1347, 95% CI [0.3102, 0.8292], exclusive of zero). However, the indirect effect of empathy was nonsignificant for participants with a high sense of power (Effect=0.1604, Boot SE =0.1002, 95% CI [-0.0206, 0.3730], including zero). Robot apology indirectly affects consumer satisfaction via consumer empathy only among participants with a low sense of power.

Discussion

Study 2 replicated the effect of apology on satisfaction in a different service setting—that is, a dining experience at a restaurant. Consistent with Study 1, in case of service failure, participants are more satisfied when the service robot provides an apology. This effect was mediated by consumer empathy. Robot apology enhances consumer empathy, which in turn leads to higher satisfaction. Of particular importance, Study 2 supported our hypothesis of the moderating role of a sense of power. Specifically, an apology can evoke greater empathy toward the service robot for consumers who perceive a low sense of power. This effect did not occur for consumers with a high sense of power. Furthermore, the moderated-mediation analysis confirmed that a sense of power moderates the impact of an apology on consumer satisfaction by influencing their empathy with the service robot. Compared with consumers with a high sense of power, those with a low sense of power are more sensitive to robot apology and show more empathy toward the robot, enhancing customer satisfaction after a service failure.

DISCUSSION AND IMPLICATIONS

Despite the rapid increase in the implementation of service robots, there are still frequent failures with service robots. With limited literature on robot service failure and recovery, especially on how service failures and recovery attempts made by a service robot affect consumer responses, the present research contributes to the existing literature in three primary ways.

First, our findings extend the field of the literature on service recovery providers from a focus on human providers to robot providers after a robot service failure. We find that an apology provided by a service robot elicits positive consumer evaluations following a service failure by robots. Previous robot service failure literature primarily promotes that emotions mimicked by robots are often perceived as programmed

(Wirtz et al., 2018) and lead to less favorable judgments. Interventions involving human service employees are necessary for service failure and recovery (Ho, 2020). As technology in engineering, machine learning, and artificial intelligence advances, robots will develop different kinds of AI with time (i.e., mechanical, analytical, intuitive, empathetic, Huang and Rust, 2018). Robots embedding these levels of intelligence may be able to recover a service failure by themselves. Consistent with recent service research (Choi et al., 2021; Lv et al., 2022), our findings suggest that it is feasible to improve service recovery by increasing the robot's emotional intelligence level. The conclusions of this paper provide a reasonable basis for further exploring the effect of service recovery provided by robots on consumer response.

Second, the present research contributes to the internal emotional mechanism of the recovery effect of a robot. We reveal that consumer satisfaction is influenced by service recovery provided by robots through consumer empathy toward the robots. Previous robot service research focuses on the robot empathy toward the consumer (de Kervenoael et al., 2020), but not vice versa. Our study echoes prior research on human empathy, suggesting that humans feel empathy not only for their peers but also for fictional characters, game characters, and even robots (Paiva, 2017). Furthermore, from the service management perspective, the present study addresses Wieseke et al. (2012) call for research on consumer empathy as an explanatory variable in service interactions. This research reveals the importance of activating customer emotional response in robot service recovery. This study is one of the first attempts to investigate consumer empathy toward robots in service settings to the best of our knowledge.

Finally, our findings enrich research on individual differences in terms of sense of power significantly related to the effect of service recovery provided by robots. We reveal that apologies provided by robots may be effective only for consumers who are in a low sense of power. In contrast, for consumers with a high sense of power, providing a robot apology may not be able to develop consumer empathy towards the robot due to their agentic orientation.

The findings of this research have significant practical implications for service firms that employ service robots that interact with consumers.

First, based on findings from the current research, important suggestions can be made to practitioners regarding robots' ability to service recovery. This research goes beyond previous studies of service failure caused by a robot—which focuses on providing service recovery with human employee intervention—by introducing robots as providers of service recovery. Robots appear to be able to recover from service failures by delivering apologies. It signifies the importance of marketing managers having a clear understanding of the critical role of robots in service recovery. Robots should be programmed and trained to detect service failures and apologize for such failures to consumers by themselves in the first place, which may avoid the costly expenses associated with human employee intervention.

Second, our study shows that the effect of robot service recovery on consumer satisfaction is driven by eliciting consumer empathy, which has been overlooked in robot service research and practice. After a service recovery by the robot, consumers may take the robot's perspective and understand its efforts. They are more likely to be satisfied with service recovery provisions. Besides designing robots that use verbal and nonverbal behaviors to simulate empathy, marketing managers should pay attention to activating empathic responses from consumers, which leads to positive consumer evaluation.

Third, our finding suggests that low-power consumers can respond empathetically after receiving a robot apology, while high-power consumers do not have such an effect. Companies may need to adjust the service recovery strategies to consumers with a different sense of power. Wong et al. (2016) suggested that customers with high power prefer status-enhancing service recovery initiatives to those for utility enhancement. Therefore, in service firms like luxury restaurants that target powerful clients, human employee engagement may be required to add social resources through interpersonal attention following a service failure caused by a robot(Choi et al., 2021; Honig & Oron-Gilad, 2018). Conversely, practitioners can express an apology through a robot to trigger an empathic response for consumers with a low sense of power.

LIMITATIONS AND FUTURE RESEARCH

We acknowledge several limitations of our research. First, we used a scenario-based experiment to examine our hypotheses. A field experiment is encouraged to enhance the generalizability of the findings. Second, the experimental scenarios used in this article were limited to cases where the negative outcomes of service failures were relatively mild. Future research is required to validate the effect of robot apology when the failure is more serious. Third, we only examined the impact of robot apology on consumer satisfaction. Besides apology, other different robot recovery strategies, such as forewarning and compensation, have been suggested in previous studies (Lee et al., 2010). Follow-up research is required to test the influence of these recovery strategies. Finally, our studies focus on consumer sense of power as a moderator. Other consumer traits may also warrant scholarly investigation, including novelty seeking (van Doorn et al., 2017), implicit theory perspectives (Puzakova et al.,2013), and technology readiness (Parasuraman, 2000).

ACKNOWLEDGEMENT

The authors acknowledge the financial support from National Natural Science Foundation of China [grant number 72072187 and 71972188].

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APPENDIX A

Suppose you go to a newly opened casual restaurant for dinner. You notice that this restaurant uses robots as servers. Once seated, a service robot comes to take your order. The service robot introduces the menu to you in detail and completes the order. A few minutes later, the robot comes back with your orders, but you realize that it is not the menu item that you ordered. You ask the service robot to get the right dish. The robot replies: "I am sorry I did not hear clearly. Please say it again." You have to repeat your request twice. Then it takes 5 minutes to get the right dish.

APPENDIX B

Suppose you go to a robot service hotel. The advanced intelligent service robot Xiao Ai completed the check-in procedure for you and handed you the room card. You got to the room but found that this card could not open the door. Other guests have occupied the room. You returned to the front desk. The robot Xiao Ai then changed the room card.