Exploring the Influence of Co-Present and Remote Robots on Persuasiveness and Perception of Politeness

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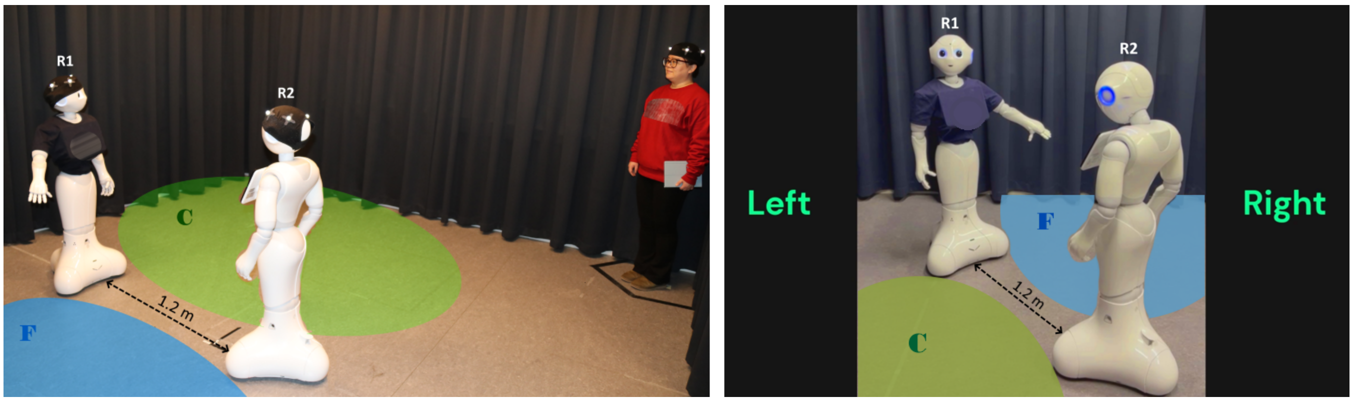

Figure 1: (left) a participant is standing at the initial location in the *co-present* condition; (right) a participant is watching a video of the robots in the *remote* condition. In both conditions, R1 invites them to join the group at the *furthest* side *F* by conducting verbal and non-verbal behaviors. *Closest* (green area, *C*) and *furthest* sides (blue area, *F*) are marked. The "Left" and "Right" markers in green (right figure) were included in the videos to disambiguate participants' perspective of the side to join.

ABSTRACT

Politeness is a crucial aspect of human social interactions. While the influence of politeness is well understood in human groups, it remains underexplored in group interactions with robots. Therefore, in this paper, we conduct an initial exploration into the influence of the presence of humanoid robots on their persuasiveness and perceived politeness in small groups. We conducted a user study (N = 119) with co-present and remote robots that invited participants to join the group using six politeness behaviors derived from Brown and Levinson's politeness theory. It requests participants to join them at the furthest side of the group, even though a closer side is also available to them, but would ignore the robot's request. The results show that co-present robots are perceived to be less persuasive than remote ones. However, co-presence enhances the clarity of the robot's requests and the perceived freedom of action while decreasing the perceived friendliness and offensiveness.

CCS CONCEPTS

• **Human-centered computing** → **User studies**; **Empirical studies in HCI**; **Empirical studies in interaction design**.

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KEYWORDS

Presence; Persuasiveness; Politeness; Human-Robot Interaction; Free-standing conversational groups

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1 INTRODUCTION

Politeness is a crucial element of human social interactions, as it plays a vital role in shaping individuals' decisions and fostering positive relationships. According to Brown and Levinson's research [5], politeness refers to the effort to prevent or mitigate actions that could harm an individual's public self-image or "face" [9]. In the Human-Robot Interaction (HRI) context, designing polite behaviors for humanoid robots helps to create positive impressions for users. To join a group politely, a newcomer should consider the group dynamics [15] and the personal space of each member [12]. Generally, when a group member invites a newcomer to join the group, the choice of politeness strategies can significantly affect the execution of the invitation and its level of persuasiveness and perceived politeness since that invitation can be perceived as a face-threatening act. Persuasion involves influencing beliefs, attitudes, or behaviors through communication to convince others to adopt a specific viewpoint, take action, or make a decision [8].

In our scenario, a robot seeks to persuade participants to join an inconvenient side of a group that they might not choose without the persuasive attempt. While these dynamics are well understood in human groups, they remain underexplored in group interactions with robots.

Previous work has shown that the *presence* of artificial agents, whether they are physically embodied such as robots or exist virtually like virtual agents, is significant in interactions between humans and agents [4, 18, 34]. A robot that shares the same physical space as the user is referred to as "*copresent*" and a robot that is displayed through a live or recorded video feed on a screen or projection is referred to as "*remote*" [18, 35]. Understanding the impact of presence on social interaction is important for a number of applications, for example, determining what social interaction behaviors can be evaluated or designed without a present physical robot platform, which may be difficult or costly to transport. Specifically, in this study, we work towards determining the potential influence of robots' *presence* on their ability to effectively communicate their requests as well as how their requests are perceived by humans in terms of their *politeness*.

In this paper, we undertake an initial investigation to examine the impact of *presence* of humanoid robots on their *persuasiveness* and the perception of *politeness* of their requests. We conducted a controlled experiment with co-present (Figure 1 left) and remote (Figure 1 right) robot experiences, in which participants were invited by a Pepper robot to join a group of two Pepper robots at the *furthest* side of the group (from the participant's perspective) using different politeness behaviors. Our results show that *co-present* robots are not as *persuasive* as *remote*. However, *copresence* improved the *clarity* of the robot's requests and the perceived freedom of action (i.e., *negative face*) while reducing the robot's perceived friendliness (i.e., *positive face*) and offensiveness *(i.e., face loss)*.

2 RELATED WORK

Brown and Levinson [5] have identified five strategies for communicating needs while minimizing face-threatening acts: not doing the act (NOT), *off-record* or *indirect* (IND), using indirect language; *negative politeness* (NEG), focusing on avoiding imposition; *positive politeness* (POS), emphasizing friendliness; and *bald on-record* or *direct* (DIR), using clear and direct language. Our design for this study was based on these strategies, and we utilized them to create six distinct combinations of verbal and non-verbal behaviors, which will be elaborated on later. Several studies have also investigated how individuals regulate their personal space within a group, with Kendon's [15] theory of "F-formation" describing the spatial organization of a group engaged in a face-to-face conversation where all members have unobstructed and equal access to the space. One of the main concepts of this study is how humans apply this concept to a group of robots when joining it.

Previous work has explored social behaviors and norms in individual or group scenarios [2, 6, 24, 30], aiming to understand how humans interact with robots and how these interactions can be improved to enhance the user experience. These studies have examined the impact of social cues such as gaze [1], facial expressions [16], and body posture on users' perceptions of robots' social presence and their willingness to interact with them [26, 28]. Other studies have focused on investigating the role of robot behavior's role in shaping users' attitudes and behaviors toward them, such as politeness. Overall, the research in HRI has shown that social behaviors and norms play a critical role in shaping the human-robot interaction and that incorporating such elements into robot design can enhance the user experience and promote positive attitudes towards robots [19, 29, 31, 32]. Moreover, similar studies have been conducted to investigate the impact of the politeness of humanoid agents on the trajectories taken by human participants when joining a group of humanoids and the persuasiveness of those strategies [14, 36, 38–40]. In experimental studies, the term "presence" refers to how an agent, such as a robot, is presented to participants. According to Zhao et al., [35], an agent is considered to be "*copresent*" when it shares the same physical space as the user. In contrast, an agent displayed on a screen or projection using a video feed is referred to as "*remote*". This presence aspect can significantly affect the participants' perception and reaction toward the agent and must be considered in designing HRI studies.

3 METHODOLOGY

We conducted a controlled experiment to investigate the influence of robots' presence and politeness on users' behavior. Therefore, for this experiment, we had the following research question: *How does a robot's physical and remote presence influence its persuasiveness and users' perception of its politeness?*

The experiment was designed with two independent variables: (1) robot's *presence* (between-subject) and (2) *politeness* behaviors (within-subject). The *presence* contained two levels: (1) co-present with a robot physically placed in a room and (2) remote with a robot being observed remotely via a video. The *co-present* condition involved two Pepper robots placed at the center of a motion capture (MoCap) room (5.2 x 4.4 m) (Figure 1 left). Although the participants were given information that the robots were controlled automatically, they were controlled by a human using the Wizard of Oz methodology [23], which was shared with the participant during the debriefing. Participants started each trial at a distance (6 meters) from the group center and when the robot invited them to join their group, they were free to move in the environment. In each trial, the participant's initial location was switched between the right-hand side and left-hand side of the group. The *remote* condition involved pre-recorded videos of two Pepper robots placed at the center of the MoCap room, and the participant's task was to watch each video and decide where they wanted to join in after watching each video (Figure 1 right).

The *politeness* behaviors of the robot included six levels (Table 1). Participants experienced all six behaviors as experimental conditions for one level of presence in a counterbalanced order created using a Balanced Latin Square. The primary robot (R1) faced participants and invited them to join the group using a combination of verbal and non-verbal politeness behaviors. R1 always invited participants from their viewpoint at the *furthest* side of the group, except in the BSL condition. R1 also maintained eye contact with the participant throughout the whole experiment.

After obtaining informed consent, we collected participants' demographic data and provided a brief overview of the experimental procedures. We introduced participants to the MoCap room and

Table 1: Robot's behaviors and their associated politeness strategies, verbal and nonverbal behaviors derived from the theory. Nonverbal behaviors: open palm up (UP), open palm sideways (SIDE), open palm sideways and partly downwards (DOWN), pointing directly at a specific place with a straight arm (POINT).

Behavior	Strategy	Verbal	Nonverbal
Baseline (BSL)	NOT	None	None
Indirect (IND)	IND	"Welcome back!"	UP
Asking (ASK)	NEG	"Would you like to come here?"	SIDE
Proposing (PRO)	POS	"This place is waiting for you!"	DOWN
Commanding (CMD)	DIR	"Come here!"	POINT
Pointing (PNT)	DIR	None	POINT

the robots and provided them with a tablet to provide feedback at each trial's end. They had to start at the initial location at the beginning of each trial, looking at the group of robots in front of them and hearing a beep signal. After joining the group, the participant answered the following questions using a 7-point Likert scale (1 –"strongly disagree", 7 – "strongly agree"):

(1) **"I could precisely understand the robot's wants."** This question was intended to assess the *clarity* of the robot's requests.
(2) **"I got offended by the robot's action."** This question was designed to measure the degree of *face loss* or *offensiveness* of the robot's requests.
(3) **"The robot wanted to increase intimacy with me."** This question aimed to determine the level of *satisfaction of a positive face*, which relates to friendly or warm behavior.
(4) **"The robot respected my freedom of action."** This question was designed to evaluate the level of *satisfaction of a negative face*, which relates to respecting the other's choice, freedom of action, or cold behavior.

For the conditions with co-present robots, we recruited 59 participants (32 F, 27 M), aged between 19 and 63 (32 ± 10) and proficient in English were recruited from the general public in Sweden. Sixteen had no previous knowledge or familiarity with AI systems (robots, virtual agents), 32 had basic, and 11 had intermediate or advanced familiarity with AI systems.

For the conditions with remote robots, we recruited 60 participants (28 F, 32 M), aged between 18 and 58 (32 ± 9) and proficient in English were recruited online from the general public using QuestionnairePro[1]. Sixteen participants had no previous knowledge or familiarity with AI systems (robots, virtual agents), 34 had basic, and 10 had intermediate or advanced familiarity with AI systems.

4 RESULTS

We found that co-present robots are less persuasive than remote. Moreover, co-presence improved the clarity of the robot's requests

[1]https://www.questionpro.com/

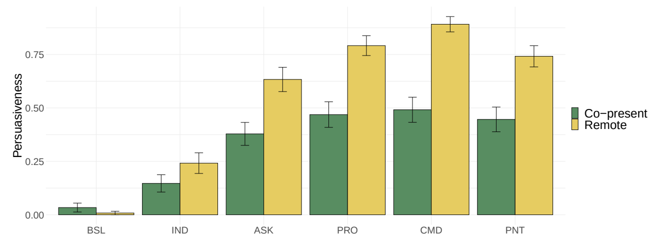

Figure 2: Persuasiveness of the robot's request in both experimental conditions and their associated politeness behaviors.

and the perceived freedom of action while reducing the robot's perceived friendliness and offensiveness. For the data analysis, we used mixed repeated measures ANOVA.

4.1 Persuasiveness

Overall, there was a significant main effect of *presence* of the robots on *Persuasiveness* (F (1, 117) = 21.546, $p < 0.001$). Our results suggested that the *co-present* robots were significantly less successful in persuading participants to join the group at the furthest side than the *remote* robots. Figure 2 provides a detailed illustration of *persuasiveness*, including both experimental conditions and their corresponding associated politeness behaviors.

4.2 Politeness

Figure 3 illustrates the results regarding the *perceived politeness* of the robots. Overall, there was a significant main effect of *presence* of the robots on *Clarity* (F (1, 117) = 17.321, $p < 0.001$). Our results suggested that *co-presence* of the robots significantly enhanced the clarity of the robot's requests. Moreover, there was a significant main effect of *presence* of the robots on *Face loss* (F (1, 117) = 11.137, $p = 0.001$). Our results suggested that *co-present* robots were seen as the most effective in minimizing the loss of face for participants. Additionally, there was a significant main effect of *presence* of the robots on *Positive face* (F (1, 117) = 24.753, $p < 0.001$). Our results suggested that the requests from the *co-present* robots were perceived as less friendly in comparison to the ones from the *remote* robots. Lastly, there was a significant main effect of *presence* of the robots on *Negative face* (F (1, 117) = 43.311, $p < 0.001$). Our results suggested that *co-present* robots made the participants feel less constrained in terms of their freedom of action.

5 DISCUSSION & FUTURE WORK

Although the requests from the *co-present* robots were perceived as significantly clearer, co-present robots showed a lower success rate in persuading participants to join the group at the *furthest* location compared to the *remote*. This contradicts the findings of several studies in the literature [4, 18, 34], which indicate that robots have more influence physically than remotely. Participants were more easily persuaded to join the group at the furthest side with remote robots, as they did not need to exert themselves to reach that location physically. However, the persuasion rate significantly declined when participants were required to walk to the location in the *co-present* condition. Consistent with psychological research [13], participants will likely choose options requiring less effort

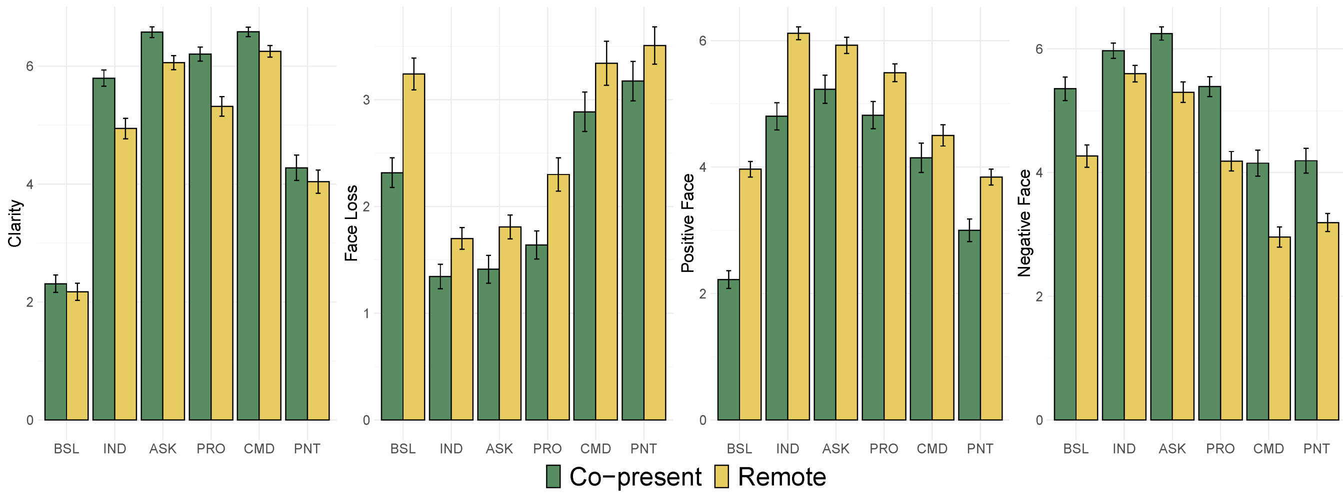

Figure 3: Perceived politeness of the robot's request in both experimental conditions and their associated politeness behaviors. Note that only in the particular case of the *Face loss,* lower values are preferred.

when presented with similar rewards. The results of this study have significant implications for the development of persuasive systems [20], as it suggests that mere physical presence alone may not always lead to positive responses from participants. Moreover, it highlights the necessity of considering additional factors such as *effort* in the equation.

Consistent with previous studies [4, 18, 34], our findings indicate that physical presence enhances the clarity of robot requests. Specifically, when the robots were physically present, participants perceived the requests more clearly. Additionally, the presence of robots made participants feel less restricted and more free to decide how they wanted to join the group. The decreased persuasiveness of robots in the *co-present* condition may also be due to the participants' sense of greater freedom and less constraint in their decision about where to join the group. The robots in the *remote* condition showed a higher level of perceived friendliness, i.e., positive face, while a higher level of offensiveness, i.e., face loss. It shows the contraction in the literature towards online and digital communication versus face-to-face. Some studies have found that digital communication can evoke more negative emotions compared to in-person interactions [3, 21]. In contrast, others showed paradoxical, i.e., positive and negative, outcomes of online communications [17]. Consistent with their results, Roos [25] found that extroverts and individuals with more social support had better outcomes when using social media. In comparison, introverts and those with less support had worse outcomes. This shows the potential impact of personality on digital communication. Moreover, several studies [10, 11] have investigated politeness in communication and found that perceptions of politeness can differ between cyber and in-person communication.

The concept of politeness, whether verbally, non-verbally, or through para-verbal behavior, may be defined differently across various cultures and personalities. Participants' interpretations of politeness in terms of clarity, loss of face, positive face, and negative face may differ significantly. Hence, there is a question about whether the findings from this study can be generalized across cultures. Moreover, several studies have shown that robot embodiment [7, 33], and its motion [27] impact human-robot interaction. This embodiment allows robots to convey emotions, intentions, and social cues through nonverbal cues such as facial expressions, gestures, and body language. We utilized the Pepper robot, which has a specific embodiment and range of motions and voice. This factor may have influenced our results, as the robot embodiment can affect how humans perceive and interact with it. Thus, future research should explore the influence of agent embodiment, i.e., robot or virtual agent, on the perception of politeness and persuasiveness of the agent. Lastly, the *remote* condition constrained participant movement within the environment, prompting future research in telepresence experiments to simulate participant mobility.

6 CONCLUSION

We explored the impact of *presence* on humanoid robot's *persuasiveness* and *politeness* in a small group scenario. The results showed that while *copresent* robots were perceived to be less persuasive than *remote* ones, *copresence* enhanced the clarity of the robot's requests and the perceived freedom of action while decreasing the perceived friendliness and offensiveness. Overall, the study's findings contribute to our understanding of the complex dynamics involved in human-robot interactions within small groups, and they highlight the importance of further research on the influence of presence and politeness on the persuasive abilities of humanoid robots, and perceived politeness for building rapport and long-term collaborations in various scenarios like education [37] or healthcare [22]. The results of this study fit into a broader context of research we are engaged in to determine which aspects of human-robot social interaction may be robustly investigated or designed via video or virtual reality demonstrations without the immediate need for present physical robot embodiments.

REFERENCES

[1] Julius Albiz, Olga Viberg, and Andrii Matviienko. 2023. Guiding Visual Attention on 2D Screens: Effects of Gaze Cues from Avatars and Humans. In *Proceedings of the 2023 ACM Symposium on Spatial User Interaction (SUI '23)*. Association for Computing Machinery, New York, NY, USA, Article 4, 9 pages.

[2] Philipp Althaus, Hiroshi Ishiguro, Takayuki Kanda, Takahiro Miyashita, and Henrik Iskov Christensen. 2004. Navigation for human-robot interaction tasks. In *IEEE International Conference on Robotics and Automation, 2004. Proceedings. ICRA '04. 2004*. IEEE, 1894–1900 Vol.2.

[3] Young Min Baek, Magdalena Wojcieszak, and Michael X Delli Carpini. 2012. Online versus face-to-face deliberation: Who? Why? What? With what effects? *New media & society* 14, 3 (2012), 363–383.

[4] Wilma A Bainbridge, Justin W Hart, Elizabeth S Kim, and Brian Scassellati. 2011. The benefits of interactions with physically present robots over video-displayed agents. *International Journal of Social Robotics* 3 (2011), 41–52.

[5] Penelope Brown and Stephen C. Levinson. 1978. *Universals in language usage: Politeness phenomena* (3 ed.). Cambridge University Press, 56–311.

[6] Filipa Correia, Samuel F Mascarenhas, Samuel Gomes, Patrícia Arriaga, Iolanda Leite, Rui Prada, Francisco S Melo, and Ana Paiva. 2019. Exploring prosociality in human-robot teams. In *2019 14th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 143–151.

[7] Eric Deng, Bilge Mutlu, Maja J Mataric, et al. 2019. Embodiment in socially interactive robots. *Foundations and Trends® in Robotics* 7, 4 (2019), 251–356.

[8] B.J. Fogg. 2003. *Persuasive Technology: Using Computers to Change What We Think and Do.* Morgan Kaufmann Publishers Inc., San Francisco, CA, USA.

[9] Erving Goffman. 1967. *On Face Work.* 5–45.

[10] Sage Lambert Graham. 2007. Disagreeing to agree: Conflict,(im) politeness and identity in a computer-mediated community. *Journal of pragmatics* 39, 4 (2007), 742–759.

[11] Sage L Graham and Claire Hardaker. 2017. (Im) politeness in digital communication. *The Palgrave handbook of linguistic (im) politeness* (2017), 785–814.

[12] E. T. Hall. 1966. *The hidden dimension.* Vol. 609. Garden City, NY: Doubleday.

[13] C. L. Hull. 1943. *Principles of behavior.* Vol. 422. Appleton-century-crofts New York.

[14] Alessandro Iop, Sahba Zojaji, and Christopher Peters. 2022. Don't walk between us: adherence to social conventions when joining a small conversational group of agents. In *Proceedings of the 22nd ACM International Conference on Intelligent Virtual Agents.* 1–8.

[15] A. Kendon. 1990. *Conducting interaction: Patterns of behavior in focused encounters.* Vol. 7. CUP Archive.

[16] Simon Kimmel, Frederike Jung, Andrii Matviienko, Wilko Heuten, and Susanne Boll. 2023. Let's Face It: Influence of Facial Expressions on Social Presence in Collaborative Virtual Reality. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (CHI '23)*. Association for Computing Machinery, New York, NY, USA, Article 429, 16 pages.

[17] Robert Kraut, Sara Kiesler, Bonka Boneva, Jonathon Cummings, Vicki Helgeson, and Anne Crawford. 2002. Internet paradox revisited. *Journal of social issues* 58, 1 (2002), 49–74.

[18] Jamy Li. 2015. The benefit of being physically present: A survey of experimental works comparing copresent robots, telepresent robots and virtual agents. *International Journal of Human-Computer Studies* 77 (May 2015), 23–37. https://doi.org/10.1016/j.ijhcs.2015.01.001

[19] Margot M. E. Neggers, Raymond H. Cuijpers, Peter A. M. Ruijten, and Wijnand A. IJsselsteijn. 2022. Determining Shape and Size of Personal Space of a Human when Passed by a Robot. *International Journal of Social Robotics* 14, 2 (Mar 2022), 561–572.

[20] Harri Oinas-Kukkonen and Marja Harjumaa. 2009. Persuasive systems design: Key issues, process model, and system features. *Communications of the association for Information Systems* 24, 1 (2009), 28.

[21] Roy Pea, Clifford Nass, Lyn Meheula, Marcus Rance, Aman Kumar, Holden Bamford, Matthew Nass, Aneesh Simha, Benjamin Stillerman, Steven Yang, et al. 2012. Media use, face-to-face communication, media multitasking, and social well-being among 8-to 12-year-old girls. *Developmental psychology* 48, 2 (2012), 327.

[22] Simon Provoost, Ho Ming Lau, Jeroen Ruwaard, and Heleen Riper. 2017. Embodied conversational agents in clinical psychology: a scoping review. *Journal of medical Internet research* 19, 5 (2017), e151.

[23] Laurel D Riek. 2012. Wizard of oz studies in hri: a systematic review and new reporting guidelines. *Journal of Human-Robot Interaction* 1, 1 (2012), 119–136.

[24] Jorge Rios-Martinez, Anne Spalanzani, and Christian Laugier. 2015. From proxemics theory to socially-aware navigation: A survey. *International Journal of Social Robotics* 7 (2015), 137–153.

[25] John Magnus Roos. 2023. The Intersection of Personality Traits and Social Media Usage: Large-Scale Representative Samples of Internet Users in Sweden. *Psych* 5, 1 (2023), 70–79.

[26] Kerstin Ruhland, Christopher E Peters, Sean Andrist, Jeremy B Badler, Norman I Badler, Michael Gleicher, Bilge Mutlu, and Rachel McDonnell. 2015. A review of eye gaze in virtual agents, social robotics and hci: Behaviour generation, user interaction and perception. In *Computer graphics forum*, Vol. 34. Wiley Online Library, 299–326.

[27] Martin Saerbeck and Christoph Bartneck. 2010. Perception of affect elicited by robot motion. In *2010 5th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 53–60.

[28] Thomas B Sheridan. 2020. A review of recent research in social robotics. *Current opinion in psychology* 36 (2020), 7–12.

[29] Sam Thellman, Annika Silvervarg, Agneta Gulz, and Tom Ziemke. 2016. Physical vs. virtual agent embodiment and effects on social interaction. In *Intelligent Virtual Agents: 16th International Conference, IVA 2016, Los Angeles, CA, USA, September 20–23, 2016, Proceedings 16*. Springer, 412–415.

[30] X. T. Truong and T. D. Ngo. 2018. "To approach humans?": A unified framework for approaching pose prediction and socially aware robot navigation. *IEEE Transactions on Cognitive and Developmental Systems* 10, 3 (2018), 557–572.

[31] Anna-Lisa Vollmer, Katrin Solveig Lohan, Kerstin Fischer, Yukie Nagai, Karola Pitsch, Jannik Fritsch, Katharina J. Rohlfing, and Britta Wredek. 2009. People modify their tutoring behavior in robot-directed interaction for action learning. In *2009 IEEE 8th International Conference on Development and Learning*. IEEE, Shanghai, China, 1–6.

[32] Anna-Lisa Vollmer, Robin Read, Dries Trippas, and Tony Belpaeme. 2018. Children conform, adults resist: A robot group induced peer pressure on normative social conformity. *Science Robotics* 3, 21 (2018).

[33] Joshua Wainer, David J Feil-Seifer, Dylan A Shell, and Maja J Mataric. 2006. The role of physical embodiment in human-robot interaction. In *ROMAN 2006-The 15th IEEE International Symposium on Robot and Human Interactive Communication*. IEEE, 117–122.

[34] Agnieszka Wykowska. 2021. Robots as mirrors of the human mind. *Current Directions in Psychological Science* 30, 1 (2021), 34–40.

[35] Shanyang Zhao. 2003. Toward a taxonomy of copresence. *Presence* 12, 5 (2003), 445–455.

[36] Sahba Zojaji, Adrian Benigno Latupeirissa, Iolanda Leite, Roberto Bresin, and Christopher Peters. 2023. Persuasive Polite Robots in Free-Standing Conversational Groups. In *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. 4006–4013.

[37] Sahba Zojaji and Christopher Peters. 2019. Towards Virtual Agents for Supporting Appropriate Small Group Behaviors in Educational Contexts. In *2019 11th International Conference on Virtual Worlds and Games for Serious Applications (VS-Games)*. 1–2. https://doi.org/10.1109/VS-Games.2019.8864528

[38] Sahba Zojaji, Christopher Peters, and Catherine Pelachaud. 2020. Influence of virtual agent politeness behaviors on how users join small conversational groups. In *Proceedings of the 20th ACM International Conference on Intelligent Virtual Agents*. ACM, 1–8. https://doi.org/10.1145/3383652.3423917

[39] Sahba Zojaji, Anthony Steed, and Christopher Peters. 2023. Impact of Immersiveness on Persuasiveness, Politeness, and Social Adherence in Human-Agent Interactions within Small Groups. In *ICAT-EGVE 2023 - International Conference on Artificial Reality and Telexistence and Eurographics Symposium on Virtual Environments*, Jean-Marie Normand, Maki Sugimoto, and Veronica Sundstedt (Eds.). The Eurographics Association.

[40] Sahba Zojaji, Adam Červeň, and Christopher Peters. 2023. Impact of Multimodal Communication on Persuasiveness and Perceived Politeness of Virtual Agents in Small Groups. In *Proceedings of the 23rd ACM International Conference on Intelligent Virtual Agents (IVA '23)*. Association for Computing Machinery, New York, NY, USA, Article 18, 8 pages.