DOI: 10.1109/RO-MAN60168.2024.10731336

Two is Better than One: Cultural Differences in the Number of Apologizing Robots in the U.S. and Japan

Masahiro Shiomi, Taichi Hirayama, Mitsuhiko Kimoto, Takamasa Iio, and Katsunori Shimohara

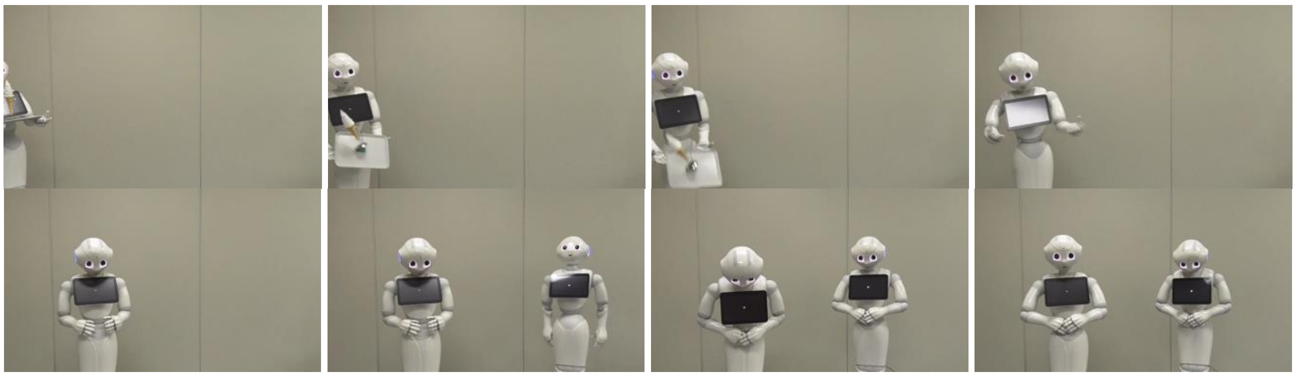

Figure 1. Robot apologizes for its mistake (dropping an ice cream cone) and also apologizes with another robot

Abstract—**Apology behavior design is becoming important for social robots that work in daily environments because of their widespread use. Robotics researchers have reported that multiple robots can effectively achieve more acceptance and trust in apology situations. Unfortunately, such effects have only been confirmed in a single country: Japan. Some studies investigated cultural differences in apologies between Japan and other cultures and reported how the former influences the perceived function and meaning of apologies. Therefore, we conducted a web-based survey to investigate whether using multiple robots in apology situations is effective in another country. We compared such perceived feelings as forgiveness and trust toward a robot's apologies between Japan and the U.S. by using the visual stimuli of one and two robots. The experiment results showed that U.S. people felt that multiple robot apologies are more acceptable than apologies from just one robot, similar to results with Japanese participants. Perceived trust did show a different phenomenon between the two countries.**

I. Introduction

The range of operations for social robots is expanding globally, and they are increasingly becoming involved in daily human activities. During the COVID-19 pandemic, for instance, such robots played a crucial role in reducing infection risks [1, 2]. Thanks to improvements in their interactive abilities and the integration of remote operation, social robots are now active in the following shared settings: cafeterias [3, 4], retail centers [3-6], mass transit systems [7-9], exhibit spaces [10-12], and senior care facilities [13-15].

For such social robots, building trust with those with whom they interact is pivotal. The robots need to exhibit behaviors that are perceived as trustworthy and reliable by the people with whom they are bonding. In fact, researchers have broadly investigated how social robots and agents build trust with others [16-21]. Incorporating ethical considerations, including gender issues, into robot design and decision-making processes has been emphasized as an avenue to enhance trustworthiness [22-25]. These efforts are crucial for ensuring that as social robots become more prevalent in various settings, they are both technically capable and socially competent and trusted by the people interacting with them.

A robot's ability to apologize for mistakes is one issue that needs further study before social robots are completely trusted in their engagements with people. Like humans, these robots are not infallible and will occasionally make mistakes. Researchers in robotics have been addressing this challenge by incorporating strategies used by humans, such as apologizing to smooth social interactions [26]. Previous research has underscored the role of apologies in forging relationships [27] and examined the implications of designing apology behaviors from a cost perspective [28, 29]. A computational understanding of apologies has also been developed through scenarios like the Prisoner's Dilemma [30, 31].

A recent study focused on using multiple robots in apology situations [32]. It compared the perceived feelings toward apologies from multiple robots and a single robot in Japan and described the effectiveness of apologies from two robots in the context of forgiveness and perceived trust. The effectiveness of multiple robots has been investigated in various settings [33]: information-providing [34-36], motivation improvements [37-39], persuasive technology [40-42], product recommendations [3, 4, 43], showing cute behaviors

* This work was partially supported by JST CREST (Core Research for Evolutional Science and Technology) Grant, Number JPMJCR18A1, Japan, and JSPS (Japan Society for the Promotion of Science) KAKENHI Grant Numbers JP22H03895 and JP23K16980.

Masahiro Shiomi, Taichi Hirayama, Mitsuhiko Kimoto, Takamasa Iio, and Katsunori Shimohara are with Advanced Telecommunications Research Institute International, Kyoto, Japan. (Corresponding author. e-mail: m-shiomi@atr.jp).

Taichi Hirayama, Takamasa Iio, and Katsunori Shimohara are also with Doshisha University, Kyoto, Japan.

Mitsuhiko Kimoto is with Meiji University, Kanagawa, Japan.

[44], designing robot-robot physical interaction [45, 46]. These results also suggest the effectiveness of using multiple robots in apology settings.

However, according to that above work [32], i.e., the effects of multiple robots on the act of apologizing remains limited from a viewpoint of cultural difference. That past study was only conducted in Japan. Other studies investigated cultural differences in apologies between Japan and other cultures [47-50] and reported how they influenced the perceived function and meaning of apologies. Therefore, it remains unknown whether this knowledge is applicable outside of Japan. Investigating the effects of multiple robots' apologies in another country is crucial to provide insightful knowledge for designing the apology behaviors of robots.

Based on these considerations, in this study, we investigated a research question that is related to cultural differences and conducted a web-based survey. We compared such perceived feelings as forgiveness and trust of a robot's apologies between Japan and the U.S. by using the visual stimuli of one and two robots.

II. Experiment

A. Hypothesis and prediction

Although the effects of apologies from multiple robots have only been investigated in Japan [32], several studies outside of it have reported the effectiveness of using multiple robots in various contexts (except for apologizing situations), such as effective information-providing tasks [51], storytelling for children [52, 53], exhibitions in public environments [54, 55], collaborative navigation [56], and peer pressure [42, 57]. Of course, related studies in Japan also reported the effectiveness of different contexts, including attracting people in advertising contexts [3, 4, 43], motivation and performance improvements [38, 58], peer pressure [41]. These studies suggested the positive effects of using multiple robots in interaction with people in several contexts regardless of cultural differences. Based on these related studies, we hypothesized that apologies from multiple robots will be more acceptable than apologies from a single robot even outside of Japan:

Prediction: If multiple robots apologize for a failure, Americans will accept the apologies more than one robot's apology, similar to Japanese people.

B. Visual stimuli and conditions

We used the same visual stimuli of our previous work [32] with a modified robot's voice that spoke English. Thus, in our situation, a food-service robot (Pepper) dropped a customer's order and apologized. Each video's resolution was 1286 x 762 pixels; the fps was 30, and the lengths were about 27 seconds. Similar to our original study, we prepared one factor (number factor, one/two conditions).

Each video featured a pair of robots (one primarily responsible for serving food and a secondary robot that assisted with other restaurant tasks). Initially, the secondary robot moved from the left side to the right, indicating the presence of two robots in the visual stimuli. Subsequently, the primary robot brings an ice cream cone from the left side, announcing, "Here you are." Unfortunately, it drops the cone: "I'm so sorry." In response, the primary robot apologizes and offers a free replacement and comps the entire initial order: "I'll replace your cone right away."

In the one-apology condition, only the primary robot apologizes, and the secondary robot makes a brief appearance at the beginning. Conversely, in the two-apology condition, the secondary robot enters from the right and issues an apology during the primary robot's expression of regret. Hence, the variation between these scenarios hinges on the secondary robot's issuance of an apology subsequent to the primary robot's mistake. Note that the secondary robot did not speak; it only bowed during the apologies to unify the speech contents across conditions.

C. Measurements

In this study, we measured questionnaire items to investigate whether participants forgave the robot's failures and how their perceived trust changed toward it. We employed and modified the following: the forgiveness scale [59], negative word-of-mouth (NWOM), performance trust from the multi-dimensional measure of trust (consisting of reliable and competent subscales) [60], moral trust from the multi-dimensional measure of trust (consisting of ethical, transparent, and benevolent subscales) [60], and intention to use (ITU) [61]. Each questionnaire item of each scale was assessed using a one-to-seven response format, where 1 was the most negative and 7 was the most positive.

In response to the necessity of filtering participants in online surveys [62, 63], we devised two control questions to verify whether participants attentively observed the videos and comprehended the guidelines presented about the questionnaires' conclusion. The inaugural question asked participants to identify the item dropped by the robot from a quartet of options. Those who responded incorrectly were disqualified. The ensuing question draws upon a model for checking the comprehension of instructions [63], which instructs participants to omit responses as a test of their ability to follow instructions, leading to the disqualification of individuals who completed these control inquiries.

D. Procedure

All the procedures were approved by the Advanced Telecommunication Research Review Boards (501-3). A consent document was prominently shown on the first page of the webpage. Only those who gave consent were eligible to partake in the survey. Initially, participants are presented with detailed descriptions of the study and guidelines for evaluating each video, followed by a check to ensure that the video's sound is satisfactory. Additionally, we provided textual scenarios to help visualize an environment where several robots are operational in a cafeteria setting.

The experiment has a within-participant design. Subsequently, our participants viewed a video under either the one-apology or two-apology conditions and responded to a set of questions. This process was repeated with a video showcasing the alternate apology condition, prompting another round of responses. The order of the conditions was counterbalanced. After viewing both videos, participants answered control questions that assessed their attentiveness to the videos and the accuracy of their responses.

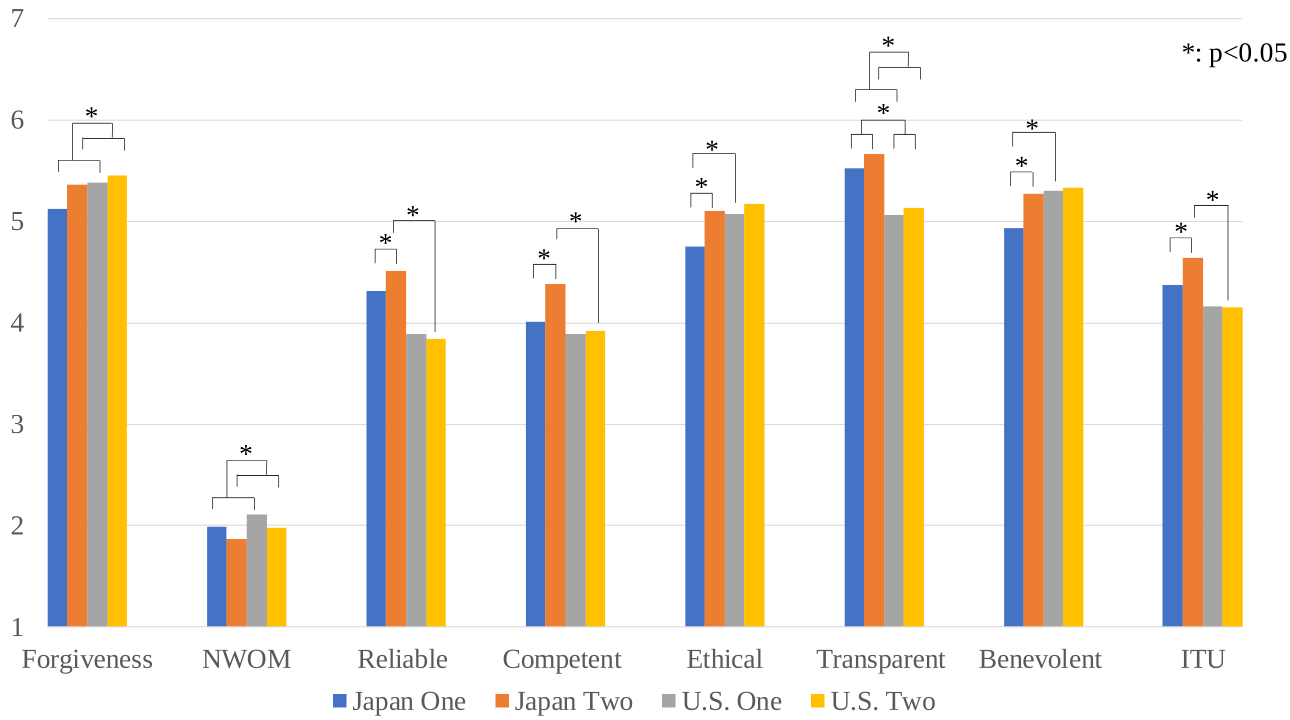

Figure 2. Questionnaire results of web-survey in Japan [22] and the U.S. One/two indicate that one or two robots apologized in the video stimuli.

E. *Participants*

In this study, 200 people living in the U.S. participated in our survey: 77 women, 121 men, and 2 who declined to specify gender, recruited via Amazon Mechanical Terk (AMT). Through a filtering process that checked invalid answers with missing data or the same value input for each question, we chose 122 valid participants (50 women, 71 men, 1 who declined to specify gender). All received a small compensation (<USD 5), regardless of the validity of their data.

Moreover, we used the data of 168 participants from our previous work [32] to compare the cultural differences between the two countries. The initial recruiting process identified 203 participants (101 women, 101 men, and 1 who declined to specify gender), a number winnowed by the screening process to 168 valid participants: 81 women, 86 men, and 1 who declined to specify. Note that the analysis results for the Japanese participants are identical as our previous work [32]; the novelty of this study lies in the comparison between Japan and the U.S.

III. Results

A. *Questionnaire results*

As shown in Fig. 2, we conducted a two-factor mixed-ANOVA with the *number* factor (*one* and *two*) and the *country* factor (*JP* and *US*) for the forgiveness scale. The results showed a significant main effect for the *number* factor ($F(1, 288) = 11.647$, $p < 0.001$, partial $\eta^2 = 0.039$), but not for the *country* factor ($F(1, 288) = 1.809$, $p = 0.180$, partial $\eta^2 = 0.006$) or the interaction effects ($F(1, 288) = 3.475$, $p = 0.063$, partial $\eta^2 = 0.012$).

We also conducted a two-factor mixed ANOVA with the *number* and *country* factors for the NWOM scale. The results showed a significant main effect for the *number* factor ($F(1, 288) = 8.800$, $p = 0.003$, partial $\eta^2 = 0.030$), but not for the *country* factor ($F(1, 288) = 0.803$, $p = 0.371$, partial $\eta^2 = 0.003$) or the interaction effects ($F(1, 288) = 0.004$, $p = 0.949$, partial $\eta^2 = 0.001$).

We also conducted a two-factor mixed ANOVA with the *number* and *country* factors for the reliable subscale. The results showed significant main effects in the *country* factor ($F(1, 288) = 18.0763$, $p < 0.001$, partial $\eta^2 = 0.059$) and the interaction effects ($F(1, 288) = 9.870$, $p = 0.002$, partial $\eta^2 = 0.002$), but not for the *number* factor ($F(1, 288) = 3.688$, $p = 0.056$, partial $\eta^2 = 0.013$). The simple main effects showed significant differences: *US* < *JP* in the *one* condition ($p = 0.002$), *US* < *JP* in the *two* condition ($p < 0.001$), and *one* < *two* in the *JP* condition ($p < 0.001$).

We also conducted a two-factor mixed ANOVA with the *number* and *country* factors for the competent subscale. The results showed significant main effects in the *number* factor ($F(1, 288) = 19.802$, $p < 0.001$, partial $\eta^2 = 0.064$), in the *country* factor ($F(1, 288) = 4.383$, $p = 0.037$, partial $\eta^2 = 0.015$), and in the interaction effects ($F(1, 288) = 13.580$, $p < 0.001$, partial $\eta^2 = 0.045$). The simple main effects showed significant differences: *US* < *JP* in the *two* condition ($p = 0.002$) and *one* < *two* in the *JP* condition ($p < 0.001$).

We also conducted a two-factor mixed ANOVA with the *number* and *country* factors for the ethical subscale. The results showed significant main effects in the *number* factor ($F(1, 288) = 34.014$, $p < 0.001$, partial $\eta^2 = 0.106$) and in the interaction effects ($F(1, 288) = 9.801$, $p = 0.002$, partial $\eta^2 = 0.033$), but not for the *country* factor ($F(1, 288) = 2.110$, $p =$

0.147, partial $\eta^2 = 0.007$). The simple main effects showed significant differences: *JP* < *US* in the *one* condition ($p = 0.023$) and *one* < *two* in the *JP* condition ($p = 0.023$).

We also conducted a two-factor mixed ANOVA with the *number* and *country* factors for the transparent subscale. The results showed significant main effects in the *number* factor ($F(1, 288) = 6.123$, $p = 0.014$, partial $\eta^2 = 0.021$) and in the *country* factor ($F(1, 288) = 17.178$, $p < 0.001$, partial $\eta^2 = 0.056$), but not for the interaction effects ($F(1, 288) = 0.842$, $p = 0.360$, partial $\eta^2 = 0.003$).

We also conducted a two-factor mixed ANOVA with the *number* and *country* factors for the benevolent subscale. The results showed significant main effects in the *number* factor ($F(1, 288) = 25.695$, $p < 0.001$, partial $\eta^2 = 0.082$) and the interaction effects ($F(1, 288) = 17.838$, $p < 0.001$, partial $\eta^2 = 0.058$), but not for the *country* factor ($F(1, 288) = 2.609$, $p = 0.107$, partial $\eta^2 = 0.009$). The simple main effects showed significant differences: *JP* < *US* in the *one* condition ($p < 0.001$) and *one* < *two* in the *JP* condition ($p < 0.001$).

We also conducted a two-factor mixed ANOVA with the *number* and *country* factors for the ITU subscale. The results showed significant main effects in the *number* factor ($F(1, 288) = 7.060$, $p = 0.008$, partial $\eta^2 = 0.024$), in the *country* factor ($F(1, 288) = 4.398$, $p = 0.037$, partial $\eta^2 = 0.015$), and in the interaction effects ($F(1, 288) = 7.980$, $p = 0.008$, partial $\eta^2 = 0.024$). The simple main effects showed significant differences: *US* < *JP* in the *two* condition ($p = 0.002$) and *one* < *two* in the *JP* condition ($p < 0.001$).

B. Summary

Our experimental results revealed similar and dissimilar trends in Japan and the U.S. Concerning the former, the results showed that both Japanese and American participants accepted the apologies from multiple robots more than from a single robot (forgiveness and NWOM scales). For the latter, the number of robots who apologized had less influence on the U.S. participants than their Japanese counterparts. Regardless of the transparent subscale, we found no significant effects in the number factor on the U.S. participants. Thus, our prediction is partially supported; apologies from multiple robots are more acceptable by both Japanese and American people in the context of forgiveness and the NWOM scales. On the other hand, unlike the Japanese, Americans are less influenced by the number of robots in the context of most of the trust scales.

IV. Discussion

A. Implication

In this study, we identified the difference between perceived feelings toward apologies from multiple robots. Although the perceptions of apologies vary from countries [47-50], experiment results with participants from two different countries provide evidence that apologies from multiple robots are more likely to be accepted in the wider cultures of the world. The results also provide additional evidence to support the effectiveness of multiple robots from different application perspectives (i.e., apologies).

Different perceptions of trust perspectives among countries are also interesting for developing more trustable robots worldwide. From a trust perspective, the number of robots is less effective for Americans compared to the Japanese. This result might reflect the differences between an individual-agency culture (the U.S.) and a collective-agency culture (Japan). In the former, apologies from another robot may have scant effect on the perception of the robot that made a mistake. On the other hand, in collective-agency cultures, apologies from another robot that belongs to the same group (e.g., working in the same shop) may have a more positive effect on the perception of the robot that dropped some food. In fact, a past study reported that the Japanese are more likely to apologize for failures in which they were not involved compared to the Americans. [48]. Therefore, Japanese participants might positively evaluate the secondary robot's apologies more than the American participants.

On the other hand, the U.S participants reported higher values when a single robot apologized in two parts of the trust subscales than the Japan participants: ethical and benevolent. This result suggests that multiple apologies from robots are less important in terms of trust for the U.S. participants. Japanese participants might have negative impressions because the secondary robot did not apologize with the primary robot. In other words, another interpretation is that the Japanese participants did not increase some of the trust subscales because two robots apologized; they decreased such subscales due to the lack of an apology from the secondary robot.

B. Limitation

This study has several limitations. First, since we only used a specific robot, i.e., Pepper, employing different robots, such as more human-like android robots [64, 65], would produce different results. We only investigated and compared the effects of multiple robot apologies in Japan and the U.S.; conducting a similar web survey in different countries would provide even more insightful knowledge about cultural differences to robot apologies.

V. Conclusion

This study investigated the cultural differences between Japan and the U.S. concerning the effects of apologies from multiple robots. We conducted a web survey with American participants living in the U.S. and compared the results with existing data gathered from Japanese participants. The experiment identified both similar and dissimilar trends in the perceptions toward robot apologies between the two countries. The participants of both countries accepted apologies from multiple robots more than apologies from a single robot in the context of the forgiveness and NWOM scales. But in the trust perspectives, the U.S participants were less influenced than the Japan participants. We believe that this knowledge will contribute to designing apology behaviors.

References

[1] Y. Jiang, and J. Wen, "Effects of COVID-19 on hotel marketing and management: a perspective article," *International Journal of Contemporary Hospitality Management*, 2020.

[2] S. S. Kim, J. Kim, F. Badu-Baiden, M. Giroux, and Y. Choi, "Preference for robot service or human service in hotels? Impacts of the COVID-19 pandemic," *International Journal of Hospitality Management*, vol. 93, pp. 102795, 2021.

[3] S. Song, J. Baba, Y. Okafuji, J. Nakanishi, Y. Yoshikawa, and H. Ishiguro, "Out for In! Empirical Study on the Combination Power of Two Service Robots for Product Recommendation," in Proceedings of the 2023 ACM/IEEE International Conference on Human-Robot Interaction, Stockholm, Sweden, pp. 408–416, 2023.

[4] T. Iwamoto, J. Baba, J. Nakanishi, K. Hyodo, Y. Yoshikawa, and H. Ishiguro, "Playful Recommendation: Sales Promotion That Robots Stimulate Pleasant Feelings Instead of Product Explanation," *IEEE Robotics and Automation Letters,* vol. 7, no. 4, pp. 11815-11822, 2022.

[5] M. Shiomi, K. Shinozawa, Y. Nakagawa, T. Miyashita, T. Sakamoto, T. Terakubo, H. Ishiguro, and N. Hagita, "Recommendation Effects of a Social Robot for Advertisement-Use Context in a Shopping Mall," *International Journal of Social Robotics*, vol. 5, no. 2, pp. 251-262, 2013.

[6] T. Kanda, M. Shiomi, Z. Miyashita, H. Ishiguro, and N. Hagita, "A communication robot in a shopping mall," *Robotics, IEEE Transactions on,* vol. 26, no. 5, pp. 897-913, 2010.

[7] P. Kong, H. Cornet, and F. Frenkler, "Personas and emotional design for public service robots: A case study with autonomous vehicles in public transportation," in 2018 international conference on cyberworlds (cw), pp. 284-287, 2018.

[8] M. Tonkin, J. Vitale, S. Herse, M.-A. Williams, W. Judge, and X. Wang, "Design methodology for the ux of hri: A field study of a commercial social robot at an airport," in Proceedings of the 2018 ACM/IEEE International Conference on Human-Robot Interaction, pp. 407-415, 2018.

[9] M. Shiomi, D. Sakamoto, T. Kanda, C. T. Ishi, H. Ishiguro, and N. Hagita, "Field Trial of a Networked Robot at a Train Station," *International Journal of Social Robotics,* vol. 3, no. 1, pp. 27-40, 2010.

[10] M. Shiomi, T. Kanda, H. Ishiguro, and N. Hagita, "Interactive Humanoid Robots for a Science Museum," *IEEE Intelligent Systems,* no. 2, pp. 25-32, 2007.

[11] P. K. Nikolić, and M. R. M. Tomari, "Robot-Robot Interaction, Toward New Conversational Artificial Intelligence Aesthetic," in 10th International Conference on Digital and Interactive Arts, Aveiro, Portugal, Portugal, pp. Article 15, 2022.

[12] A. Nijholt, "Robotic Stand-Up Comedy: State-of-the-Art," in Distributed, Ambient and Pervasive Interactions: Understanding Humans, Cham, pp. 391-410, 2018.

[13] T. Iio, Y. Yoshikawa, M. Chiba, T. Asami, Y. Isoda, and H. Ishiguro, "Twin-Robot Dialogue System with Robustness against Speech Recognition Failure in Human-Robot Dialogue with Elderly People," *Applied Sciences,* vol. 10, no. 4, pp. 1522, 2020.

[14] H. Sumioka, N. Yamato, M. Shiomi, and H. Ishiguro, "A minimal design of a human infant presence: a case study toward interactive doll therapy for older adults with dementia," *Frontiers in Robotics and AI,* vol. 8, pp. 633378, 2021.

[15] N. Yamato, H. Sumioka, H. Ishiguro, M. Shiomi, and Y. Kohda, "Technology Acceptance Models from Different Viewpoints of Caregiver, Receiver, and Care Facility Administrator: Lessons from Long-Term Implementation Using Baby-Like Interactive Robot for Nursing Home Residents with Dementia," *Journal of Technology in Human Services*, pp. 1-26, 2023.

[16] M. Natarajan, and M. Gombolay, "Effects of anthropomorphism and accountability on trust in human robot interaction," in Proceedings of the 2020 ACM/IEEE International Conference on Human-Robot Interaction, pp. 33-42, 2020.

[17] T. Law, and M. Scheutz, "Trust: Recent concepts and evaluations in human-robot interaction," *Trust in human-robot interaction*, pp. 27-57, 2021.

[18] C. Esterwood, and L. P. Robert, "A Literature Review of Trust Repair in HRI," in 2022 31st IEEE International Conference on Robot and Human Interactive Communication (RO-MAN), pp. 1641-1646, 2022.

[19] K. Okuoka, K. Enami, M. Kimoto, and M. Imai, "Multi-device trust transfer: Can trust be transferred among multiple devices?," *Frontiers in Psychology,* vol. 13, pp. 920844, 2022.

[20] F. Fossa, and I. Sucameli, "Gender bias and conversational agents: an ethical perspective on social robotics," *Science and Engineering Ethics,* vol. 28, no. 3, pp. 23, 2022.

[21] E. K. Duarte, M. Shiomi, A. Vinel, and M. Cooney, "Trust in Robot Self-Defense: People Would Prefer a Competent, Tele-Operated Robot That Tries to Help," in 2023 32nd IEEE International Conference on Robot and Human Interactive Communication (RO-MAN), pp. 2447-2453, 2023.

[22] S. Anjomshoae, A. Najjar, D. Calvaresi, and K. Främling, "Explainable agents and robots: Results from a systematic literature review," in 18th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2019), Montreal, Canada, May 13–17, 2019, pp. 1078-1088, 2019.

[23] T. Nomura, "Robots and gender," *Gender and the Genome,* vol. 1, no. 1, pp. 18-25, 2017.

[24] R. Wullenkord, and F. Eyssel, "Societal and ethical issues in HRI," *Current Robotics Reports,* vol. 1, pp. 85-96, 2020.

[25] M. Maroto-Gómez, F. Alonso-Martín, M. Malfaz, Á. Castro-González, J. C. Castillo, and M. Á. Salichs, "A Systematic Literature Review of Decision-Making and Control Systems for Autonomous and Social Robots," *International Journal of Social Robotics,* vol. 15, no. 5, pp. 745-789, 2023.

[26] H. Wagatsuma, and A. Rosett, "The implications of apology: Law and culture in Japan and the United States," *Law & Soc'y Rev.,* vol. 20, pp. 461, 1986.

[27] J. Abeler, J. Calaki, K. Andree, and C. Basek, "The power of apology," *Economics Letters,* vol. 107, no. 2, pp. 233-235, 2010.

[28] L. A. Martinez-Vaquero, T. A. Han, L. M. Pereira, and T. Lenaerts, "Apology and forgiveness evolve to resolve failures in cooperative agreements," *Scientific reports,* vol. 5, no. 1, pp. 1-12, 2015.

[29] Y. Ohtsubo, M. Matsunaga, T. Himichi, K. Suzuki, E. Shibata, R. Hori, T. Umemura, and H. Ohira, "Costly group apology communicates a group's sincere "intention"," *Social Neuroscience,* vol. 15, no. 2, pp. 244-254, 2020.

[30] T. A. Han, L. M. Pereira, F. C. Santos, and T. Lenaerts, "Why is it so hard to say sorry? evolution of apology with commitments in the iterated Prisoner's Dilemma," in Proceedings of the Twenty-Third international joint conference on Artificial Intelligence, pp. 177-183, 2013.

[31] T. Han, L. Pereira, F. Santos, and T. Lenaerts, "Why is it so hard to say sorry," in BNAIC 2013: Proceedings of the 25th Benelux Conference on Artificial Intelligence, Delft, The Netherlands, November 7-8, pp. 4-9, 2013.

[32] Y. Okada, M. Kimoto, T. Iio, K. Shimohara, and M. Shiomi, "Two is better than one: Apologies from two robots are preferred," *Plos one,* vol. 18, no. 2, pp. e0281604, 2023.

[33] M. Shiomi, "A systematic survey of multiple social robots as a passive- and interactive-social medium," *Advanced Robotics,* pp. 1-15, 2023.

[34] H. Itahara, M. Kimoto, T. Iio, K. Shimohara, and M. Shiomi, "How Does Exposure to Changing Opinions or Reaffirmation Opinions Influence the Thoughts of Observers and Their Trust in Robot Discussions?," *Applied Sciences,* vol. 13, no. 1, pp. 585, 2023.

[35] J. Nakanishi, I. Kuramoto, J. Baba, K. Ogawa, Y. Yoshikawa, and H. Ishiguro, "Continuous Hospitality with Social Robots at a hotel," *SN Applied Sciences,* vol. 2, no. 3, pp. 452, 2020.

[36] M. Aizawa, and H. Umemuro, "Behavioral Design of Guiding Agents to Encourage their Use by Visitors in Public Spaces," in Companion of the 2021 ACM/IEEE International Conference on Human-Robot Interaction, Boulder, CO, USA, pp. 247–251, 2021.
[37] M. Alemi, A. Taheri, A. Shariati, and A. Meghdari, "Social Robotics, Education, and Religion in the Islamic World: An Iranian Perspective," *Science and Engineering Ethics,* vol. 26, no. 5, pp. 2709-2734, 2020.
[38] M. Shiomi, S. Okumura, M. Kimoto, T. Iio, and K. Shimohara, "Two is better than one: Social rewards from two agents enhance offline improvements in motor skills more than single agent," *PloS one,* vol. 15, no. 11, pp. e0240622, 2020.
[39] M. Shiomi, Y. Tamura, M. Kimoto, T. Iio, R. Akahane-Yamada, and K. Shimohara, "Two is better than one: verification of the effect of praise from two robots on pre-school children's learning time," *Advanced Robotics,* vol. 35, no. 19, pp. 1132-1144, 2021.
[40] M. Shiomi, and N. Hagita, "Do Synchronized Multiple Robots Exert Peer Pressure?," in Proceedings of the Fourth International Conference on Human Agent Interaction, Biopolis, Singapore, pp. 27-33, 2016.
[41] M. Shiomi, and N. Hagita, "Do the number of robots and the participant's gender influence conformity effect from multiple robots?," *Advanced Robotics,* vol. 33, no. 15-16, pp. 756-763, 2019.
[42] M. Hashemian, A. Paiva, S. Mascarenhas, P. A. Santos, and R. Prada, "The power to persuade: a study of social power in human-robot interaction," in 2019 28th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN), pp. 1-8, 2019.
[43] J. Amada, Y. Okafuji, K. Matsumura, J. Baba, and J. Nakanishi, "Investigating the crowd-drawing effect, on passersby, of pseudo-crowds using multiple robots," *Advanced Robotics,* vol. 37, no. 6, pp. 423-432, 2023.
[44] M. Shiomi, R. Hayashi, and H. Nittono, "Is two cuter than one? number and relationship effects on the feeling of kawaii toward social robots," *PLOS ONE,* vol. 18, no. 10, pp. e0290433, 2023.
[45] Y. Okada, R. Taniguchi, A. Tatsumi, M. Okubo, M. Kimoto, T. Iio, K. Shimohara, and M. Shiomi, "Effects of Touch Behaviors and Whispering Voices in Robot-Robot Interaction for Information Providing Tasks," in 2020 29th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN), pp. 7-13, 2020.
[46] T. Hirayama, Y. Okada, M. Kimoto, T. Iio, K. Shimohara, and M. Shiomi, "Speed effects in touching behaviours: impact on perceived relationships in robot-robot interactions," *Advanced Robotics*, pp. 1-18.
[47] N. Sugimoto, "A Japan-US comparison of apology styles," *Communication Research,* vol. 24, no. 4, pp. 349-369, 1997.
[48] W. W. Maddux, P. H. Kim, T. Okumura, and J. M. Brett, "Cultural differences in the function and meaning of apologies," *International negotiation,* vol. 16, no. 3, pp. 405-425, 2011.
[49] R. Gee, and Y. Murata, "Comparing Malaysian apologies and responses to accusations with those of Japanese, British and Canadians: what is Malaysian pragmatic style?," *Asian Englishes,* vol. 16, no. 1, pp. 19-31, 2014.
[50] N. Isagozawa, and K. Fuji, "An Exploratory Study of Cultural Differences in Behavior and Intentions in Workplace Apologies: With the Perspective of Responsibility," *Japanese Psychological Research*, 2023.
[51] A. M. Velentza, D. Heinke, and J. Wyatt, "Human Interaction and Improving Knowledge through Collaborative Tour Guide Robots," in 2019 28th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN), pp. 1-7, 2019.
[52] A.-M. Velentza, N. Fachantidis, and S. Pliasa, "Which One? Choosing Favorite Robot After Different Styles of Storytelling and Robots' Conversation," *Frontiers in Robotics and AI,* vol. 8, 2021.
[53] P. Wicke, and T. Veale, "The Show Must Go On: On the Use of Embodiment, Space and Gesture in Computational Storytelling," *New Generation Computing,* vol. 38, no. 4, pp. 565-592, 2020.
[54] P. K. Nikolic, and H. Yang, "Artificial Intelligence Clone Generated Content toward Robot Creativity and Machine Mindfulness," *Mobile Networks and Applications,* vol. 25, no. 4, pp. 1504-1513, 2020.
[55] J. Swaminathan, S. Jujjuri, and H. Knight, "Using Street-Performance Style Robot Comedians To Attract Audiences For HRI Studies," *Workshop on Performing Art Robots & Technologies (PAR-T) at International Conference of Robots and Systems*, 2020.
[56] X. Z. Tan, S. Reig, E. J. Carter, and A. Steinfeld, "From one to another: how robot-robot interaction affects users' perceptions following a transition between robots," in Proceedings of the 14th ACM/IEEE International Conference on Human-Robot Interaction, Daegu, Republic of Korea, pp. 114–122, 2020.
[57] N. Salomons, M. v. d. Linden, S. S. Sebo, and B. Scassellati, "Humans Conform to Robots: Disambiguating Trust, Truth, and Conformity," in Proceedings of the 2018 ACM/IEEE International Conference on Human-Robot Interaction, Chicago, IL, USA, pp. 187–195, 2018.
[58] Y. Tamura, M. Shiomi, M. Kimoto, T. Iio, K. Shimohara, and N. Hagita, "Robots as an interactive-social medium in storytelling to multiple children," *Interaction Studies,* vol. 22, no. 1, pp. 110-140, 2021.
[59] R. Casidy, and H. Shin, "The effects of harm directions and service recovery strategies on customer forgiveness and negative word-of-mouth intentions," *Journal of Retailing and Consumer Services,* vol. 27, pp. 103-112, 2015.
[60] B. F. Malle, and D. Ullman, "A multi-dimensional conception and measure of human-robot trust," *Trust in Human-Robot Interaction,* pp. 3, 2020.
[61] M. Heerink, K. Ben, V. Evers, and B. Wielinga, "The influence of social presence on acceptance of a companion robot by older people," *Journal of Physical Agents,* vol. 2, no. 2, pp. 33-40, 2008.
[62] J. S. Downs, M. B. Holbrook, S. Sheng, and L. F. Cranor, "Are your participants gaming the system? screening mechanical turk workers," in Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Atlanta, Georgia, USA, pp. 2399–2402, 2010.
[63] D. M. Oppenheimer, T. Meyvis, and N. Davidenko, "Instructional manipulation checks: Detecting satisficing to increase statistical power," *Journal of experimental social psychology,* vol. 45, no. 4, pp. 867-872, 2009.
[64] D. F. Glas, T. Minato, C. T. Ishi, T. Kawahara, and H. Ishiguro, "Erica: The erato intelligent conversational android," in Robot and Human Interactive Communication (RO-MAN), 2016 25th IEEE International Symposium on, New York, NY, United States, pp. 22-29, 2016.
[65] M. Shiomi, H. Sumioka, K. Sakai, T. Funayama, and T. Minato, "SŌTO: An Android Platform with a Masculine Appearance for Social Touch Interaction," in Companion of the 2020 ACM/IEEE International Conference on Human-Robot Interaction, Cambridge, United Kingdom, pp. 447–449, 2020.