Robot Moderation of Hot Topic Political Conversations

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Abstract

In this work, we set out to investigate the differences between a human and robot moderator in conversations regarding hot-button political issues. Groups of three human subjects participated in a discussion about abortion. In one condition, a robot moderated the conversation, while in the other, a human moderated the conversation. Each moderator could pull from a set list of questions and phrases to spark discussion, draw opinions out of others and introduce ambiguous situations to force participants to think critically about their own beliefs and interact with others. This study aims to investigate the potential benefits of robots acting as moderators on a person's experience and dialogue in a group setting. We hypothesized that while participants will positively perceive the robot as completely objective, they will view the robot as having no direct political opinion and thus will be forced to more directly engage with the other participants in the group, offering a more satisfactory and productive session than those who engage with a human moderator. Our results demonstrated that while participants did see the robot as an unbiased third party, forcing them to engage more directly with each other, and felt more comfortable with the robot than the human, their overall rating of the enjoyability of the session fell in favor of the human moderator. We also discuss the potential benefits and detriments to each type of moderator and potential ways to continue this research in the future.

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Introduction

In the United States, Republicans and Democrats often struggle to determine the best way to address social, economic or political issues in public discourse. The 2016 election represented more than just a classic debate between political parties. Candidate debates and voters' political preferences now roped emotion, decency, reason and compassion into fact-based arguments and opinions, redefining the public's perception of national conversation. Within a democracy, political issues should "stimulate a broad and open public discussion;" however, some issues remain so controversial that "views cluster around two seemingly irreconcilable poles" (Becker, 144). In the aftermath of the 2016 American presidential election, 70% of Democrats and 62% of Republicans reported that they fear the opposing political party (Pew). Moreover, an analysis of Robert Nash's book *How to Talk About Hot Topics on Campus* by Liesa Stamm reports that students and faculty at American colleges and universities have "become increasingly polarized, divisive and often intolerant of diverse viewpoints on controversial topics" (Stamm, 1). Such hostility demonstrated towards opposing points of view potentially poses a threat to the political processes and relations between citizens in the United States.

For this study, we will refer to political discussion, debate and conversation interchangeably, encompassed by the definition put forth by Eveland et. al in their article, "Beyond deliberation: New directions for the study of informal political conversation from a communication perspective". Eveland et al. defined political conversation as an informal, interpersonal interaction with a small group of people about a political topic, "outside of formal deliberation settings," that takes into consideration diverse opinions and viewpoints (Eveland et. al, 1083, 1089). Overall, improving the manner that political conversations take place both helps to increase their knowledge of political issues, promote political participation, enhance the

democratic process and create empathetic and compassionate connections between those of conflicting beliefs (Eveland et. al, 1084; Matthes, 24; Becker, 146). Hot topic political issues should neither be ignored nor stigmatized in conversations. It is necessary to find ways to communicate and understand in order to make progress.

Deliberative political conversations are intended to embrace conflict but can only find success when participants are open to and respectful of the conflict (Moy, 445). In an environment where hostility exists between the sides of an issue, influences such as perception and emotion can take hold. In such situations, pushback on an opinion may cause a subject to become ambivalent and uncertain in their position or could cause subjects to withdraw from discussion in an attempt to maintain social harmony and preserve their relationship with those on the either side (Matthes, 25). When emotion dominates discussion, participants often "retreat into a defensive, tribal position" that prevent effective communication (Morris, 1). On the contrary, when conversations are too polite, real opinions can be stifled and suppressed (Morris, 1). Such polarization has caused the balance between hearing and being heard to be lost. In hot topic conversations, participants run the risk of feeling personally attacked or judged, often leaving them frustrated, distraught, relegating those who hold counter-opinions to enemy status (Rose-Redwood et al, 110).

Successful discussion should foster open dialogue that encourages people to voice their beliefs and talk about the circumstances and perspectives that helped them develop such beliefs. A productive conversation prevents one party from condemning others' opinions and encourages each side to reflect upon the subjective nature of every argument and find truth in a view that may not be their own (Dickens, 87). Listeners are expected to make sure that they take each piece of the discussion and consider the speaker's points, perspectives, cultural differences, and

any additional factors that could help frame their opposing point of view (Moy, 445). In his book *How to Talk About Hot Topics on Campus,* Robert Nash presents the concept of moral conversation (Nash, 8). Moral conversation aims to transform the rhetoric, in an attempt to depolarize the opposing sides to the topic (Dickens, 87). In addition, moral conversation helps to find a way to foster healthy discussion and disagreement "grounded in respect for the opinions of others" (Stamm, 1). An opportunity for "individuals to exchange ideas, opinions and personal truths although they may contradict and disagree with each other," where each participant "leaves the experience both affirmed and informed," signals a successful moral conversation (Stamm, 1/2). It is still acceptable to push back on the validity of claims and offer counter arguments. The goal of these conversations is for subjects to "emerge with a clearer understanding of the reasons and values underlying opposing points of view," not necessarily to be swayed into an alternate viewpoint (Moy, 445).

The study proposed uses the abortion debate to study how to promote open dialogue. The passion and polarization that play into the abortion debate often make people want to avoid a discussion rather than attempt to work through the nuances of the issue (Crawley, 228). A previous report on dialogue facilitation from the Public Conversations Project opted for abortion as their topic of conversation. Their study gave people on contrasting sides of the issue the opportunity to hear, consider and discuss differences in opinion in a welcoming and safe atmosphere (Becker et. al, 147). The clear divide between the pro-choice and pro-life camps makes the abortion debate sufficiently divisive for this kind of research. Furthermore, since membership to either group is based primarily on one's opinions, contestation of viewpoints is subjective (Ntontis and Hopkins, 667). The reality behind a choice either for or against abortion,

the history behind its regulations, personal experiences, religion and other nuances all make the abortion debate an emotional and polarizing topic.

Background

Moderators

The term 'moderator' highlights a role involving the "control and guidance of discussions with and among several individuals" (McDonald, 161). Moderators can only partly predict the amount of controversy they will face in a given conversation; reactions and responses depend more heavily on a subject's situated interpretations, making it the moderators job to manage the dialogue as much as it is to lead the discussion (Kello, 37). Furthermore, when trying to moderate polarizing discussions, moderators should act unbiased and neutral to the best of their ability, leaving it to the other participants to judge the issues for themselves (Haug, 81). Overall, the role of the moderator is to foster productive and inclusive conversations, while helping to direct the conversation away from a situation in which a person in a minority view would feel attacked or attempt to fade into the background.

In order to lead conversations effectively, Matthes argues that moderators must focus on emphasizing social trust between participants. Social trust, different from the traditional sense of trust, plays a main role in human behavior and human to human interactions. Social trust can be defined as the expectation that "other people are, in general, fair, trustworthy and helpful" (Matthes, 26; Cappella, 230). In a risky situation, like a hot topic political conversation, social trust helps people perceive and judge how best to react to their counterparties in the discussion (Matthes, 27). It is important for the moderator to possess high social trust with all of the participants to help avoid negative participant reactions.

Moderator Bias

In order to foster two-sided, civil and open discussions effectively, moderators should be "unbiased and neutral to the greatest extent possible," not favoring one side or another (Haug, Koppang, Svenning, 80). Moderator bias can pose a challenge to the implementation of many recommended courses of action for effective conversation. In his paper *Identifying and Controlling for Sources of Bias & Error in Focus Group Assessment Research*, Herbert Marlowe defines moderator bias as differences in style and personality that can introduce confounding variables into an assessment (Marlowe, 2). In a study conducted by Leticia Bode at Georgetown University on partisan hosts of political talk shows, researchers referenced the social identity theory -- "that people categorize themselves by their membership in groups," as evidence for why people find greater enjoyment and are less likely to be affected by their bias when listening to others that align with their same ideology (Bode, 599). Similar to a partisan political talk show host, a biased moderator can greatly influence a person's satisfaction with the engagement, and either engage or alienate people from the discussion. A human moderator will naturally have their own opinion on a topic and often will unconsciously cue in favor of that side, whether it be with direction of the conversation, responses to questions, body language or tone, potentially creating bias (Golbeck, 741/742).

Robots as Moderators

Research in the human-robot interaction (HRI) field presents the idea that robots can positively influence the behavior and relationships between members of a group. Robots in group settings have been shown to "increase human social connection, mediate conflict, and shape positive team dynamics" (Anon et al, 111:09). In a study conducted at Cornell and Stanford by Jung, Martelaro and Hinds, robots successfully repaired interpersonal violations between

members of a team (Jung et al, 229). In the presence of a robot, human subjects became more hyper aware of normative social violations and were more likely to engage with the conflict than to let it pass by mutely (Jung et al, 234). Another study called "Robot Moderation of a Collaborative Game" by Elaine Short and Maja Mataric demonstrated how active robot moderation could increase social cohesion amongst group members (Short, 389). A robot's ability to positively influence social dynamics provides support for their use to help group goal achievement (Short, 390). Similarly, robots have been used to increase participants' willingness to be vulnerable with each other (Sebo, 185). In the context of polarizing political conversations, increased engagement and vulnerability between the robots and other human subjects supports the use of robots as moderators.

A robot's lack of agency and consciousness are important factors to consider when analyzing their role as moderators. Even though human and humanoid robot interactions follow similar stereotype classifications, social rules and social behaviors as human-human interactions, humans are aware of a robot's limitations to express emotion and limited capacity for its own mental thoughts and opinions (Broadbent, 640). A robot could be viewed as a true, non-biased mediator with no inherent opinion on the discussion topic and may even help us to challenge ourselves to think more deeply about a controversial issue while becoming more reflective with ourselves (Broadbent, 639). Another benefit of a robot moderator is that without the ability to create natural characteristics of emotion in their voice, body movements and demeanor, robots cannot effectively communicate their own emotional standing to the participants. Moreover, they do not have an inherent emotional investment in the topic, nor can they influence participants' opinions or take the conversation in any specific direction (Breazeal, 125).

Alternatively, research in the human-robot interaction field examines the lifelike nature and positive personality traits of humanoid robots (Kiesler, 177). Human subjects reported that they were less likely to speak about socially undesirable topics and less likely to exhibit socially undesirable behaviors with the humanoid robot than with a human agent (Kiesler, 177). This could suggest that the participants could be more hesitant to dive into the nuances of the abortion debate with a robot than with a human moderator leading the discussion.

Current Study

The call for improvements in national dialogue permeates many different parts of society from the political to the religious to secular circles. A book titled *I Think You're Wrong (But I'm Listening)* by Beth Holland and Sarah Stewart Silvers explains the need for "grace filled political conversations" -- using religion to argue for a better way to engage with peers about even the most difficult issues (Holland and Silvers, xii). Reporters for well-regarded news organizations such as *The New York Times* also write about the necessity to "have real, substantive, difficult exchanges" — about our personal biases, about our bad policies — that reach far and go deep" (Morris). This study aims to add academic research to the overall literature surrounding this topic. By exploring different types of conversation moderation, this study investigates whether or not social robots could positively influence participants' experience and improve the dialogue in a group setting. I hypothesize that while participants will perceive the robot positively. they will view the robot as having no direct political opinion and thus will be forced to more directly engage with the other participants in the group, offering a more satisfactory and productive session than those sessions led by a human moderator.

__Methods__

This experiment was designed so that groups of three participants could engage in a thirty-minute discussion led by one moderator. We ran two conditions:

- A human moderator

- A robot moderator

Robot Platform and Behaviors in the Robot Moderator Condition

For the robot moderation condition, we utilized the Aldebaran Robotics Nao humanoid robot. Nao stands 22.8 inches in height, can be programmed to move its limbs and is capable of real time text-to-speech in English, as well as other languages. For this experiment, we utilized the Wizard of Oz graphical user interface technique. The goal is for participants to think that the robot was acting autonomously, when in fact, an experimenter controlled all of the utterances, responses and gestures from a computer outside the room (Villano et al, 279). In Wizard of Oz, the experimenter, out of sight of the participants, controlled the robot via an IP address connection and a Tkinter graphical user interface (GUI) coded in python. The experimenter ran a program that created GUI with a set list of introductions, transitions, questions and scenarios that could quickly be chosen for the robot to say to the group. The GUI is organized into four columns of buttons, labeled with the speech produced by the command. Using a webcam and an open door in the back of the experiment room, the experimenter could see and hear the discussion session and choose appropriate questions and responses for the robot to say to the group.

Human Moderator Condition

Sarah, a 28-year-old, 6th year PhD Candidate from the Yale Social Robotics Lab acted as the human moderator for each session. The set-up of the human condition is designed to be the

same as the robot condition. In the human condition, the moderator sat in the same location as the robot and would begin by introducing themselves as Sarah and had access to an identical list of questions and responses. The moderators were designed to be unbiased and neutral in their political beliefs, even when participants were encouraged to be vocal about their opinions.

Participants

Participants for this experiment were recruited from Yale University's campus and the broader New Haven area. Flyers were posted in Facebook groups, across Yale's campus, and distributed to various restaurants in downtown New Haven. A total of 10 groups participated in this experiment. Each session required three participants in addition to the moderator. Overall for the experimentation we ran 10 trials; 5 robot moderation and 5 human moderation, $N = 30$, M_{age} $= 21.8$, with a gender breakdown 17 females, 11 males and 2 non binaries.

Procedure

The set up was identical for each condition. The experiment took place in a small room with three chairs for the participants positioned around the moderator. Each chair was assigned to a specific participant prior to the conversation to ensure that the human moderator knew who to address, and that code for the robot moderator could be adjusted to include participant names. The experimenter greeted and distributed informed consent forms to the participants outside the experiment room. The experimenter then directed the participants to the room, assigning them to seats associated with their participant number. In the human moderator condition, the moderator sat in a chair facing all the participants, while in the robot condition the moderator was positioned on a table to be at the same height as the participants. The experimenter then left the room, returning to the monitoring station outside the experiment room. Two video cameras recorded the session, one situated behind the group of participants, focused on the moderator and

the other positioned above the moderator to film the participants throughout the session. In addition, a webcam positioned to film the participants connected to the experimenter's computer so they could watch the discussion session from the monitoring station.

Phase 1 (approximately thirteen minutes)

When participants settled into their seats, the moderator would begin the discussion by introducing themselves following set pieces of dialogue from a predetermined script of phrases and questions. The moderator then asked each participant to introduce themselves as well and to give a two to three sentence summary of their views on abortion to get the conversation flowing. Then the conversation moved into the main discussion portion. Certain questions pertained to the subjects' knowledge about abortion, their initial viewpoints and stances and why, while others posed questions about the role of the government or the pertinence surrounding the issue.

Phase 2 (approximately sixteen minutes)

Moving into the second half of the experiment, the moderator would choose more challenging questions for the participants to answer. These questions were designed to be thought-provoking and offer situational anecdotes to force participants to think about the abortion debate on a deeper level. The goal was to challenge peoples' beliefs and spur potential controversy within the group. The moderator would choose an opening escalation question and would allow participants to discuss amongst themselves or offer follow up questions for approximately eight minutes. After eight minutes, the moderator would interrupt an existing conversation to move participants on to the next escalation question.

Phase 3 (approximately one minute)

The moderator would end the session by thanking the participants for sharing their views with the group and instruct them to direct their attention to the experimenter for closing steps.

The experimenter then entered the session room to give each participant a Samsung Tablet to complete the three post-experiment surveys. Participants were escorted out of the room, into the waiting area where they silently and individually completed their surveys. Upon the completion of all three surveys, they received ten dollars for their participation.

Constants Throughout the Session

The moderator possessed the ability to choose any question they desired from the predetermined set list to guide the conversation. In addition, moderators could choose predetermined follow-up questions to their original question or move on to another question when they felt necessary within the phase blocks. Phase blocks were used as guidelines instead of hard rules, more focused on ensuring participants experienced a variety of questions, rather than focusing on one point for the duration of the session. Also, moderators could call upon certain participants by name, asking them to express how they were feeling or what their opinions were if they seemed disengaged or appeared overwhelmed.

The Discussion Questions

The conversation is formatted to last approximately thirty minutes. Questions and utterances were divided into various groups (See Appendix 1.1):

- Introduction

- Main Discussion

- Elevated Discussion

- Clarification/Inclusion/Transition

- Conclusion

- Bucket of Water

Introduction

The moderator begins by introducing themselves to the group and explaining the premise of the conversation. They state that their goal as the moderator is to facilitate the discussion, but not to express any of their own views. Then, the moderator leads the group through simple introductions before diving into the topic. The dialogue would adhere to the following format:

- *"Today we will be talking about abortion. There are many sides to hear, consider, and discuss. My role is to facilitate the discussion by posing questions and soliciting input from all members of the group. I will not express any of my own views on this topic. We will finish our discussion promptly after 30 minutes have elapsed. Before we dive in, let's begin with introductions. Let's start with you P1?"*

After participants introduce themselves to the group, the moderator would ask participants to briefly explain their views on abortion in order to get acquainted with the topic and start the conversation.

- *"I'd like to start out by asking each of you give a 2-3 sentence summary on your view on the topic of abortion. Let's start with [Participant 1] and go around the circle."*

Main Discussion

The purpose of the main discussion questions is for the participants to express their own views and stances on abortion. Participants were able to answer the questions in popcorn style (i.e. no particular order). The moderator would pose new questions to the group after every person had given their answer, if the conversation stagnated or if a designated amount of time (approximately eight minutes) was spent on the same question. These questions included, but were not limited to, the following:

- *"When does life begin?"*

- *"Should abortion be regulated by the government?"*

- *"What do you all feel are the rights that a father should have in the decision to get an abortion?"*

- *"In what circumstances do you all think that abortion should considered 'always okay' or 'always not okay'?"*

- *"If you were to write the law for the U.S. for all states to follow on the topic of abortion, what would your law say?"*

These questions were curated by the experimenters. Topics and question phrasings were created by watching the United States political debates from the 2016 election and the 2020 primaries. These were further revised in conversations with conservatives, moderates and liberals in an attempt to be as unbiased as possible. These questions were then tested in two dry run trials and modified further based on participant feedback. Further revisions led the experimenters to the final list of questions each moderator could choose during the trials.

Elevated Discussion

These questions were developed to challenge the participants' viewpoints and force them to consider new, uncomfortable situations. Such topics target specific instances (e.g., "gendercide", the rights of a minor seeking abortion) in order to provoke deeper thought and consideration about abortion rights and regulations. The moderator often gave a brief anecdote to introduce the question, then asked participants to consider the situation in the context of their views of abortion regulation. Examples of these questions include:

- *"In 2010, The Economist featured a cover story on the war on girls and the growth of gendercide in the world -- abortion based solely on the sex of the baby. What do you all*

think concerning whether it is ok for someone to terminate a pregnancy because of the

sex of the unborn fetus?"

- "What do you all think about parental notification or restrictions regarding abortion

access for minors?"

- "Do you all think that doctors should be obliged to offer care to any infant that survives

an abortion in the third trimester?"

In addition to these questions, there were follow-on questions that the moderator could ask the

group to build upon the conversation or force participants to think more critically about the topic

of discussion.

In conjunction with the question on gendercide:

- *"Similarly, in the process of in-vitro fertilization (IVF), doctors create potentially viable*

    embryos in a petri dish that can be implanted in a woman's uterus. Currently, genetic

    testing can be done to evaluate these embryos. Do you think it is ok for parents to

    selectively choose embryos of a particular gender to be implanted in the mother for

    IVF?"

To follow up on the question regarding abortion access for minors:

- *"Do you think that a minor is capable of making this kind of decision on her own?",*

    "Since we enforce parental notification in other medical realms for minors, what makes

    is parental notification in the case of a minor getting an abortion different?", "What

    about in cases where the minor does not have a good relationship with her parents?"

In response to answers to the question regarding doctors performing abortions in the third

trimester:

- *"Doctors have a duty to treat patients and avoid harming them, also known as the Hippocratic oath. How should a doctor weigh these duties in this situation?"*

Clarification/Inclusion/Transition

Clarification questions were put into place to directly ask a participant to clarify a point they made or a question that they had. Also, clarification phrases could be used to answer questions that participants asked the moderator. Within this category we included a question that asks participants to reconcile their answers with their overall view on the issue. This question is important for situations where participants contradict themselves or seem hypocritical in their answers. Clarification questions include:

- *"Could you explain that a little bit more, P1/P2/P3?"*

- *"P1/P2/P3, could you please clarify for me and the group what you mean by that?"*

- *"How do you reconcile your viewpoint on this with your overall view on abortion?"*

- *"Yes"*

- *"No"*

- *"I can't answer that"*

- *"I am unsure but maybe someone in the group knows".*

Inclusion questions are directed towards individual participants. In the study, these questions were to be used in moments of silence, in cases where one participant seemed inactive in the conversation or to draw commentary out of a participant who seemed unsure, disengaged or threatened. Inclusion questions and phrases the moderator could choose from included:

- *"P1/P2/P3, how do you feel about that?"*

- *"P1/P2/P3, what do you think?"*

- *"Could you explain that a little bit more, P1/P2/P3?"*

- *"Thanks for sharing P1/P2/P3. P1/P2/P3 and P1/P2/P3, what do you think?"*

Transition phrases were used to move the conversation along and often were interjected as interruptions in an existing dialogue between participants. These phrases were:

- *"I'm going to move us on to a new question."*

- *"Sorry to interrupt, but I'm going to move us on to a new question."*

Conclusion

At the conclusion of the session, the moderator thanks all the participants for sharing their perspectives and directs their attention to the experimenter to close out with surveys. The phrasing for the conclusion is as follows:

- *"Congratulations! You have completed the session. It was interesting discussing these issues today. I hope you all learned a lot from each other, thanks for your participation and insight. The experimenter will now give you instructions on how to complete the survey. Have a great day. Bye!"*

Measures

Before the discussion, participants were required to fill out a prescreening survey (see Appendix 1.2.1). After the discussion session, participants were asked to complete three surveys

1. Post Discussion Survey (see Appendix 1.2.2)

2. Post Discussion Moderator Assessment (see Appendix 1.2.3)

3. Participant Familiarity Survey (see Appendix 1.2.4)

Prescreening Survey

Prior to a participant's arrival to the experiment location, they were required to fill out a pre-screening survey, emailed to them as a Google Form. Participants were asked to designate their political preferences and stances on abortion using a seven-point Likert scale with "1" being

extremely liberal and "7" representing extreme conservatism and "1" representing strongly

disagree and "7" strongly agree in response to questions pertaining to abortion. This was

imperative to ensure all participants were comfortable in discussing abortion in a larger scale

setting (see Appendix 1.2.1).

Post-Discussion Survey

The post discussion survey aims to gather information about a participant's satisfaction

with the group discussion (see Appendix 1.2.2). Some of the questions help to measure inclusion,

more specifically whether a participant felt that their comments and points of views were both

heard and understood by the others in the group. In addition, this survey attempts to capture the

level of satisfaction participants had within the conversation. Participants answered questions on

a five-point Likert scale with "1" being "strongly disagree" and "5" being "strongly agree". In

addition, participants were asked to record short answer responses to questions regarding their

experience, such as "was there something you learned from the discussion?" and "What were the

best and worst aspects of the session?".

Post-Discussion Moderator Assessment

The post discussion moderator assessment measures a participant's perception of the

moderator throughout the session (see Appendix 1.2.3). The moderators were assessed based on

warmth, competence and discomfort. We administered a modified version of Robot Social

Attributes Scale (RoSAS), as reported in Carpinella et. al. to participants (Carpinella, et. al, 257).

Our modified scale contained 17 out of the 18 original scale items, and our modifications added

more specific traits that we were aiming to assess such as intelligent and useless. For the warmth

measure, we assessed attributes of happy, social, organic, compassionate and emotional, but

excluded feeling. Capable, responsive, interactive, reliable, competent and knowledgeable

makeup competence. Scary, strange, awkward, dangerous, awful, aggressive are the traits that derive discomfort. Participants ranked how much they associated each trait with the moderator on a five-point Likert scale ("1" = not associated, "5" = highly associated).

Participant Familiarity Survey

The participant familiarity survey gives the experimenter context to any preexisting relationships that participants may have with each other (see appendix 1.2.4). This is important to collect because it can have a significant impact on the way that subjects interact with other members in the group and with the moderator. Also, it may affect how open and honest they are throughout the discussion, as it is often easier to discuss difficult themes with familiar people and it could influence the overall feelings towards the interaction as a whole.

Results

This section discusses the findings from the human and robot moderation trials. In particular, we examine the observed phenomena including how participants rated human moderator trials as more enjoyable experiences than robot trials, participants associated more traits of discomfort with the human moderator than the robot moderator, participants tended to gaze towards the human moderator more than the robot moderator and participants with reported abortion stances close to a purely pro-choice viewpoint felt less included. To study potential differences between the robot and human moderator conditions, we used a one-way analysis of variance (ANOVA) with covariates of gender, age, average participant familiarity and average political leaning on the data collected from the surveys from the 10 trials (5 per condition). The effect size used was partial eta squared, reported as η^2. The average length of each trial was 25 minutes and 44 seconds; average length of a human trial was 23 minutes and 8 seconds and the average length of a robot trial was 28 minutes and 21 seconds.

Participants rated human moderator trials as more enjoyable experiences than robot trials

We ran a one-way ANOVA on the human and robot conditions and found that there were statistically significant differences in the way participants measured how much they enjoyed the discussion across the human and robot trials ($F = 6.349$, $p = .0199$, $\eta^2 = .243$). Participants in the human condition enjoyed the discussion more ($M = 4.133$, $SD = 0.640$) than participants in the robot condition ($M = 3.40$, $SD = 0.828$), ($t(28) = 2.714$ $p = 0.011$). We investigated this trend further, looking to see if those who enjoyed the conversation with the human moderator more were also more engaged or more likely to recommend the discussion to others. We did not find statistically significant differences in the human and robot conditions to support this; whether participants would recommend the discussion ($F = 0.078$, $p = 0.782$, $\eta^2 = .002$) or whether participants were engaged ($F = 0.333$, $p = .570$, $\eta^2 = .030$).

In the 8th trial, the robot seemed to be viewed more as something that could interrupt their conversation rather than effectively moderate it. Like many robot trials, participants spent more time conversing between themselves such that when the moderator did speak, they felt that it broke up their discussion in a way that prevented them from saying everything they wanted to say. For example, in their survey, participant 23 felt they did not have the chance to make points about "about societies where individual lives are not respected and the futility of popular sovereignty" because the moderator moved on from the gendercide topic.

Participants associated more traits of discomfort with a human moderator than a robot moderator

We examined participants' responses for the RoSAS discomfort attributes from the Post-Discussion Moderator Assessment to determine whether there was a difference in the way people

perceived robot and human moderators. We ran a one-way ANOVA on the human and robot conditions. We found a significant main effect for the experimental condition on the RoSAS discomfort measure (F = 6.80, p = 0.016, η^2 = .158). These results showed that participants in the human moderator condition reported higher levels of discomfort attributes (M = 1.66, SD = 0.52) than participants in the robot condition (M = 1.27, SD = 0.29), (t (28) = 2.446, p = 0.021).

It is possible that the increased discomfort with the human moderator can partially be explained by more laughter leading to decreased discomfort in robot moderator trials. In an analysis of the video recorded trials, we noticed that participants would laugh in the beginning of the session when they first heard the robot speak. Then, in various trials, the participants continued to laugh whenever the robot called out participants by name later in the session. In comparison, the video recordings showed no laughter in the human moderator condition.

Similarly, the short answer responses from the post-discussion survey provide further evidence that participants found more discomfort associated with the human moderator than the robot moderator. When asked "what was the worst aspect of this discussion" participant 19 from a human moderator trial discussed how it felt that some of the questions did not come up organically and required more background knowledge and information than they had access to. Along similar lines, participant 18 answered "the human moderator". This negative connotation towards the human moderator likely played into the level of discomfort participants felt. In contrast, when asked "what was the best aspect of this discussion," participant 15 from a robot moderator condition responded that "the moderator was truly neutral". Upon further analysis, we noted that the human moderator tended to act more robotic, engaging less with participants and sticking to a strict script, in an attempt to be as homogenous to the robot condition as possible.

This type of behavior likely defied the participants expectations of how the moderator should act, resulting in greater feelings of discomfort.

Participants directed their gaze more towards the human moderator than the robot moderator

In an assessment of the video data, we found various trends regarding eye contact and gaze. In both the human and moderator conditions participants tended to look to the moderator as a signal that the group was ready to move on the next question. Participants relied on the moderator for structure and guidance. In their short answers, participant 19 said that having a human lead the discussion, rather than the participants leading themselves was useful. But we noticed that participants relied more heavily on the human moderator than the robot moderator. Participants tended to direct their gaze back towards the human moderator while answering questions and avoid eye contact with others while not speaking. This was a distinct difference from the robot moderator condition in which participants were more likely to look at and engage with each other, rather than with the robot moderator. Increased engagement amongst the participants in the robot condition is further upheld through an examination of the short answer responses. Participant 14 from a robot trial wrote that the conversation "flowed in many directions after answering the [robot] moderator's questions". The participants seemed more willing to build off each other's ideas, rather than settling on just answering the question put forth.

We examined participants' responses from the Post-Discussion Survey and Post-Discussion Moderator Assessment in search of statistical evidence to support why participants tended to gaze more towards the human moderator than the robot moderator. We ran a one-way ANOVA across the data and found no statistical significance between the human and robot condition for group inclusion ($F = 1.233$, $p = .279$, $\eta^2 = .0001$), warmth of the moderator ($F = 0.269$, $p = .610$, $\eta^2 = .0003$) , or the moderator as an effective leader ($F = 0.321$, $p = .577$, $\eta^2 = .006$). However, we found a significant interaction between the human and robot condition for the RoSAS discomfort measure ($F = 6.80$, $p = 0.016$, $\eta^2 = .158$), but an independent sample t test showed that participants in the human moderator condition reported higher

levels of discomfort attributes (M = 1.66, SD = 0.52) than participants in the robot condition (M = 1.27, SD = 0.29), (t(28) = 2.446, p = 0.021). This effect is in the opposite direction than what would be expected given the amount participants looked to the human moderator.

Participants with reported abortion stances close to a purely pro-choice viewpoint felt less included

There were no statistically significant differences in the group means across the human and robot conditions in the participant reported feelings of group inclusion as determined by one-way ANOVA (F = 1.233, p = .279, η^2= .0001). However, we did find a significant effect of participants' political leaning on their group inclusion scores (F= 21.633, p < .001, η^2 = .507). Upon further analysis of this finding, we ran a Pearson correlation test with average group inclusion and the average political leaning score and found a negative correlation (r = -0.488). In order to ensure this finding was not due to an outlier in the data, we ran the ANOVA and correlation tests again, excluding the 8th trial, which contained the only pro-choice leaning participants in our data. The findings for average political leaning and group inclusion after running the ANOVA, adjusted to exclude the 8th trial, showed similar results (F = 13.969, p = .001, η^2= .424). Moreover, the correlation results followed the same trend, even without the 8th trial (r = -0.406). This correlation supports the finding that as a participants' rating of their stance on abortion moved towards purely pure life (a rating of "1" on the Likert scale), the higher their reported discomfort levels were.

Observations from the video recordings offer support to the claim that participants who leaned more pro-choice felt less included in the group conversation. When faced with the elevated discussion questions, many participants reacted to the unfamiliarity of the extreme cases. Given the novelty of the proposed situations, it was likely that some participants had never

considered how various scenarios could affect their own beliefs on the issue. This was discerned through instances of perceived hypocrisy or contradiction. In their response to the short answer questions in the post-experiment survey, participant 5 said that one of the worst aspects of the discussion was "*having to realize there are contradictions in my views*". Participant 4 was one of the only participants to acknowledge this during the session and addressed their own internal conflict about the elevated discussion questions with the group. This participant noted that it is hard to reconcile what she feels is appropriate or her own beliefs with the fact that no matter what, she wants abortion to always be the woman's choice and is willing to sacrifice certain things in order to maintain that right.

In general, pro-choice participants appeared to work through the nuances of their stance and their gut reactions to the proposed extreme scenario in the moment. However, participants leaning more pro-life seemed to find it easier to digest and rectify these cases with their original beliefs. In fact, Participant 23's responses to the elevated discussion questions offered potential solutions to how the extreme cases could be handled, making their beliefs and propositions appear more tangible to the others in the group. This participant appeared poised and rehearsed in comparison to their peers who found themselves shocked by the questions.

In response to the question, "what was something you learned from the discussion?" many participants answered that they learned something new from the elevated questions such as "*people abort autistic fetuses*", *"I learned about a study showing women were aborting their pregnancies due to the gender of their child"* and *"I had never considered some of the ethical issues raised by the robot, e.g. whether the father should have a say in the abortion process."* Participant 3 had an average political leaning score of 2 out of 7 (with "7" being the most conservative) and in their response said *"I learned how to separate my personal opinions from*

what the government should do" during the session. The feedback from these short answers

provided evidence to support the idea that pro-choice participants were more likely to face

contradiction between their own beliefs and what they consider right.

Discussion

In this experiment we set out to explore the differences between human and robot

moderation of hot topic political conversations. We investigated whether socially assistive robots

could positively moderate the behavior and discussion between members of a group, and overall

improve the experience of discussing charged issues. Our hypothesis predicted that participants

would overall find the robot moderated conversation more enjoyable and perceive the robot

moderator positively and would engage more heavily with other members of the group. While

our findings do not support the robot moderated conversation as the more enjoyable of the

conditions, the perception of positive attributes towards the robot moderator and increased

interactions with the other participants in the group offer validate the potential benefits that a

robot moderator could serve in these kinds of discussions.

There were several limitations to this experiment. First, the overall sample size (N=30

participants, 10 groups) is smaller than expected because the experiment was disrupted by the

COVID-19 pandemic. Due to updated Institutional Review Board and Yale Social Robotics Lab

standards and the closing of Yale University, all human subject research had been halted before

the experiment could be completed. In addition, our participant pool posed another limitation.

Given that Yale is a college campus, participants tended to fall within a small age range with

political leanings skewed towards the left. Similarly, given the short time frame and nature of

participant recruitment, many of the participants knew each other. To account for these

confounding factors, we included the covariates of gender, age, average participant familiarity

and average political leaning in our analysis. In an attempt to recruit pro-life participants, we contacted the Yale Debate Association, the Federalist Party and The Choose Life at Yale directly. In addition, we reached out to groups away from the Yale community including Vox Church. Another point of limitation is that the agents behind the robot and human condition were not the same people. In the human condition, Sarah was responsible for conducting the dialogue while in the robot condition, Hannah controlled which questions the robot said. Given that we were working in a team of two and Hannah was in charge of recruiting participants and thus knew the majority of them, we felt it would be an experimental conflict if Hannah acted as the human moderator.

Overall, the data showed that participants rated human moderator trials as more enjoyable experiences than robot trials and did not offer support for our hypothesis or the use of socially assistive robots in discussion moderation. Even though the results listed above offer support for the robot moderator, such technique may still be too unfamiliar and limited to put into practice. Talking about abortion is a delicate and sensitive process, and the unconventional nature of a robot with limited, awkward speech, while entertaining, could have seemed unfitting.

The finding that participants tended to view the human moderator with greater discomfort than they did the robot moderator offered support for the beneficial use of robots to lead difficult discussions amongst groups of people. In order for the human moderator condition and the robot moderator condition to be as similar as possible, Sarah needed to act more robotic than she would under normal circumstances. Her flat affect and limited engagement were likely off-putting to participants, while the same characteristics in the robot moderator seemed to have little effect on the participants' rankings for discomfort attributes. Moreover, our interpretation of the increased amount of laughing in robot moderator trials is that it likely led to decreased

discomfort. The laughs were not discerned as nervous or uneasy, but instead of amazement and newness. Furthermore, because participants saw the moderator as a truly neutral party, it is likely that they felt more comfortable expressing their views without the risk of taking the contrary or the same side as the human moderator.

Throughout the trials, we noticed how participants would gaze more towards the human moderators than they would towards the robot moderators. We found this trend to be interesting and felt it could signal perceived agency. Eye contact can oftentimes be recognized as a sign of engagement, trust and warmth. If the participants viewed the robot moderator with similar agency – with thoughts, opinions and emotions – to the human moderator, then we would expect them to look at the moderator more. However, the statistical analysis showed that there was no significant difference in the perceived warmth between the robot and human moderator; in fact, the statistical analysis showed that participants rated the human moderator with greater discomfort. This led us to think that the natural agency of the human moderator helped to assert themselves as the leader of the conversation and attracted the attention of the participants in the session. Participants could look to the human for guidance and assurance throughout the session in body language, facial expressions and other characteristics that the robot fails to offer. Furthermore, in the robot moderator condition, participants interacted with each other more and were more likely to build off of each other's points, creating a higher quality and dynamic conversation.

In regard to pro-choice leaning participants feeling less included in the conversation than pro-life leaning participants, it is likely due to the unfamiliarity of the situations given in the elevated questions. As noted in the results, it seemed that the pro-choice participants were more uncertain of the nuances of their stance when faced with challenging scenarios. It became clear

that blanket statements about abortion rights were ineffective during the discussion and participants were forced to analyze, interpret and rectify their beliefs in the moment.

Future Directions

This experiment could be expanded to continue the study of using socially assistive robots for moderation techniques, especially in group, political conversation. For the purposes of our experiment, we kept our moderator as a neutral, unbiased party. It would be interesting to explore the differences in participants' perceptions of the moderator if they were biased towards a side and actively advocated for one viewpoint over another. Another point of emphasis would be to expand the conversation beyond abortion rights. Abortion can often be viewed as a gendered issue, so another divisive issue, such as immigration would likely be equally as polarizing, without the covariate of gender playing a role in people's opinions.

Conclusion

In conclusion, the research conducted demonstrates both the benefits and deficits offered by a robot moderator. Our hypothesis aimed to test whether discussions moderated by a robot would be more enjoyable than those run by a human, and given the inherent unbiased nature of a robot, whether a robot would be perceived more positively than a human and foster increased engagement between participants. Through experimental testing, we found that while participants found discussions moderated by humans to be more enjoyable experiences, the data put forth evidence in support of the robot moderator. Participants rated the human moderator with more characteristics of discomfort and tended to gaze towards each other and interact more in the robot condition. Our results demonstrate that in some cases, a robot agent can be a more effective moderator, helping to foster hot topic political conversations. Existing research calls for increased attention towards the improving dialogue around these pressing issues, and keeping

that in mind, socially assistive robots could provide a benefit not only to academia but also to society.

<u>Acknowledgements</u>

<u>Resources</u>

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Appendix

1.1 Question List
Introduction:
My name is Sarah, I am a graduate student at Yale in computer science. and I will be leading you through our discussion today. Today we will be talking about abortion. There are many sides to hear, consider, and discuss. My role is to facilitate the discussion by posing questions and soliciting input from all members of the group. I will not express any of my own views on this topic. We will finish our discussion promptly after 30 minutes have elapsed.

Before we dive in, let's begin with introductions. Let's start with you P1

I'd like to start out by asking each of you give a 2-3 sentence summary on your view on the topic of abortion. Let's start with P1 and go around the circle.

Conclusion:
· Congratulations! You have completed the session. It was interesting discussing these issues today. I hope you all learned a lot from each other, thanks for your

participation and insight. The experimenter will now give you instructions on how to complete the survey. Have a great day. Bye!"

Buckets of Water:
· 	Let's take a pause from this topic and we can move on to the next question
· 	That's all the time we have for today. The experimenter will be in to give you the surveys in a moment

Clarification/Inclusion/Transition:
· 	P1/P2/P3?
· 	P1/P2/P3, how do you feel about that?
· 	P1/P2/P3, what do you think?
· 	Could you explain that a little bit more, P1/P2/P3?
· 	Thanks for sharing P1/P2/P3. P1/P2/P3 and P1/P2/P3 what do you think?
· 	P1/P2/P3, could you please clarify for me and the group what you mean by that?
· 	How do you think someone with a pro-choice/pro-life/opposing opinion would view this?
· 	How do you reconcile your viewpoint on this with your overall view on abortion?
· 	Yes
· 	No
· 	I am unsure but maybe someone in the group knows
· 	I can't answer that
· 	I'm going to move us on to a new question
· 	Sorry to interrupt, but I'm going to move us on to a new question

Main Discussion Questions:
· 	When does life begin in your opinion?
· 	How prevalent do you think it is for women to have abortions?
    o 	What do you know about the demographic descriptors of the women who are most likely to get an abortion?
· 	Who do you all think should have the right to choose whether a fetus has the right to life?
    o 	Is it the mother, the government, God or someone else who you think has the right to choose whether a fetus has the right to life?
· 	In what circumstances do you all think that abortion should considered "always okay" or "always not okay"?
    o 	What about in the case of rape, incest, and potential harm to the mother's health?
· 	What do you all feel are the rights that a father should have in the decision to get an abortion?
    o 	Do you think a woman should alert the father before getting an abortion?
    o 	Does your opinion change whether the man and woman are married or unmarried?

o Do you think the father should have a say in whether or not a woman has an abortion?

· Please explain your opinion on whether or not the government should be involved in the regulation and allowance of abortions in the second or third trimesters?

· How can we best protect and respect both women considering an abortion as well as a developing fetus?

· Does a fetus have a right to life? If so, does that right take priority over the mother's right to control her own body?

· Do you think that a fetus is a part of a woman's body? Or is a fetus a life IN a woman's body?

· In your opinion, which components of the topic of abortion do you find it easy to talk about, and which components do you find difficult to talk about?

· What do you all think are the key differences in your perspectives that are affecting the conversation?

· What do you all think the role of the government should be in regulating abortion?

· If you were to write the law for the U.S. for all states to follow on the topic of abortion, what would your law say?

· How stringent would you accept state by state laws to be?

Elevated Questions:

· In 2010, The Economist featured a cover story on the war on girls and the growth of gendercide in the world -- abortion based solely on the sex of the baby. What do you all think concerning whether it is ok for someone to terminate a pregnancy because of the sex of the unborn fetus?

o Similarly, in the process of in-vitro fertilization (IVF), doctors create potentially viable embryos in a petri dish that can be implanted in a woman's uterus. Currently, genetic testing can be done to evaluate these embryos. Do you think it is ok for parents to selectively choose embryos of a particular gender to be implanted in the mother for IVF?

o How do you think we could effectively combat this practice of aborting based on the sex of the fetus?

· What do you all think about parental notification or restrictions regarding abortion access for minors?

o Do you think that a minor is capable of making this kind of decision on her own?

o Since we enforce parental notification in other medical realms for minors, what makes is parental notification in the case of a minor getting an abortion different?

o What about in cases where the minor does not have a good relationship with her parents?

· Currently, when genetic testing reveals an unborn child has Down Syndrome, many women choose to abort. How would you address this practice? Do you think we should have the right to make these kinds of decisions?

o How do you think we could effectively combat this practice of aborting based on a potential disability in the fetus?

·   Do you all think that doctors should be obliged to offer care to any infant that survives an abortion in the third trimester?

o   Doctors have a duty to treat patients and avoid harming them, also known as the Hippocratic oath. How should a doctor weigh these duties in this situation?

1.2 Surveys
  1.2.1 Pre-Screen (Catapano et. al, 2019)
    •What is your gender
      o   Male
      o   Female
      o   Non-Binary
      o   Other
      o   Prefer not to answer
    •What is your age
      o   18-23
      o   24-29
      o   30-35
      o   36-41
      o   >41

    •How would you describe your political ideology? (if it depends on the issue, select the one that best applies for social issues such as abortion)
    Strongly liberal 1 - 7   Strongly conservative

    •How do you classify your stance on abortion in United States?
    Strongly pro-choice 1   - 7 Strongly pro-life

    •Do you feel that abortion is a legal issue?
    Strongly disagree 1 - 7 Strongly agree

    •Do you feel that abortion is a medical issue?
    Strongly disagree 1 - 7 Strongly agree

    •When does life begin?
    At conception   1 - 7 At birth

    •How do you feel about abortion in the case of fetal disability?
    Strongly disagree 1 - 7 Strongly agree

•How do you feel about abortion in the case of potential harm to the mother?
Strongly disagree 1 - 7 Strongly agree

•How do you feel about abortion in the case of rape?
Strongly disagree 1- 7 Strongly agree

•How do you feel about abortion in cases of incest?
Strongly disagree 1 - 7 Strongly agree

1.2.2 Post Experiment Survey (Hogan, 2018)

Please indicate how much you agree/disagree with the following statements about the group interaction you just participated in with the other two participants and Nao:

[The following questions are evaluated using the following scale 1-5]:
1 – Strongly Disagree
2 – Disagree
3 – Neither Agree nor Disagree
4 – Agree
5 – Strongly Agree

· This discussion was an enjoyable experience
· The topic posed in the discussion was interesting
· Following the discussion, I have a better understanding of the controversial issue
· I found the moderator to be an effective leader in the conversation

The following questions are evaluated through Yes, No or Prefer Not To Say choices

· Would you recommend that we use this method of moderation again?

Short Answer Questions
· What was the best aspect of the discussion?
· What was the worst aspect of the discussion?
· Was there something you wish you got to say but did not?
· If so, what was it and why did you not vocalize?
· What was something you learned from the discussion?
· Did your perspective on the issue change at all over the course of the discussion?
· How do you perceive the others in the group?
· How do you think the others perceived you?

Perceived Group Inclusion Scale. Please indicate how much you agree/disagree with the following statements about the group interaction you just participated in with the other two participants and Nao: [The following questions are evaluated on this 5-point Likert scale]
Strongly Disagree 1 2 3 4 5 Strongly Agree

This group...

· gives me the feeling that I belong
· gives me the feeling that I am part of this group
· gives me the feeling that I fit in
· treats me as an insider
· likes me
· appreciates me
· is pleased with me
· cares about me
· allows me to be authentic
· allows me to be who I am
· allows me to express my authentic self
· allows me to present myself the way I am
· encourages me to be authentic
· encourages me to be who I am
· encourages me to express my authentic self
· encourages me to present myself the way I am

1.2.3 Post-Discussion Moderator Assessment

Perception of the Moderator (From Carpinella et al.)
<u>Warmth</u>
Using the scale provided, how closely would you consider the following words associated with Nao (or the human moderator)?

Happy
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated
Feeling
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Social
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Organic
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Compassionate
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Emotional

Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

<u>Competence</u>

Capable
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Responsive
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Interactive
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Reliable
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Competent
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Knowledgeable
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

<u>Discomfort</u>

Scary
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Strange
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Awkward
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Dangerous
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Awful
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

Aggressive
Definitely not associated   1 2 3 4 5 6 7 8 9 Definitely associated

1.2.4 Participant Familiarity (Sebo, 2019)
·   Enter the participant ID of one of your two fellow participants: ___
·   Which of these statements most closely matches your familiarity with this participant?
      o   I had not met this participant before we completed this study together; I do not know them.

- o I have seen this participant before and we may have talked once or twice, I do not know them well.
- o I would consider this participant and I acquaintances, we are moderately familiar with each other.
- o This participant and I are friends, we spend / have spent time together outside of work/school together.
- o I would consider this participant to be one of my closest friends.

·   Do you have this participant's phone number?
- o Yes
- o No

·   Are you connected via social media with this participant (follow/friends with on Facebook, Twitter, Instagram, etc.)?
- o Yes
- o No