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DO WE MITIGATE FACE-THREATENING ACTS EVEN WHEN COMMUNICATING WITH FACELESS ROBOTIC ARMS? POLITENESS STRATEGIES IN HUMAN-ROBOT VS. HUMAN-HUMAN INTERACTION

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ABSTRACT

Politeness is commonly defined as a system of interpersonal relations designed to facilitate interaction by minimizing the potential for conflict and confrontation inherent in all human interchange (cf. Lakoff 1973). Building on this, Brown and Levinson's (1987) classic theory of politeness centers on the concept of protecting one's "face" or image in a public domain. This study explores whether humans extend the use of polite interaction strategies to situations in which they collaborate with non-anthropomorphic robots. Using a Wizard-of-Oz experimental setup, native German speakers were instructed to assemble an IKEA shelf with either a robotic arm supposedly equipped with a conversational agent or a human partner. Audio recordings of the interactions were transcribed and annotated to analyse the use of linguistic mitigators and to compare politeness strategies across both conditions. Results showed that participants used more impositives and conventionally indirect strategies when interacting with the robot, whereas interactions with humans featured more information requests and nuanced mitigation. This research contributes to the growing field of human-robot interaction by providing empirical evidence on how social norms such as politeness are maintained or altered when

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interacting with artificial agents. The findings have implications for the design of socially aware, non-anthropomorphic manufacturing robots that can engage in natural and culturally appropriate communication.

Keywords: *HumanRobot Interaction, Mitigation Strategies, Politeness, Design Implications*

1. INTRODUCTION

Politeness is a fundamental aspect of human communication that governs social interaction patterns and relationship-maintaining strategies (Luo, 2025). It represents a core component of human social behaviour, as individuals continuously make choices about when and how to employ politeness devices to navigate social exchanges (Danescu-Niculescu-Mizil et al., 2013). Politeness involves a repertoire of linguistic and behavioural strategies used to minimize conflict and foster positive interpersonal relationships between humans. In everyday discourse, it functions as a means of establishing rapport and avoiding conflict and confrontation between individuals (Kumar, 2022). As recent technical advancements have led to the increasing integration of robotic agents into both personal and professional environments, this leads us to the question if politeness strategies are also extended to include non-anthropomorphic artificial agents.

1.1 Politeness and requests

One of the most influential frameworks for understanding politeness is Brown and Levinson's (1987) politeness model, which builds upon Goffman's concept of face as the public self-image that every competent member of society seeks to maintain. According to this model, face consists of two components: negative face, which refers to an individual's desire for freedom of action and freedom from imposition, and positive face, which reflects an individual's need to be liked, approved of, and appreciated by others (Brown and Levinson 1987: 13). This face is emotionally invested, it can be maintained, enhanced, or lost during interaction and therefore must be continuously attended to in communication between humans. In every interaction, speakers engage in acts that may threaten either their own or their interlocutor's face. These are known as face-threatening acts (FTAs), and their potential impact depends on several sociolinguistic variables, such as the power relationship between interlocutors, the social distance separating them, and the rank of imposition involved in the act (Ackermann, 2023). Politeness theory thus offers a systematic account of how individuals manage and mitigate these threats through strategic linguistic choices. Brown and Levinson (1987:15) proposed that many speech acts are inherently face-threatening, as they may challenge either the speaker's or the hearer's positive or negative face.

Among these, requests represent a particularly significant class of face-threatening acts. A request places an imposition on the hearer and threatens the hearer's negative face, i.e. their desire for autonomy and freedom from obligation (Brown & Levinson 1987:19; Ackermann 2023). To reduce this effect, speakers may employ negative politeness strategies (Danescu-Niculescu-Mizil et al. 2013) such as hedging, indirectness, or apology, to minimize the perceived imposition on the hearer and to maintain social equilibrium.

Searle (1969), in his Speech Act Theory (SAT), classified requests under the category of directives, which are attempts by the speaker to get the listener to do something. Requests can be realized through various linguistic structures, they may consist of a single head act (a direct utterance), or the head act may be modified by internal modifiers like politeness markers (e.g., *please*) or lexical downgraders (e.g., *maybe*). These linguistic means soften or reinforce the request's force. In this paper, we focus specifically on the head act and its internal modifiers as key indicators of politeness levels in request formulation.

Blum-Kulka et al. (1984) further refined the understanding of politeness in requests by defining it as an interactional balance between two communicative needs: the need for pragmatic clarity (ensuring that the request is understood) and the need to avoid coerciveness (maintaining politeness and mitigating threat). Her Cross-Cultural Speech Act Realization Project (CCSARP) developed a typology of request strategies ranging from the most direct and least polite mood derivable (e.g., "Move your car") to the most indirect and polite mild hints (e.g., "We don't want any crowding." – an implicit request to move the car). These categories provide a framework for measuring the degree of politeness expressed in requests.

While all of the above observations are known to work for humans, our study covers new ground by investigating whether the concept of face and the mitigating linguistic strategies associated with it can also be extended to robots – more specifically to industrial robots, which only consist of a mechanic arm and do not even have a face in the literal meaning of the word (in contrast to social robots like Pepper by SoftBank Robotics). We aim to further politeness research in human-robot interaction (HRI) by analysing which mitigators are used by native German speakers when collaborating with an industrial robot and how these differ when the same task is done with a human partner. Our study looks into the distribution of head act strategies in human-robot (H-R) and human-human (H-H) collaboration in the directive speech act as classified by Searl in his speech act theory. To conduct this analysis, the study adopts a modified annotation schema based on Ackermann's (2023) adaptation of the CCSARP framework.

2. RELATED WORK

Most research on politeness in human-robot and human-agent interaction has explored how varying levels of politeness of the artificial agent influence users' perceptions, trust, and cooperation with artificial agents.

Kumar et al. (2022) conducted an experiment testing three levels of politeness based on Lakoff's politeness theory (cf. Lakoff, 1973), which defines politeness as a system of interpersonal relations designed to facilitate interaction by minimizing the potential for conflict and confrontation inherent in human communication. Their study aimed to assess the impact of polite robot behaviour on users' perceptions of enjoyment, trust, and satisfaction. Fifty adults participated, 30 of which were students (primarily engineering students open to technology), and 20 were older adults. Results showed that while older adults had difficulty distinguishing between the different levels of politeness, they nonetheless preferred the robot operating in the politest mode. Across all participants, the robot's polite behaviour significantly enhanced perceptions of enjoyment, satisfaction, and trust. Robots that adhered more closely to Lakoff's

rules consistently achieved higher ratings across all three dependent variables, demonstrating the positive effect of politeness on user experience.

Inbar et al. (2019) examined interactions between civilians and peace-keeping robots, finding that people's expectations of robot guards mirrored those they held for human guards. Polite robots were consistently perceived as friendlier, fairer, and more appropriate in behaviour, while also being viewed as less intimidating. The study concluded that the robots' manners rather than their functionality influenced the participants' perception of the robots.

Similarly, Ramachandran and Lim (2021) explored the design of a nursing robot capable of performing hospital-related tasks. The robot was equipped with animated eyes, a localized voice, and polite context phrases designed to emulate nurse-patient communication. Their findings indicated that polite communication significantly increased users' perceptions of the robot's trustworthiness and overall acceptability in healthcare contexts.

Williams et al. (2020) examined the effect of wakewords ("Hey, Pepper" vs. "Excuse me, Pepper") on robot-directed human politeness. They used a fully automated humanoid robot (SoftBank's Pepper) in their experiment with 30 student participants. The experiment simulated a restaurant setting in which the experimenter used one of the above-mentioned wakewords to start the robot. Their results suggest that polite wakeword-driven priming could increase indirect speech act usage in users (which is a subtle marker of politeness).

Politeness has also been studied beyond traditional humanoid robots. Lee et al. (2019) investigated the politeness of vehicles with built-in conversational agents on driver interaction experience. In this experiment, the driving assistant gave instructions either in a plain, direct style or in a polite manner. The results showed politeness improved the interaction with conversational systems when the conditions were normal. However, in failure conditions, users found overly polite behaviour to reduce interaction efficiency, suggesting that the benefits of politeness may depend on situational context. The study highlights the importance of balancing social cues and functional clarity in the design of polite machine communication systems.

It becomes clear from the above that most studies in human-agent interaction so far focus on how robots' politeness is perceived by humans. By contrast, the present study examines how humans use request strategies in a collaborative context, and if they employ different types and levels of politeness when asking a robot or another human to do something.

Building on previous research, we analysed the data according to the following hypotheses:

- **H1:** Owing to the inherent asymmetry between humans and robots regarding power and other social aspects in the communicative situation, we expect a difference in the frequency and type of head act strategies employed in human-human (H-H) versus human-robot (H-R) conversation. We expect this asymmetry to result in more polite language being used with a fellow human than with a robot.
- **H2:** For the same reasons as above, we expect the usage of politeness-increasing internal modifiers (like please) in the head act to be higher in human-human (H-H) interactions compared to human-robot (H-R) interactions.

3. METHODOLOGY

The study used the same methodology as Coelho et al. (2025). The Wizard-of-Oz (WoZ) setup, participant recruitment strategy, task design and data collection were adopted without any changes. Below, we summarize the key steps of the experiment, while highlighting our annotation approach.

3.1. Participants and experimental setup

A total of 13 participants were recruited via the Chemnitz University of Technology mailing lists. They were semi-randomly assigned to one of two groups, collaborating either with a robot arm (7 participants) or with a human partner (3 groups). Three participants reported having worked with robots before. All participants gave informed consent regarding audio and video recordings and were debriefed about the WoZ setup at the end of the experiment. The robot used in this experiment was the Franka 3 robotic arm, which was operated in impedance mode, similar to the setup in Kaden et al. (2024). This mode allowed the participants to stop the robot at any time with light pressure. Three researchers conducted the experiment; one gave instructions and had access to an emergency stop button. The robot was tele-operated via a 3Dconnexion mouse by one backstage researcher, while another managed verbal interactions. The robot's communication with participants consisted of synthetic speech combined with pre-scripted and live responses, supported by three cameras that provided full coverage of the workspace. After building the shelf, participants answered a survey on LimeSurvey and participated in a post-experiment interview. All data for this study was collected in the first half of 2025.

3.2. Collaborative Task

Participants were instructed to assemble an IKEA JONAXEL shelf (25 × 51 × 70 cm) together with their partner (human or robot). No manuals, time limits, or verbal instructions were provided, encouraging spontaneous dialog. The shelf could be fully assembled in 12 steps. In the H-H condition, the complete unit was built, whereas in the H-R condition, only two shelves were assembled, because the robot arm had a limited capacity of 2 kgs, so that assembling the whole unit would have been beyond its capacity.

3.3. Transcription

The collected audio recordings were transcribed using NextGen, which is a Whisper-based transcription tool developed at the University of Applied Sciences Mittweida. These were then corrected manually by a student assistant to ensure accuracy of the text.

3.4. Annotation

The analysis was conducted on transcripts from Coelho et al. (2025) which had been annotated for speech acts. The analysis in the present study focused specifically on the directive

utterances. There were a total of 327directives in the H-R condition and 72 in the H-H condition. Each utterance was annotated following the schema in Table 1, which is a modified version of the categories outlined in Ackermann (2023) based on the CCSARP framework. The examples in Table 1 are from our German dataset. We translated them into English as literally as possible.

The CCSARP (1984) mentions 3 levels of directness. The most direct and explicit level is typically expressed through imperatives (e.g., "Close the window!"). At the second level, requests are conventionally indirect, using a question or other indirect form (e.g., "Could you close the window?"). These forms do not explicitly command the listener, but they are understood socially and linguistically as polite requests. Finally, at the non-conventional indirect level, requests are conveyed through open-ended strategies that rely on hints rather than explicit linguistic markers. Such utterances may involve partial reference to the object or element required for the act (e.g., "Why is the window open?") or depend on shared contextual knowledge (e.g., "It's cold in here."), leaving the listener to infer the intended request.

With CCSARP as the base, Ackermann (2023) developed a schema to annotate a German discourse completion task manipulating the weight of imposition. Each of the head act strategies was further subdivided into subcategories.

In order to better align the existing annotation framework with the present experimental context and classify utterances in our dataset that could not be captured by Ackermann's (2023) original schema, we introduced several additional categories (marked in blue in Table 1) based on the form of the speaker's utterances and the intended reactions of the hearer. For instance, our database contained many directives that did not necessarily require any action from the speaker beyond a verbal response for clarification or instruction. We therefore added the category questions requiring a verbal response with the subcategories instruction request (e.g. "What should I do now?") and information request – the latter with a further form-based differentiation between the literal value of the question. Thus the willingness information request seeks to determine or confirm the listener's preference (e.g., "So, would you like to build that vertically or horizontally?"), the ability information request seeks to assure if the interlocutor is capable of performing an action, and the possibility information request seeks to determine whether an action can be done. In addition to these full realisations, we also included context-dependent elliptical variants of both information request (e.g., "(Shall I do it) Like this?") and instruction request (e.g., "(Shall I) Screw (it tight)?"), because these occurred in our data.

Elliptical categories were also introduced as subtypes in all categories within the impositive head act for utterances lacking an explicit verb but suggesting a (relatively) conventionalised interpretation, e.g. "One moment" instead of the explicit "Wait one moment". In English, explicit directions employ the imperative, but German has two options, of which the more usual one is the imperative (e.g. "Bitte lass los!" = 'Please let go!'), which makes use of the uninflected verb stem in the second person of regular verbs. The alternative is the infinitive (found in cooking recipes, official instructions,[6] and prohibition signs like "Nicht stören" = 'Do not disturb'), which uses the base form of the verb without conjugation and is marked by the ending -en (e.g. "Bitte loslassen!" = 'Please let go!'). While imperative and

[6] See *Duden* (https://www.duden.de/sprachwissen/sprachratgeber/Bildung-des-Imperativs). Last accessed December 8, 2025.

infinitive cannot be translated into English in different ways, it was important for the analysis of the German dataset to keep these two forms apart. That is why we added infinitive to Ackermann's (2023) scheme. The only instance where this was not possible was in elliptical statements. Since it is unclear whether the unexpressed part corresponds to an imperative ("(Bitte warten Sie einen) Moment!") or an infinitive ("(Bitte einen) Moment (warten)!"), we created the combined category of imperative/infinitive ellipsis. Furthermore, we added the subtypes should statement, where the speaker prescribes or suggests an action to be performed, and declarative statement. As an example of the latter, "That is enough." signals the request to stop perform an action by stating that the desired state has been reached.

In the conventionally indirect category, the subtype ability statement was added (e.g. "You can hold the leg."). Ability statements capture requests using the modal verb can without posing a direct question about capability. This subtype typically occurs in response to the question "What should I do now?", with an answer of the form "You can + [verb phrase]". The category yes-no question (e.g. "Will you let it go?") was added to capture direct questions that do not require a detailed answer beyond "yes" or "no" and do not make use of expressions of modality.

In the non-conventionally indirect category, the subtype possibility statement was added to capture what the speaker considers possible in a given situation, expressed as a declarative sentence, e.g. "I would say each of us does one side".

During the annotation process, all head act strategies were annotated by two researchers, and ambiguous cases were resolved through discussion among annotators prior to final coding.

Table 1. Modified version of the annotation schema used by Ackermann (2023)

Type	Example	Translation
HEAD ACT STRATEGY – Impositive		
Imperative	Lass mal bitte los.	Please let go.
Infinitive[7]	So, bitte wieder loslassen.	Okay, please let go.
Imperative/Infinitive ellipsis	Moment.	One moment.
Must statement	Du muss nochmals loslassen.	You must let go again.
Want statement	Aha, ich möchte die Beine mit dem Boden verschrauben.	Aha, I want to screw the legs to the shelf.
Should statement	Ja, das sollte reichen.	Yes, that should be enough.
Declarative statement	Das reicht.	That is enough.
HEAD ACT STRATEGY – Conventionally indirect		
Ability question	Kannst du es mir geben?	Can you give it to me?

[7] In contrast to the other examples, where care was applied to imitate the linguistic means used in German in the English translation, this was not possible for the infinitive (which is marked through the ending *-en* in German verbs, e.g. *loslassen*).

Ability statement	Du kannst das Bein halten.	You can hold the leg.
Yes / No Question	Lässt du es nochmal los?	Will you let it go?
HEAD ACT STRATEGY – Non-conventionally indirect		
Willingness question	Wenn du bitte diesen Stab halten würdest?	If you could please hold this rod?
Possibility question	Geht es noch etwas straffer?	Can it be a bit tighter?
Possibility statement	Ich würde sagen, es macht jeder eine Seite.	I would say each of us does one side.
Questions requiring verbal responses		
Information request	Ist alles in Ordnung?	Is everything okay?
Information request ellipsis	So?	Like this?
Information request (willingness)	Und zwar, möchtest du das vertikal oder horizontal aufbauen?	So, would you like to build that vertically or horizontally?
Information request (ability)	Hm, kannst du das?	Hm, can you do it?
Information request (possibility)	Kann man das irgendwie also so, weißt du, was ich meine, so?	Is it possible to somehow… like this… do you know what I mean? Like this?
Instruction request	Was soll ich jetzt machen?	What should I do now?
Instruction request ellipsis	Schrauben?	Screw?
INTERNAL MODIFICATION		
Subjunctive	Du *könntest* mir eine der Schrauben geben.	You *could* give me one of the screws.
Downtoner	Ich würde es mal *vielleicht* noch nicht ganz fest festmachen.	I would *maybe* not make it completely tight yet.
Understater	Schieb *mal* in deine Richtung *kurz*.	Give it a *quick* push in your direction.
Politeness marker	So, *bitte* wieder loslassen	Okay, *please* let go again.

Note: *The examples are taken from our dataset. The schema has been adapted to include new categories (highlighted in blue) relevant to human-robot interaction dialogues. Categories that do not occur in our dataset were not considered.*

4. RESULTS

A frequency analysis of head act strategies was conducted for directive utterances in both conditions using the programming language R. Percentages were calculated relative to the total number of utterances in each condition. Raw counts along with percentages of all categories and subcategories can be found in the appendix. These also clarify the huge differences in the number of directives in H-H mode (72) and H-R mode (327) that were analysed in the present study. Figure 1 illustrates the distribution of head act strategies across

both conditions, ordered from least to most polite. It becomes immediately obvious that H-R communication relies predominantly on highly direct impositive strategies, such as "Hold tight," which account for 62.8% of the utterances. In contrast, H-H communication shows a clear preference for questions requiring verbal responses, like "What should I do now?" (55.5%). By comparison: these strategies only make up 20.1% of the utterances in H-R interactions. Non-conventionally indirect strategies like "If you could please hold this rod?" occur in only 1.5% of H-R communication – but 16.7% of the H-H utterances. Conventionally indirect (e.g. Can you + VP) strategies represented 6.9% of H-H and 15.2% of H-R utterances. Across all head acts, overall distributional differences were confirmed by a Pearson's Chi-square test of independence ($\chi^2 = 80.525$, df = 3, $p < .001$).

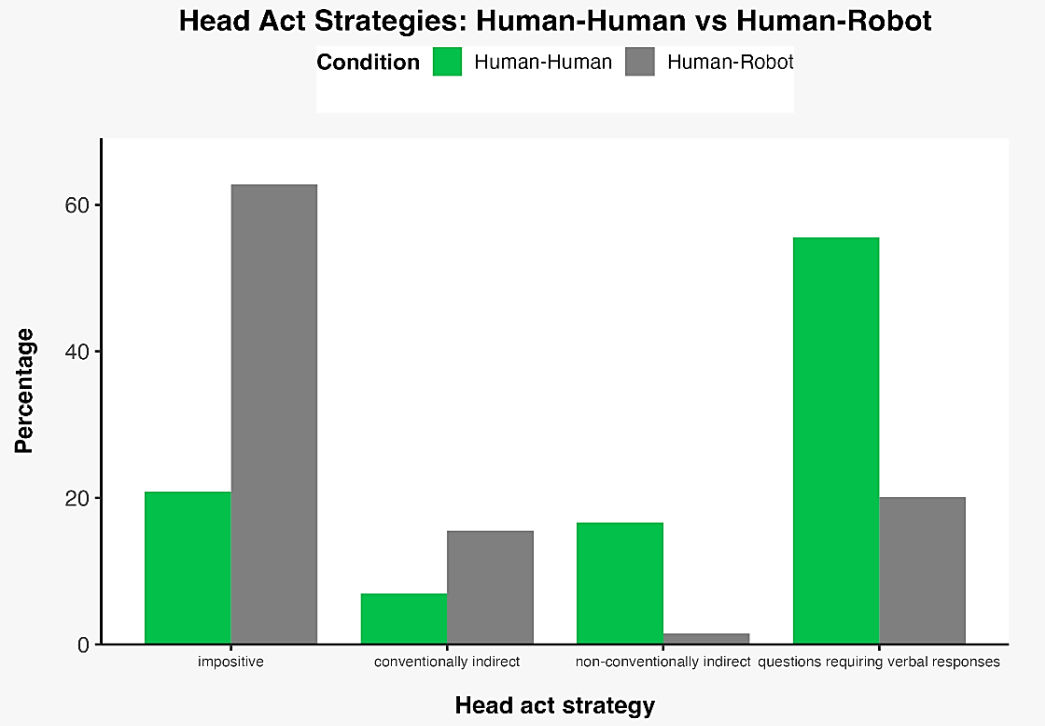

Figure 1. Percentage of the head act strategy in H-H and H-R condition, ordered from least to most polite strategy

4.1. Impositive strategies

Given their predominance in the H-R condition, impositives were further analysed (see Figure 2). Most importantly, in the H-R condition, imperative/infinitive ellipses (e.g., "One moment") formed 47.8% of the conversation, with the raw count being 98. Imperatives and infinitives ("Let go") each represented 22.9%, with the raw counts for both being 47. In the H-H condition, imperatives constituted 33.3% of all utterances (raw count = 5). However, no infinitive constructions were produced in collaboration with a human. Declarative statements (e.g., "That's enough") accounted for 20% of H-H and 3.9% of H-R interactions. The should and want statements occurred only in the H-R condition (0.4%). The goodness-of-fit test indicated that impositives occurred significantly more frequently in the H-R condition ($\chi^2 = 164.09$, df = 1, p-value < .001).

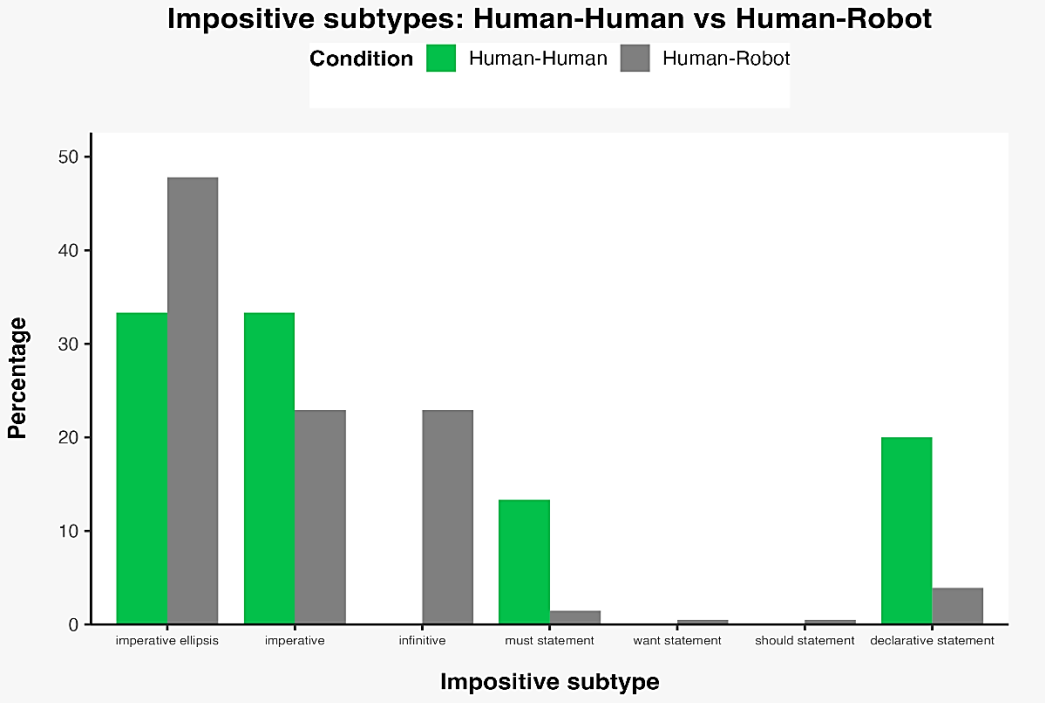

Figure 2. Percentage of the impositive subtype in H-H and H-R condition

4.2. Non-conventionally indirect strategies

Figure 3 shows the percentage of non-conventionally indirect subtypes. Within the category of non-conventionally indirect head act strategies, possibility statements (e.g. *"I* would say each of us do one side.") represented 91.6% of H-H (n=11) and 60% of H-R utterances (n=3). Willingness questions (e.g. "Would you like to do it again?") occurred only once in each condition. A goodness-of-fit test revealed no significant difference between the two conditions.

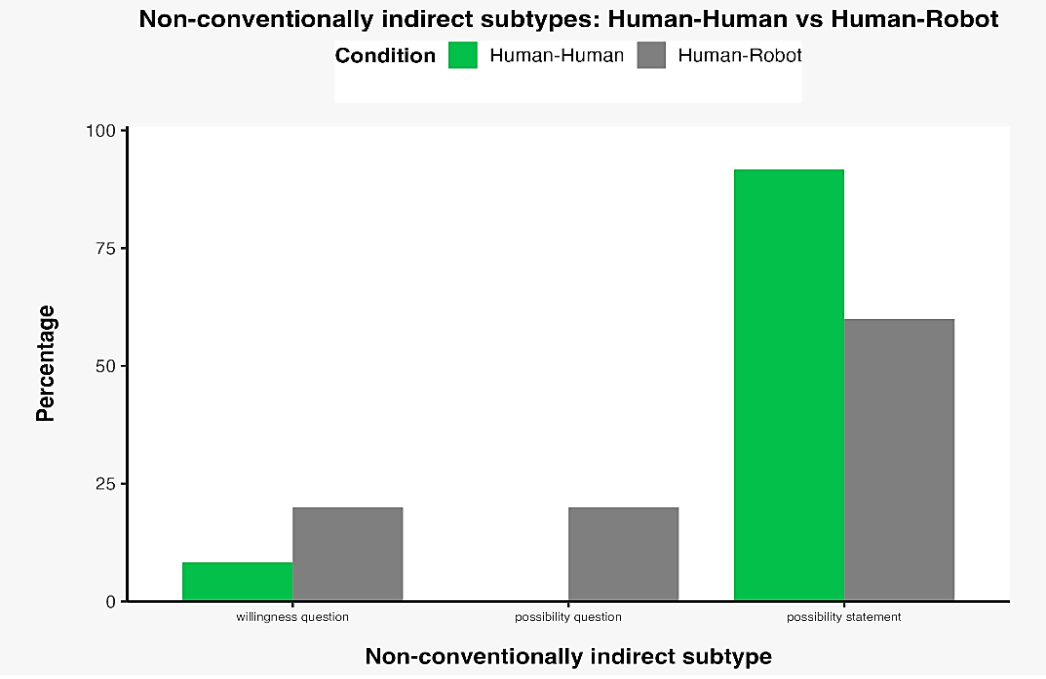

Figure 3. Percentage of the non-conventionally indirect subtype in H-H and H-R condition

4.3.Conventionally indirect, instruction and information requests

60% of the conventionally indirect utterances in the H-H condition were ability statements (e.g. “You can hold the leg.”). In the H-R condition, 31% were ability statements, and 62% were ability questions (e.g. “Can you give it to me?”). Because some subtypes occurred fewer than five times, a Chi-square test was not applied.

In the category of questions requiring verbal responses, instruction requests (e.g. “What should I do now?”) accounted for 52.2% in the H-R condition and 15% in the H-H condition. On the other hand, information requests (e.g. “Is everything alright?”) accounted for 67.5% of the H-H utterances and only 26.9% of the H-R utterances (see Figure 4). Although the subcategories of information requests were annotated separately, they were grouped under the broader category of information request for the statistical analysis. A goodness-of-fit test revealed a significant difference in the frequency of questions requiring a verbal response (χ^2 = 6.8131, df = 1, p-value = 0.009).

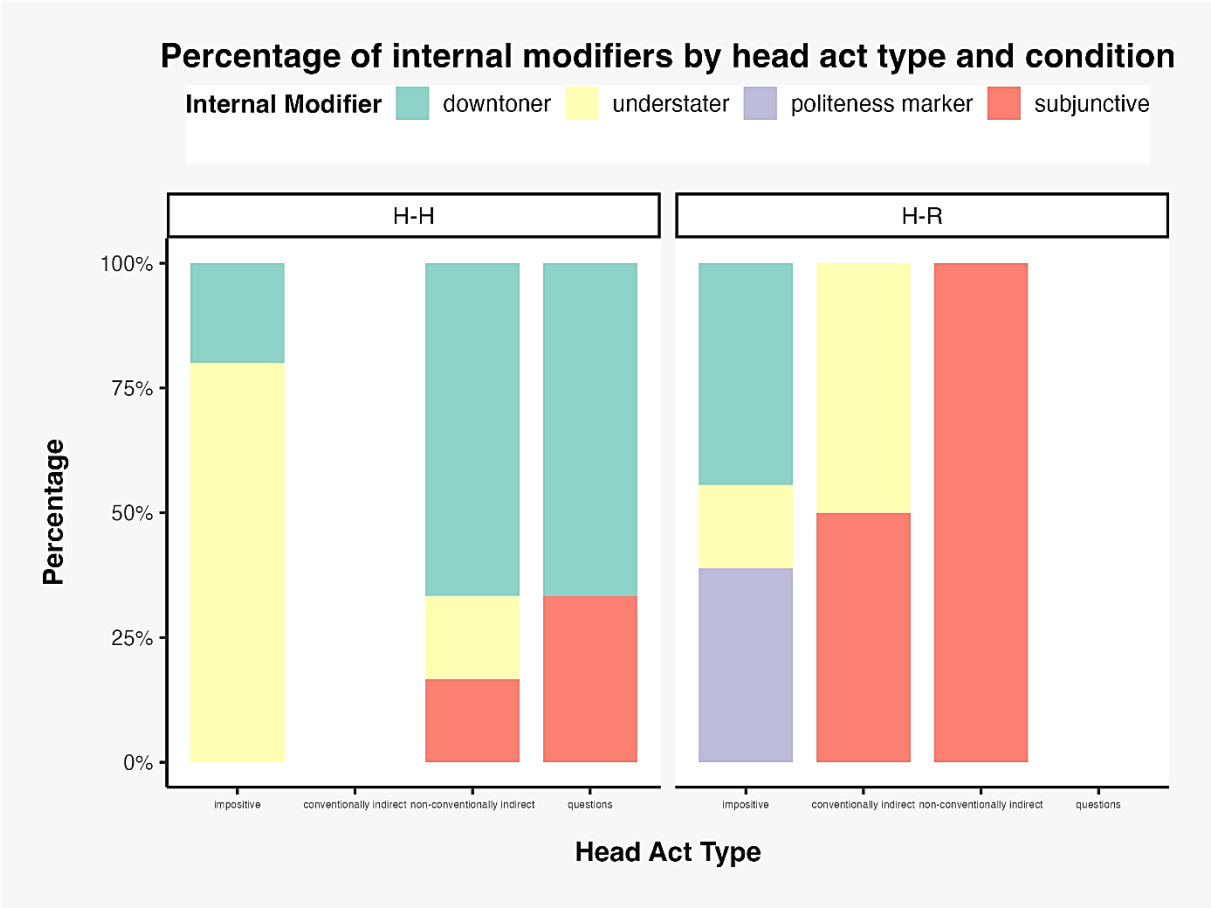

Figure 4. Percentage of internal modifiers in H-H and H-R condition

4.4.Internal Modification

Table 2 summarizes the distribution of internal modifiers by condition. Internal modification occurred more frequently in the H-R condition. Downtoners were used in 33.3% of H-R utterances, primarily in combination with impositives. The downtoners in the H-H condition co-occurred with impositives and questions requiring verbal responses. In the H-R condition, all the politeness markers co-occurred with impositives.

Table 2. Usage of internal modification percentages and raw counts

Condition	Internal Modifier	Counts	Percentage
H-H	downtoner	7	50%
	understater	5	35.7%
	subjunctive	2	14.3%
	politeness marker	0	0%
H-R	downtoner	8	33.3%
	politeness marker	7	29.1%
	subjunctive	4	16.6%
	understater	5	20.8%

5. DISCUSSION

The findings support H1, revealing clear differences in the frequency and distribution of head act strategies between H-H and H-R communication during a collaborative task. In line with the predicted power asymmetry, participants interacting with the robot used more impositive strategies, both explicit and elliptical, whereas H-H interactions exhibited a more balanced use of information requests, instruction requests, and both conventionally and non-conventionally indirect forms. The most striking difference occurred in the use of infinitives – which humans never used with another human in the dataset, but 47 times with the robot. One explanation for this is that the usage of the infinitive might have been perceived as too hierarchical to be used with hitherto unknown human collaborators. Similarly, the predominance of impositives in H-R communication suggests that participants considered the robot as a subordinate collaborator, prioritizing efficiency and task completion over *face* considerations. This aligns with Brown and Levinson's (1987) politeness theory, which posits that speakers adjust politeness according to social distance and relative power. When the interlocutor is perceived as less socially powerful or less sensitive to *face* threat, speakers are less likely to employ mitigation or positive politeness strategies.

In H-H pairings, the greater use of questions requiring verbal responses and the balanced use of non-conventionally indirect, conventionally indirect and impositive strategies can therefore be interpreted to reflect heightened sensitivity to interpersonal dynamics and mutual *face* management. Previous studies have shown that *Can you + VP?* constructions are among the most frequently used request strategies in German (Ackermann 2021), allowing speakers to remain polite while maintaining clarity of intent. In our study, this was the third most common strategy used in H-R communication. A further look into the subtypes, however, revealed that 36% of these were ability statements, which resembled orders rather than polite requests (e.g., "Yes, you can hold the leg."). What needs to be kept in mind here, though, is that the robot was only able to provide limited contributions to the conversation due to the WoZ nature of the task.

The situation may be different if a more verbose robot with an AI- based agent were employed – which we aim to do in a follow-up study.

The analysis of internal modifiers provides limited support for H2. Although both conditions exhibited a low overall use of internal modification, H-R interactions featured a slightly higher overall count of modifiers (24 in H-R interaction vs. 14 in H-H interaction), particularly politeness markers and downtoners. These often co-occurred with impositives, suggesting a tendency toward surface-level politeness, even when addressing non-anthropomorphic robots. Compared to the number of impositives, the use of such internal modifiers is, however, relatively uncommon. In contrast, H-H interactions included fewer modifiers, namely understaters, downtoners, and subjunctives, and there was no use of the politeness marker. These modifiers were used to soften impositives and indirect utterances. Downtoners reduce the strength of a request by introducing tentativeness, whereas the subjunctive mitigates imposition by lowering the expectation of compliance (Ackermann, 2021). Understaters, such as *quickly* or *for a second*, minimize the force of the proposition (Blum-Kulka et al., 1984). The use of these forms in H-R communication suggests that participants partially transfer human politeness conventions to interactions with robots.

Taken together, the results suggest that politeness in H-R interaction is selectively adapted from human norms. Participants calibrate their politeness based on the nature of the task and the functional role of the robot. Since the social concept of *face* is a conceptual extension of the body part, the physical presence or absence of a *face* in a robot may influence how it is perceived by human interlocutors and the degree to which it is anthropomorphized (Fussell et al., 2008). As robots become more socially expressive and capable of responding to politeness cues, users may increasingly align their linguistic behaviour with patterns typical of interaction with humans. This potential shift has important implications for the design of socially aware robotic systems capable of sustaining natural, cooperative communication and to adjust to their interlocutor’s stress or fatigue level based on their verbal (and possibly also non-verbal) cues.

6. CONCLUSION

This study provides insights into HRI design for communication with robots and contributes to the growing research on politeness analysis in interactions with robots. The main limitations of this study are the Wizard of Oz setup and the small number of participants. Still, this study adds to the growing research focusing on developing socially intelligent AI systems that can communicate with humans. While the observed differences between H-H and H-R interactions support the notion that perceived social hierarchy and agency shape linguistic behaviour, the usage of politeness markers and downtoners suggest that politeness norms are partially extended to artificial agents.

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APPENDIX

Table A1. Raw counts of the head-act strategy

Condition	Head-act strategy	Count	Percentage
H-H	impositive	15	20.8%
	conventionally indirect	5	6.9%
	non-conventionally indirect	12	16.7%
	questions requiring a verbal response	40	55.6%
H-R	impositive	205	62.8%
	conventionally indirect	50	15.2%
	non-conventionally indirect	5	1.5%
	questions requiring a verbal response	67	20.4%

Table A2. Raw counts of the impositive subtypes

Condition	Head-act strategy	Count	Percentage
H-H	imperative ellipsis	5	33.3%
	imperative	5	46.6%
	must statement	2	13.33%
	want statement	0	0%
	should statement	0	0%
	declarative statement	3	6.6%
H-R	imperative ellipsis	98	47.1%
	imperative	47	47.1%
	infinitive	47	0%
	must statement	3	1.4%
	want statement	1	0.5%
	should statement	1	0.5%
	declarative statement	8	3.4%

Table A3. Raw counts of the conventionally indirect strategy

Condition	Conventionally indirect strategy	Count	Percentage
H-H	ability question	1	20%
	ability statement	3	20%
	yes-no question	1	60%
H-R	ability question	31	62%
	ability statement	18	36%
	yes-no question	1	2%

Table A4. Raw counts of the non-conventionally indirect strategy

Condition	Conventionally indirect strategy	Count	Percentage
H-H	willingness question	1	8.3%
	possibility question	0	0%
	possibility statement	11	91.6%
H-R	willingness question	1	20%
	possibility question	1	20%
	possibility statement	3	60%

Table A5. Raw counts of the non-conventionally indirect strategy

Condition	Conventionally indirect strategy	Count	Percentage
H-H	information request ellipsis	5	12.5%
	information request	27	67.5%
	instruction request ellipsis	2	5%
	instruction request	6	15%
H-R	information request ellipsis	11	16.4%
	information request	18	26.9%
	instruction request ellipsis	3	4.4%
	instruction request	35	52.2%

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