Human and Robot Bonding: A Study on Implying Homophily in HRI

Roya Salek Shahrezaie[1]*, Bashira Akter Anima[2] and David Feil-Seifer[3]

***Abstract*—Homophily, a person's bias for having ties with people who are similar to themselves in social ways, has a vital role in creating a connection between human interactions. Studying homophily in human-robot interactions can provide valuable insights for improving those interactions. In this paper, we investigated two main ideas: first, does share similar interests have a positive effect on a human-robot interaction similar to the positive impact it can have on human-human interaction; second, does share similar interests can affect trust? The experiment consisted of a session of two speeches on two different topics from two NAO robots, respectively, in the presence of the participant. For each participant, their national origin was asked in the pre-questionnaire, and during the session, one of the robot's topic was chosen based on that. The other speech was about a general point. Since one robot shared a familiar topic, we expected to observe bonding between humans and the robot. We gathered data from a post-questionnaire and analyzed them. The results supported both hypotheses. We concluded that homophily plays a significant role in human-robot interaction and can even affect trust in HRI.**

***Index Terms*—HRI, Homophily, Trust**

I. Introduction

People tend to connect with others who are similar to themselves [1]. This tendency referred by social scientists as homophily manifests itself concerning similarities due to gender, national origin, social class background, and other socio-demographic, behavioral and interpersonal characteristics [2]. Individuals in homophilic relationships share common characteristics (such as beliefs, values, education) that make communication and relationship formation easier. In HRI, a robot needs to create a smooth interaction with its audience in order to perform well in social settings. We wish to investigate robots can benefit from the same social tendency and leverage from homophily in their interactions. We proposed an experiment where a social robot acts in such a way that implies homophily while another robot does not. Then we observe how the person will react toward the robots. We expected that achieving homophily, or bonding based on a common interest or implying similarity, between a human user and a robot, holds a promise of improvement in trust between them.

The similarity between humans and robots is an essential facilitator of positive attitudes toward robots [3]. For instance, Bernier and Scassellati [4] showed that the more an individual believes that a robot is similar to them, the more they like and prefer to interact with them. Also, research of Bowman et al. [3] found that individuals tend to like and build healthier emotional attachment toward robots that appear to have a similar personality to theirs. Finding homophily between individuals is a useful for human-robot interaction. Therefore, we wanted to investigate if this phenomenon could occur between humans and robots as well.

We want to measure the scale of homophily in our experiment between humans and robots. Suppose we can determine that the similarities between the autonomous agent and the human agent can improve connection and trust. Such a measurement might be beneficial for future robot design in the socially assistive environment between humans and robots; this could lead to an improved first impression of a robot, which might eventually help humans communicate and interact with the robot more easily.

The rest of the paper is organized as follows. Section II describes the related works. Section III includes the study aim and the hypothesis of our work. Section IV narrates the study design step by step. Section V gives a detail description about the agent and the participant in the experiment. Section VI showed how the experiment was carried out. Section VII presented our statistical approach and visual presentation of our result. Finally, in Section VIII we discuss about results, limitations and future work.

II. Background

A. Homophily in HRI

Homophily is a familiar word in the social study fields. In Rhetoric and Nichomachean Ethics, Aristotle noted that people "love those who are like themselves" [5]. It was also observed by Plato that "similarity begets friendship" [6]. Back in 2001, McPherson et al. [2], presented a principle named homophily. It states that "a contract between similar people occurs at a higher rate than among dissimilar people." Overall homophily can be differentiated into two types: 1) value homophily and 2) status homophily. Value homophily is based on attitudes, beliefs, and values. Status homophily is based on national origin, sex, age, and characteristics like religion, education, occupation.

Many research in the robotic world also worked on the common factors that a robot and a human can share. As an example, propensities of preference for Human-Robot Interaction (HRI) according to different personalities and facial expressions of human and robot are presented in A paper of Jung et al. [7]. In this paper, two types of personalities: extrovert and introvert were applied to the robot named KMC-EXPR to observe the impact of different personality type in

* First and second authors have same contribution on this paper.
[1,2,3] Socially Assistive Robotics Group, Robotics Research Lab, University of Nevada, Reno, Reno, NV, 89557
[1,2,3]Rsalek@nevada.unr.edu, Banima@nevada.unr.edu, Dave@cse.unr.edu

interaction between humans and robots. Also Kahn's work [8], a humanoid robot named Robovie was used to interact with children. After each 15 min session, the experimenter interrupted the session and sent the robot to the closet. Later, it was observed how the children felt towards the robot in many aspects.

The effect of verbal and nonverbal behavior based on personality traits in human-robot interaction has been observed [9]. A Nao robot was used to validate their model that a person preferred more robots to interact with if they both had the same personality traits. And finally a study from Heerink [10], shows that age, gender, education, and computer experience had an influence on robot acceptance by older adults.

B. Trust in HRI

It is observed that people tend to trust more easily those people who appear similar to themselves. By similarity, it may include common values, membership in a defined group (such as manufacturing departments, a local church, gender), shared personality traits, etc. [11]. In that research, when people evaluate others' trustworthiness, cues such as gender [12], age [13], race, and nationality influence the initial assessment. 11

Due in part to increasing coexistence, human-robot trust and factors influencing interactions involving trust has been the subject of several recent research efforts [14]. In this paper, we expand on this previous work by measuring trust and cooperation using a game method to see the effect of sharing and interest between a human and robot.

Salem et al. [15], conducted an experiment in which participants interacted with a home companion robot in one of two experimental conditions named correct mode and faulty mode while tapping different dimensions of trust based on a variety of unusual collaborative tasks. It was observed that the robot's performance did not influence participants' decisions to comply with its request. In the paper of Hancock et al. [16], the effects of the human, robot, and environmental factors on perceived trust in human-robot interaction were evaluated. Human related factors depend on ability-based and characteristics, robot-related factors are based on performance and attribute, and environmental factors include team collaboration and tasking. In this study [17], whether a robot's vulnerable behavior can create ripple effects on a team and increase team physiological safety and human-human trust-related behavior were explored. It was seen that the 'ripples' of the robot's vulnerable behavior influences not only team member's interaction with the robot but also team members' human-human-trust-related interaction with each other.

III. Study Aims

In this user study, we aimed to measure the similarities between human and robot when they shared a common interest. As our second interest, we were looking into the effect of homophily in trust between humans and robots. Based on this idea, we proposed two hypotheses on similarity and trust between humans and robots.

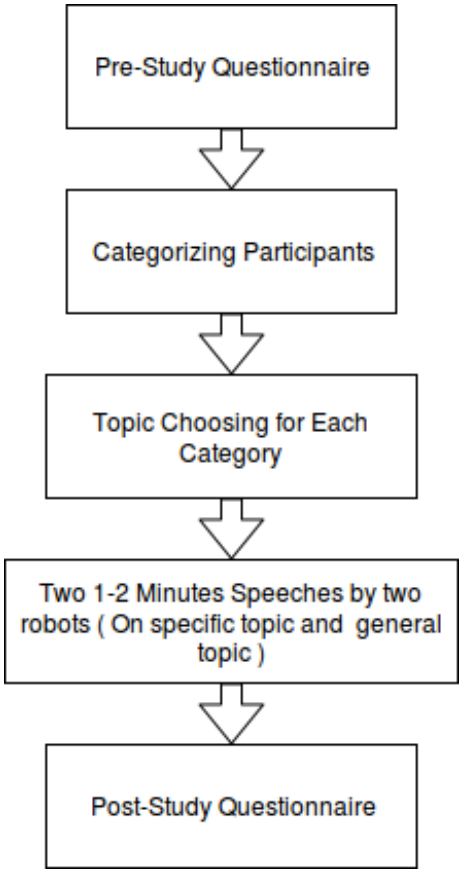

Fig. 1: Proposed Method

- H1: Human will feel a similarity (homophily) to the robot in a human-robot interaction when they share a common interest
- H2: There is a correlation between homophily and trust in a human-robot interaction

IV. Study Design

This section will present an experiment that examines homophily interaction with robots. Our proposed method is divided into a few steps, which is also illustrated in Fig. 1.

A. Categorizing Participants

Homophily can be of many types, defined by: age, gender, national origin, socio-economic state, ethnicity, attitude, etc. For this purpose, we chose only one age range (18-35) of university students, and between gender and national origin we chose national origin as our divider for different groups because 'National Origin' is a powerful homophily feature and the correlation between national origin and homophily is higher than gender [18]. In the pre-questionnaire form, general information such as age, gender, major, and national origin information were asked from the participant.

We categorized the participant into one of 12 broad national origins: European, Middle East, North African, African, North American, South American, Central American, Southeast Asia, East Asian, West Asian, South Asian, and Other. The

TABLE I: Topic for Each national origin Category

National Origin	Topic
Europe	Pirozhki
Middle East	Kebab
North African	Coucous
African	Bobotie
North American	Cheese Steak
South American	Ceviche
Central American	Pupusa
Southeast Asia	Nasi Campur
East Asia	Sichuan Cuisine
West Asia	Kebab
South Asia	Biriyani
Others	Ice Cream

name of the national origin category in the U.S. was collected from the United States Census Bureau data [19].

B. Experiment Task

In this experiment, we first approached the participant and explained about the experiment and consent regarding this issue. If the participant felt comfortable to attend this experiment we gave a pre-questionnaire form to answer. After receiving the information from the pre-questionnaire we asked them to listen two different presentation delivered by two different NAO robots respectively. Later, the participant were asked to fill up another post-questionnaire form.

One robot (Blue NAO) gave the presentation on a special topic related to the participant in that current session. After this, the other robot (Red NAO) gave another presentation on a general topic which will be similar to every participant in this user study.

The special topic of the presentation for each participant was selected based on the national origin information given by the specific participant in the pre-questionnaire. The most popular food from each region of the national origin was chosen as the special topic for each national origin group (Table I). The robot gave a speech presentation on bread which is familiar to every national origin categories.

Samples of the speeches by the Blue NAO and the Red NAO are given below respectively, where the Blue NAO's speech is about 'kebab' towards the participants categorized into 'The Middle East' and the Red NAO's speech is about 'bread.'

- Blue NAO: *'Hi, I am Blue Nao. I am going to talk about a dish named Kebab. Kebab is a very popular dish all around the world. Shish Kebab or doner Kebab can be two familiar names of Kebab. It is often served during special occasions. It can be made with ground meat or seafood, even sometimes with fruits and vegetables. Traditional meat of Kebab is most often mutton or lamb, but regional recipes may include beef. Sometimes Onions are often added with Kebab to enhance the taste. Kebab is served with various dishes according to each recipe. Kebab with naan is very popular in some regions. Yogurt drink is often served with Kebab. It is also served with rice, grilled tomatoes, tabouli salad, or bread. There are many restaurants in Reno where we can find Kebab, and they are delicious. Well, I hope you enjoyed my speech.'*
- Red NAO: *'Bread is a staple food prepared from a dough of flour and water, usually by baking. Throughout recorded history, it has been popular around the world and is one of the oldest artificial foods, having been of importance since the dawn of agriculture. Proportions of types of flour and other ingredients vary widely, as do modes of preparation. As a result, types, shapes, sizes, and textures of bread differ around the world. Bread may be leavened by processes such as reliance on naturally occurring sourdough microbes, chemicals, industrially produced yeast, or high-pressure aeration. Some bread is cooked before it can leaven, including for traditional or religious reasons. Non-cereal ingredients such as fruits, nuts and fats may be included. Commercial bread commonly contains additives to improve flavor, texture, color, shelf life, nutrition, and ease of manufacturing. Also, bread has a social and emotional significance beyond its importance as nourishment. It plays an essential role in religious rituals and secular culture. Well, I hope you enjoyed my speech.'*

Each speech took less than 3 minutes. After listening to this presentations one after another, the participant filled up a post-questionnaire form. There were questions regarding homophily, trust, and provided speeches.

V. Agent and Participants

The experiment was conducted in a room in one of the libraries on the University of Nevada, Reno campus.

A. Agent

For the experiment, we used two NAO robots. We distinguished the robots as Red NAO and Blue Nao based on their color. As we previously mentioned, the Red NAO was talking about the general food topic 'bread' and the Blue NAO was talking about the special topic. Fig. 2 shows the set up of the robots during the user study.

B. Participant Recruitment

Participants were gathered from the University of Nevada, Reno campus area. Majority of the participants' age range was from the age of 18-35. The number of participants was 16, where there were 6 males and ten females. However, at first, the number of participants was 19, but we had to discard three participant's data due to one NAO having trouble performing the speech. Among the participants, there were 4 participants from Southeast Asia, 4 participants from Middle East, 3 participants from South Asia, 2 participants from East Asia, 2 participants from North America, and 1 participant from Europe.

VI. Experiment Setup

Before starting the experiment, every participant was made aware of the consent form individually. After being explained

TABLE II: Post-Questionnaire

Category	Question	Type
Homophily	The Robot was similar to me	(1-5)
	The Robot thinks like me	(1-5)
	The Robot behaves like me	(1-5)
	The Robot and I had a common interest	(1-5)
	I felt a bond with the Robot while it was speaking	(1-5)
Being Suspicious	The Robot is deceptive	(1-5)
	The Robot behaves in the underhanded manner	(1-5)
	I am suspicious of the Robot's intent,action or outputs	(1-5)
	I am wary of the Robot	(1-5)
	The Robot's actions will have a harmful or injurious outcomes	(1-5)
Security	I am confident in the Robot	(1-5)
	The Robot provides security	(1-5)
Trust	The Robot is dependable	(1-5)
	The Robot is reliable	(1-5)
	I can trust the Robot	(1-5)
Familiarity	I am familiar with the Robot	(1-5)
Topic	Are you familiar with the blue Robot talked about?	(1-5)
	Which speech did you find more interesting?	(1-5)

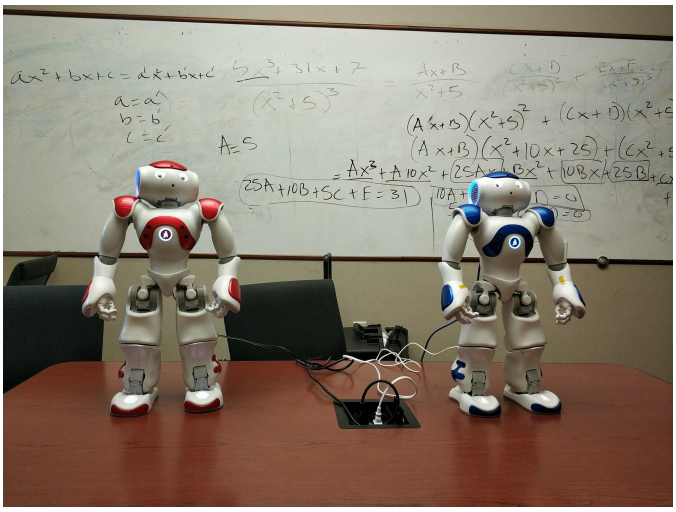

Fig. 2: Red and Blue Nao for the experiment

about the consent, if the participant was willing to continue then we started the experiment.

Each participant was asked to sit in front of the robots as shown as the Fig. 3. At first, pre-questionnaire form was given to the participant to fill up. After explaining this process and receiving the filled up pre-questionnaire form, the experimenter left the room and leave the participant to listen to the presentation given by the robots one after another. When the participant finished listening both the presentations, the experimenter entered the room again with the post-questionnaire form. While one experimenter was talking with the participants about the consent, experiment and the questionnaire, another experimenter was staying in another room tele-operated the robots. The participants did not know about the existence of the robot's operator from the other room.

A. Data Collection

We collected our data from two questionnaires. A pre-questionnaire was given before the experiment. After the

Fig. 3: The participant is listening to the robot's speech

robot's presentation, a post-questionnaire was given to the participant.

1) Pre-Questionnaire: The pre-questionnaire included general questions to know the age, gender, major, familiarity with robots. Besides the general question, there was an significant question which was asking the participant to choose one national origin category where he/she belongs to. The answers to choose for this questions were the 12 national origin categories that was mentioned before. The pre-questionnaire information helped to categorize the participant to select a speech matching their national origin.

2) Post-Questionnaire: After the speech presentation, each participant was given a questionnaire to fill up (TABLE II). The questionnaire was divided into three different parts. First part was observing the effect of the speech on the trust by asking each participant to choose one of the robots to pick one snack for themselves from the other room. The other two parts consisted of questions to measure the degree of both homophily and trust in two sections. These two parts consisted of standard questionnaire for measuring homophily and trust gathered from prior works. We added some extra questions related to this experiment that would help us to analysis the

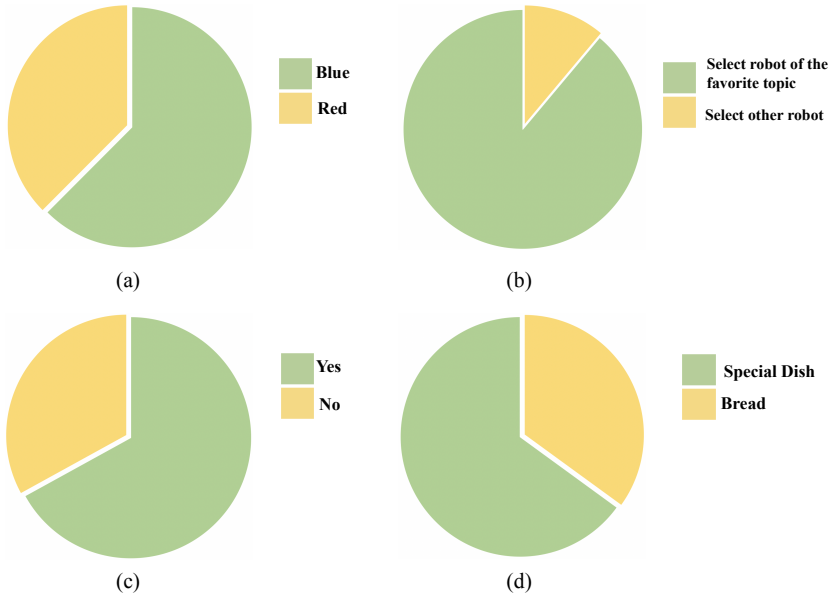

Fig. 4: (a) Chosen Robot, (b) Familiarity with topics, (c) Chosen robot is the one with dish topic, (d) More interesting topic

TABLE III: One-Sample Test (Test Value = 3)

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Common Interest	7/500	12	0/000	1/154	0/82	1/49
Felt Bonding	2/856	125	0/014	0/846	0/20	1/49
Similarity	3/411	12	0/005	0/615	0/22	1/01

answers.

The questions in the post-questionnaire were divided into some categories. They are: Homophily, Being Suspicious, Security, Reliability, Familiarity and Topic.

The degree of homophily between human and robot are measured with a questionnaire adapted from [20]. In order to measure the trust in the robot to capture the degree to which one believes the robot is dependable and trustworthy, a trust scale was used, which was adapted from Jian et al. [21]. All the questions in the questionnaire are based on five-point Likert scale.

VII. Results and Analysis

Details of experiment results and analysis are presented in this section. We analyzed data from questionnaires in order to support or refute our hypotheses presented above.

We explored results related to our hypothesis: first, homophily among participants (two groups of the ones who chose the Blue Nao and those who chose the Red Nao); second, correlation between homophily and trust categories in data.

To have a better understanding of our data, we used pie charts. The data shown in figures 4(a)-(d) relate to our experiment hypotheses. The majority of the participants (62.5%) chose the blue robot (special topic) in the first part of post-questionnaire which we mentioned in Section VI-A.

We further investigated why some participants preferred the red Nao. Many countries share one origin, but there is a possibility that people of one origin may not be familiar with exceptional food. For those participants with no idea about the unique food, the general topic of 'bread' the familiar topic. Fortunately, The last two questions in the 'topic' category of post-questionnaire shown in TABLE II define this issue and clear if the person is familiar with the blue NAO topic or not, and which topic was more interesting for him/her. So, we used the favorite topic question to compare 'chosen robot' and 'favorite topic' to have a new query, which is 'the participants whose choice was in line with their favorite topic. If choosing (Red NAO-favoring bread) and (Blue NAO-favoring dish), the person gets a one and otherwise gets a 0. We observed this group owned 80% of the population (Fig. 4(c). We conclude that participants mostly chose the robot that was talking about a familiar topic.

To investigate our first hypothesis for each independent variable, we analyzed the results using T-Test, knowing that the experiment has one sample group with two variables. According to TableIII, Using one-sample T-test, we found that there is a significant difference in mean 'common interest' between the homophilic and non homophilic conditions ($p < .001$). Also, there is a significant difference in mean 'felt bonding' between the the homophilic and non homophilic conditions ($p < .001$). And there is a significant difference in mean 'similarity' between the homophilic and non homophilic conditions ($p < .001$). (see Table III).

To explore our second hypothesis, we used Pearson correlation test results(see tableIV). We found that there is a

TABLE IV: Correlation

		Reliability	Trust	Similarity	Common Interest
Reliability	Pearson Correlation	1	.631**	0/316	-0/022
	Sig. (2-tailed)		0/009	0/233	0/937
	N	16	16	16	16
Trust	Pearson Correlation	.631**	1	.665**	.539*
	Sig. (2-tailed)	0/009		0/005	0/031
	N	16	16	16	16
Similarity	Pearson Correlation	0/316	.665**	1	0/205
	Sig. (2-tailed)	0/233	0/005		0/447
	N	16	16	16	16
Common Interest	Pearson Correlation	-0/022	.539*	0/205	1
	Sig. (2-tailed)	0/937	0/031	0/447	
	N	16	16	16	16

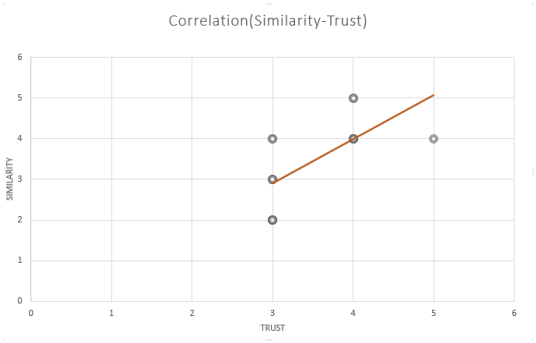

Fig. 5: Correlation (Similarity-Trust)

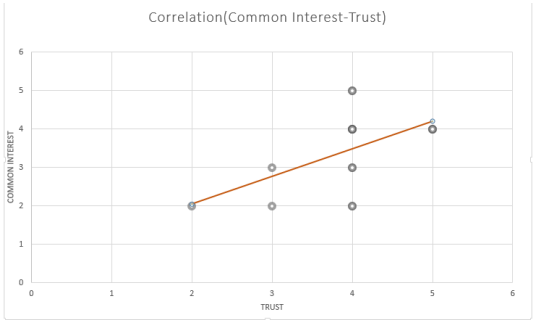

Fig. 6: Correlation (Common Interest-Trust)

positive correlation between 'similarity' and 'trust' variables ($r = 0.665, n = 16, p = 0.005$) (Fig 5). Also there is a positive correlation between 'Common Interest' and 'Trust' ($r = 0.539, n = 16, p = 0.03$) (Fig 6).

VIII. Discussion and Conclusion

Homophily can be based on gender, age, national origin, ethnicity, education, attitude, belief, behavior pattern, etc. We chose 'national origin' to perform our experiment because among all of these 'national origin' is a significant social divider today [22]. Although behavior patterns or attitudes also play an important role, they seem to be more specific to certain types of networks [22], where the national origin can be the divider at once. Since we wanted to observe that in a human-robot interaction if human acts the same way that literature for human-human interaction indicates it should. It was observed that national origin elicited a homophilic response for human-robot interaction. Personality of the person interacting with the robot may be relevant, and should be examined in more detail, as done for human-human interaction by Walters, et al., [23]. However, personality evaluation may require more time and much specific topic where a special topic for a national origin can be favorable by people of different personality traits but the same national origin. After the experiment, we tried to explore the effect national origin has by adding the questions under the 'Homopily' category in the post questionnaires.

Our two hypotheses were supported by our results shown in the prior section. Our first hypothesis, H1: **"Human will feel a similarity(homophily) to the robot in a human-robot interaction when they share a common interest"** is supported since we found a significant result in the One sample t-test with the value of 3. (See Table III) Also, our H2: **"There is a correlation between homophily and trust in a human-robot interaction"** is supported by showing that there is a correlation between homophily and trust in human-robot interaction in Table IV'. Also, in question one, we see the high percentage of the chosen blue robot and an even higher percentage of choosing a robot based on a favorite topic, see Fig 4. This question was directly asking participates in choosing one robot to pick their prize (snack), which reflects trust in a social situation. We also asked our participants to explain their reason after choosing a robot, and most of the comments showed that they were trusting the robot that shares the interest or the topic robot was talking about was more familiar to them. We only add two of the comments below: "If he were talking about Bombs, I would have not to trust him, but he was talking about Biryani! I love spicy food.","I chose the blue one because I love kebab, and I miss it."

A. Limitations and Future Work

There is room for more investigation on our proposed hypotheses by having more participants. One thing we can change in the follow-up work is collecting two groups of participants instead of one and running the experiment with different speeches performed by one robot. Then, participants will be asked about 'feeling connected' and 'trust' and investigate the results according to our two hypotheses.

We can have more accurate homophily categories and related speech for each category. That will profoundly affect our results because the more robot's speech is close to a

person's homophily group; our results can reflect the more accurate result.

ACKNOWLEDGMENTS

We appreciate all of the help that was provided by Andrew Palmer and our fellow classmates for sharing their opinions with us. The authors would also like to acknowledge the financial support of this work by the National Science Foundation (NSF, #IIS-1528137).

REFERENCES

[1] P. Lazarsfeld and R. Merton, "Friendship as social process: A substantive and methodological analysis," pp. 18–66, 1954.

[2] M. McPherson, L. Smith-Lovin, and J. M. Cook, "Birds of a feather: Homophily in social networks," *Annual Review of Sociology*, vol. 27, no. 1, pp. 415–444, 2001. [Online]. Available: https://doi.org/10.1146/annurev.soc.27.1.415

[3] M. Bowman, S. K. Debray, and L. L. Peterson, "Reasoning about naming systems," *ACM Trans. Program. Lang. Syst.*, vol. 15, no. 5, pp. 795–825, November 1993.

[4] E. P. Bernier and B. Scassellati, "The similarity-attraction effect in human-robot interaction," in *2010 IEEE 9th International Conference on Development and Learning*, Aug 2010, pp. 286–290.

[5] Aristotle, "Rhetoric.nichomachean ethics," *In Aristotle in 23 volumes. Rackman transl. Cambridge: Harvard Univ. Press*, 1934.

[6] Plato, "Laws," *Twelve Volumes, Vol. 11. Bury translator. Cambridge: Harvard Univ. Press*, 1968.

[7] S. Jung, H. taek Lim, S. Kwak, and F. Biocca, "Personality and facial expressions in human-robot interaction," in *Human-Robot Interaction (HRI), 2012 7th ACM/IEEE International Conference on*. IEEE, July 2012, pp. 161–162.

[8] P. H. Kahn, T. Kanda, H. Ishiguro, N. G. Freier, R. L. Severson, B. T. Gill, J. H. Ruckert, and S. Shen, ""robovie, you'll have to go into the closet now": Children's social and moral relationships with a humanoid robot," *Developmental Psychology*, vol. 48, no. 2, pp. 303–314, March 2012. [Online]. Available: https://www.learntechlib.org/p/88709

[9] A. Aly and A. Tapus, "A model for synthesizing a combined verbal and nonverbal behavior based on personality traits in human-robot interaction," *2013 8th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, pp. 325–332, 2013.

[10] M. Heerink, "Exploring the influence of age, gender, education and computer experience on robot acceptance by older adults," in *Proceedings of the 6th International Conference on Human-robot Interaction*, ser. HRI '11. New York, NY, USA: ACM, 2011, pp. 147–148. [Online]. Available: http://doi.acm.org/10.1145/1957656.1957704

[16] P. A. Hancock, D. R. Billings, K. E. Schaefer, J. Y. C. Chen, E. J. de Visser, and R. Parasuraman, "A meta-analysis of factors affecting trust in human-robot interaction," *Human Factors*, vol. 53, no. 5, pp. 517–527, 2011, pMID: 22046724. [Online]. Available: https://doi.org/10.1177/0018720811417254

[11] R. Hurley, "The decision to trust," vol. 84, pp. 55–62, 156, 10 2006.

[12] N. R. Buchan, R. T. Croson, and S. Solnick, "Trust and gender: An examination of behavior and beliefs in the investment game," *Journal of Economic Behavior & Organization*, vol. 68, no. 3, pp. 466 – 476, 2008. [Online]. Available: http://www.sciencedirect.com/science/article/pii/S016726810800139X

[13] M. Sutter and M. G. Kocher, "Trust and trustworthiness across different age groups," *Games and Economic Behavior*, vol. 59, no. 2, pp. 364 – 382, 2007. [Online]. Available: http://www.sciencedirect.com/science/article/pii/S0899825606001199

[14] J. Wu, E. Paeng, K. Linder, P. Valdesolo, and J. C. B. Jr., "Trust and cooperation in human-robot decision making," *In 2016 AAAI Fall Symposium Series*, 2016.

[15] M. Salem, G. Lakatos, F. Amirabdollahian, and K. Dautenhahn, "Would you trust a (faulty) robot?: Effects of error, task type and personality on human-robot cooperation and trust," in *Proceedings of the Tenth Annual ACM/IEEE International Conference on Human-Robot Interaction*, ser. HRI '15. New York, NY, USA: ACM, 2015, pp. 141–148. [Online]. Available: http://doi.acm.org/10.1145/2696454.2696497

[17] S. Strohkorb Sebo, M. Traeger, M. Jung, and B. Scassellati, "The ripple effects of vulnerability: The effects of a robot's vulnerable behavior on trust in human-robot teams," in *Proceedings of the 2018 ACM/IEEE International Conference on Human-Robot Interaction*, ser. HRI '18. New York, NY, USA: ACM, 2018, pp. 178–186. [Online]. Available: http://doi.acm.org/10.1145/3171221.3171275

[18] J. Moody, "Race, school integration, and friendship segregation in america," *American Journal of Sociology*, vol. 107, no. 3, pp. 679–716, 2001. [Online]. Available: http://www.jstor.org/stable/10.1086/338954

[19] U. C. Bureau, "Race and ethnicity," 2017. [Online]. Available: https://www.census.gov/mso/www/training/pdf/race-ethnicity-onepager.pdf

[20] L. L. McCroskey, J. C. McCroskey, and V. P. Richmond, "Analysis and improvement of the measurement of interpersonal attraction and homophily," *Communication Quarterly*, vol. 54, no. 1, pp. 1–31, 2006. [Online]. Available: https://www.tandfonline.com/doi/abs/10.1080/01463370500270322

[21] J.-Y. Jian, A. Bisantz, and C. Drury, "Foundations for an empirically determined scale of trust in automated systems," vol. 4, pp. 53–71, 03 2000.

[22] M. McPherson, L. Smith-Lovin, and J. M. Cook, "Birds of a feather: Homophily in social networks," *Annual Review of Sociology*, vol. 27, no. 1, pp. 415–444, 2001. [Online]. Available: http://arjournals.annualreviews.org/doi/abs/10.1146/annurev.soc.27.1.415

[23] M. L. Walters, K. Dautenhahn, R. te Boekhorst, K. L. Koay, C. Kaouri, S. Woods, C. Nehaniv, D. Lee, and I. Werry, "The influence of subjects' personality traits on personal spatial zones in a human-robot interaction experiment," in *ROMAN 2005. IEEE International Workshop on Robot and Human Interactive Communication, 2005.*, Aug 2005, pp. 347–352.