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Cognitive Impact of Anthropomorphized Robot Gaze: Anthropomorphic Gaze as Social Cues

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Attentional control does not have fix functioning and can be strongly impacted by the presence of other human beings or humanoid robots. In two studies, this phenomenon was investigated while focusing exclusively on robot gaze as a potential determinant of attentional control along with the role of participants' anthropomorphic inferences toward the robot. In study 1, we expected and found higher interference in trials including a direct robot gaze compared to an averted gaze on a task measuring attentional control (Eriksen flanker task). Participants' anthropomorphic inferences about the social robot mediated this interference. In study 2, we found that averted gazes congruent with the correct answer (same task as study 1) facilitated performance. Again, this effect was mediated by anthropomorphic inferences. These two studies show the importance of anthropomorphic robotic gaze on human cognitive processing, especially attentional control, and also open new avenues of research in social robotics.

CCS Concepts: • **Human-centered computing** → *Interaction paradigms; Empirical studies in collaborative and social computing*; • **Computer systems organization** → *Robotics*;

Addition Key Words and Phrases: Social robotics, human-robot interaction, robot gaze, selective attention, Anthropomorphism, Eriksen Flanker task

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1 INTRODUCTION

In the coming decades, millions of people worldwide may benefit from the presence of humanoid robots (e.g., to ensure support to the elderly, disabled people, or pupils). Despite this unstoppable trend, research has only scratched the surface of the cognitive impact of **Human-Robot Interaction (HRI)** especially on the fundamental process that is attentional selection/inhibition. Attentional selection/inhibition processes allow us to sort through the information that enters the system and to discriminate between useful and unnecessary information for the current activity.

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Its role is fundamental since it protects a cognitive system with limited capacities from information overload and allows an efficient processing of the environment. The aim of the present studies is to investigate how the mere presence of a robot gaze, prior to any type of interaction, may bias such a fundamental human cognitive process. Such consideration is not only important to better understand and predict the impact of HRI on humans but also to better understand the nature of the influence of the gaze on human cognition.

An emerging trend of research shows that the mere presence of a robot alters humans' attentional selection/inhibition performances on various tasks [76, 78] similarly to human presence [15, 46]. Social psychology literature called this effect **Social Facilitation/Inhibition (SFI)**. The key idea is that, in a selection/inhibition attention task, when a social cue is distracting or diverts attention away from the focal task, an attentional conflict emerges and modulates how humans distribute their attention between the different percepts [12, 73]. However, robots' presence does not produce SFI effects as easily as humans. For such effects to occur, a prerequisite is the attribution of anthropomorphic characteristics to the robot (such as intentionality) [30]. These attributions stress the importance of top-down inferences in robot SFI effects [76] changing a machine into a social agent.

These SFI effects have been also demonstrated with the specific social stimuli that are human gazes [22]. When we look at a face (familiar or not), 60%–70% of our eye fixations focus on the eyes [3, 50, 51, 89, 90]. The gaze is so important that humans have a brain network especially dedicated to its analysis [18, 20]. The gaze of other agents is not only very informative [29, 37], it is also a powerful facilitator of interactions [10], especially in the case of direct gaze [38]. Conty and colleagues proposed a paradigm to evaluate the effect of gaze processing: the “Stroop Eyes” paradigm [22]. In the standard Stroop task, individuals have to identify the color in which a word is printed, while ignoring the word itself (e.g., RED written in green). Because of the automaticity of word reading [7, 72], identification times are consistently longer for color-incongruent words (the word “BLUE” in green ink) than for color-neutral items (“DESK” in green ink), a phenomenon typically referred to as standard Stroop interference. This interference indicates how difficult the control of attention can be when faced with competing, conflictual automatic activations. In the Stroop Eyes paradigm, social distractors (direct gaze) appear concomitantly with the semantic distractors, so the subject must resist not only word reading but also the potentially interfering effect of social stimuli. Results show that, while there was no effect of averted gaze, the presence of direct gaze above semantic distractors increased the size of the Stroop interference, suggesting that refraining from processing eye contact is as difficult as refraining from word reading [22]. Whether robot direct gaze may produce similar attentional interference remains an open question.

Some evidence already points to the importance of robots' gazes in HRI [1, 35, 47, 49, 60, 61, 74, 92, 94, 95, 98, 99]. Robot gaze has been studied regarding the engagement of users in HRI [84, 97], the fluidity of conversation [58], gaze following [23, 48, 59, 93, 94], collaboration in learning contexts [2, 19, 45], but not on attentional control per se. Overall, in these earlier works, participants' anthropomorphic inferences toward the robot being present seemed to play an important role [17, 24, 57, 64]. However, not only were the anthropomorphic inferences not systematically measured, but their exact role in participants' reactions to the robot being present remained poorly specified.

2 STUDY 1

In this first study, we investigate whether the simple presence of robot direct gaze (Figure 1) may interfere with the processing of information completely unrelated to it, and the role that anthropomorphic inferences may play in this interference (if any). Attentional interference was measured here using the **Eriksen Flanker Task (EFT)** [31] that has already been used in robots' SFI paradigm [76]. This task required one to judge the direction (left or right) of a spatially central



Fig. 1. Robot gaze stimuli. The left image presents the direct gaze; the right image presents the averted gaze.

cue (< vs. >)—hereafter referred to as the target—flanked by non-target stimuli corresponding either to the same directional response as the target (congruent flankers, e.g., >> > >>), or to the opposite response (incongruent flankers, e.g., << > <<). Typically, the time needed to respond is significantly greater in incongruent than congruent conditions, a well-known difference termed the flanker interference [91]. Attentional control is required to stay focus on the target so as not to be distracted by the incongruent flankers and reduce the interference as much as possible. As in the Stroop task [4, 26], the response selection/inhibition processes involved in the EFT proved sensitive to the social cues present in the environment [26]. One advantage of the EFT compared to the standard Stroop task is the absence of any semantic component which facilitates its modeling [5, 7, 8, 68].

2.1 Method

Participants were 94 young adults ($M_{\text{age}} = 19.58$ years, $SD = 1.72$, 50 females and 30 males) from Clermont Auvergne University with a normal (or corrected-to-normal) vision that participated in exchange for credit courses. The sample size was determined—as recommended by Tabachnick and Fidell [96]—based on the desired power (0.80), alpha level (0.05), number of condition (two in the main analysis), and anticipated effect size based on human presence effects (using between-subjects design) in a flanker paradigm ($\eta^2_p = 0.25$). Using G*Power 3.1 [34]; the minimum required sample size was calculated as 54.¹

Participants watched a video presenting the NAO robots interacting with a human, an object and another NAO for 1.36 minutes. The video came from an Aldebaran Nao presentation video (<https://www.youtube.com/watch?v=rSKRgasUEko>). To control from external priming effects, the video was cut to not display any logo or any sound. For half of the participants (social information condition) the video displayed social information on the robot (e.g., “This is Nao [...]. It² knows how to walk around in a human environment. It enjoys social contact with humans but he also knows how to talk with other robots, so he doesn’t get bored”), while for the other half (non-social information condition), the video displayed non-social information (e.g., “This is Nao [...]. Its program also allows it to identify objects on which codes are placed. It is also programmed to recognize and interact with other robots.”)

Anthropomorphic inferences. After the video, participants evaluated the robot on the dehumanization scale based on Haslam’s [41, 42] dehumanization taxonomy made of two bi-dimensional constructs: (1) human uniqueness (e.g., moral sensibility, $\alpha = 0.67$) and animalistic dehumanization (e.g., irrationality, $\alpha = 0.72$), and (2) human nature (e.g., agency, $\alpha = 0.84$) and mechanistic dehumanization (e.g., inertness, $\alpha = 0.72$). For each dimension (consisting of five items), participants rated whether they agreed or disagreed (from 1 to 7) to attribute related characteristics to the robot is present. Human uniqueness, animalistic dehumanization, human nature, and mechanistic dehumanization dimensions were evaluated separately resulting in four

¹We recruited more participants than recommended to solve the amount of credit courses allocated to this project.

²The text was displayed in French, a language that does not use neutral pronouns.

dimensions. We choose this scale because it proved to be more reliable than others (e.g., **Robotic Social Attribute Scale (RoSAS)** [21] or Godspeed scale [13]) to measure the (mediating) effect of anthropomorphic inferences on human cognition that we specifically want to address here [76, 78]. The reason could be that dehumanization relies on social categorization. Social categorization consists in categorizing agents into differentiated groups and acknowledging a (conceptual) distance between them [16, 43, 63, 83, 85]. This fundamental phenomenon of human psychology is not based on specific attributions (as in RoSAS or Godspeed), but rather on a comparison between concepts and mental representation of groups (e.g., human group vs. robot group) [33, 80] and is central to explain human social interactions with other humans [53, 55, 56] or with robots [54, 81].

Flanker task. The final task of the participants was to complete the flanker task. The participants were instructed to fixate the white cross (“+”), which appeared in the center of the (black) screen for a random duration between 400 and 600 ms. The cross was then replaced by the flankers and the target continued to be displayed until the participant responded (or until 2,500 ms had elapsed). After this response, a new stimulus appeared on the screen, again replacing the fixation point and beginning the next trial. The participants responded using the S “left” and L “right” key. Participants completed 30 training trials (i.e., X X > X X, X X < X X) and 108 experiment trials with 54 congruent (i.e., < < < < <, > > > > >) and 54 incongruent (i.e., < < > < <, > > < > >) items. Above half of the items, a picture displaying the direct gaze of a NAO robot was present, while the other half were displayed with the head of a NAO robot looking in the bottom right field of the picture (averted gaze) (Figure 1).³

2.2 Results⁴

Participants (16) with an accuracy rate lower than 65% were discarded because they were significant outliers (for a similar procedure, see [6, 9, 79]). Trials with a reaction time lower than 250 ms were considered outliers and excluded from the analyses⁵ [71], which corresponded to 516 trials (5.97% of the trials). Errors occurred in 19.63% (467 trials).

Analyses were conducted on the composite **linear integrated speed-accuracy score (LISAS)** [86, 87]. The LISAS score represents response times weighted by the proportion of incorrect responses. The higher the LISAS, the less performing were participants. LISAS scores are defined as $LISAS = RT_j + \frac{Srt}{Spe} \times PE_j$. RT_j is the participant’s mean RT in condition j ; PE_j is the participant’s proportion of errors in condition j ; Srt is the participant’s overall RT standard deviation, and Spe is the participant’s overall PE standard deviation. This score makes it possible to take account for both accuracy and response time, which must be taken into account in attention selection/inhibition task analyses and has proved to be more reliable than standards or other composite measures [86, 87].

LISAS. We conducted a mixed ANOVA including the LISAS as DV, the type of gaze (direct gaze vs. averted gaze) and the type of items (congruent vs. incongruent) as within factor and the condition (social vs. non-social information) as between factor. Participants were slower to produce a correct answer on incongruent compared to congruent items, $F(1,68) = 37.86$, $p < 0.001$, 95% *CI* [634.41; 774.32], a typical flanker interference. Results also showed a main effect of the type of gaze, $F(1,68) = 93.07$, $p < 0.001$, 95% *CI* [-105.48; -69.32]: Participants were slower to produce a correct answer on items displayed with a direct gaze than averted gaze, which is consistent with previous results in Stroop Eye Paradigm [22]. The gaze by type of items interaction was also

³According to a pretest, the stimuli presenting the NAO’s eyes reached the 90% threshold of identification following the answer “Are eyes present on this picture” (100%) while it was unanimous for the full head (100%).

⁴Raw data are available at <https://osf.io/9a5zv/>.

⁵We did not use an upper threshold due the set of response time limit in the paradigm.

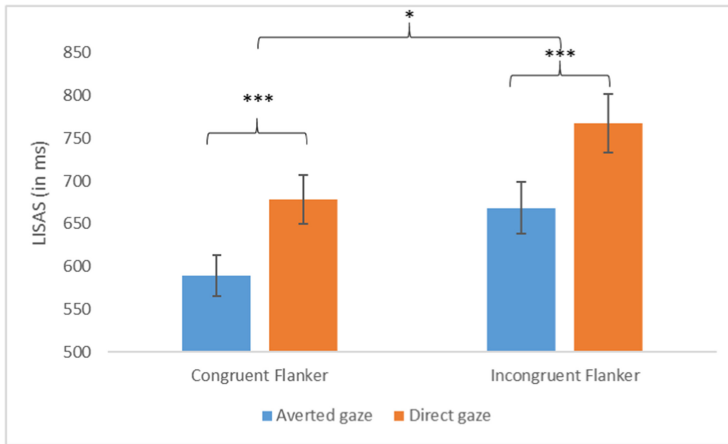


Fig. 2. LISAS for the type of items (congruent vs. incongruent) as a function of the type of gaze (averted vs. direct). *, $p < 0.05$; ***, $p < 0.001$.

significant, $F(1,68) = 4.54$, $p = 0.037$ (Figure 2): The flanker effect was higher in the presence of direct compared to averted gaze. All the contrasts (with Sidak correction) were significant ($p < 0.001$).

Anthropomorphic attributions. Using the PROCESS plugin in SPSS, we conducted a mediation analysis with the bootstrap method [65] including the LISAS score difference between direct vs. averted gaze as the dependent variable (further mentioned as LISAS^c), the condition (social vs. non-social information) as the independent variable, and the four dimensions of dehumanization taxonomy as mediators.⁶ In the presence of social information, participants attributed more **Human Uniqueness (HU)**, $b = -0.52$, $t(76) = -3.32$, $p = 0.001$, 95% CI [-0.84; -0.21] and **Human Nature (HN)** traits to the robot, $b = -0.57$, $t(76) = -3.20$, $p = 0.002$, 95% CI [-0.93; -0.22]. There were no differences on **Animal (AD)** and **Mechanistic (MD) dehumanization** attributions. Regarding the effects of mediators on LISAS^c, the more participants attributed HN, $b = -0.53$, $t(76) = -2.90$, $p = 0.005$, 95% CI [-69.45; -12.87] or MD, $b = -0.32$, $t(76) = -2.19$, $p = 0.031$, 95% CI [-47.50; -2.27] traits to the robot, the lower the difference of time to produce a correct answer on direct versus averted gaze trials. However, only the Condition → HN → LISAS^c mediation reached significance, $b = 24.52$, 95% CI [4.55; 52.41]. It is worthy to mention that the effect of MD on LISAS^c we did not control for the covariation with the other dimensions (HU, AD, HN), $b = -0.13$, $t(76) = -1.09$, $p = 0.277$, 95% CI [-27.95; 7.92], while HN remains significant, $b = -0.29$, $t(76) = -2.66$, $p = 0.010$, 95% CI [-39.80; -5.72]. These last results argue for a positive confounding regarding MD. The effect only appears because of the distortion of the isolated effect of the MD on LISAS^c due to the presence of the covariates. The consequence is to drive the effect away from the null hypothesis. An exploratory analysis showed that the result was explained, mostly, by the covariation with the HN dimension. A median split on the HN dimension showed that the effect of the MD on LISAS^c was significant only for participants scoring high on HN, $b = -0.28$, $t(41) = -2.62$, $p = 0.012$, 95% CI [-62.09; -7.98], and non-significant for the lower half, $b = -0.17$, $t(34) = -0.97$, $p = 0.337$, 95% CI [-32.83; 11.58]. MD effect on LISAS^c is therefore conditional to a high score in HN. The reason could be a compensation bias. Participants with strong anthropomorphic inferences

⁶To include multiple mediators in the same analysis makes it possible to estimate the association between a given independent variable and the outcome holding all other variables constant; it provides a way of adjusting for potentially confounding variables that have been included in the model. The results provide the unique contribution of each variable.

could be prone to put the humanization of the robot into perspective by attributing its mechanistic characteristics but this explanation remains speculative. Importantly, this effect cannot be imputed to a general response bias toward the upper half of the scale as MD is conditioned by HN and not the opposite.

2.3 Discussion

First, our results show that robot direct gaze results in more time to produce a correct answer (compared with averted gaze) indicating a stronger attentional interference in this critical condition, which replicates and extends Conty and colleagues' earlier findings to robotic gaze [22]. Refraining from processing robot eye contact, like human eye contact, seems therefore at least as difficult as processing flankers interference, otherwise the presence of direct gaze would not have influenced the time to produce a correct answer. This first finding suggests that robotic direct gaze is automatically processed as a social signal [1, 94]. This is consistent with previous results showing that others' gaze is so important that humans have a brain network especially dedicated to its analysis [18, 20, 29], potentially even with robots.

Another important finding is the fact that the difference between direct and averted gaze was modulated by participants' anthropomorphic inferences. The higher these inferences, the lower the attentional effect of the direct gaze compared to the averted gaze. Interestingly, this finding strengthens distraction-conflict theory [12] predicting that the attentional cost created by interfering social stimuli leads to focusing more exclusively on the task at hand, therefore more exclusively to its central cues (central arrows) at the expense of peripheral cues such as the flankers in the present task. This phenomenon seems to be facilitated by anthropomorphic inferences, which provides further support to the general idea that anthropomorphism can lead machines to operate as proto-social agents.

3 STUDY 2

Although robot direct gaze seems more critical than averted gaze in study 1, this does not mean that robot averted gaze is neutral. By directing attention to the left or right, averted gaze may itself—like flankers—be congruent (i.e., looking in the same direction as the central cue) or incongruent (i.e., looking in the opposite direction of the central cue) with the target and facilitate or impair participants' attentional focusing. We tested this hypothesis in study 2 while still measuring anthropomorphic inferences.

3.1 Method

Participants were 53 young adults (Mage = 31.09 years, SD = 7.88, 23 females and 30 males) recruited online on Mechanical Turk.⁷ The sample size was determined—as recommended by Tabachnick and Fidell [96]—based on the desired power (0.80), alpha level (0.05), number of conditions (two in the main analysis), and anticipated effect size based on human presence effects (using between-subjects design) in a flanker paradigm ($\eta^2p = 0.25$). Using G*Power 3.1 [34], the minimum required sample size was calculated as 48.

Flanker task. The task of participants was to complete the flanker task (see study 1).

Above one-third of the items, a picture displaying an averted gaze of a NAO robot congruent with the target (central arrow) was present (half on the left, half on the right); the second third of trials displayed an incongruent averted gaze with the target (half on the left, half on the right); the

⁷To ensure that participants performed the experiment well, we added three attentional checks. To include a participant in the study, the three attentional checks had to be accurately completed.



Fig. 3. Neutral stimuli (above) and averted robot gaze (bottom).

last third of trials was displaying neutral items that were designed to present roughly the same amount of visual information as the two others (Figure 3).

Anthropomorphic inferences. Finally, as before (study 1), participants evaluated the robot on the dehumanization scale based on Haslam's [41, 42] dehumanization taxonomy: (1) human uniqueness ($\alpha = 0.91$) and animalistic dehumanization ($\alpha = 0.93$) and (2) HN ($\alpha = 0.86$) and mechanistic dehumanization ($\alpha = 0.79$).

3.2 Results

Trials with a reaction time lower than 250 ms were considered outliers and excluded from the analyses [71], which corresponded to 730 trials (5.76% of the trials).⁸ Errors occurred in 15.19% (1,570 trials).

As before (study 1), analyses were conducted on the composite LISAS [86, 87].

LISAS. We conducted a mixed ANOVA, with the type of items (congruent vs. incongruent) and robot gaze congruency (congruent gaze vs. incongruent gaze vs. neutral stimuli) as within factor. Results showed a main effect of item congruency, $F(1, 52) = 12.40$, $p < 0.001$, 95% CI [26.08; 95.20]. Participants were slower to produce a correct answer on incongruent (vs. congruent) flanker trials, again indicating the presence of a flanker interference. This interference was modulated, as expected, by the robot gaze congruency with the target, $F(2, 51) = 9.61$, $p < 0.001$. It was higher when the robot's gaze was congruent (vs. incongruent) with the central target, $F(1, 52) = 12.38$, $p = 0.001$, 95% CI [68.57; 250.68]. This higher interference was due to the fact that, on congruent flanker trials, participants were faster to accurately respond in the presence of congruent gaze compared to incongruent gaze, $F(1, 52) = 7.20$, $p = 0.010$, 95% CI [32.54; 225.79], or compared to neutral stimuli, $F(1, 52) = 5.21$, $p = 0.027$, 95% CI [12.85; 200.42], while there were no differences between the two latter, $F(1, 52) = 3.79$, $p = 0.057$, 95% CI [-0.69; 45.74] (Figure 4).

Anthropomorphic attributions. We conducted a regression analysis including the four dimensions of anthropomorphism questionnaire as a predictor of the difference in response times to produce a correct answer between congruent gaze vs. neutral and incongruent gaze averaged. We found that the more participants inferred HN traits to the robot, the more the congruent gaze facilitated the speed of correct responses compared to the two other conditions averaged, $b = 0.66$, $t(52) = 2.83$, $p = 0.007$, 95% CI [50.34; 298.24]. The same analysis on the difference between congruent and incongruent flanker trials in the presence of congruent gaze also showed an effect of HN attribution, $b = 0.53$, $t(52) = 2.03$, $p = 0.048$, 95% CI [1.48; 258.68]. The more participants attributed HN

⁸No participants were considered as outliers because of an accuracy rate lower than 65%.

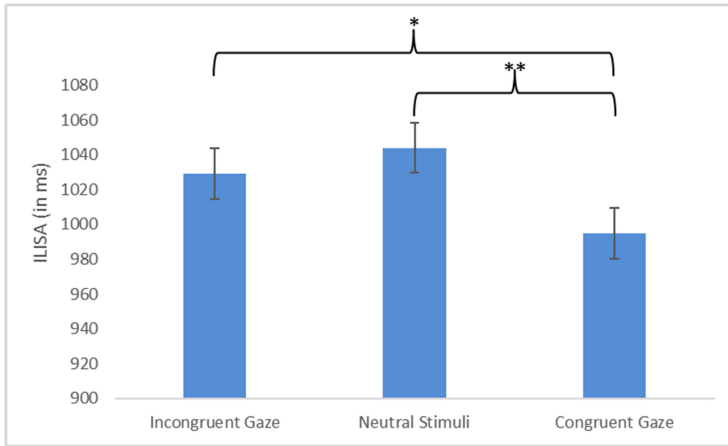


Fig. 4. LISAS for congruent flankers as the function of the gaze congruency (incongruent gaze vs. control gaze vs. congruent gaze). *, $p < 0.05$; **, $p < 0.01$.

to the robot, the higher the correct response time difference between congruent and incongruent flanker trials in the presence of congruent gaze.

3.3 Discussion

As expected, we found a significant impact of robot averted gaze on flanker performance. Averted gazes congruent with the correct answer facilitated performance, while there was no interfering effect of the incongruent robot averted gaze. This result shows that robot gaze does not necessarily interfere with attentional control, but may facilitate it when it is congruent with the task at hand. As before (study 1), top-down inferences mediated this robot gaze effect: the more participants attributed anthropomorphic characteristics to the robot, the higher the facilitation of congruent responses.

4 GENERAL DISCUSSION

Taken together, these two studies show the importance of robotic gaze on human cognitive processing, especially attentional control. As such, they complement the few (emerging) studies indicating the sensitivity of the human cognitive system to the presence of proto-social robots. The major difference with these earlier studies is that we focused here specifically on robot anthropomorphic gaze as a critical element (more than robotic presence as such). More generally, this research program also complements previous studies regarding the engagement of users in HRI [84, 97], the fluidity of conversation [58], gaze following [23, 44, 48, 59, 93, 94], and collaboration in learning contexts [2, 19, 45]. While very informative, these studies did not make it possible to understand the impact of robot gaze on human attentional control, nor the mediating role of anthropomorphic inferences. At best, the mediating role of such inferences has been inferred but never measured. Here we show their causal role in robotic gaze effect on human cognition. As there is a mediating role of anthropomorphism, this is not the robotic gaze per se that makes a difference but the way humans interpret it. In other words, this interpretation is at least as important as knowing the objective characteristics of humanoid robots (as sophisticated as they may be) in predicting their effects on cognition.

How can simple robots made of electronic components and plastics be considered as social agents? The “Computers Are Social Actors” theory [67] posits that people may understand and

relate to machines in a similar way that they do with fellow creatures. Humans tend to apply the same social scripts (specifying actions to be produced in various social situations [52]). This process may result in a change in the intrinsic representation of robots [14, 41, 42] that has proved to be a reliable measure for anthropomorphic inferences [76, 78]. Anthropomorphic attribution has proved to be a fundamental dimension of HRI as it deeply influences acceptance, attitudes, perception, and behavior toward robots [25, 39].

From a general standpoint, the present studies, and others, support the importance of carefully considering how we integrate robots in human environments. To consider these agents as simple tools or objects would be misleading considering the impact that they may have on the human cognitive system. According to the Ethopoeia concept [62], social reactions are triggered by situations that include social cues (e.g., gaze), which need not consist solely of human-human Interaction [11, 82] but also apply to HRI [28, 62, 67, 69, 77]. Our brains are wired to recognize social signals even when they are associated with machines, and humanoid robots are a perfect target for that. For instance, research showed that Human and Robot elicit similar neural activation patterns in limbic structures when observing video of affectionate interactions [70]. Indeed, we are designing social robots based on human social patterns. This conception is quite beneficial since it facilitates interactions with these new entities without having to learn new modalities of interaction. Therefore, using the same social schemas, we are using the same social neural pathway and therefore the same socio-cognitive processes involved in human-human interaction but to a lower extent [66]. In return, building on these shared social schemas, individuals tend to attribute the same social constructs to robots (rather than fellow creatures) such as gender [32], personality traits [40], or stereotypes [75]. This human-borrowed attribution process is a dimension of anthropomorphism with potential consequences on attentional control during HRI or in the presence of robots [76–78].

Nevertheless, some limits must be pointed out. First, our study used a single robot that displayed an enjoyable face and an iconic design [27]. Therefore, we could assume that the effect could be modulated by the type of robots and especially the social valence associated with this robot [77]. Second, the two types of gazes that we used here were dichotomous, while in live HRI it should be transitive, reducing the difference between the direct and averted gaze. Third, according to the confidence interval, variability between participants seems important. Our studies do not allow us to conclude whether this variance can be explained by the difference in anthropomorphism tendency or other factors. Finally, the use of video as stimuli may have biased the results. Indeed, studies show that embodiment in HRI can positively change social attitudes (e.g., closeness, empathy) [36, 88]. We may assume that direct observation (or interaction) with a robot instead of the simple observation of a video could moderate anthropomorphic attributions (and expectations) or the social presence of the agent and, as a consequence, impact attentional control effects.

In conclusion, in line with previous works, our results support that the integration of robots in the human environment is far from being neutral and may have a strong effect on human attention (and attentional resources) distribution. The applicability of social cognition processes on HRI, when robots are anthropomorphized to some extent, opens the floor to (attentional and other cognitive) biases that are likely to influence human behaviors and decisions. In the present series of studies, we were able to provide keys to better understand the impact of robot gaze on human attentional control and the primary role of anthropomorphic attributions as a mediator of these effects. Overall, it seems important to consider the perception of robots (anthropomorphic attributions) to better understand or predict how humans react to robot stimuli.

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