“Who Owns the Robot Matters!” – How Robot Ownership Shapes Belonging and Social Roles in Human Groups

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Abstract

Robot ownership is not merely a background characteristic but a potentially salient social signal. When robots mediate group interaction, ownership may quietly reorganize power, trust, and cohesion. In this study, participants (n = 225) watched one of five videos in which a robot was introduced as owned by (1) a faceless outgroup entity, (2) an active ingroup speaker, (3) a passive ingroup peer, (4) the participant, or (5) the group collectively. Participants then observed a group discussion in which the robot consistently nodded in agreement with the speaker. We measured perceived group cohesion, the robot's status within the group, and elicited descriptions of the robot's social role. Robots that were participant-owned or group-owned fostered greater cohesion and were perceived as socially closer and more collaborative. Despite identical behavior, the speaker-owned robot was perceived as more distant and manipulative. These findings highlight robot ownership as a critical aspect of Human–Human–Robot Interaction.

CCS Concepts

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

Keywords

Human–Robot Interaction, Human–Human–Robot Interaction, Human–Robot Group Interaction, Robot Ownership, Social Robots, Social Influence

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1 Introduction

Imagine a small group engaged in a discussion. As one person speaks, a robot standing nearby subtly nods along. No one addresses the robot directly, yet its behavior does not go unnoticed. Some group members may interpret the nodding as supportive; others may perceive it as biased or even manipulative – depending on who they assume the robot belongs to and sides with.

Such moments illustrate a challenge in Human–Human–Robot Interaction research. While a growing body of work examines how robots interact with groups of people, we still lack a clear understanding of how these robots shape group dynamics, particularly their socio-emotional dimensions. These dimensions include feelings and perceptions such as cohesion, trust, and relational quality, including mutual liking, feelings of inclusion, as well as shared meaning. While prior work shows that robots can influence group-level aspects [14, 15, 43, 48, 55, 56], such effects remain hard to disentangle within complex group interactions [13], particularly when the robot's social position is ambiguous.

A key reason for this difficulty is that group feelings and perceptions are shaped collectively rather than by individuals [16, 17]. Consequently, recent work conceptualized Group Experience (GX) as an emergent outcome of the collective interaction of human members and robotic agents, rather than the simple aggregation of individual user experiences [32]. The social meaning of a robot and its behavior becomes co-constructed. It depends on how a robot is socially positioned relative to the collective and its members [15]. For instance, in an earlier study, we found that the same robot behavior was experienced as supportive by some members, but as suspicious by others [44].

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This raises the question of what establishes a robot's social positioning within a group. One particularly salient yet often overlooked aspect may be robot ownership. While robots function as autonomous, interactive agents, they are also encountered as artifacts owned by someone (i.e., an individual, an organization, or the public) [3, 7, 11, 40, 49]. This may shape thoughts about the purpose of the robot in a specific situation. For example, ownership provides a social anchor that helps people to infer robot alignment and the robot's intent. Who-owns-the-robot is therefore not a mere background characteristic but, for example, a signal for whose interests the robot is likely to represent, and who is accountable for its actions. These signals may then inform the role attributed to the robot, such as collaborator, facilitator, or manipulator. In this way, robot ownership can quietly reorganize power, interpersonal trust, and group cohesion.

To explore these assumptions, we conducted a video vignette study (n = 225) in which robot ownership was systematically varied. First, participants viewed one of five video vignettes that introduced a robot as being owned by either an external entity, an active speaker, a passive peer, the participant themself, or the group as a whole. All participants then observed the same group discussion, during which the robot consistently nodded in agreement with the speaker. This experimental design allowed us to manipulate robot ownership as an independent variable while holding robot behavior and group interaction constant across conditions.

We then measured participants' perceptions of robot–group alignment (i.e., its social proximity and status within the group) and their sense of group cohesion (i.e., feelings of belonging, unity, and inclusion). We assume that robot ownership functions as a social signal that influences how the robot's behavior is interpreted in the group context. Depending on who the robot belongs to, the same nodding behavior may signal endorsement, alliance, or neutrality. We expect that varied robot ownership may also bias impressions of the group and individual members, extending beyond the robot itself.

This work makes three contributions to Human–Human–Robot Interaction research: (1) it conceptualizes robot ownership as a social signal that shapes the perception of the robot and the understanding of the situation, (2) it empirically demonstrates how ownership alters group-level aspects, and (3) it advances a group perspective on robot interaction design with implications for real-world group dynamics (for example, in workplaces, classrooms, and healthcare teams).

We first review prior work on robots as mediators and robot ownership. We then present a mixed-methods video-vignette study, report its quantitative and qualitative findings, and discuss implications for Human–Human–Robot Interaction.

2 Background

2.1 Robots as Mediators of Human Group Interaction

Human–Human–Robot Interaction (HHRI) and Human–Robot–Group Interaction (HRGI) research examines how robots shape social dynamics within human groups, not only by supporting tasks but also by influencing how groups experience cohesion, alignment, and interpersonal relations.

Reviews of group mediator and non-dyadic HRI show that robots influence turn-taking, coordination, participation balance, and conversational dynamics across collaborative contexts [51, 52, 60, 61]. Importantly, these effects do not require explicit intervention. Even minimal or peripheral behaviors can produce measurable changes in group interaction. For example, *MicBot*, a microphone-shaped robot, has been shown to balance conversational participation through subtle movement cues such as orienting toward or away from participants [55]. Similarly, non-verbal behaviors such as gaze, nodding, or responsive movement can redistribute attention, alter interpersonal evaluations, and improve perceived conversation quality without the robot taking on an active participant or conversational role [44, 48].

Beyond shaping interactional flow [21], robots also exert social influence on judgments and decisions in group settings. In laboratory studies inspired by the Asch conformity paradigm, researchers examined group decision-making tasks in which robots expressed converging or diverging judgments alongside human participants. These studies show that people may align their responses with robots that agree with each other or form a numerical majority, particularly in situations without a clear correct answer [6, 50].

Building on this, Erel et al. [15] proposed the *RoSI* (Robot Social Influence) model: it synthesizes findings across multiple studies to describe how robot behavior, context, and social positioning jointly shape a robot's social influence in group interaction. One implication is that when a robot appears socially close, its influence tends to be stronger. Complementary studies show that robot agreement or disagreement can shape interpersonal relations among humans, for example, by influencing how close people feel after engaging in joint decision-making tasks [35].

Another line of work focuses on social categorization and the perceived positioning of a robot in relation to groups (e.g., outgroup–ingroup, member–tool, etc.). Studies using mixed human–robot teams, competitive and cooperative tasks, and vignette-based scenarios demonstrate that people apply ingroup–outgroup distinctions to robots depending on framing, appearance, and task context. For instance, robots framed as ingroup members are evaluated more favorably than robots framed as outgroup, and in some cases even more favorably than outgroup humans, though still less favorably than ingroup humans in terms of cohesion and affiliation [18, 19]. At the same time, robots are evaluated differently from humans: while ingroup robots are subject to group-based expectations, humans often attribute less agency, intention, or responsibility to the robot compared to a human group member [1, 53]. Work on deviant group members further suggests that ingroup robots may elicit particularly negative evaluations when they violate shared expectations, resembling classic group dynamics such as the black sheep effect [54]. Further studies also show that a robot's visible alignment with particular members (such as selectively attending to or endorsing someone) can shift perceived leadership and inclusion, even when task performance remains unchanged [8]. These studies highlight that a robot's behavior does not carry a fixed social meaning in group settings. Rather, how a robot and its actions are perceived depends on how it is situated within ongoing social relations.

So far, HHRI research has paid limited attention to factors that establish a robot's positioning within a group. In a previous study

[44], we found robot ownership to be such a potential factor: participants observed a nodding robot accompanying a person delivering an argument in a group conversation. Although the robot was explicitly introduced as a neutral listener, participants arrived at different interpretations: some understood the nods as mere acknowledgment, while others saw strategic alignment and assumed that the speaker must have manipulated or owned the robot. While ownership was not part of the scenario description, it emerged spontaneously as a way to resolve ambiguity about the robot's role and behavior.

This raises the possibility that, given multiple potential owners are present, people may speculate about who-owns-the-robot because it provides a convenient social anchor – one that helps make sense of the robot in the group context. This addresses a similar gap found in a recent scoping review on robot facilitators of groups, which notes that "ownership and intent" are rarely explicitly addressed in HHRI literature, even though they likely influence how group dynamics are experienced and unfold [60].

All in all, this body of work shows that robot behavior can shape group interaction, but that the effects may depend on how the robot is socially positioned and "read". If robot ownership is a social cue that people draw on to better understand what the robot does and represents in a group, it warrants closer examination. Thus, we will next review how ownership has been conceptualized in HRI and related fields.

2.2 Ownership in HRI

Robots occupy an uneasy middle ground between objects and social counterparts [22, 30]. They can be bought, assigned, repaired, and passed on like property, yet they also speak, gesture, and respond in ways that invite social interpretation and interaction [11, 27]. Because of this hybrid status [37], robot ownership becomes more than a logistical or legal detail: it serves as a cue that people use to make sense of a robot's agency, alignment, and role in interaction. Thus, ownership helps resolve whether a robot is treated primarily as a controllable object or as a socially considerable other [11].

Against this background, HCI research has approached ownership as a lived, interpretive experience that shapes how people relate to interactive artifacts in situated contexts [27]. This aligns closely with the notion of psychological ownership, which has been defined as a cognitive-affective state in which people feel a sense of possession and experience a target as "theirs" or as an extension of the self, independent of legal ownership [4, 46]. In HCI, this "mineness" is associated with experiential dimensions such as perceived control, self-identity, belongingness, and responsibility toward the owned artifact [27].

This is particularly evident in HRI studies on robot customization. When users design or configure aspects of a robot, they experience stronger psychological ownership, which contributes to trust and a deeper emotional bond [28]. Studies on long-term consumer robots show that ownership also involves care, repair, and transfer beyond use, making it a lasting social relationship rather than a temporary state [26]. This helps explain why people often treat owned technologies with heightened emotional attachment. Experiences of ownership can be further supported through design: systems that allow users to shape, influence, or contribute to agent behavior (such as human-guided training of the robot) foster psychological ownership even in short-term interactions, resulting in more positive attitudes and satisfaction [10, 42]. Notably, this body of work treats ownership as an experiential outcome, a feeling that emerges through interaction.

A complementary line of research approaches robot ownership from an institutional perspective. Ostrowski et al.'s review of ethics, equity, and justice in HRI [40] analyzes how prior work addresses questions of who controls robotic systems, who owns and governs robot data and behavior, who benefits from deployment, and who is held accountable for harm. In this literature, ownership is treated as part of a robot's political economy and governance context (alongside issues such as surveillance, liability, and access) rather than as an immediate interactional cue [10, 40]. Building on this, Axelsson et al. [3] show that potential robot users actively question institutional ownership arrangements. They worry about safety, inclusivity, ownership of the robot and its recorded data, and the rationale for deploying a robot at all. Perceptions of ownership shaped judgments of trust, legitimacy, and alignment, depending on whether robots were perceived as owned by employers or healthcare providers. Particularly employer-owned robots were often associated with surveillance, coercion, and misaligned interests.

Drawing on qualitative case studies and focus groups, Cameron et al. [7] further argue that people understand robots within a triadic relationship involving the user, the robot, and its deployer, and that assumptions about who stands behind a robot shape trust, legitimacy, and engagement prior to direct interaction. A vignette-based experiment by Roesler et al. [49] suggests that minimal ownership attribution can already shape perceptions of a robot, even without a prior interaction: a robot shopping assistant framed as user-owned is perceived as more comfortable to engage with than when it is attributed to the organization that factually owns and provides the robot, in this case, a supermarket.

Beyond robot-specific ownership, organizational psychology emphasizes *shared and collective psychological ownership* as a group-level phenomenon. Work on *collective psychological ownership* shows that groups can experience a shared sense of "ours", which is closely tied to social identity processes as well as self-categorization: claiming something as "ours" presupposes an "us" and carries expectations about entitlement and responsibility [45, 47]. Such collective ownership can enhance belonging and shared stake. Importantly, *collective psychological ownership* is not purely prosocial: it can also sharpen boundaries and exclusion by legitimizing ingroup claims and restricting outgroup access (e.g., "this is ours, not yours"), with implications for ingroup–outgroup relations and perceived threats [57, 58]. For instance, studies of shared technologies, such as smart home devices and smart speakers, demonstrate that ownership and control are often distributed unevenly among multiple users (e.g., a main owner and co-users), leading to the emergence of negotiation practices and power asymmetries within households and teams. These systems become socially consequential not only through what they do, but through how ownership and access relations reorganize shared resources as well as interpersonal dynamics [20, 23, 38].

Taken together, prior work shows that robots can meaningfully shape human group interaction and that ownership shapes how people relate to robots and other interactive systems. However, these two lines of research have rarely been brought together. In HRI, ownership is typically treated either as an experiential outcome that emerges through access, use, maintenance, and sharing or as a structural condition tied to deployment, governance, and ethics. At the same time, research on group interaction demonstrates that the social meaning of robot behavior is co-constructed and dependent on how the robot is socially positioned in relation to the group.

What remains largely unexamined is how ownership operates within group interaction itself: that is, how the fact that a robot is owned by one group member, another group member, or the group collectively shapes how identical robot behaviors are interpreted and experienced. By leaving ownership relations implicit or assuming neutrality, existing studies effectively treat who-owns-the-robot as inconsequential to group dynamics.

3 Method

3.1 Participants

A video vignette study was conducted online using SurveyMonkey[1]. Participants were recruited via Prolific[2]. The eligibility criteria were: English-speaking adults who reside in the US or UK. No other inclusion or exclusion criteria were applied. Each participant received compensation of $5 for their participation, which exceeded the local minimum wage. The study took between 14 and 16 minutes to complete.

We conducted an *a priori* power analysis for a one-way between-subjects ANOVA with five ownership conditions. Assuming a medium effect size (f = .25, reflecting a practically meaningful effect in the absence of prior effect-size estimates for comparable ownership-framing studies), an α of .05, and power of 0.80, the analysis indicated a minimum sample size of approximately 200 participants (~40 per condition) to reliably detect differences. We therefore recruited 225 participants (45 per condition) to maintain a balanced design and provide margin for potential exclusions.

The final sample consisted of 225 participants (108 male, 111 female, 6 non-binary; age range: 22–81 years, SD = 12.3, median = 42).

3.2 General Scenario

All participants viewed the same 23-second video depicting an everyday group setting: a casual, low-stakes planning conversation in which three people discuss options for an upcoming group trip. The scenario was chosen to be familiar and easy to imagine, while still leaving room for social interpretation (e.g., who is leading, who is included, and whose suggestions "count"). The interaction takes place in a meeting-like space in front of a whiteboard, with two visible ingroup members, *Alex* and *Riley* (played by actors), and the participant represented through a stand-in person shown from behind (i.e., the camera perspective presents the participant as the third group member; see Figure 1A for the embodied and spatial arrangement of the group and the robot).

Participants were instructed via on-screen text to adopt the perspective of the stand-in and to imagine themselves as being part of the discussion. They were told that a small robot would be present in the meeting and that it is able to express agreement by nodding its head. Importantly, at this stage, no claims were made about the robot's goals or intended function beyond this minimal capability. This was deliberate: the scenario was designed to keep the robot's social meaning open, such that participants would need to interpret what the robot "does" in relation to the group interaction.

The robot itself was a small, non-humanoid robot mounted on top of the whiteboard so that it was clearly visible without becoming the main focus of the interaction shown. Given that the present study aims to foreground ownership rather than stronger anthropomorphic, verbal, or embodiment-related cues, we chose to use the custom-built prototype from our prior laboratory and online group studies [43, 44]. The robot's behavioral repertoire was intentionally minimal and consistent: it could slightly orient toward the current speaker and perform brief nods. This ensured that the robot appeared sufficiently responsive, while avoiding richer verbal or task-oriented behavior that might dominate the interaction or prescribe a specific functional role (e.g., facilitator, assistant, or evaluator). Across all conditions, the robot's subsequent behavior in the group discussion was identical: it repeatedly nodded in apparent agreement when Alex spoke. Thus, the general scenario established a shared, plausible group context in which the robot is present, perceptible, and behaviorally interpretable.

These experimental design choices trade ecological breadth for experimental control, while maintaining continuity through a comparable setup from prior research and helping to isolate ownership as the primary source of variation.

Before viewing this group discussion video, participants were shown one of five short ownership-establishing video vignettes that presented who the robot belonged to. This ownership framing constituted the key experimental manipulation and is described in the next section.

3.3 Experimental Design and Vignettes

To examine the impact of robot ownership on perceived group cohesion, the robot's social status, and interpersonal perception, we used the experimental vignette method (EVM). This method, which is frequently used in psychology, sociology, and educational research [2], is based on short scenarios that are presented in textual or audiovisual form and systematically manipulated. In recent years, vignette-based designs have also become increasingly prominent within HCI and HRI research contexts [31, 34, 36, 49].

EVM allows us to systematically vary robot ownership within a shared group context while maintaining a high degree of experimental control. In an in-person group study, this would require tightly scripted behavior from other group members (confederates) and would still leave ownership largely to participants' imagination (e.g., imagining that they bought and brought the robot). By contrast, EVM enables us to communicate ownership relations clearly and consistently through standardized video scenarios.

From a technical perspective, the study can be conducted without fully implementing the robot's behavior and responses. While less expensive, this approach also helps avoid technical issues with a prototype (e.g., reaction latency, inconsistent robot actuation, software glitches). Although EVM uses hypothetical scenarios, we carefully constructed situations that participants could easily "step

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[1] https://www.surveymonkey.com
[2] https://www.prolific.com

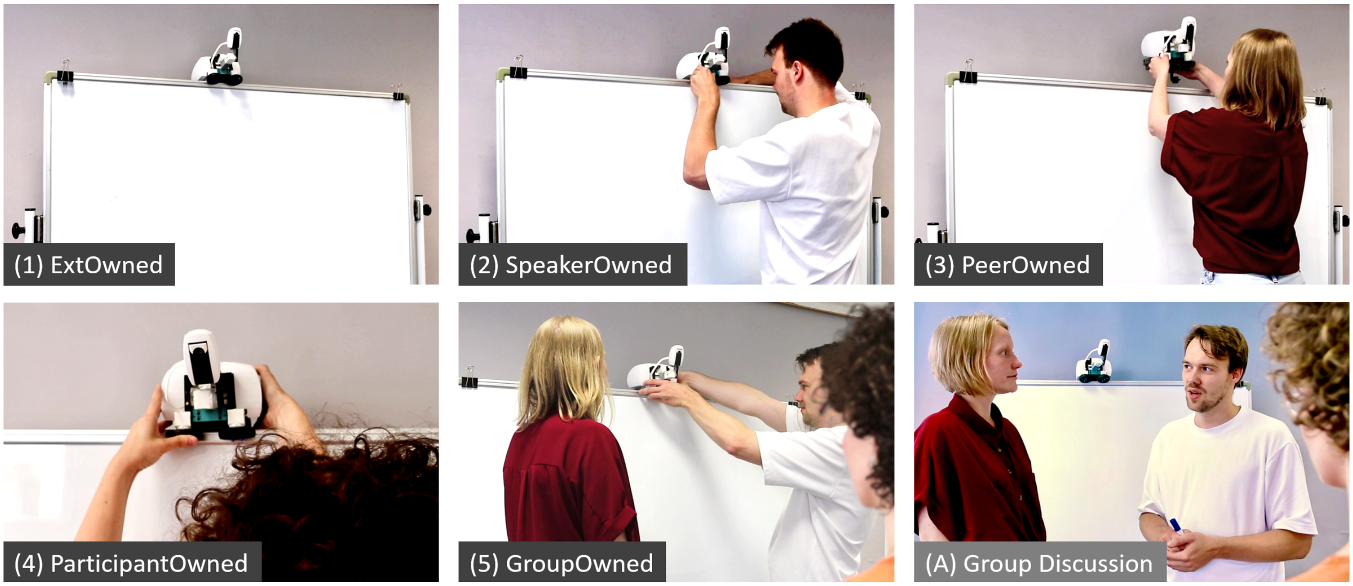

Figure 1: Video vignettes used to establish robot ownership across the five experimental conditions and the subsequent group discussion viewed by all participants. Panels (1)–(5) depict brief ownership-establishing scenes in which the robot is brought to and placed on a whiteboard by its owners (or shown as already present in ExtOwned): ExtOwned (faceless outgroup entity, belongs to facility), SpeakerOwned (ingroup speaker Alex), PeerOwned (ingroup peer Riley), ParticipantOwned (participant; first-person perspective), and GroupOwned (collective ownership). Panel (A) shows the identical group discussion video viewed by all participants, in which the robot consistently indicates agreement for the speaker Alex (white shirt) by nodding.

into": concrete, plausible, and close to everyday group encounters, with ownership communicated explicitly and consistently.

Previous research has shown that experiential evaluations of the same vignette or concept are largely stable across representation formats, including text, images, and video [12, 39]. Thus, EVM offers notable advantages in efficiency, scalability, and experimental control, making it especially well-suited for early-stage research.

We created five video vignettes to introduce who the robot belonged to (see Figure 1; panels 1–5). Each showed a short scene lasting about 3 to 4 seconds, in which the respective owner could be seen placing the robot onto a whiteboard. In three conditions (*SpeakerOwned*, *PeerOwned*, *GroupOwned*), this action was shown from a third-person perspective. In the *ParticipantOwned* condition, the placement was filmed from a first-person perspective to depict the participant themself bringing and mounting the robot. In the *ExtOwned* condition, the robot was shown already positioned on the whiteboard, indicating that it belonged to the building's facilities (i.e., a faceless outgroup entity, such as a landlord or an office property company that furnishes the space). Conceptually, this condition served as a control condition in which the robot was not owned by any group member (a plausible "no-owner" scenario) even though it is implicitly assumed to belong to *someone*, whether an external entity or an organization. This allowed us to contrast individual and shared ownership with a plausible form of institutional ownership.

In all ownership vignettes, a caption below the clip explicitly stated who owned the robot and clarified that "the robot can indicate agreement by nodding with its head". We included this to standardize the ownership manipulation and to ensure that participants shared a minimal understanding of the robot's behavior. At the same time, this wording may have drawn attention to the ownership aspect. Therefore, the present study captures effects under explicit ownership attribution.

After the ownership-establishing vignette, all participants viewed the same 23-second group discussion video (cf. Section *3.2 General Scenario* and see Figure 1A). The video shows an interaction between two visible ingroup members, *Alex* (the active speaker) and *Riley* (the ingroup peer), while the participant is represented through a stand-in person shown from behind. *Riley* first suggests traveling to Southern Europe. *Alex* then proposes a trip to Rome, Italy, mentioning specific places to visit (e.g., museums, the Colosseum). Each time *Alex* elaborates on his suggestion, the robot performs a brief affirmative nod. *Alex* concludes by writing "Rome" on the whiteboard and asking the others for their opinion. Throughout the discussion, the robot slightly orients its gaze toward *Alex* when he speaks. The group members do not visibly acknowledge the robot's presence or behavior. Crucially, robot behavior and human interaction are identical across all five ownership conditions.

3.4 Procedure

Participants completed the study online. After opening the survey link, participants first read an information sheet and provided informed consent. They then received brief written instructions introducing the group setting and were asked to adopt the perspective of the stand-in group member shown in the videos.

Participants were then randomly assigned to one of five ownership conditions (ExtOwned, SpeakerOwned, PeerOwned, ParticipantOwned, GroupOwned; between-subjects design; 45 participants per condition). Participants were not informed about the existence of other ownership conditions or the random assignment. Depending on the condition, participants first viewed a short ownership-establishing video vignette lasting approximately 3–4 seconds (see Section 3.3 and Figure 1, panels 1–5). These vignettes depicted who the robot belonged to and included an on-screen caption explicitly stating the ownership relation and clarifying that the robot could indicate agreement by nodding its head.

Immediately afterward, they watched the identical group discussion video described in Section *3.2 General Scenario* (and see Figure 1A). The clip depicts a vacation planning discussion between two visible ingroup members, *Alex* and *Riley*, with the participant represented through a stand-in group member shown from behind. Across all conditions, robot behavior and human interaction were identical: the robot slightly oriented toward *Alex* when he spoke and performed brief affirmative nods during *Alex's* contributions.

After watching the clip, participants assessed various aspects of the situation using a number of rating scales (see Subsection *3.5 Measures*). This included perceived group cohesion and the robot's alignment with the group. Participants then responded to open-ended questions, identifying what caught their eye and how it possibly influenced their evaluation of the situation. Participants were further asked to describe the relationship between the robot and the group (cf. Section *3.6 Open-Ended Questions*, see Table A.1 in the Appendix for a full set of questions).

Finally, participants completed a manipulation check verifying their understanding of robot ownership and an immersion check assessing how well they were able to imagine themselves in the presented situation. The study concluded after all questionnaire items and open-ended responses had been completed.

3.5 Measures

We constructed a group cohesion scale based on the *Perceived Cohesion Scale*, which conceptualizes cohesion as an individual's sense of belonging and the morale associated with group membership [9, 33]. The scale comprised six items capturing group belonging and morale ("I feel a sense of belonging to this group.", "I feel that I am a member of this group.", "I am enthusiastic about this group."). We added two more items assessing perceived inclusion by others (e.g., "I felt included in the group's interactions."; "In this group, my ideas were valued."), drawing on Jansen et al.'s conceptualization of inclusion as signals conveyed by the group toward the individual [25]. We incorporated these items to better capture the interpersonal dynamics of short group interactions, in which explicit cues of acknowledgment and validation are central to participants' experience of cohesion. Participants responded to these eight items on a 5-point Likert scale, with the verbal anchors 1 = "Strongly disagree", 2 = "Disagree", 3 = "Neither agree nor disagree", 4 = "Agree", and 5 = "Strongly Agree". The resulting scale showed high internal consistency (Cronbach's α = .90), and an overall perceived group cohesion score (PGC) was computed by averaging all eight items. See Table 1 for all internal consistencies (Cronbach's alpha; diagonal) and discriminant validity (intercorrelations, Pearson's r).

We assessed robot–group alignment to capture how socially close or distant the robot was perceived relative to the group. Specifically, whether the robot was seen more as a member of the group and acting in its interest, or as a detached, independent outsider. Two of the five items assessed perceived dependence on the group ("The robot is subservient to the group"; "The robot is an impartial bystander, which has its own opinion" [reverse-coded]) and three items measured social alignment with or in the group ("The robot is a member of our group"; "The robot and our group are on the same side"; "The robot is an outsider to our group" [reverse-coded]). Participants responded on a 5-point Likert scale, with the verbal anchors 1 = "Strongly disagree", 2 = "Disagree", 3 = "Neither agree nor disagree", 4 = "Agree", and 5 = "Strongly Agree". The scale showed high internal consistency (Cronbach's α = .87, see Table 1), and an overall robot–group alignment score (RGA) was computed by averaging all five items.

To control for variations in how well participants could immerse themselves in the scenario portrayed in the video vignettes, we included two items: "I was able to put myself into the situation shown in the video" and "I had a hard time imagining myself in the presented situation". Participants responded on a 5-point Likert scale, with the verbal anchors 1 = "Strongly disagree", 2 = "Disagree", 3 = "Neither agree nor disagree", 4 = "Agree", and 5 = "Strongly Agree". The internal consistency of both items was high (Cronbach's α = .80, Table 1). We computed an overall *immersion* (imm) score by averaging the responses to the two items per individual for further analysis.

To verify that participants correctly understood the presented ownership condition, the questionnaire included a manipulation check in the form of a multiple-choice item asking, "Who owns the robot?", with response options "None of us owns the robot", "Alex (white shirt) owns the robot", "Riley (red blouse) owns the robot", "I own the robot", and "We, the group, own the robot". The manipulation check confirmed that all 225 participants correctly identified the robot's owner across conditions (100% correct). No participants were excluded based on this check.

3.6 Open-Ended Questions

Alongside the quantitative measures, we gathered brief written responses with an average length of two to three sentences to capture participants' interpretations of the robot's role. The questions focused on noteworthy details and on the relationship between the robot and the group. We additionally asked participants to elaborate on why the robot responded to what was being discussed (see Table A.1 in the Appendix, Section *Open-Ended Questions* for the full set).

The responses from 225 participants across the five study conditions were analyzed. The first author conducted a thematic analysis [5], systematically reviewing the responses to generate initial codes and themes. A second coder then independently reviewed and labeled the responses using this initial code list. Subsequently, the two coders collaboratively refined and finalized the themes by comparing, organizing, and clustering the data to extract insights across the five ownership conditions, resulting in the final set of themes.

While our hypotheses guided the thematic focus (whether robot ownership impacts robot-related, group-level, and other members' intentions, see Section *3.7 Hypotheses*), we employed an inductive,

Table 1: Internal consistency (Cronbach's α) and discriminant validity (intercorrelations, Pearson's r) (n = 225).

Measure	Perceived Cohesion	Robot–Group Alignment	Immersion
Perceived Cohesion	(.90)		
Robot–Group Alignment	0.42	(.87)	
Immersion	0.30	0.22	(.80)

data-driven approach during coding and theme development. Initial codes and themes were generated based on responses and without imposing predefined categories. This allowed emergent insights to surface, even if they were not explicitly anticipated by the hypotheses.

Cohen's kappa for all annotated text responses was calculated as $\kappa = 0.63$, which indicates a moderate to substantial agreement between the two coders [29].

3.7 Hypotheses

Although theories of social distance and group identity suggest that ownership might shape social perceptions and experienced cohesion, the effects of robot ownership in group interactions remain largely unexplored. We therefore formulated non-directional, exploratory hypotheses, expecting the following:

- **H1:** Ownership will influence the perceived group cohesion (consisting of a felt sense of group belonging, group morale, and feelings of being included).
- **H2:** Ownership will influence the robot's status within the group (social distance, relevance, membership status).
- **H3:** Ownership will shape interpretations of the group interaction, including the robot's social role and other members' intentions.

4 Results

4.1 Immersion

A one-way ANOVA with *robot ownership* (ExtOwned, SpeakerOwned, PeerOwned, ParticipantOwned, GroupOwned) as factor and *immersion* as the measure revealed no significant main effect of *robot ownership*, $F(4, 220) = 0.09$, $p = .99$, $\eta_p^2 = .002$.

Post-hoc Bonferroni-corrected pairwise comparisons between the conditions indicated no significant differences (all *ps* = 1.00). Descriptively, mean immersion ratings were comparable across conditions (ExtOwned: M = 3.63; SpeakerOwned: M = 3.67; PeerOwned: M = 3.58; ParticipantOwned: M = 3.66; GroupOwned: M = 3.68). See Table 2 for an overview of mean values and standard errors. Collapsing across conditions, participants reported a moderately high level of immersion overall (M = 3.64, SD = 0.89).

The results show that *immersion* did not differ across the five ownership conditions ($\eta_p^2 = .002$, indicating a negligible effect) and was consistently above the scale midpoint. This indicates that participants were able to engage with the scenario regardless of ownership condition. Therefore, immersion was unlikely to confound the results and was not included as a covariate in subsequent analyses.

4.2 Quantitative Results

4.2.1 *Perceived Group Cohesion.*

A one-way ANOVA with *robot ownership* (ExtOwned, SpeakerOwned, PeerOwned, ParticipantOwned, GroupOwned) as factor and *perceived group cohesion* as the measure revealed a significant main effect of robot ownership, $F(4, 220) = 5.70$, $p < .001$, $\eta_p^2 = .094$. Post-hoc Bonferroni-corrected pairwise comparisons indicated significant differences between ExtOwned (M = 3.53) and ParticipantOwned (M = 4.22, mean diff = -0.69, SE = 0.19, $p < 0.01$) as well as between ExtOwned and GroupOwned (M = 4.21, mean diff = -0.68, SE = 0.19, $p < 0.01$). No significant differences were found between ExtOwned and SpeakerOwned (mean diff = -0.08, SE = 0.19, $p = 1.00$) and PeerOwned (mean diff = -0.13, SE = 0.19, $p = 1.00$). The pairwise comparisons further indicated significant differences between SpeakerOwned (M = 3.61) and ParticipantOwned (mean diff = -0.61, SE = 0.19, $p < 0.05$), as well as GroupOwned (mean diff = -0.60, SE = 0.19, $p < 0.05$). Additionally, significant differences were found between PeerOwned (M = 3.67) and ParticipantOwned (mean diff = -0.55, SE = 0.19, $p < 0.05$), and GroupOwned (mean diff = -0.54, SE = 0.19, $p < 0.05$). Finally, there was no significant difference between ParticipantOwned and GroupOwned (mean diff = 0.01, SE = 0.19, $p = 1.00$). See Table 2 for an overview of mean values and standard errors. Collapsing across conditions, perceived group cohesion was moderately high overall (M = 3.83, SD = 0.94).

The results indicate that *perceived group cohesion* is higher when ownership of the robot is assigned to the participant themself or shared with the group than when ownership is assigned to an external entity or to another group member (active speaker *Alex* or more passive peer *Riley*). The effect size was moderate ($\eta_p^2 = .094$), suggesting a meaningful impact of ownership on perceived cohesion. No difference in *perceived group cohesion* was observed between participant and group ownership. These results are consistent with H1, indicating that robot ownership shapes perceived group cohesion.

4.2.2 *Robot–Group Alignment.*

An ANOVA with *robot ownership* (ExtOwned, SpeakerOwned, PeerOwned, ParticipantOwned, GroupOwned) as factor and *robot–group alignment* as the measure revealed a significant main effect of robot ownership, $F(4, 220) = 9.02$, $p < .001$, $\eta_p^2 = .141$. Post-hoc Bonferroni-corrected pairwise comparisons between the conditions indicated significant differences between ExtOwned (M = 3.29) and Participant-Owned (M = 4.07, mean diff = -0.78, SE = 0.17, $p < .001$) as well as GroupOwned (M = 4.14, mean diff = -0.85, SE = 0.17, $p < .001$). No significant differences were found between ExtOwned and SpeakerOwned (M = 3.58, mean diff = -0.29, SE = 0.17, $p = .85$) or PeerOwned (M = 3.67, mean diff

Table 2: Average means and standard errors for each ownership condition.

Measures	ExtOwned	SpeakerOwned	PeerOwned	ParticipantOwned	GroupOwned
Perceived Cohesion	3.53 (0.14)	3.61 (0.14)	3.67 (0.13)	^{abc}4.22 (0.13)	^{abc}4.21 (0.14)
Robot–Group Alignment	3.29 (0.13)	3.58 (0.13)	3.67 (0.12)	^{ab}4.07 (0.12)	^{abc}4.14 (0.10)
Immersion	3.63 (0.17)	3.67 (0.17)	3.58 (0.18)	3.66 (0.15)	3.68 (0.16)

[a] significantly different from ExtOwned at $p < 0.05$ or less.
[b] significantly different from SpeakerOwned at $p < 0.05$ or less.
[c] significantly different from PeerOwned at $p < 0.05$ or less

= -0.38, SE = 0.17, $p = .25$). The pairwise comparisons further indicated significant differences between Speaker-Owned (M = 3.58) and ParticipantOwned (mean diff = -0.49, SE = 0.17, $p < .05$), as well as GroupOwned (mean diff = -0.56, SE = 0.17, $p < .01$). Additionally, a significant difference was found between PeerOwned (M = 3.67) and GroupOwned (mean diff = -0.47, SE = 0.17, $p < .05$), whereas the difference between PeerOwned and ParticipantOwned did not reach significance (mean diff = -0.40, SE = 0.17, $p = .17$). Finally, there was no significant difference between ParticipantOwned and GroupOwned (mean diff = -0.07, SE = 0.17, $p = 1.00$). See Table 2 for an overview of mean values and standard errors. Collapsing across conditions, robot–group alignment was moderately high overall (M = 3.75, SD = 0.85).

The perception that the robot is socially positioned with or in the group was higher when the robot was owned by the participant themself or shared with the group than when it was owned by an external entity or the ingroup speaker *Alex*. Robot alignment was also perceived to be higher when the robot was shared with the group than when it was owned by the more passive peer *Riley*; however, no significant difference was observed between ownership by the participant and ownership by the peer *Riley*. Finally, perceived robot–group alignment did not differ between a participant-owned and group-owned robot. This pattern is consistent with H2 and, given the large effect size ($\eta_p^2 = .141$), indicates that robot ownership substantially influences the robot's perceived status and alignment within the group.

4.3 Qualitative Results

Across ownership conditions, participants were exposed to identical robot behavior. Yet their interpretations diverged meaningfully depending on ownership. Ownership functioned as a social lens that shaped whether the robot's behavior was understood as inclusive participation, background motion, or strategic influence. Below, we detail how ownership structured (1) group experience, (2) robot role attribution, and (3) speaker perception (see Table 3 for an overview of the 12 themes across the three categories identified from the participant responses, with "Dominant in condition" indicating a frequent occurrence in the respective condition).

4.3.1 Group Experience and Social Dynamics.

Inclusive vs. Exclusionary Group Dynamic. Participants' sense of inclusion depended less on the robot's observable actions (nodding for the speaker) than on whether the robot was perceived to represent them or the group as a whole. When the robot was participant-owned or group-owned, participants interpreted its behavior as inclusive, collaborative, and affirming their role in the discussion. In these conditions, the nodding was understood as encouraging attentiveness to the group rather than support for a particular speaker. Participants described this as feeling actively invited into the exchange:

> "I felt present and included because the others were asking for my input. Everyone seemed friendly and genuinely interested in others' opinions." (P155, ParticipantOwned)

> "I did feel part of the group, because they kept talking to me and including me in their decisions."
> (P174, GroupOwned).

In contrast, when ownership represented the robot as potentially aligned with the speaker or an external entity, participants more often experienced the interaction as exclusionary, even though the speaker's and the robot's behavior remained unchanged. Under these circumstances, nodding was interpreted as reinforcing power asymmetries rather than inviting participation:

> "I felt like I was on my own. I felt like the three [Alex, Riley, and the Robot] were on one side and I was alone on the other side." (P75, SpeakerOwned)

> "[. . .] I felt like a bystander or being talked at." (P6, ExtOwned)

Robot Establishing a Personal or Shared Stake. Beyond momentary inclusion, ownership also influenced whether participants perceived themselves to have a legitimate stake in the group's activity. Participant- and group-owned conditions encouraged interpretations of the robot as an extension of the member(s), linking robot ownership to a collective purpose:

> "The robot is mine, [and] it encourages good ideas and support[s] us." (P141, ParticipantOwned)

> "The robot was jointly owned by [us] friends. It was there for all of us." (P177, GroupOwned).

This sense of shared or personal stake underpinned participants' willingness to interpret the robot's behavior as supportive rather than biased, even when it visibly affirmed one speaker more than others.

4.3.2 Robot Role Attribution.

Table 3: Emerging themes across three thematic categories identified from participant responses to open-ended questions.

Theme	Description	Dominant in Condition
A. Group Experience & Social Dynamics		
Exclusionary Group Dynamic	Participants feel sidelined or less involved in the discussion, with the interaction perceived as unbalanced.	ExtOwned, SpeakerOwned
Inclusive Group Dynamic	Participants report a sense of being included and socially acknowledged as part of the group.	PeerOwned, ParticipantOwned, GroupOwned
Collaborative Dynamic	The interaction is described as cooperative, with shared idea-building and mutual engagement.	PeerOwned, ParticipantOwned, GroupOwned
Personal or Shared Stake	Ownership leads participants to feel personally responsible for or invested in the group outcome.	ParticipantOwned, GroupOwned
B. Robot Role Attribution		
Robot Ambiguity or Invisibility	Participants report confusion about the robot's role or describe it as irrelevant or unnoticed.	ExtOwned, SpeakerOwned
Robot Object-Likeness	The robot is perceived as an inert object rather than a social entity that meaningfully responded to group activity.	ExtOwned, SpeakerOwned
Robot as a Group Tool	The robot is interpreted as a shared resource or functional aid that supports the group rather than any individual.	PeerOwned, ParticipantOwned, GroupOwned
Robot as a Group Member	The robot is described as an additional member of the group, participating socially in the interaction.	PeerOwned, ParticipantOwned, GroupOwned
Robot as a Social Influence	The robot is perceived as endorsing, legitimizing, or shaping opinions within the group.	SpeakerOwned, PeerOwned, ParticipantOwned, GroupOwned
C. Speaker Perceptions		
Speaker Centrality	Alex is perceived as the focal point of the interaction, with attention revolving around his actions and suggestions.	SpeakerOwned
Perceived Imposition	Alex is seen as pushing his ideas or dominating the discussion, sometimes aided by the robot's behavior.	ExtOwned, SpeakerOwned, PeerOwned
Strategic Use of the Robot	Participants speculate that Alex programmed, controls, or intentionally uses the robot to support his position.	SpeakerOwned

From Object to Shared Tool to Group Member. Ownership changed the social role participants assigned to the robot, ranging from irrelevant and more object-like to socially embedded and group-oriented. When the robot was framed as participant-owned or group-owned, participants more often described it as a shared tool or even a peripheral group member. In these cases, nodding was interpreted as a socially situated response embedded within the group interaction. As one participant noted:

> "The robot is like a 4th person in the group that listens to what we are saying." (P88, GroupOwned)
>
> "The robot seems to be a part of the group. As Alex was talking, the robot was nodding its head to agree with him." (P142, ParticipantOwned).

In contrast, in external-ownership and some peer-ownership cases, participants struggled to ascribe relevance to the robot. Rather than interpreting nodding as communicative, they framed it as decorative, confusing, or purposeless:

> "The robot seemed like mostly decoration. I wasn't sure what it contributed as it just nodded at everything said." (P173, ExtOwned)
>
> "I don't understand what the point of the robot even is, let alone how it's involved." (P123, PeerOwned).

These interpretations show how ownership changed whether nodding was interpreted as *participation* rather than background motion.

Robot as a Social Influence: Legitimate vs. Suspect. Across most conditions, participants recognized that the robot's nodding could shape opinions. However, whether this influence was perceived as helpful or problematic also depended on ownership. In group- and participant-owned conditions, influence was often perceived as positive:

> "[. . .] the robot was a huge help in gaining insight into what the group agreed on."
> (P157, ParticipantOwned)

In speaker-owned conditions, nodding was no longer understood as informational but as an instrument of persuasion, highlighting how ownership reframed influence from assistance to control by the speaker *Alex*, frequently seen as strategic or coercive:

> "Alex programmed the robot to agree with whatever he said. The robot is just following orders." (P74, SpeakerOwned)
>
> "The robot seems tactical and quiet and probably has a closer relationship to Alex behind closed doors." (P68, SpeakerOwned).

4.3.3 Speaker Perceptions: Centrality and Perceived Imposition. In the speaker-owned condition, participants often described the robot as amplifying the speaker's dominance and marginalizing others:

> "The robot would enthusiastically agree whenever Alex spoke. It barely acknowledged anyone else."
> (P77, SpeakerOwned)
>
> "It felt like Alex immediately shut down Riley's ideas, which I found quite rude." (P74, SpeakerOwned)

This perceived alignment contributed to discomfort and pressure to conform, even when participants were invited to share their opinions:

> "I feel like it was 3 against 1 [me] even though Alex asked for my opinion." (P75, SpeakerOwned)

Notably, such critical/negative sentiments were absent in the other ownership conditions, despite identical robot and human behavior in the group discussion across all conditions. This underscores how ownership reconfigured participants' experience of social power distributed within the group.

4.3.4 Summary of Qualitative Findings. In line with H3, the qualitative findings show that robot ownership strongly shaped how participants made sense of the group interaction. Identical robot behaviors were not interpreted in a fixed way; instead, ownership framed whether nodding was experienced as inclusive group participation, neutral background behavior, or strategic social influence.

Importantly, ownership also structured how participants interpreted the speaker's position and intentions. When the robot was attributed to the speaker, participants frequently inferred strategic use, persuasion, imbalance, or even manipulation, whereas such interpretations were largely absent when ownership was shared or participant-based. These findings complement the quantitative results by showing that ownership does not merely affect abstract evaluations of cohesion or alignment, but also reorganizes how agency, influence, and legitimacy are attributed within the group.

5 Discussion

This study shows that robot ownership is not a background detail but a social signal that structures group interaction. Even with identical behavior of the robot, ownership influenced perceived group cohesion and robot alignment, as well as interpretations of social roles of the robot and human group members. Participant- and group-owned robots were experienced as inclusive and collaborative, while speaker-owned robots felt distant, suspicious, and were associated with strategic use. We thus identify ownership as a social signal and interpretive means through which robot status and behavior are assigned meaning in group interaction.

5.1 Ownership as an upstream social signal in Human–Human–Robot Interaction

Group interaction is complex and can feel messy at times. When a robot is included without articulating its purpose, people try to understand whether the robot is an (irrelevant) background gadget, a group helper, a member, or a tool for someone else's agenda. Our results suggest that ownership works as a social signal that makes some attributions more likely or reasonable than others. This, in turn, impacts the effect of the robot's contribution (e.g., nodding) on several important, group-related attributes.

Interestingly, prior HHRI and group-robot studies have largely treated the robot's social positioning as emerging from its appearance or behavior alone, or they have implicitly assumed "built-in" neutrality. In multi-person settings, however, this does not seem to be the case. When multiple potential owners are present, but it is not specified which ownership relation applies, people try to resolve the resulting ambiguity themselves by speculating [43, 44]. This is problematic since who owns the robot can change fundamentally how the group interaction is experienced – supportive or manipulative – without any apparent difference in robot behavior.

5.2 Participant and group ownership: "Our robot" makes cohesion easier

Quantitatively, group cohesion was perceived as higher when the robot was participant-owned or group-owned. Qualitatively, these conditions elicited more inclusive experiences: the robot became a shared tool or a quiet group member, and participants felt to be more personally involved in the group.

While effects are similar, we argue that this happened for different reasons, depending on whether it was participant-owned or group-owned. Participant ownership made the robot to be felt as an extension or proxy of the self that "joined the group with me".

In contrast, group ownership signaled a shared stake: the robot belongs to "us" and is therefore more readily interpreted as acting for the collective. Consistent with this, the robot felt most aligned with the group when it was group-owned. In contrast, participant ownership did not distinctly differ in perceived robot–group alignment from when it was owned by the passive peer. This echoes prior work distinguishing individual psychological ownership ("mine"), often tied to self-extension [4, 46], from collective psychological ownership ("ours"), tied to shared entitlement [45]. What these conditions have in common is that ownership clearly positions the robot inside the group and with the participant.

These effects emerged even without long-term use or actual control over the robot. Minimal ownership framing was sufficient to create noticeably different understandings of the situation. This raises the question of how richer, real-world ownership practices (such as buying, maintaining, or simply having the robot around) might further shape feelings of ownership [11, 26] and, in turn, how the robot is subsequently experienced in group interactions.

Importantly, while individual participant ownership produced inclusive effects in our study, this configuration may not readily translate to real group settings. In practice, not every group member can meaningfully "own" the same robot without sharing it, and assigning each participant their own robot would fundamentally change the interaction dynamics. Rather than functioning as a collective mediator, robots would become individualized companions, shifting the nature of group interaction altogether (see Section *5.7 Limitations and Future Work* for the prospect of multiple robot mediators in a group).

From a design perspective, this makes group ownership the more viable and relevant target within our study: it preserves a single, group-facing robot while still supporting inclusion, symmetry, and collective stake.

5.3 Ownership by the active speaker: when simple gestures signal power

Participants perceived the robot most critically when it belonged to the active speaker. They mostly suspected that the robot nodded exclusively for the speaker (e.g., "he uses the robot", "he programmed it"). Ownership turned the robot into an accomplice - into a strategy to persuade. Consequently, depending on ownership, robots can create perceptions of (unfair) power dynamics through a simple gesture. Instead of helping the group, the robot appeared to only help the speaker. Robot ownership shaped how participants experienced the human–human interaction itself by activating thoughts about fairness and exclusion.

5.4 Outgroup ownership and passive peer ownership

External ownership placed the robot outside the group, which made its behavior easier to dismiss and harder to integrate. When the robot belonged to a faceless out-group entity, participants often described the robot as confusing, irrelevant, or socially disconnected. Compared to the ingroup ownership conditions, the robot's behavior appeared less relevant to what was happening inside the group and between its members. This can limit the robot's ability to function as a group mediator. Notably, external ownership did not produce worries of surveillance, despite such concerns in prior work on institutional ownership [40]. We suspect this may be due to the casual, low-stakes vacation planning scenario. In higher-stakes contexts such as workplace evaluation or healthcare coordination, external robot ownership may instead intensify concerns about oversight or opposing interests.

Peer ownership, in turn, produced less distinct effects. The robot was attributed to the passive peer and seemed less anchored than with the more relatable or prominent owners (the participant, the group, or the speaker). This left the robot in an ambiguous middle ground: it was still ingroup, but without a clear meaning or cue as to what it represented or who it was for, which likely contributed to the muted effects observed. Future work should examine the conditions under which peer ownership becomes consequential. For example, it should explore whether stronger roles, richer interactions, or more targeted measures are needed to understand how ownership by passive individuals functions.

5.5 Methodological implications for HHRI research

Prior HHRI and group-robot research focused on robot behavior while leaving ownership vague or assuming robot neutrality as a default [60]. One possible result could be a situation implicitly resembling our external-ownership condition, where the robot was framed as belonging to a faceless external party, such as "the lab", "the study setup", or the "institution behind the study". Our findings show that this is not a neutral baseline. Participants had difficulty to understand the robot's purpose since it appeared "outside" the group and thus irrelevant to the group interaction.

Another possible outcome of leaving robot ownership unspecified is that participants will inevitably speculate about ownership and come to their own conclusions, which can impact the social understanding of the robot and its behavior [7, 44, 49] – and ultimately study results. While this does not invalidate prior findings, it suggests a methodological necessity. At a minimum, future HHRI studies should specify, justify, or experimentally control robot ownership when studying group interaction.

5.6 Design implications for HHRI

Our findings imply a number of concrete design implications for robots that mediate group interaction:

1. **Establish sharedness visibly and from the start.** Early moments, such as the introduction, matter. A short norming moment ("this is for all of us") can set expectations before behavior is interpreted. Simple rituals or shared setup steps, such as robot activation that requires all members, can stabilize inclusive perceptions of the robot and the other members. Even when a robot is not owned by everyone, these design choices support a shared-ownership-like experience.
2. **Support symmetrical access and rapport.** Group-facing interactions and shared controls can reinforce the experience of "our robot" throughout group interaction. Include brief, shared interaction moments, such as periodic group-level check-ins or simple turn-taking interactions with the robot.

These function as lightweight "micro–team-building" practices that can sustain a shared relationship with the robot across all members.
(3) **Avoid unexplained asymmetry.** If the robot must align with one member (e.g., with a human facilitator), make that role explicit and accountable, because otherwise, people will likely experience the robot as a form of manipulation.

5.7 Limitations and Future Work

We reported and discussed a short video-vignette study that focused on particular ownership cues rather than on long-term ownership practices. While immersion was high, short videos cannot fully convey the complexity of real group interaction and co-present encounters with a robot, where emergent dynamics, accountability, power, and richer interaction histories shape interpretations. Real-world groups, for example, may renegotiate robot ownership attribution and social meaning over longer interactions [59], especially when the robot has a richer behavioral repertoire.

Additionally, the present manipulation operationalized robot ownership in the form of an introductory attribution ("who it belongs to") rather than as a lived ownership practice (e.g., ongoing access, control, maintenance). While this strengthens experimental control, it does not allow inferences about how ownership evolves in shared use over time. Related work on repeated interaction reports that first impressions of robots vary in stability and can change later on [41].

Our sample was further limited to US and UK participants, and all materials were presented in English; yet ownership can carry different connotations across cultures [57, 58]. Replication across languages and cultural contexts would help test whether the observed ownership patterns and role attributions hold more broadly or differ.

Interpretations of speaker intent and influence were captured qualitatively rather than through targeted quantitative scales. Based on the categories found, future work could operationalize constructs, such as perceived legitimacy, dominance, coercion, and fairness, to test these effects quantitatively.

Finally, ownership attributions may implicitly bundle assumptions about control and intent (e.g., who can program, direct, or "use" the robot), which likely contributes to the social meaning participants derive. Disentangling ownership from perceived operational control and accountability seems to be an important next step.

Based on this, we see two directions for future research: (1) to design and test concrete onboarding and interaction patterns that reliably create shared ownership- *like* dynamics, and (2) to study how ownership signals hold up (or decay) in longer, real group collaborations and higher-stakes settings.

To separate different dimensions that are currently confounded, future studies could factorially vary operational control ("who can configure or command it"), access/shared use ("who can interact with it"), and accountability ("who is responsible for its actions") to determine which dimension drives which group-level effects.

Our findings are further tied to one specific behavioral configuration: a robot that repeatedly nodded affirmingly for the active speaker. Future work should test whether ownership effects persist when the robot disagrees, interrupts, or distributes its responses more evenly across members. It should also examine how these effects change when human group members visibly acknowledge or challenge the robot. This would clarify whether ownership matters most under minimal behavioral cues or remains influential once richer behavior constrains interpretation more strongly.

An additional Research-through-Design-oriented direction would be to examine how a robot's shape and interaction modalities impact perceptions of ownership. In the present study, the robot remained a small, non-humanoid, minimally expressive artifact. Future studies could vary morphology and materiality more systematically (e.g., by comparing anthropomorphic versus more object-like embodiments, or softer versus more technical expressions) to examine how these qualities affect ownership perceptions as well as a group's dynamics.

Beyond such direct follow-up work, an important extension concerns group settings with multiple robots. While our study focused on a single, shared robot, future research could examine scenarios in which each participant has their own robot. These robots could then coordinate or negotiate among themselves [24], or actively mediate between human members by responding to computationally inferred intentions, affect, or group-level mood. Such configurations raise new questions about alignment, power, and collective sensemaking: Do multiple robots amplify or dampen power asymmetries? How do people interpret numerical imbalances – such as when some group members have robots and others do not, or when one person is accompanied by several robots? Exploring these scenarios would help to clarify whether ownership effects scale with the number of robots or whether qualitatively new dynamics emerge once robots become a distributed presence within the group. As robots are increasingly studied as ensembles, ownership and numerical presence may become as important as behavior itself.

Accessibility as a structural condition of "who gets to own" or routinely use robots also warrants examination. If robots are primarily present in certain homes, schools, or workplaces, familiarity with them may become unevenly distributed, thereby quietly advantaging some groups while leaving others less able to interpret, contest, or appropriate robot-mediated interaction. Future work should therefore account for participants' prior familiarity with robots when examining how ownership is understood and how it shapes related effects.

6 Conclusion

This paper shows that robot ownership impacts how groups, group interaction, and group members are perceived. Even when robot behavior was held constant, ownership cues shaped whether participants felt included, how closely the robot was associated with the group, and how the robot's actions were interpreted. Participant- and group-owned robots were easier to integrate into the group, while a speaker-owned robot was more often seen as biased or strategic. The same robot behavior led to different experiences because ownership framed how that behavior was understood.

Our findings suggest that robot ownership functions as a social signal that guides sensemaking. It helps people to understand what the robot is doing, whose interests it represents, and how it relates to the others. This highlights a limitation in much prior HHRI work: when ownership is left implicit, interpretations do not disappear; they simply become uncontrolled. Making ownership visible, therefore, supports clearer, more predictable group experiences.

For design, this means that shaping group experience is not only about robot behavior, but also about how robots are socially positioned. Introducing robots as shared resources and establishing this sharedness early may support inclusion and trust in group settings. Attending to ownership as part of interaction design offers a simple but powerful way to influence how robots are experienced in human groups and, thus, in Human–Human–Robot Interaction.

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References

[1] Clarissa Sabrina Arlinghaus, Viktoria Hörning, Charlotte Wulff, and Günter W. Maier. 2025. Asymmetrical Team Dynamics: Exclusion by Robot Coworkers Hurts Less, Inclusion by Human Coworkers Satisfies More. doi:10.31219/osf.io/3uthv_v2

[2] Christiane Atzmüller and Peter M. Steiner. 2010. Experimental Vignette Studies in Survey Research. *Methodology* 6, 3 (Jan. 2010), 128–138. doi:10.1027/1614-2241/a000014

[3] Minja Axelsson, Jiaee Cheong, Rune Nyrup, and Hatice Gunes. 2025. Who Owns the Robot?: Four Ethical and Socio-Technical Questions About Wellbeing Robots in the Real World Through Community Engagement. *Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society* 8, 1 (Oct. 2025), 249–264. doi:10.1609/aies.v8i1.36546

[4] Russell W. Belk. 1988. Possessions and the Extended Self. *Journal of Consumer Research* 15, 2 (Sept. 1988), 139–168. doi:10.1086/209154

[5] Ann Blandford, Dominic Furniss, and Stephann Makri. 2016. *Qualitative HCI Research*. Springer International Publishing, Cham. doi:10.1007/978-3-031-02217-3

[6] Jurgen Brandstetter, Peter Racz, Clay Beckner, Eduardo B. Sandoval, Jennifer Hay, and Christoph Bartneck. 2014. A peer pressure experiment: Recreation of the Asch conformity experiment with robots. In *2014 IEEE/RSJ International Conference on Intelligent Robots and Systems*. IEEE, 1335–1340. doi:10.1109/IROS.2014.6942730

[7] David Cameron, Emily C. Collins, Stevienna De Saille, Iveta Eimontaite, Alice Greenwood, and James Law. 2024. The Social Triad Model: Considering the Deployer in a Novel Approach to Trust in Human–Robot Interaction. *International Journal of Social Robotics* 16, 6 (June 2024), 1405–1418. doi:10.1007/s12369-023-01048-3

[8] Elior Carsenti, Adi Manor, Agam Oberlender, Avi Parush, and Hadas Erel. 2025. Raising Stars: Influences of Robotic Peer Liking on Emergent Leadership. In *2025 20th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, Melbourne, Australia, 447–457. doi:10.1109/HRI61500.2025.10973930

[9] Wynne W. Chin, Wm. David Salisbury, Allison W. Pearson, and Matthew J. Stollak. 1999. Perceived Cohesion in Small Groups: Adapting and Testing the Perceived Cohesion Scale in a Small-Group Setting. *Small Group Research* 30, 6 (Dec. 1999), 751–766. doi:10.1177/104649649903000605

[10] Bianca Dalangin, Stephen Gordon, Heather Roy, and Catherine Neubauer. 2026. Fostering Positive Interactions Through Psychological Ownership in Intelligent Systems. In *HCI International 2025 – Late Breaking Papers*, Helmut Degen and Stavroula Ntoa (Eds.). Vol. 16345. Springer Nature Switzerland, Cham, 176–189. doi:10.1007/978-3-032-13184-3_11 Series Title: Lecture Notes in Computer Science.

[11] Marco Dehnert and David J Gunkel. 2025. Beyond ownership: Human–robot relationships between property and personhood. *New Media & Society* 27, 2 (Feb. 2025), 1110–1126. doi:10.1177/14614448231189260

[12] Sarah Diefenbach, Marc Hassenzahl, Kai Eckoldt, and Matthias Laschke. 2010. The impact of concept (re)presentation on users' evaluation and perception. In *Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries*. ACM, Reykjavik Iceland, 631–634. doi:10.1145/1868914.1868991

[13] Judith Dörrenbächer, Ronda Ringfort-Felner, and Marc Hassenzahl. 2023. The Intricacies of Social Robots: Secondary Analysis of Fictional Documentaries to Explore the Benefits and Challenges of Robots in Complex Social Settings. In *Conference on Human Factors in Computing Systems - Proceedings*, Vol. 13. ACM. doi:10.1145/3544548.3581526

[14] Hadas Erel, Denis Trayman, Chen Levy, Adi Manor, Mario Mikulincer, and Oren Zuckerman. 2022. Enhancing Emotional Support: The Effect of a Robotic Object on Human–Human Support Quality. *International Journal of Social Robotics* 14, 1 (Jan. 2022), 257–276. doi:10.1007/s12369-021-00779-5

[15] Hadas Erel, Marynel Vázquez, Sarah Sebo, Nicole Salomons, Sarah Gillet, and Brian Scassellati. 2024. RoSI: A Model for Predicting Robot Social Influence. *ACM Transactions on Human-Robot Interaction* 13, 2 (June 2024), 1–22. doi:10.1145/3641515

[16] Donelson R. Forsyth. 2009. *Group Dynamics* (5 ed.). Wadsworth Cengage Learning, Belmont, CA.

[17] Donelson R. Forsyth. 2021. Recent advances in the study of group cohesion. *Group Dynamics: Theory, Research, and Practice* 25, 3 (Sept. 2021), 213–228. doi:10.1037/gdn0000163

[18] Marlena R. Fraune. 2020. Our Robots, Our Team: Robot Anthropomorphism Moderates Group Effects in Human–Robot Teams. *Frontiers in Psychology* 11 (July 2020), 1275. doi:10.3389/fpsyg.2020.01275

[19] Marlena R. Fraune, Selma Šabanović, and Eliot R. Smith. 2020. Some are more equal than others: Ingroup robots gain some but not all benefits of team membership. *Interaction Studies. Social Behaviour and Communication in Biological and Artificial Systems* 21, 3 (Dec. 2020), 303–328. doi:10.1075/is.18043.fra

[20] Christine Geeng and Franziska Roesner. 2019. Who's In Control?: Interactions In Multi-User Smart Homes. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*. ACM, Glasgow Scotland Uk, 1–13. doi:10.1145/3290605.3300498

[21] Sarah Gillet, Marynel Vázquez, Sean Andrist, Iolanda Leite, and Sarah Sebo. 2024. Interaction-Shaping Robotics: Robots that Influence Interactions between Other Agents. *ACM Transactions on Human-Robot Interaction* (Feb. 2024). doi:10.1145/3643803

[22] Marc Hassenzahl, Jan Borchers, Susanne Boll, Astrid Rosenthal-von Der Pütten, and Volker Wulf. 2021. Otherware: how to best interact with autonomous systems. *Interactions* 28, 1 (Jan. 2021), 54–57. doi:10.1145/3436942

[23] Yue Huang, Borke Obada-Obieh, and Konstantin (Kosta) Beznosov. 2020. Amazon vs. My Brother: How Users of Shared Smart Speakers Perceive and Cope with Privacy Risks. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. ACM, Honolulu HI USA, 1–13. doi:10.1145/3313831.3376529

[24] Shogo Ikari, Yuichiro Yoshikawa, and Hiroshi Ishiguro. 2020. Multiple-Robot Mediated Discussion System to support group discussion. In *2020 29th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*. IEEE, Naples, Italy, 495–502. doi:10.1109/RO-MAN47096.2020.9223444

[25] Wiebren S. Jansen, Sabine Otten, Karen I. Van Der Zee, and Lise Jans. 2014. Inclusion: Conceptualization and measurement. *European Journal of Social Psychology* 44, 4 (June 2014), 370–385. doi:10.1002/ejsp.2011

[26] Waki Kamino, Selma Šabanović, and Malte F Jung. 2025. "A Robot's Life is Over When People Give Up": Socio-Technical Infrastructure for Sustaining Consumer Robots. In *2025 20th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, Melbourne, Australia, 142–151. doi:10.1109/HRI61500.2025.10974029

[27] Anastasia Kuzminykh and Jessica R. Cauchard. 2020. Be Mine: Contextualization of Ownership Research in HCI. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems*. ACM, Honolulu HI USA, 1–9. doi:10.1145/3334480.3383058

[28] Dimitri Lacroix, Ricarda Wullenkord, and Friederike Eyssel. 2022. I Designed It, So I Trust It: The Influence of Customization on Psychological Ownership and Trust Toward Robots. In *Social Robotics*, Filippo Cavallo, John-John Cabibihan, Laura Fiorini, Alessandra Sorrentino, Hongsheng He, Xiaorui Liu, Yoshio Matsumoto, and Shuzhi Sam Ge (Eds.). Vol. 13818. Springer Nature Switzerland, Cham, 601–614. doi:10.1007/978-3-031-24670-8_53 Series Title: Lecture Notes in Computer Science.

[29] J. Richard Landis and Gary G. Koch. 1977. The Measurement of Observer Agreement for Categorical Data. *Biometrics* 33, 1 (March 1977), 159. doi:10.2307/2529310

[30] Matthias Laschke, Robin Neuhaus, Judith Dörrenbächer, Marc Hassenzahl, Volker Wulf, Astrid Rosenthal-Von Der Pütten, Jan Borchers, and Susanne Boll. 2020. Otherware needs Otherness: Understanding and Designing Artificial Counterparts. *ACM International Conference Proceeding Series* (2020), 6–9. doi:10.1145/3419249.3420079 ISBN: 9781450375795.

[31] Theresa Law, Meia Chita-Tegmark, and Matthias Scheutz. 2021. The Interplay Between Emotional Intelligence, Trust, and Gender in Human–Robot Interaction. *International Journal of Social Robotics* 13, 2 (April 2021), 297–309. doi:10.1007/s12369-020-00624-1

[32] Soohwan Lee, Seoyeong Hwang, and Kyungho Lee. 2025. Beyond Individual UX: Defining Group Experience(GX) as a New Paradigm for Group-centered AI. In *Companion Publication of the 2025 ACM Designing Interactive Systems Conference*. ACM, New York, NY, USA, 357–362. doi:10.1145/3715668.3736348

[33] Marietta Lieb, Werner Adler, Regina Herold, Yesim Erim, and Eva Morawa. 2024. Validation of the German version of the *Perceived Cohesion Scale*. *International*

Journal of Occupational Medicine and Environmental Health 37, 4 (Nov. 2024), 421–432. doi:10.13075/ijomeh.1896.02327

[34] Gabriel Lima, Nina Grgić-Hlača, and Meeyoung Cha. 2021. Human Perceptions on Moral Responsibility of AI: A Case Study in AI-Assisted Bail Decision-Making. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. ACM, New York, NY, USA, 1–17. doi:10.1145/3411764.3445260

[35] Ting-Han Lin, Yuval Rubin Kopelman, Madeline Busse, Sarah Sebo, and Hadas Erel. 2026. The impact of a robot's agreement (or disagreement) on human-human interpersonal closeness in a two-person decision-making task. *Computers in Human Behavior* 174 (Jan. 2026), 108807. doi:10.1016/j.chb.2025.108807

[36] Christoph Lutz and Aurelia Tamò-Larrieux. 2021. Do Privacy Concerns About Social Robots Affect Use Intentions? Evidence From an Experimental Vignette Study. *Frontiers in Robotics and AI* 8 (April 2021). doi:10.3389/frobt.2021.627958

[37] Diana Löffler, Judith Dörrenbächer, Julika Welge, and Marc Hassenzahl. 2020. Hybridity as Design Strategy for Service Robots to Become Domestic Products. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems*. ACM, Honolulu HI USA, 1–8. doi:10.1145/3334480.3382832

[38] Nicole Meng, Dilara Keküllüoğlu, and Kami Vaniea. 2021. Owning and Sharing: Privacy Perceptions of Smart Speaker Users. *Proceedings of the ACM on Human-Computer Interaction* 5, CSCW1 (April 2021), 1–29. doi:10.1145/3449119

[39] Stanislava Naneva, Marina Sarda Gou, Thomas L. Webb, and Tony J. Prescott. 2020. A Systematic Review of Attitudes, Anxiety, Acceptance, and Trust Towards Social Robots. *International Journal of Social Robotics* 12, 6 (Dec. 2020), 1179–1201. doi:10.1007/s12369-020-00659-4

[40] Anastasia K. Ostrowski, Raechel Walker, Madhurima Das, Maria Yang, Cynthia Breazea, Hae Won Park, and Aditi Verma. 2022. Ethics, Equity, & Justice in Human-Robot Interaction: A Review and Future Directions. In *2022 31st IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*. IEEE, Napoli, Italy, 969–976. doi:10.1109/RO-MAN53752.2022.9900805

[41] Maike Paetzel, Giulia Perugia, and Ginevra Castellano. 2020. The Persistence of First Impressions. In *Proceedings of the 2020 ACM/IEEE International Conference on Human-Robot Interaction*. ACM, New York, NY, USA, 73–82. doi:10.1145/3319502.3374786

[42] Tuan Vu Pham, Chao Wang, Heiko Wersing, and Marc Hassenzahl. 2025. "Teach Me About Objects!" – Experience-Driven Interaction for Teachable Robots. In *Proceedings of the 2025 ACM Designing Interactive Systems Conference*. ACM, New York, NY, USA, 806–824. doi:10.1145/3715336.3735811

[43] Tuan Vu Pham, Thomas H. Weisswange, and Marc Hassenzahl. 2024. Embodied Mediation in Group Ideation – A Gestural Robot Can Facilitate Consensus-Building. In *DIS '24: Proceedings of the 2024 ACM Designing Interactive Systems Conference*. ACM, New York, NY, USA, 2611–2632. doi:10.1145/3643834.3660696

[44] Tuan Vu Pham, Thomas H. Weisswange, and Marc Hassenzahl. 2025. Impact of Affirmative and Negating Robot Gestures on Perceived Personality, Role, and Contribution of a Human Group Member. In *Proceedings of the 2025 ACM Designing Interactive Systems Conference*. ACM, New York, NY, USA, 271–286. doi:10.1145/3715336.3735765

[45] Jon L. Pierce and Iiro Jussila. 2010. Collective psychological ownership within the work and organizational context: Construct introduction and elaboration. *Journal of Organizational Behavior* 31, 6 (Aug. 2010), 810–834. doi:10.1002/job.628

[46] Jon L. Pierce, Tatiana Kostova, and Kurt T. Dirks. 2003. The State of Psychological Ownership: Integrating and Extending a Century of Research. *Review of General Psychology* 7, 1 (March 2003), 84–107. doi:10.1037/1089-2680.7.1.84

[47] Jon L. Pierce, Jonathan I. Lee, and Dahui Li. 2025. Collective psychological ownership: A literature review and future directions. *Journal of Management & Organization* (Oct. 2025), 1–20. doi:10.1017/jmo.2025.10053

[48] Danielle Rifinski, Hadas Erel, Adi Feiner, Guy Hoffman, and Oren Zuckerman. 2021. Human-human-robot interaction: robotic object's responsive gestures improve interpersonal evaluation in human interaction. *Human–Computer Interaction* 36, 4 (July 2021), 333–359. doi:10.1080/07370024.2020.1719839

[49] Eileen Roesler, Sophie Rudolph, and Felix Wilhelm Siebert. 2024. Exploring the Role of Sociability, Ownership, and Affinity for Technology in Shaping Acceptance and Intention to Use Personal Assistance Robots. *International Journal of Social Robotics* 16, 6 (June 2024), 1463–1474. doi:10.1007/s12369-024-01098-1

[50] Nicole Salomons, Sarah Strohkorb Sebo, Meiying Qin, and Brian Scassellati. 2021. A Minority of One against a Majority of Robots. *ACM Transactions on Human-Robot Interaction* 10, 2 (June 2021), 1–22. doi:10.1145/3442627

[51] Eike Schneiders, EunJeong Cheon, Jesper Kjeldskov, Matthias Rehm, and Mikael B. Skov. 2022. Non-Dyadic Interaction: A Literature Review of 15 Years of Human-Robot Interaction Conference Publications. *ACM Transactions on Human-Robot Interaction* 11, 2 (June 2022), 1–32. doi:10.1145/3488242

[52] Sarah Sebo, Brett Stoll, Brian Scassellati, and Malte F. Jung. 2020. Robots in Groups and Teams: A Literature Review. *Proceedings of the ACM on Human-Computer Interaction* 4, CSCW2 (Oct. 2020), 36. doi:10.1145/3415247

[53] Eliot R. Smith, Selma Šabanović, and Marlena R. Fraune. 2020. Human–robot interaction through the lens of social psychological theories of intergroup behavior. *Technology, Mind, and Behavior* 1, 2 (2020), 90–100. doi:10.1037/tmb0000002

[54] Andrew Steain, Christopher John Stanton, and Catherine J. Stevens. 2019. The black sheep effect: The case of the deviant ingroup robot. *PLOS ONE* 14, 10 (Oct. 2019), e0222975. doi:10.1371/journal.pone.0222975

[55] Hamish Tennent, Solace Shen, and Malte Jung. 2019. Micbot: A Peripheral Robotic Object to Shape Conversational Dynamics and Team Performance. *ACM/IEEE International Conference on Human-Robot Interaction* 2019-March (March 2019), 133–142. doi:10.1109/HRI.2019.8673013 ISBN: 9781538685556.

[56] Margaret L. Traeger, Sarah Strohkorb Sebo, Malte Jung, Brian Scassellati, and Nicholas A. Christakis. 2020. Vulnerable robots positively shape human conversational dynamics in a human-robot team. *Proceedings of the National Academy of Sciences of the United States of America* 117, 12 (March 2020), 6370–6375. doi:10.1073/pnas.1910402117

[57] Maykel Verkuyten. 2025. "Ours": Understanding Collective Psychological Ownership. *The Journal of Psychology* 159, 6 (Aug. 2025), 389–418. doi:10.1080/00223980.2024.2414286

[58] Maykel Verkuyten and Borja Martinovic. 2017. Collective Psychological Ownership and Intergroup Relations. *Perspectives on Psychological Science* 12, 6 (Nov. 2017), 1021–1039. doi:10.1177/1745691617706514

[59] Sebastian Wallkötter, Rebecca Stower, Arvid Kappas, and Ginevra Castellano. 2020. A Robot by Any Other Frame: Framing and Behaviour Influence Mind Perception in Virtual but not Real-World Environments. In *Proceedings of the 2020 ACM/IEEE International Conference on Human-Robot Interaction*. ACM, Cambridge United Kingdom, 609–618. doi:10.1145/3319502.3374800

[60] Thomas H. Weisswange, Hifza Javed, Manuel Dietrich, Malte F. Jung, and Nawid Jamali. 2025. Design Implications for Robots that Facilitate Groups–A Scoping Review on Improving Group Interactions through Directed Robot Action. *ACM Transactions on Human-Robot Interaction* (Nov. 2025), 3777455. doi:10.1145/3777455

[61] Thomas H. Weisswange, Hifza Javed, Manuel Dietrich, Tuan Vu Pham, Maria Teresa Parreira, Michael Sack, and Nawid Jamali. 2023. What Could a Social Mediator Robot Do? Lessons from Real-World Mediation Scenarios. (June 2023). http://arxiv.org/abs/2306.17379 arXiv: 2306.17379.

A Appendix

A.1 Complete Questionnaire with All Items

Table A.1: Full set of questionnaire items that participants responded to after viewing the videos vignette.

Category	Item	Construct	Response Scale
Demographics	Your gender		
	Your age in years		
Immersion Check	I was able to put myself into the situation shown in the video.	Immersion	Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly Agree
	I had a hard time imagining myself in the presented situation.	Immersion	
Perceived Group Cohesion (PGC)	I feel a sense of belonging to this group.	Belonging	Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly Agree
	I feel that I am a member of this group.	Belonging	
	I see myself as part of this group.	Belonging	
	I am enthusiastic about this group.	Morale	
	I feel good about this group.	Morale	
	I am happy to be part of this group.	Morale	
	I felt included in the group's interactions.	Inclusion by others	
	In this group, my ideas were valued.	Inclusion by others	
Robot–Group Alignment	The robot is subservient to the group.	Dependence	Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly Agree
	The robot is an impartial bystander, which has its own opinion.	Dependence (-)	
	The robot is a member of our group.	Social Alignment	
	The robot and our group are on the same side.	Social Alignment	
	The robot is an outsider to our group.	Social Alignment (-)	
Open-Ended Questions	What stood out to you and influenced your opinion of the group situation presented?		Free text response
	Please describe the relationship between the robot and the group (consisting of you, Riley and Alex).		
	Please describe the relationship between the robot and Alex.		
	Why do you think the robot agreed with Alex?		
	Did you feel included as part of the group? Why or why not?		
	How did the robot affect how connected you felt to the group?		