Robot Vs. Stick: The Impact Of Anthropomorphism On The Use Of Hand Sanitizer

by

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Anthropomorphism is described as the human tendency to see human-like shapes in the environment and robots have the potential to be anthropomorphized. However, it is unclear if anthropomorphic robots are effective in human-robot interactions (HRI). Using the context of hand sanitizer service as an application, this work assessed whether a social robot would be more effective at distributing hand-sanitizer than traditional commercial sanitizers. In an experiment at the fitness center of our university campus, we observed that more passersby used hand sanitizer dispensed from a social robot or a stick. The dataset was collected over a two week period and included 2048 participants, out of which, 256 took hand-sanitizer. The results show that people are more willing to use hand sanitizer from a robot than compared to a stick.

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Robot vs Stick: Impact of Anthropomorphism on the Use of Hand Sanitizer

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Abstract

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CCS Concepts: • **Computer systems organization** → **Embedded systems**; *Redundancy*; Robotics; • **Networks** → Network reliability.

Keywords: human robot interaction, hand sanitizer, form, motion

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1 Introduction

This past year there was a global pandemic. As people were forbidden from coming into contact with each other, the use of technology has seen a significant rise, from automated checkout lines at grocery stores to robots delivering packages at the doorstep of people's homes [10, 20]. This has created enormous opportunities for automation in everyday human spaces. For example, prior to the pandemic, people were less informed of the contact based transmission of the disease via the use of hand sanitizer from traditional dispensers, but now they are more informed and use hand sanitizer from automated dispensers. As a result, we see a multitude of automated hand sanitizer dispensers and even robots dispensing hand sanitizer, in most everyday spaces such as hospitals, groceries and offices [8, 16]. Dispensing hand sanitizer is one of the many services that robots are designed to perform, during the pandemic. Robots that interact, communicate and deliver service to customers are called service robots [14] and there has been a significant rise of such robots post pandemic.

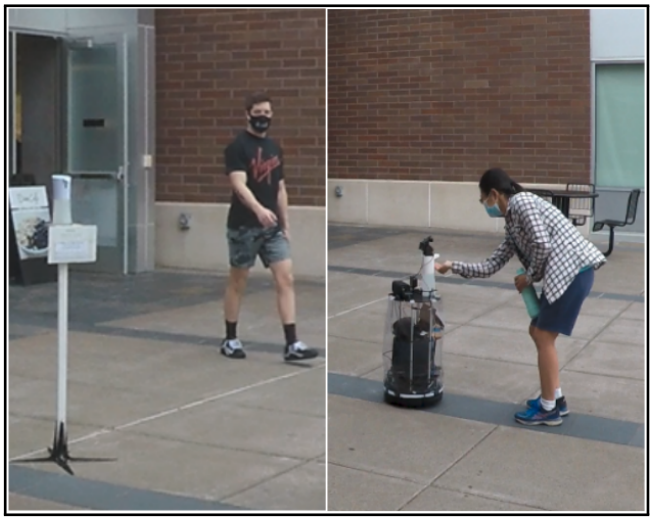

Figure 1. A Stick (left) and Robot (right) distributing hand sanitizer to passerby in front of the fitness center on campus.

As service robots move around our social spaces, their role and our interaction with them changes significantly. Scholars have explored a range of factors that affect the integration of service robots in everyday spaces and **anthropomorphism** is one crucial factor among them [3]. Anthropomorphism is the tendency of ascribing human characteristics to inanimate objects [5]. The behavioral outcomes of people around service robots exhibiting anthropomorphic traits is not clear.

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While some researchers inform to have found positive experiences such as joy and trust when human-like characteristics (e.g. greetings via gaze cues) are considerably exhibited by robots [19], others reveal negative attitudes such as scariness and eeriness to be perceived when anthropomorphism reaches a high level [17]. Therefore, this phenomenon of anthropomorphism is hard to generalize for service robots in social spaces.

It has been found that the appearance of an agent to look human-like, attracts people's attention and leads to an interaction with the agent [13]. However, this was established from experiments involving simulations and videos of human interactions with those agents. This may not be true for robots in a natural setting. Prior work on the affect of robot appearance and movement on social interaction, particularly with service robots, is relatively immature. In this study, we use the context of distributing hand sanitizer to understand the impact of anthropomorphism on the willingness of people to use hand sanitizer, by particularly focusing on two traits: **form** and **motion**.

To promote the use of hand sanitizer on campus, we designed and tested a mobile robot that delivers hand sanitizer on the Oregon State University campus. Our work aims to compare how many people would use hand sanitizer from a dispenser mounted on a stick versus from a hand sanitizer dispensing robot. In our initial trials, we deployed the stick and robot to dispense hand sanitizer to people at the entrance of the fitness center on campus. An automatic hand sanitizer dispenser is mounted on the stick. The robot hardware involves a hands-free hand sanitizer dispenser mounted atop a TurtleBot base. A wizard tele-operated the robot to approach bystanders, communicating via its approach that it would like them to use hand sanitizer. The research questions we answer in this paper, are as follows:

RQ1: Will a robot be more effective at distributing hand santizer than status quo systems?

The *functional behaviors* of participants, such as **use hand sanitizer** and **notice** the presence of stick/robot helps us answer RQ1. Our hypotheses about the functional behaviors of participants include:

H1: The robot will be more effective in attracting people to use hand sanitizer than compared to the stick.

H2: The moving robot will attract more participants into using hand sanitizer than compared to a still robot.

Social behaviors such as participants **talk to each other** and **talk to robot** while interacting with the stick/robot to use hand sanitizer, helps us answer RQ2. H3 helps validate these social behaviors seen in our experiment.

RQ2: Does having this robot out there in the middle of a pandemic impact the social environment?

H3: The hand sanitizer dispensing robot will be the subject of interest to participants than compared to the stick

Results from our experiment show that more people used hand-sanitizer from a robot as compared to a stick. Also, it was seen that the robot's ability to approach and persuade people into using hand-sanitizer via movement patterns such as moving back and forth, turning left and right in place, potentially influenced the people's willingness to use the robot. The combination of form and motion together is a significant predictor of whether people use hand sanitizer, notice, talk to each other and talk to the stick/robot.

In the following sections, we discuss prior work related to the impact of robot appearance and motion on human robot interactions, independently. We then present the technology design of Sanitizerbot and the Stick. Section 4 details the study setup, rationale for choice of robot vs. stick and an overview of the data collection process. The results of our experiment are discussed in section 5 and section 6. We conclude with our findings and discuss the opportunities in future design of robot form and motion strategies for service robots.

2 Related Work

Robots are designed with numerous physical attributes based on their application domain (eg. food/supply delivery, medical aid, military aid, etc). The notion that form follows function, has been a primary focus for researchers during robot design. Service robots exhibit certain cues such as physical attractiveness and non verbal behaviors (eg. motion and gestures) which help people to form quick impressions about that entity [2]. Although people may not have the knowledge about the complex functionalities of the robot, based on the physical form of the robot people develop some idea about its nature and capabilities. In regards to this, prior work suggests that the integration of robots in everyday human spaces should carefully consider the physical form and function of the robot to facilitate appropriate social interactions with people [4]. People are more likely to accept a robot when they feel that its appearance is compatible with its function [6, 7].

Using the context of distributing hand sanitizer to people on our university campus, in this study, we explore how form (i.e. Robot vs Stick) can influence people's willingness to use hand sanitizer. In addition, we also manipulated the presence of motion of the robot (i.e. still vs moving) which helps us explore the effect of motion cues on social attention. Prior work on exploring expressive motion for simple low Degree-of-Freedom robots, provides implications that robot motion influences people's behavior and a robot's functional tasks influences people's understanding of the robot's motion [11, 12]. The approaching behavior of a robot is also found to influence the extent to which people would care to interact with the robot [9].

3 Technology Design

This section presents the details about the technology design of the stick and the robot. The hardware description and

Figure 2. Hardware design of Stick (on left) and SanitizerBot (on right)

rationale of choices for the stick is presented first, followed by the hardware and software design of the robot.

The stick consisted of a automatic hand sanitizer dispenser mounted on it. The stick was designed to be 115cm tall similar to the average height of most hand sanitizer dispenser stands seen in everyday spaces. Also, this height was considered to make sure that there was no affect of height of the stick on the willingness of people to use hand sanitizer from it. The robot consisted of hardware and telepresence control from our previous work on a robot health coach [1]. We call the new implementation of our robot as SanitizerBot. Sanitizerbot consists of a Turtlebot2 mobile base that is fitted with an on-board computer, 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. This was the same automatic hand sanitizer dispenser as used on the stick. Its flat platform on the top allowed the installation of the webcam. With the help of video feed from the servo-controlled webcam, a distantly located wizard teleoperated the robot to approach people and distribute hand-sanitizer, in the wild. A router enabled communication between the wizard's laptop and on-board computer of the robot.

A tele-operation interface helped the wizard to move the robot and approach people while avoiding obstacles and changing direction of movement when necessary. Adapted from our prior work, the GUI consisted of a window to enable video feed display from webcam that was mounted on the robot. 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. A placard notice about the research experiment being conducted was attached on the robot and the stick, to inform the participants.

4 Robot vs Stick Experiment

In this section we discuss about our motivation to perform the Robot vs Stick experiment, the details of our study setup and experimental manipulations, followed by the description of our data collection process and video coding.

4.1 Why Robot vs Stick?

The aim of this study is to understand the effect of form and motion on the willingness of people to interact with the robot. In the COVID pandemic, we find the use of hand sanitizer to be a common health practice followed by humans, to prevent the spread of germs. To promote such a health practice, we developed a hand sanitizer distributing robot that dispenses hand sanitizer to passersby on campus. We chose this application domain to contrast the effectiveness of a stick and robot in dispensing hand sanitizer to passersby. Hand sanitizer dispensers mounted on a stand are ubiquitous in everyday human spaces such as a library, airport, office space, etc. Contrasting these dispenser stands with SanitizerBot could help understand the impact of form. The ability of SanitizerBot to move and approach passersby, unlike the stick which remains still, could help understand the impact of motion.

4.2 Study Setup

Following the protocols mentioned in the resumption plan that was approved by the IRB from Oregon State University, we deployed the stick and the robot at the entrance of the fitness center on our university campus. Our pilot trials include deployment of robot and stick in front the University's library and student center. From initial pilot observations, we found that the entrance of the fitness center was an egress point where people practiced hygiene and used hand sanitizer before their entry and exit to the building. Therefore, we chose this place as the research site for our study. The red lines in figure 3 indicate the boundaries of the research site. In each trial. the robot and the stick were deployed at the same location between 5pm and 7pm in the evening, during weekdays, within this research site. Three conditions were tested in each trial: *Stick, Robot still* and *Robot move*. The *stick* and *robot still* conditions had the stick and robot standing still in one position with the hand sanitizer dispenser. In these conditions people interested in using the hand sanitizer, had to approach the stick or robot. On the other hand,

Figure 3. Research site

in the *robot move* condition, the robot was made to forward to approach a participant and dispense hand sanitizer. Once the participant moved past the robot, then the robot would return back to its starting point.

4.3 Data collection

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. 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. 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.

- **Notice**: The participants notice the presence of stick or robot if they turned their gaze towards it.
- **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.

4.4 Data Analysis

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 used sanitizer or talked to the robot. To relate these phenomena, we therefore used the Chi-squared test of independence [15], 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 independant 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 [18], which is designed to find the linear relationship between two variables. All analysis was performed using the IBM SPSS Statistics software.

5 Main Results

This section presents an overview the data collected from video coding, followed by the results of our analyses of how form and motion impact the functional and social behaviors of people when using hand sanitizer from the stick/robot. This section helps us to understand RQ1: whether the robot is more effective in distributing hand sanitizer than other status quo systems and RQ2: whether this robot impacts the social environment during the pandemic.

During the video coding process, we also observed different behaviors of participants while interacting in groups and as individuals, which we discuss in section 6.

5.1 Data Summary

Video coding revealed a total of 1636 interactions, including 2048 participants. Of these interactions, there were 256 instances (out of 1636) in which at least one participant used hand sanitizer (16%). Further information about noticing the robot, talking to the robot, and talk is available in Table 1. Participants used hand sanitizer in 256 interactions, noticed the presence of stick/robot in 1002 interactions, talked to the robot by expressing their comments in 32 interactions and talked to each other, or other bystanders, about the stick/robot in 182 interactions. There were a total of 1255 interaction behaviors annotated. We found a total of 521 interactions in the stick condition, 614 interactions in the robot still condition and 501 interactions in the robot move condition.

Research Condition / Behavior	Use HS	Notice	Talk to each other	Talk to robot
Stick	7% (36/521)	35% (186/521)	0% (0/521)	1% (7/521)
Robot Still	11% (68/614)	62% (380/614)	1% (4/614)	11% (69/614)
Robot Move	30% (152/501)	87% (437/501)	6% (28/501)	21% (106/501)
Total instances	16% (256/1636)	61% (1002/1636)	2% (32/1636)	11% (182/1636)

Table 1. Summary of total types of interaction behaviors observed for research condition deployed

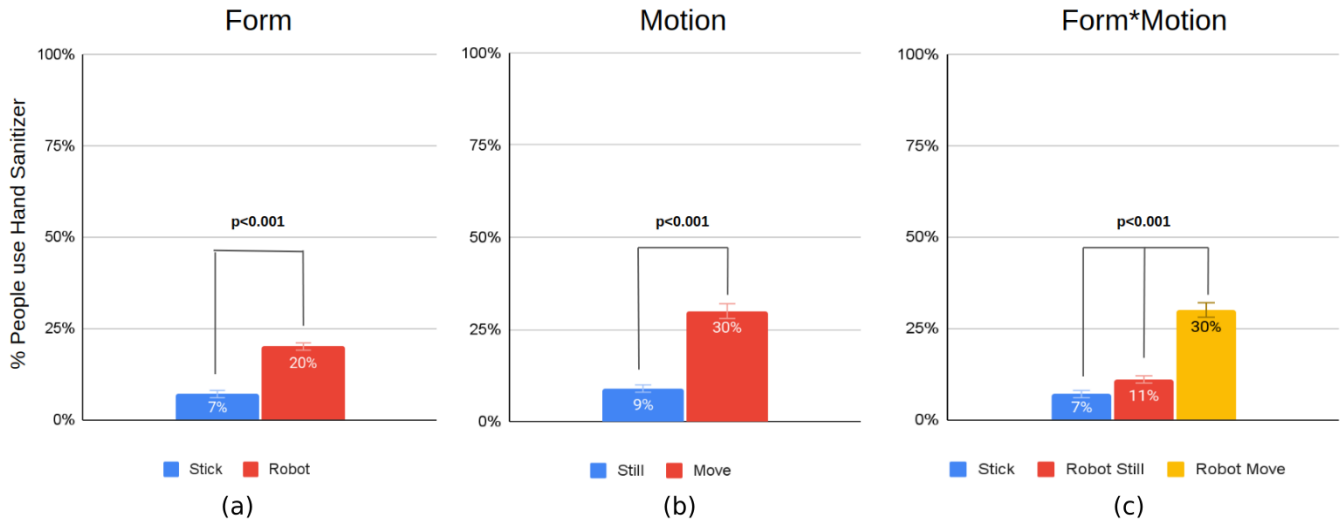

Figure 4. Functional behavior - Use HS

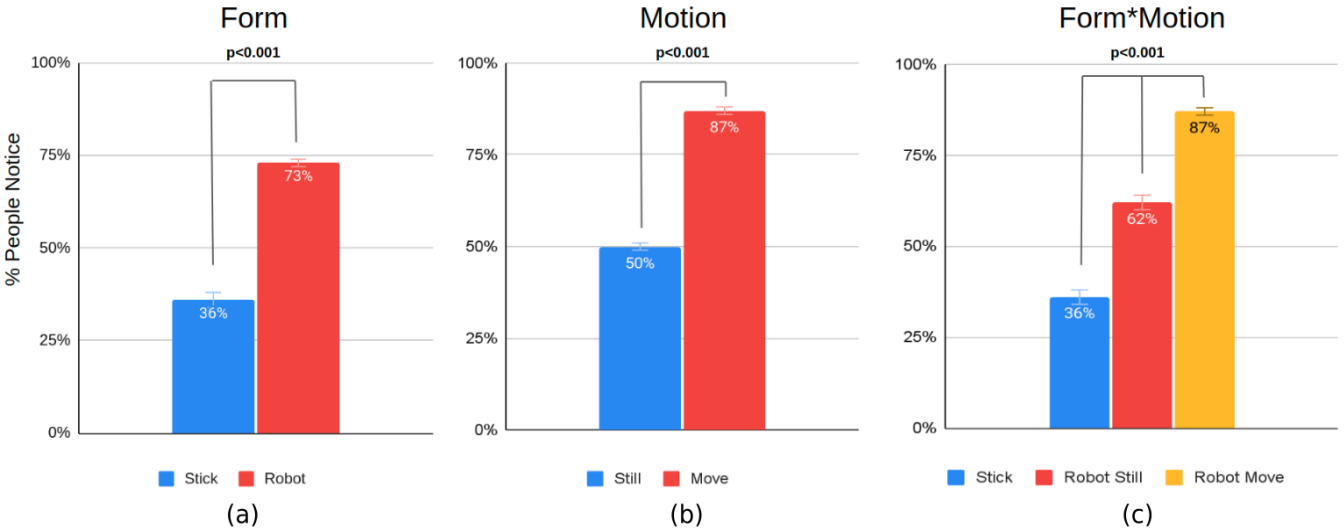

Figure 5. Functional behavior - Notice

Pearson's Correlations

Variable		Use HS	Notice robot/stick	Talk to each other	Talk to robot
1. Use HS	Pearson's r	—			
	p-value	—			
2. Notice robot/stick	Pearson's r	0.343	—		
	p-value	< .001	—		
3. Talk to each other	Pearson's r	0.500	0.282	—	
	p-value	< .001	< .001	—	
4. Talk to robot	Pearson's r	0.316	0.112	0.315	—
	p-value	< .001	< .001	< .001	—

Figure 6. Interaction effects

5.2 Functional Behaviors

This subsection presents the impact of robot form and motion on whether people **used hand sanitizer** and/or **noticed** the presence of stick/robot. These results help us evaluate H1: whether the robot would attract more people to use hand sanitizer than the stick. We find that robot form combined with robot motion was the most effective in attracting people to use hand sanitizer and to notice the robot, as displayed in Fig. 4 and Fig. 5.

Use hand sanitizer: 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. 4).

Form significantly impacted people's willingness to use hand sanitizer **(χ^2=44.221, p<0.001***)**. As shown in 4(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 than compared to the still robot and the stick. As shown in Fig. 4(b), the moving robot (30% use hand sanitizer) significantly outperformed the still robot (9%).

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 4(c), the moving robot (30% use hand sanitizer) outperformed the still robot (11%) and stick (7%).

Notice robot/stick: Both form and motion together had the highest numerical impact on whether people noticed the presence of stick/robot. Also, form and motion alone significantly predicted the notice of stick/robot, as seen in 5.

Form significantly impacted people's attention in noticing the presence of stick/robot **(χ^2=215.411, p<0.001***)**. As shown in 5(a), higher number of participants were attracted to the robot form (73% notice) than compared to the stick form (36%).

Motion was a significant predictor of whether people were attracted to the stick/robot **(χ^2=206.185, p<0.001***)**. As shown in 5(b), a moving robot attracted more attention (87% notice) than the still robot (50%).

Form and motion together had the highest statistical significance **(χ^2=289.983, p<0.001***)** in predicting whether people would notice the presence of stick/robot. As shown in 5(c), the moving robot attracted more attention (87% notice) than the still robot (62%) and the stick (36%).

Review of Pearson's correlations as seen in Fig. 6, showed a trend that higher the notice rate, the more people use hand sanitizer **(r=0.343, p<0.001**)**.

5.3 Social Behaviors

This subsection presents the impact of robot form and motion on the social behaviors of people during the pandemic. We analyzed whether people **talk to each other** about the stick/robot and/or **talk to stick/robot** to interact with it. These results help us evaluate H3: whether people would accept the robot and use hand sanitizer. We find that robot form combined with robot motion was the most effective in influencing people's social behavior to talk to each other about the robot, as seen in Fig. 7 and Fig. 8.

Talk to each other: As seen in Fig. 7(a), the robot form significantly impacted people's interest to talk to each other about the presence of the robot, than the stick **(χ^2=73.970, p<0.001***)**. People were seen to be more interested in the presence of a robot (16% talk to each other) than compared to the stick (1%).

Motion was also a significant predictor of whether people would talk to each about the presence of stick/robot **(χ^2=73.522, p<0.001***)**. As seen in Fig. 7(b), the moving robot was 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 most significance on people's interests towards discussing the presence of stick/robot **(χ^2=101.428, p<0.001***)**. The moving robot was topic of discussion for more number of people (21% talk to each other) than compared to the still robot

Also, as seen from Fig. 6, the Pearson's correlation test showed a trend that the higher the people talked to each other about the stick/robot, the higher is the probability of them using hand-sanitizer **(r=0.500, p<0.001**)**.

Talk to robot/stick: The moving robot form was the strongest predictor of people talking to the system. In fact, not a single participant talked to the stick. As seen in Fig. 8, 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)

However, 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%). From Pearson's test, we further find a positive correlation between people talking to the robot and using hand sanitizer, i.e., there is a higher chance that people who interact with the robot will use hand sanitizer from it **(r=0.316, p<0.001***)**, as seen in Fig. 6.

Participants interacted with the robot while they used hand sanitizer from it. Some attributed the moving robot to be friendly and expressed their gratitude through comments such as: *'Thanks bro!'*, *'I love that robot!'* while some were scared of it: *'I am scared of it. He is a squirter!'*, *'That robot is crazy!'*. The still robot, however, seemed interesting to people. This was seen from their curious expressions: *'I wonder what this robot does? Does it talk?'*, *'Is the robot dead?'*. On the other hand, it seemed that people are used to seeing hand-sanitizer dispenser stands ubiquitously in the pandemic and so the stick did not attract their interests.

6 Group Results

Besides the main results, during the video coding process, we also observed different social behaviors in participants interacting as groups and as individuals. This could provide insight on the design of service robots that are made to interact with groups and individuals, in the future. This section presents the impact of participants interacting with the robot as a **group** vs. interacting with the robots as **individuals** on our functional and social results. In short, the experimental

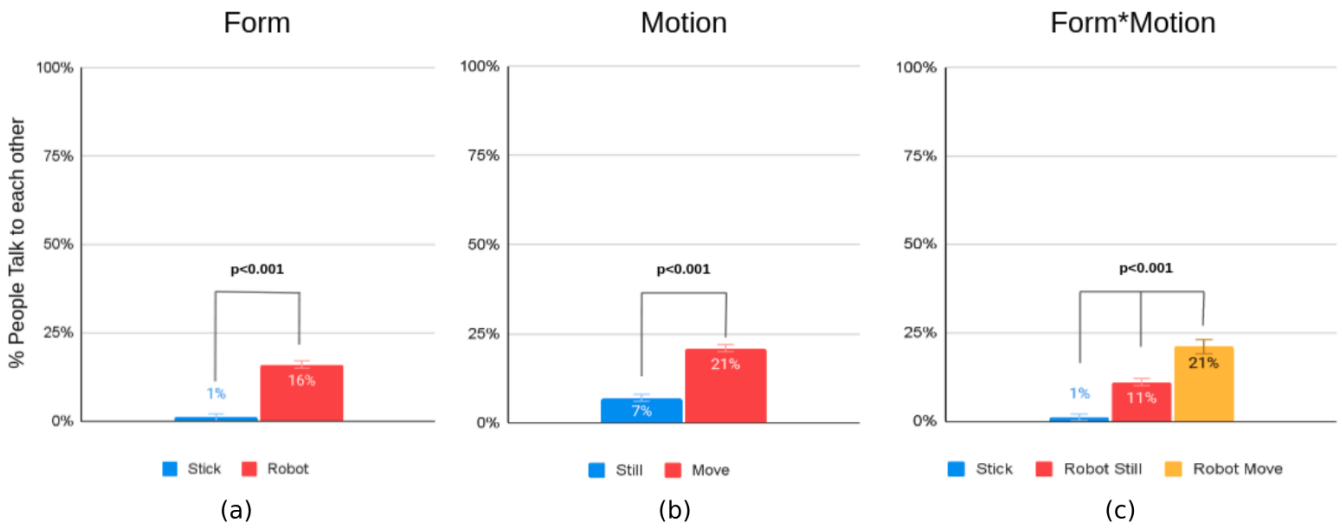

Figure 7. Functional behavior - Talk to each other

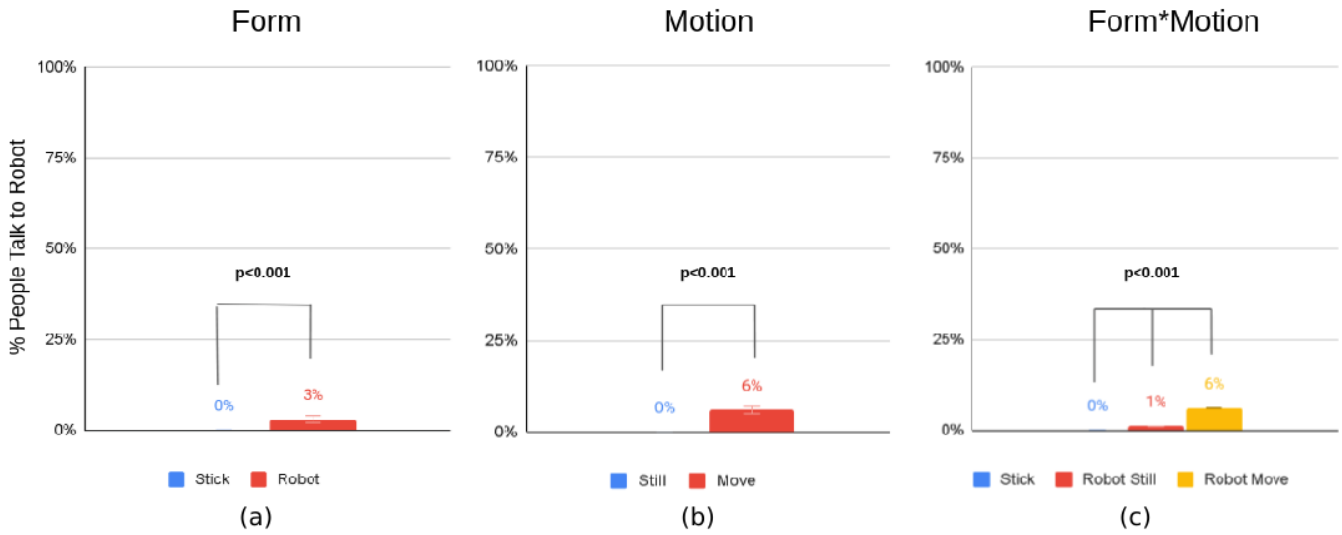

Figure 8. Functional behavior - Talk to Stick/Robot

results show that groups are more likely to interact with the robot and use hand sanitizer from it than compared to individuals.

Overall there were 344 group interactions and 1292 individual interactions across the 1636 total interactions. Mean group size was 2 (var = 0.19112313), with 744 participants in groups overall.

6.1 Functional Behaviors

This subsection presents the impact of groups and individuals on whether people **used hand sanitizer** and/or **noticed** the presence of stick/robot. These results help us understand the effect of groups on whether people were attracted to the stick/robot. We find that moving robot was the most effective in attracting more number of groups to use hand sanitizer than individuals, as displayed in Fig. 9.

Use hand sanitizer: Groups were a strong predictor of use of hand sanitizer and notice the presence of stick/robot, than compared to individuals, as seen in Fig. 9. A significantly higher number of participants moving in groups (30%) tended to use hand sanitizer than compared to their individual counterparts (12%) as shown by Chi-squared test of independence (χ^2**=67.423, p<0.001*******)**.

In particular, as seen in Table 2, across all conditions, 179 of the 744 (24%) participants who participated in groups, used hand sanitizer. On the other hand. only 153 out of 1292 (12%) participants used hand sanitizer among the individual interactions.

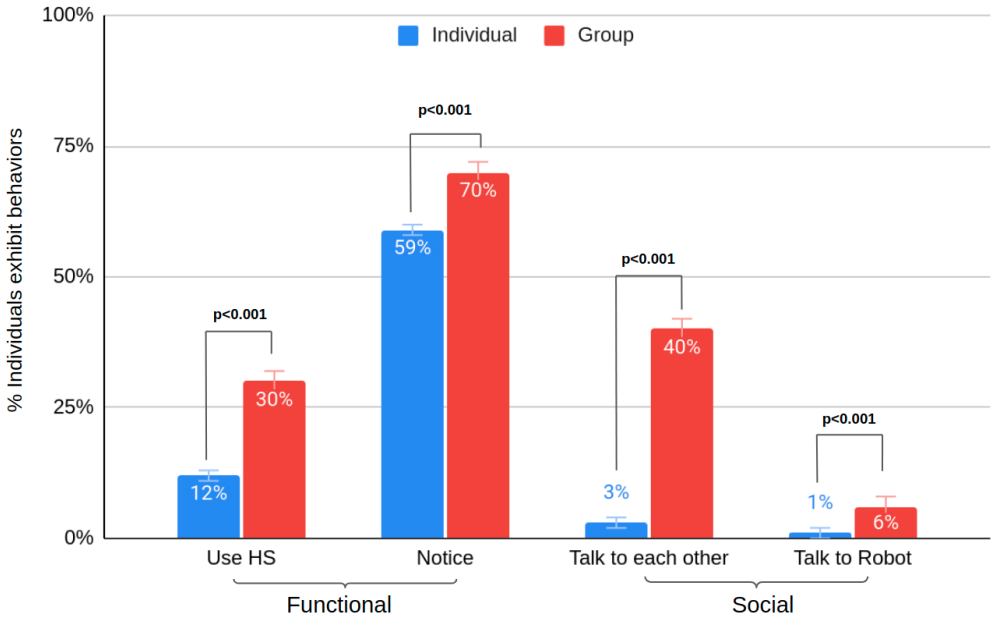

Figure 9. Group behavior - Results

Research condition / Behavior	Use HS	Notice	Talk to each other	Talk to robot
Stick	10% (20/225)	30% (67/225)	7% (17/225)	0% (0/225)
Robot Still	18% (59/326)	77% (252/326)	48% (156/326)	2% (8/326)
Robot Move	52% (100/193)	91% (175/193)	68% (131/193)	15% (30/193)
Total instances	24% (179/744)	66% (494/744)	41% (304/744)	5% (38/744)

Table 2. Summary of total types of group interaction behaviors observed for research condition deployed

Notice robot/stick: Groups are more likely to notice the presence of robot/stick than compared to individuals. While 494 out of 744 (66%) participants in groups, seen in table 2, noticed the presence of robot/stick, only 760 out of 1292 (58%) individuals noticed the robot/stick. A chi-squared test of independence shows that groups are highly likely to be attracted towards the robot/stick than compared to individuals (**χ^2=14.438, p<0.001*****), as seen in Fig. 9.

6.2 Social Behaviors

This subsection presents the impact of group interactions and individual interactions on the social behaviors of people during the pandemic: whether people **talk to each other** about the stick/robot and/or **talk to stick/robot** to interact with it. These results help us understand the effect of group size on the social behavior of people, during the pandemic. The robot was the most effective in influencing groups to talk to each other about the robot than compared to individuals.

Talk to each other: Overall, groups significantly outperformed individuals in talking to each other about the presence of stick/robot distributing hand sanitizer. Participants in individuals interactions, who were attracted by the stick/robot, shared their comments with passersby, while those that were in group interactions, shared them with their group members.

As seen in Fig. 9, across all conditions, groups were a significant predictor of whether people were likely to talk to each other about the stick/robot (**χ^2=27.779, p<0.001*****). People in groups were seen to be more interested in the presence of a stick/robot (40% talk to each other) than compared to the individual interactions (3%). We find that even if one participant in the group notices the presence of stick/robot, they would lead the group into involving in the interaction.

Talk to robot/stick: Groups significantly outperformed individuals in talking to the robot while interacting with it, as seen in Fig. 9. In fact, none passed comments/talked to the stick while using hand sanitizer from it. Participants in group and individual interactions, who were attracted by the robot interacted with it by making comments.

As seen in table 2, a higher number of participants who interacted in groups, 38 out of 744 (5%), outperformed their individual counterparts 10 out 1292 (<1%), in talking to the robot (**χ^2=44.764, p<0.010****).

7 Discussion

Our research demonstrates the significant link between the form and motion on people's willingness to use the robot. From our main results, we can accept H1 that a robot is effective in influencing people to use hand sanitizer when compared to the stick. Our statistical results also revealed that a moving robot attracts more people into using hand sanitizer than compared to the still robot. This supports H2. As for H3, the social behaviors observed from participants during video coding suggests that people are more willing to interact with a robot than compared to a stick. There can be many explanations for these results. One possibility could be that people anthropomorphize this robot and that the physical form and function of this robot facilitate the functional and social behaviors in participants as seen in our experiment [4]. Our findings add evidence to the positive experiences of incorporating anthropomorphism in service robots. Further, during the pandemic, with the increase in number of service robots that are seen in everyday spaces, people seem to be intrigued about these robots' behavior. This could also attribute to the social behaviors of people that we observed in our experiment.

The group results, discussed in section 6, provide a key takeaway that groups are highly likely to be interactions partners. Therefore service robots could consider approaching groups more frequently than individuals to increase the number of interactions. Furthermore, in this work we performed experiment trials at ingress points like the entrance of fitness center on the university campus. Generally, people in this location tend to follow hygiene and therefore may find the necessity to use hand sanitizer from the stick/robot. However, there can be other demographic areas such as sidewalks and corridors which are passing points where following hygiene may not be a necessity. Future work could explore the impact of location on the use of hand-sanitizer. Interaction via voice/speech which is another important human-like trait, could be a potential area of research for this application. Robot form factors (ranging from not all human-like to fully humanoid) and motion patterns that enable the passersby to form different opinions about the robot could be also explored.

8 Conclusion

This paper presents our approach towards understanding the impact of robot form and motion on the behavioral outcomes of passersby in a natural setting. We ran an experiment in which passersby interacted with a hand sanitizer distributing stick and a robot. We measured how these factors influenced people's behaviors such as **use hand sanitizer**, **notice presence of stick/robot**, **talk to each other** and **talk to stick/robot** while they interacted with them. Our results are an evidence that both robot form and motion affect the willingness of people to use hand sanitizer.

The main take away from our experiment is that robot designers should be aware that anthropomorphic traits of a robot such as form and movement characteristics, play a key role in determining people's responses during HRI. The statistical analysis of main results suggests that both form and motion significantly influence the use of hand sanitizer and increase interaction rates between humans and robots. A potential use case of this study is that these variables could be used by social robots entertaining people in waiting halls, to improve HRI. Overall, we can conclude that the attention of passersby can be gained by incorporating anthropomorphic form to a service robot, and that motion along with form can positively influence the willingness of people to interact with the robot.

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