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SanitizerBot: How Human-in-the-Loop Social Robots Can Playfully Support Humans

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Abstract—**This paper evaluates a robot that distributed hand-sanitizer over an eight month period (October 2020-June 2021) in public places on the Oregon State University campus. During COVID times, many robots have been deployed in public places as social distancing enforcers, food delivery robots, UV-sanitation robots and more, but few studies have assessed the social situations of these robots. Using the context of robot distributing hand sanitizer, this work explores the benefits that social robots may provide to encouraging healthy human activities, as well as ways in which street-performance inspired approaches and a bit of humor might improve the quality and experience of functional human-robot interactions. After gaining human-in-the-loop deployment experience with a customized interface to enable both planned and improvized responses to human bystanders, we run two sub-studies. In the first, we compare the performance of the robot (moving or still) relative to a traditional hand sanitizer dispenser stick (N=2048, 3 week data collection period). In the second, we evaluate how varied utterance strategies further impact the interaction results (N=185, 2 week data collection period). The robot dramatically outperforms the stick dispenser across all tracked behavioral variables, cuing high levels of positive social engagement. This work finds the utterance design is more complex socially, and offer insights to future robot designers about how to integrate helpful and playful speech into service robot interactions. Finally, across both sub-studies, the work shows that people in groups are more likely to engage with the robot and each other, as well as sanitize their hands.**

Index Terms—**Human-Robot-Interaction, Human-in-the-loop, Social Robotics, Service Robots, Entertainment Methods**

I. Introduction

During the COVID-19 outbreak, many robots were deployed to decrease the chances of humans getting exposed to the virus and address novel safety concerns. For example, UV disinfectant robots sought to sanitize surfaces [1], the food delivery robotics industry massively expanded to reduce the risk of human-human contact [2], [3], robots were deployed to enforce social distancing [4], and robots began to distribute [5]. During this surge of innovation, social robotics researchers had a unique opportunity to explore how and whether the knowledge of our field could contribute to positive health behaviors. Turning sociable robots to social actors to encouraged people taking hand sanitizer and improved the times when people were discouraged from engaging with each other, isolation (quarantine) that leads to loneliness [6].

Fig. 1. SanitizerBot interacting with two participants, a group interaction: (left) participants take hand sanitizer, (right) participants converse with each other afterwards.

As a first step to cross-applying this prior knowledge to a pandemic-related scenario, this paper involved the creation of a robot that distributed hand sanitizer. Given that we had access to a campus with 24,000+ students, commensurate instructors, professors, and staff, we decided to deploy this system in public spaces on our university campus. Getting permission to run a human-study this early in the pandemic required a university research resumption plan and happened to also coincide with the leasing of the Starship Technologies food delivery robots by Campus & Dining services. So the study timing was when more automation was being added to various scenarios of our everyday lives. In this timely context, we thus sought to evaluate the following two research questions, **RQ1:** *Will social robots outperform existing technological methods for hand-sanitizer distribution?*, and, upon discovering a significant benefit of the robot over a traditional stick-style dispenser, **RQ2:** *Could entertainment-inspired utterances further increase these effects?*

The results from the two large sample sized sub-studies show that the technology projects a higher anthropomorphism and social interactivity that enhanced the functional (taking hand sanitizer) and social (talking to each other and/or the technology) responses (Sec. IV). Within the social interactive approach, entertainment-inspired utterances, we find that certain *attentional* strategies work better than others, i.e., topical statements and inviting someone to be your friend worked better than sharing a non-sequitur which is quite confusing, and *relational* strategies, like focusing on the human rather than one's robot-self may shift people's reactions to an utterance. Along the way, we also discovered that groups were

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significantly more likely to interact and engage with the robot than those that were walking by individually (Sec. VI).

II. Related Work

The present work leverages (1) prior findings about how humans anthropomorphize even simple robots, (2) prior works related to creating charismatic, humorous, or entertaining robots, and (3) the rise of human-in-the-loop systems in a post-pandemic world.

A. Anthropomorphism & The Social Robot

Prior work in social robotics has shown that robot behaviors cue social storytelling [7], [8], in part because of how robots look but also because of how they behave, including non-verbal signaling [9]. The attribution of human characteristics to non-human entities is defined as anthropomorphism [10], [11]. Such attributions also occur toward simple form robots, such as making decisions and moving around an obstacle toward a goal conveys inner motivations and state, especially when attention is given to the style of motion in which that path is conducted [12]–[16]. This contrasts with non-anthropomorphic devices such as tablets [17], which are not generally seen as social agents (unless they start talking to us). Because people can smoothly interpret agent-like behaviors, robots can use social cuing to support human goals such as motivation [18], distributing objects to bystanders [19], acting in service roles [20], or directing a museum tour [21]. Though our knowledge of the COVID-19 virus, transmission has since reduced the desire for hand sanitation, the conducted studies illustrate how social robotics findings can be cross applied to supporting human health and safety needs.

B. Entertainment Methods in Social Robots

Prior work in robot entertainment spans robots acting as entertainers e.g, [22], [23], and robots using entertainment methods e.g., [24], [25], all offering interesting insights for ways in which robots might add joy or playfulness in environments with one or many humans. For example, RoboThespian robot is a humanoid robot that detects and analyzes the audience and responds with facial expression to elicit the audience to laugh and applaud [26]; other work uses robots to perform traditional Japanese two-people comedy-Manzai including human-multi-robot communication system [27], [28] and Nao robots have been used for stand-up comedy [23], [25], [29]. The human responses to these systems underscore the accessibility of using robots as entertainers. In this work, we follow prior entertainment-inspired robot development pathways e.g., [24], hypothesizing that a street-performance style mechanism of recruiting bystanders [30], will also be effective in attracting bystanders to come and take hand-sanitizer. The long overall robot deployment time, followed by a concentrated period of data collection also parallels the rehearsal than performance structure utilized by [31].

C. Human-in-the-loop Control

Human-in-the-loop (HiL) control, which shares many attributes with Wizard-of-Oz [32], [33], where researchers purposely pretend there is not human operator, has become even more prevalent and useful in a post-pandemic world, from telemedicine robots [3], [34], [35] to robots acting as social agents [36], [37]. Due to the desire for physical distancing, there has been a shift to remote rather than collocated operators, with companies like Starship Technologies pioneering the robot food delivery industry and completing more than 2 million deliveries as of October 2021 [38]. Wizard-of-Oz has also been used in by prior work to explore prospective robot behaviors [39] and to test which features of robots work well in particular situations [40]. Thus, the results of this work can inform both autonomous and HiL control.

III. Sanitizer Distribution Technology

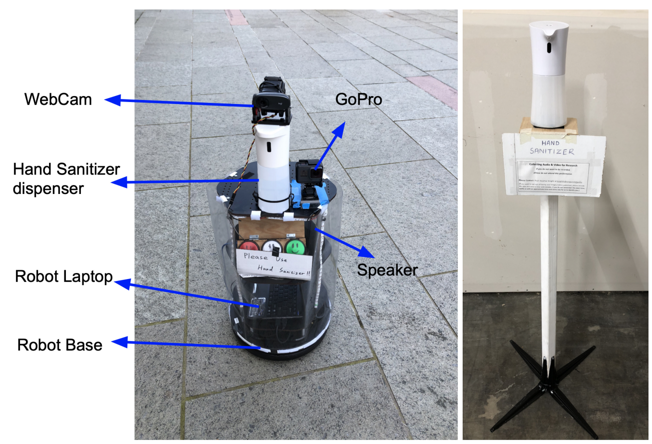

Fig. 2. (left) SanitizerBot is the robot that was used in both experiments. (right) Stick is constructed in traditional format with the same dispenser.

Hardware: Fig. 2 presents the respective designs of the stick dispenser and TurtleBot robot with a dispenser added on top. We modified the robot from our previous work on a robot health coach to create the SanitizerBot platform [41], [42]. Sanitizerbot consists of a Turtlebot2 mobile base fitted with an on-board computer, a servo controlled webcam with built-in microphone, and a hand-sanitizer dispenser on top of the robot. An automatic soap dispenser with 500ml storage that is able to store large amount of hand sanitizer liquid was used.

The automatic hand sanitizer dispenser with stick consisted of the same automatic hand sanitizer dispenser mounted on a painted wooden stick and a metal stable base. The 115cm tall device was designed to look and work like hand sanitizer dispensers that are placed in the public. A placard notice about the research experiment being conducted was attached to the front of the robot and the stick to inform the participants of the research study upon the school ethics board approval.

Human-in-loop Interface: Fig. 3 shows the tele-operation technology setup, including wizards operating the robot on site via a router. With the help of video feed from the servo-controlled webcam, a distantly located wizard teleoperated

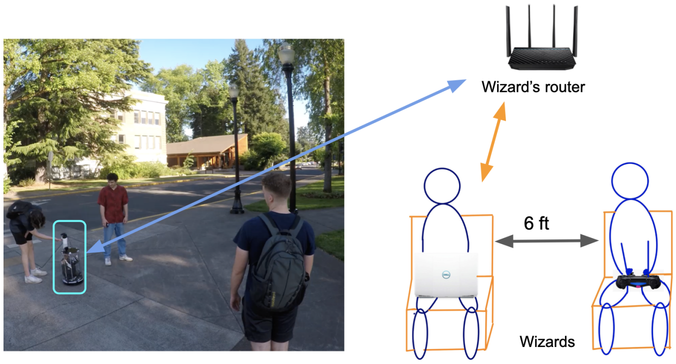

Fig. 3. The figure shows the concept of the control flow, which is a system that wizards tele-operate the robot and follow the COVID safety regulation (maintain 6ft social distance and wear masks).

the robot to approach people and distribute hand-sanitizer in the wild. Adapted from our prior work [42], the laptop GUI included screen-based button controls for repeated speech and the option to type new messages while a P34 controller enabled an operator to move the robot. The Robot Operating System (ROS) was used to interconnect all system functionalities. Custom packages in ROS enabled transmission of live video feed from the robot to enable first person view for the wizard.

IV. Study 1: Robot vs. Stick

In this section, we describe the Robot vs. Stick experiment, including details of our study setup and experimental manipulations, followed by the description of our data collection process and video coding.

A. Experiment Procedure

In each trial, the robot and the stick were deployed at the same location, between 5pm and 7pm in the evening on weekdays. The location was on the outside of a dorm building and memorial union building on campus, so it had individuals frequently walking into the area that may desire hand sanitizer. Three conditions were tested in each trial: *Stick, Robot-still* and *Robot-move*. The *Stick* and *Robot-still* conditions had the hardware still in one position. In these conditions, people interested in using the hand sanitizer had to approach the stick or robot. In the *Robot-move* condition, the robot instead approached the participant. Once the participant moved past the robot, the robot would return to its starting point.

A total of 6 trials were performed with a counter balanced sequence of conditions in each trial. This was to ensure that there was no effect of time and weather on the behavior of participants in each trial. In order to run a human subjects experiment during the pandemic, the research team submitted a research resumption plan, following the university COVID protocol. To enable cleaning, the robot was given a full body transparent cover that the wizard disinfected every ten interactions or when direct touch was observed. The operators sat around the corner of the building out of view of the participants and wore masks to decrease the likelihood of transmission.

B. Data Analysis

The experiment consisted of 6 trials with the robot and stick being deployed for 90 minutes in each trial. Overall, 9 hours of video footage was collected using a GoPro camera situated in the wild. An interaction is said to occur when a passerby enters the defined area in the research site as seen in figure 3. For each interaction, in the video, the participants' behavior was annotated as follows.

- **Use HS**: The participants used hand-sanitizer from stick or robot if they dispensed it on their hands.
- **Talk to each other**: The participants talked to each other about the stick/robot
- **Interact with robot**: The participants interacted with the stick/robot and expressed their feelings to it.

Our research data was nominal in nature, for example, categorical research manipulations such as *form* and *motion*, as well as categorical behavioral annotations such as whether people *take hand sanitizer* or *talked to the robot/each other*. To relate these phenomena, we therefore, used the Chi-squared test of independence [43], which is designed to determine the association between any two categorical variables in a collection of data from a random population. To find the effect of two independent variables on functional behaviors, such as the use of hand sanitizer and notice stick/robot and social behaviors such as people talking to each other and/or to the stick/robot, we used the Pearson's correlation test [44], which is designed to find the linear relationship between two variables. All analysis was performed using the IBM SPSS Statistics software.

V. Results 1: Robot vs. Stick

Our dataset included 1636 interactions, in which a robot approached someone to offer hand-sanitizer, which included 2048 human participants. The full data is detailed in Fig. 4, i.e., what the numerical data was related to using hand-sanitizer, people talking to each other, and people talking to the robot (detailed further in V-A, V-B). During the video coding process, we also observed different behaviors of participants while interacting in groups and as individuals, which we discuss in section V-C.

Research Condition / Behavior	Use HS	Talk to each other	Talk to robot
Stick	7% (36/521)	0% (0/521)	1% (7/521)
Robot Still	11% (68/614)	1% (4/614)	11% (69/614)
Robot Move	30% (152/501)	6% (28/501)	21% (106/501)
Total instances	16% (256/1636)	2% (32/1636)	11% (182/1636)

Fig. 4. Summary of total types of interaction behaviors observed for research condition deployed

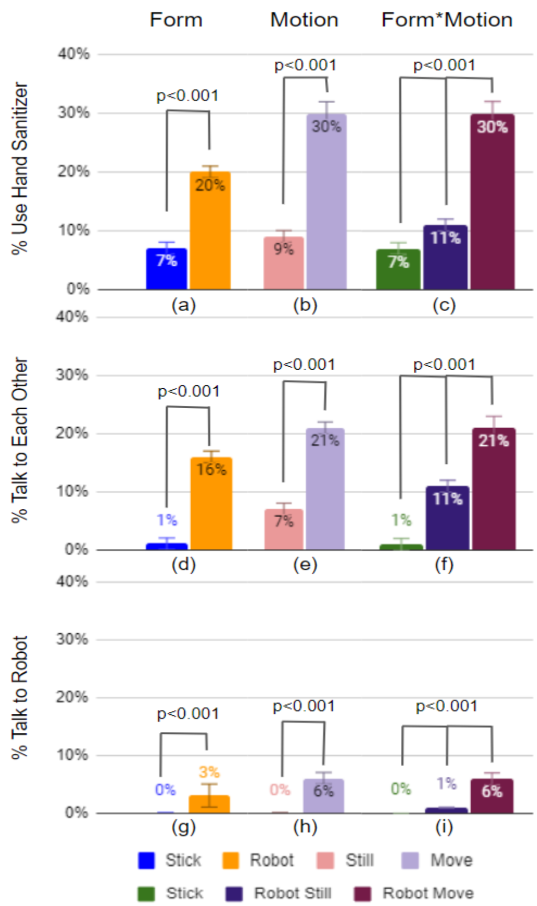

Fig. 5. Functional and Social Behaviors

A. Robot Outperformed Stick in Attracting People to Take Hand Sanitizer

Robot form and motion predicted whether people **used hand sanitizer**. The most effective was **robot form** combined with **robot motion**, as displayed in Fig. 5(a) and Fig. 5(b). While both form and motion significantly predicted taking of hand sanitizer, the two together had the greatest numerical impact on whether people took hand sanitizer (Fig. 5(c)). This was supported by the Chi-squared results that we used due to the nominal nature of the data. **Form** significantly impacted people's willingness to use hand sanitizer (**χ^2=44.221, p$<$0.001****). As shown in 5(a), the robot form (20% use hand sanitizer) significantly outperformed the stick (7%). **Motion** was also a significant predictor of hand-sanitizer taking (**χ^2=118.086, p$<$0.001****). The moving robot attracted more participants into using hand sanitizer compared to the still robot and the stick. As shown in Fig. 5(b), the moving robot (30% use hand sanitizer) significantly outperformed the still robot (9%). Finally, the conjugation of **Form and Motion** together had the most significance on hand sanitizer taking (**χ^2=121.791, p$<$0.001****). As shown in 5(c), the moving robot (30% use hand sanitizer) outperformed the still robot (11%) and stick (7%).

B. Robot Elicited Higher Socialization

Robot form combined with robot motion was the most effective in influencing people's social behavior to **talk to each other** about the robot and to **talk to the robot**, as seen in Fig. 5(f) and Fig. 5(i).

Talk to each other: As seen in Fig. 5(d), **Form** significantly impacted people's interest to talk to each other about the presence of the robot (16% talk to each other) than the stick (1%) (**χ^2=73.970, p$<$0.001****). **Motion** was also a significant predictor of whether people would talk to each other about the presence of stick/robot (**χ^2=73.522, p$<$0.001****). As seen in Fig. 5(e), the moving robot was the topic of discussion for more number of people (21% talk to each other) than the still robot (7%). On the other hand, **Form and Motion** together had the greatest numerical impact on people's interests towards discussing the presence of stick/robot (**χ^2=101.428, p$<$0.001****). As seen in fig. V(f), the moving robot (21%) interested more people than the still robot (11%) and stick (1%).

Talk to robot/stick: Form combined with **Motion** was the strongest predictor of people talking to the robot. In fact, not a single participant talked to the stick. As seen in Fig. 5(g), form was a moderate predictor of speech (3% for robot form as opposed to 0% for stick). Numerically stronger, we also see that the presence of motion increases the likelihood of people talking to the robot (6% for motion as opposed to 0% for no motion). The conjugation of both form and motion has the highest significance (**χ^2=50.321, p$<$0.001****) with most participants interacting with the moving robot (6%), rather than the still robot (1%), and, again, none at all for the stick (0%).

During the interactions, participants expressed different feelings to the moving robot. Some expressed gratitude through the usage of phrases, for example: *'Thanks bro!'*, *'I love that robot!'* while some others expressed fear of the robot through phrases such as *'I am scared of it. He is a squirter!'*, *'That robot is crazy!'*. On the other hand, the robot still scenario also seemed to attract people's attention. This can be explained by the participants' responses: *'I wonder what this robot does? Does it talk?'*, *'Is the robot dead?'*. Further, from the data, it appears that people may have lost interest in the stick. Maybe the repetitive design of the traditional automatic hand sanitizer dispenser attributes to this behavior.

C. Groups Engage More Than Individuals

Overall there were 344 group interactions and 1292 individual interactions across the 1636 total interactions. The mean group size was 2 (var = 0.19112313), with 744 participants in groups overall. Groups were significantly more likely to interact with the robot than individuals. They were also more likely to use hand sanitizer and talk among each other and to the robot (Fig. 6). Group membership was a significant predictor of whether people were likely to talk to each other (**χ^2=27.779, p$<$0.001****) and to the robot (**χ^2=44.764, p$<$0.010****).

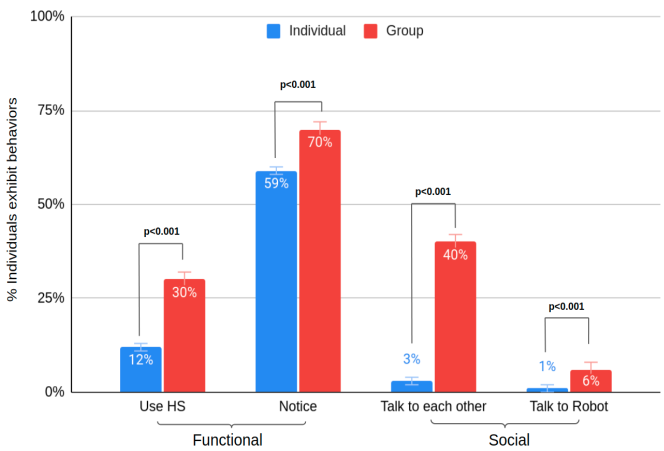

Fig. 6. Group behavior - Results

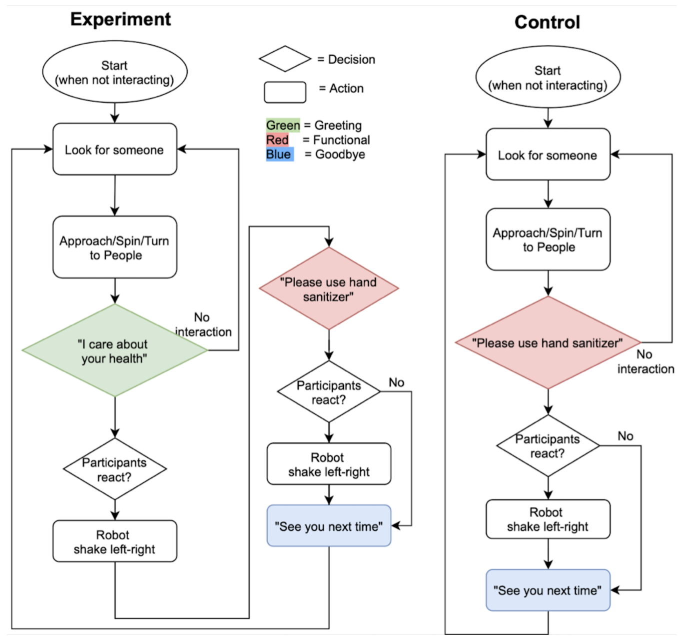

Fig. 7. Interaction Flow. The block diagram shows the steps of how the robot engages with people in the compression of experiment and control. Refer to Fig. 9, the interaction flow "Control," on the right side of the figure, was designed for the scenario of "Hello" and "∅". Participants are not required to interact with the robot, but the robot will respond with left-right movement if participants go off script.

VI. Study 2: An Invitation to Interact

Our follow-up study focuses on the power of robot utterances, in particular street performance and comedy-inspired invitations, on the likelihood of participants taking hand sanitizer and socializing with each other and the robot. This section details the updated study approach, interaction flow, and experimental conditions to enable the evaluation of verbal invites.

A. Why Entertainment Inspired Utterances?

People working in live entertainment are often great at attracting the audience's attention, which we hypothesized to be a good match for a robot attempting to distribute hand-sanitizer in a public setting. Entertainment includes strategies for delivering different levels of fun and joy (among other reactions) [45], which we thought people would find particularly valuable at a time of isolation and loneliness.

While performance methods, in general, are inspired by hundreds of years of practice and pedagogy in human-human entertainment, the utterance strategies in this were sampled from two specific performing arts strategies: (1) street performance, in which performers actively recruit audiences and engage the interest of those passing by, and (2) stand-up comedy [24], as joke structures can provoke emotional reactions that might inspire a person to participate in something they wouldn't otherwise.

B. Converting Bystanders to Interaction Partners: Now with Utterances

To evaluate whether utterances can help attract people walking by the robot to become interaction partners, we first developed an interaction flow diagram (Fig. 7). This interaction flow is intended to offer a repeatable structure over which we can evaluate varied robot phrases, similar to street performers attracting passersby. The robot will start the conversation with one of the 10 experimental utterances (randomized order in Fig. 9) followed by "Please use hand sanitizer" with a short pause between. The wizard can also respond to participants' responses if they go off script by performing robot shake gestures (left and right motion) to bring them back to the script [46]. At the end, the robot will say "See you next time" to end the interaction.

C. Utterance Strategies Evaluated

The ten utterance strategies evaluated are presented in Fig. 9, spanning *attentional* and *relational* strategies. Comedians use various skills to get the audience's attention. Our ***attentional strategy*** research variables are selected from within such strategies as concepts to attract people's attention. We initially sampled attentional strategies from 45 humor categories from [24]. After five months of in-the-wild testing and iteration, we subselected to friendly, flirtatious, absurd, and health-related. **Friendly** was chosen because of positive observed reactions, e.g., social bounding between human and the robot. **Flirtatious** often provoked laughter and confusion, a verbally humorous way of being slapstick that presses a human-robot social boundary. **Absurd** provoked surprise or pause for reflection, which we hypothesized would draw people's attention. Finally, **Health-related** was chosen as it relates to the pandemic and typical robot behaviors.

Our second set of research variables involved The ***relational strategy***, i.e., to whom the robot was directing its speech. As introduced in [30], there is much written about who is the butt of a joke. For example, a performer making fun of itself is often said to be more acceptable than a performer making fun of the audience. Thus, we chose two variables, **about robot** in which the robot references itself and **about people** in which

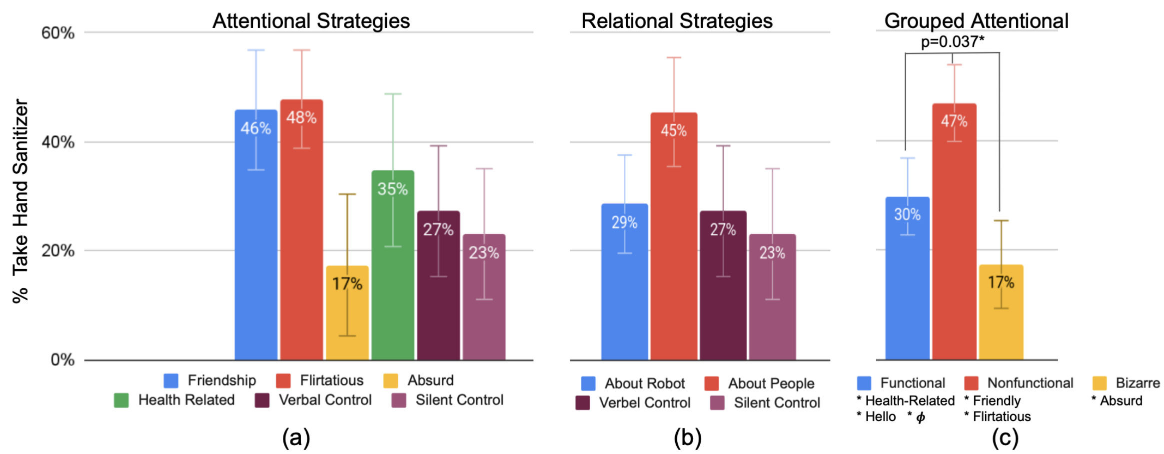

Fig. 8. Functional results. (a) Impact of ”attentional strategy” on taking hand sanitizer; (b) impact of ”relational strategy” on taking hand sanitizer; (c) impact of functional dialog on hand sanitizer taking with a new categorical breakdown: functional (health-related, hello, ∅), nonfunctional (flirtatious, friendship),and bizarre (absurd).

INVITE	About Robot	About People
Friendship	"Do I want to be your friend"	"Do you want to be my friend"
Fliratatious	"Am I attractive?"	"Are you attractive?"
Absurd	"You can see I do not have hands to use hand sanitizer	I can see you have hands to use hand sanitizer"
Health related	"I care about your family"	"You care about your health"
Control	"Hello"	∅

Fig. 9. Entertainment-Inspired Robot Utterances, a total of 10 conditions that was randomized and selected for the interaction instances.

the robot references the people. Data collection and analysis methods were the same as in the previous experience. We summarized all conditions in Fig. 9.

VII. Results 2: Robot Utterances Impact

Our data set includes 117 interactions, in which the robot offered hand sanitizer to a total of 185 (73-male, 112-female) participants in the time span of 4.5 hours, 4 trials. The full data is separated into two parts, the functional (do people take hand sanitizer) and the social (do people talk to the robot or each other) results of our varied relational and attentional strategies.

A. Functional Results: Participant Hand Sanitizer Taking

This subsection shows the hand sanitizer-taking results or functional results across different strategies. The most effective was the attentional strategy combined with the relational strategy. Our attentional results (Fig. 8a) shows that friendly social conversation can boost people’s response (Friendship-46% Flirtatious-45%), and relational results (Fig. 8b) shows that there is a higher influence when the robot references people (About People-45%).

To show the impact of the functional and nonfunctional effects on people taking hand sanitizer, a new set of categories have been generated (Fig. 8c). The new categories are functional, nonfunctional, and bizarre dialogues. Functional dialogues are health-related dialog that includes simple greeting starters (e.g., hello) that directly leads to the functional objectives; nonfunctional dialogues are non-health-related dialogues; they are bizarre dialogues that make people feel awkward and weird. This was supported by the Chi-square test that shows a significant result of nonfunctional dialog impact on people’s willingness of taking hand sanitizer (**χ^2 (2, N =23) = 6.616, p = 0.037***)

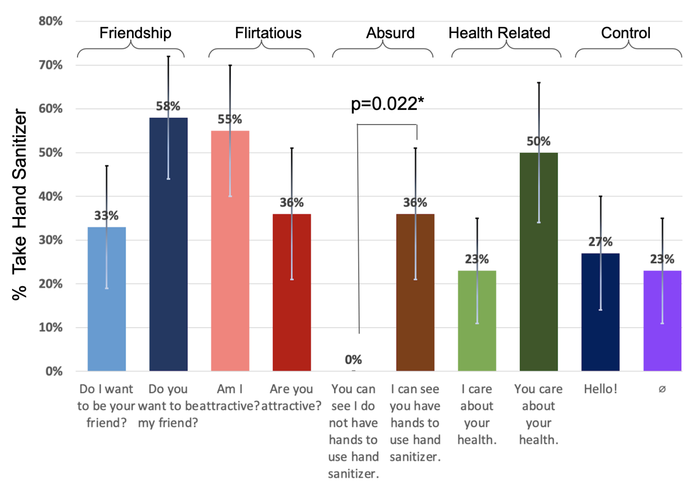

Fig. 10. Impact of attentional strategy pairs on people taking hand sanitizer.

The interaction effect between attentional and relational strategy indicates that it is not just what the robot says but who the robot is referencing. In Fig. 10, Friendship, Absurd, and Health-related have a higher rate of attracting people taking hand sanitizer, in which the Chi-square test in the ”Absurd” category shows the absolute significance of people being more interested in taking hand sanitizer when robot reference about people (**χ^2 (1, N =23) = 5.282, p = 0.022***). On the contrary, ”Flirtatious” shows the complete opposite, where people are more interested in taking hand sanitizer when the robot references itself.

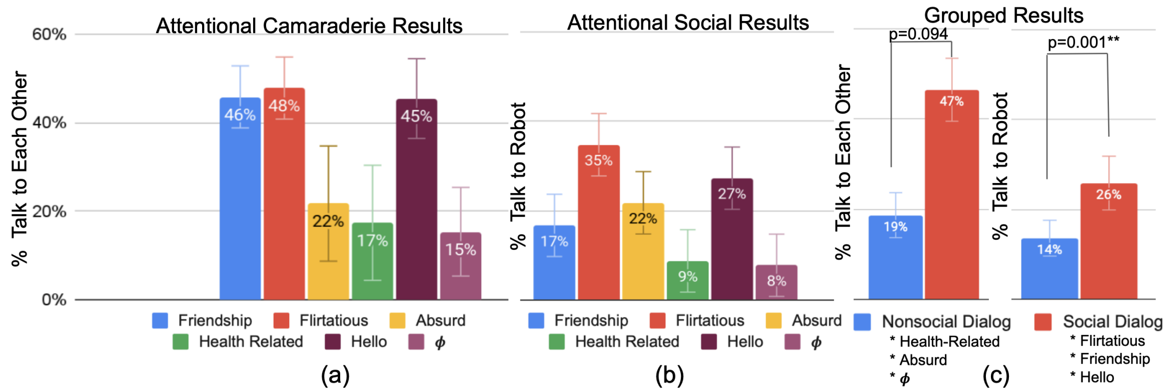

Fig. 11. Social results. (a) Impact of attentional strategy on people talking to each other; (b) Impact of attentional strategy on people talking to the robot; (c) Impact of social dialog on people's social behavior. Categorical breakdown: social (Flirtatious, Friendship, Hello), nonsocial (Health-Related, Absurd, ∅).

B. Social Results: Participant Talking

This subsection presents the results of social impact during the human robot interaction, including the impact of attentional strategy on people talk to each other (Fig. 11a and Fig. 11b) and a recategorization of attentional strategy into social/nonsocial categories (Fig. 11c).

Talk to each other: As seen in Fig. 11a, there is a higher efficiency on friendly and social dialogues to prompt human social behavior with their peers, between attentional strategies (Friendship-46% Flirtatious-48% Hello-45%). **Talk to robot/stick:** in Fig. 11b, have the similar results, whereas "Flirtatious" and "Hello" have a higher impact on prompting human social conversation with the robot.

Although there is no significant results on either of attentional or relational data, the regroup (refer to Fig. 11c based on Fig. 11a and Fig. 11b) results have an outstanding performance. In terms of the right side of Fig, 11c, a Chi-square test was performed to examine the relationship between social and nonsocial dialog on people talking to each other was significant, (**χ^2 (1, N =117) = 10.387, p = 0.001****). By looking into Fig. 11c, "Friendship", "Flirtatious", and "Hello" are socially impactful dialogues that have over 40% of effectiveness, prompting people to talk to each other during the study. As referred to on the left side of Fig. 11c, on the regroup categories, social dialog (Friendship, Flirtatious, and Verbal Control), which is more socially interactive dialogues, and nonsocial dialog (Health related, Absurd, and ∅), which is weird and less social interactive dialogues, a chi-square test was performed to examine the relation between social and nonsocial dialog on people talking to the robot (**χ^2 (1, N =117) = 2.803, p = 0.094**). Social dialog may also incentivize people to talk to the robot.

VIII. Discussion & Conclusion

This paper uses a robot that distributes hand sanitizer on the university campus to investigate whether social robots can increase bystander openness to positive health practices and socialization during a global health pandemic. Our first sub-study illustrated the attentional and social value of robots that offer hand sanitizer, particularly to groups of humans. Our second sub-study illustrated the complexities and benefits of adding engaging utterances, again, more significantly impacting groups than individuals. More broadly, this work shows how human-in-the-loop service robots can effectively integrate into everyday human environments, particularly after significant in the wild testing. Additional insights:

Robots significantly outperform non-social technology for distributing hand sanitizer. Even with purely non-verbal communication, the robot attracted many interaction partners. Compared to the non-social stick, the robot may have seemed more sociable and responsive, cuing many anthropomorphic responses(social goal: people talk to the robot and each other), as well as prompting healthy human behavior (functional goal: use hand sanitizer).

Social conversations can help robots achieve functional goals. There is a high impact of friendship and flirtatious utterances on people's social behavior. Both categories had significant impact on people taking hand sanitizer (Fig. 8). Such as, when the robot said "do you want to be my friend" or "are you attractive," often times people do respond "yes" or "this is weird" and had further conversation with the robots afterward. Perhaps sassy dialogues are seen as friendly, at least on a college campus, and certainly provoked some smiles.

Entertainment approaches can convert bystanders to interaction partners, but they must be done well (Fig. 10). We now know that robots that are trying to get things done should not be too bizarre, or it will cause confusion. It is not only what a robot says to the people, but also who the robot is referencing that makes people take hand sanitizer. Friendship invitations such as, "do you want to be my friend," were well received, however, people preferred when the robot called itself attractive than visa-versa. As always in social robotics, context is key.

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