Exposure to Cinematic Depictions of Robots and Attitudes Towards Them

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ABSTRACT

We present an exploratory study that surveys 287 people from a wide range of ages and cultural backgrounds on both their attitudes towards robots and which of 12 fictional films portraying robots they have seen. Our preliminary findings suggest a relationship between overall movie watching and NARS scores (more robot movies seen correlates with more positive attitudes towards robots), and between certain positive portrayals of robots and NARS scores (*Bicentennial Man*, *Moon*, and *Wall-E* contribute to more positive attitudes).

Categories and Subject Descriptors

K.4.2 [**Computer and Socity**]: Social Issues; I.2.9 [**Artificial Intelligence**]: Robotics

General Terms

Experimentation

Keywords

robots, human-robot interaction, film, culture

Figure 1: A few of the people at the London Secret Cinema exhibition interacting with our face-mimicking robot. *Photo credit: Guerilla Science.*

1. INTRODUCTION

Whenever a person encounters a robot for the first time they bring with them a plethora of prior beliefs, attitudes, and expectations. These ideas can come from many places, including cultural beliefs [**?**, **?**], user expectations [**?**], robot role assumptions [**?**], and so on. However, perhaps the most oft mentioned "robot topic" we the authors hear about, both in experimental and lay settings, is film. We are asked if we've seen *The Terminator*. We are asked if we've seen *I, Robot*. Occasionally we are asked if we have seen the latest (real) robots from ATR, CMU, or MIT, but most typically we are asked about fictional robots depicted in film.

It is not surprising that most people's attitudes about robots come from popular media; in 2009, only 5.6 million domestic service robots and 3.1 million entertainment and leisure robots were purchased globally [**?**]. These figures indicate that a relatively low percentage of the global population has daily contact with a personal robot. Moreover, the types of personal robots purchased were largely vacuum-cleaning robots, lawn-mowing robots, robotic toys and hobby systems - none of which resemble the advanced, futuristic humanoid robots often portrayed in popular culture.

Thus, it is highly likely that people's attitudes toward robots are largely shaped by popular culture and media such as films, newspapers and television. Indeed, Ray et al. [**?**] report that while only half of their participants stated that they had had some previous contact with robots in reality, more than two-thirds had seen robots on TV and 65% had seen robots in movies.

In this work, we wanted to explore how these cinematic portrayals of robots relate to people's attitudes towards them. Breazeal [**?**], MacDorman et al. [**?**], and Bartneck et al. [**?**] all touch upon the role of cinema in shaping our views towards robots; here we sought to delve a bit deeper.

We present an exploratory study that surveys 287 people from a wide range of ages and cultural backgrounds on their attitudes towards robots (via the NARS measure [**?**]) and which of 12 films portraying robots (half positive/half negative) they have seen. Our preliminary findings suggest an overall relationship between movie watching and NARS scores (more robot movies seen correlates with more posi-

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tive attitudes towards robots), and between certain positive portrayals of robots and NARS scores (viewing *Bicentennial Man*, *Moon*, or *Wall-E* contributes to more positive attitudes).

2. METHODOLOGY

We conducted two within-subjects studies. The first was conducted in person at the London Secret Cinema during a week in June 2010, and the second was conducted online via Survey Monkey during the months of November and December 2010.

2.1 Measures

We prepared two self-report measures for this study. The first was the Negative Attitudes Toward Robots Scale (NARS) [?]. This is a summed measure that assesses negative attitudes toward robots via a 5-point attitudinal scale. The measure contains three sub-scales: "negative attitudes toward emotions in interaction with robots," "negative attitudes toward the social influence of robots," and "negative attitudes toward situations of interaction with robots." [?]. We used the abbreviated, 11-item version of NARS introduced by Syrdal et al. [?] due to its high validity in predominantly English-speaking/Western populations.

Our second measure was a list of twelve films, and participants indicated which they had seen. Each film on the list involved robots as main characters and the release dates of the films spanned across several decades. Half of the films portrayed their robot protagonists generally in a positive way (*Bicentennial Man*, *Moon*, *Short Circuit*, *Star Wars*, and *Wall-E*) and the other half generally in a negative one (*Artificial Intelligence*, *I, Robot*; *Metropolis*, *Surrogates*, *Terminator*, and *2001: A Space Odyssey*). Further details about each of the films can be found in Fig. 4.

2.2 Data Collection

In June of last year, the first author was invited to bring her real-time mimicking robot [?] to be part of a science exhibition at a London "Secret Cinema" event. (See Fig. 2). Attendees purchase tickets in advance to an unknown film, and are told to dress up in unusual styles of clothing and bring various props (e.g., sunglasses and umbrellas). Also, before the film is screened they explore a large warehouse filled with artists, musicians, and actors, all interacting with sets and scenes from the film.

June's Secret Cinema film was *Bladerunner*, and the author brought her robot and joined other scientists (zoologists and perceptual scientists) to be part of a "stealthy science" exhibition embedded within a room in the warehouse. Our robot was installed for a week at the warehouse, and attendees were opportunistically asked to complete our survey before entering the room with the robot.

Following the initial data we received from the film exhibition, we wanted to expand our sample of respondents, and therefore also conducted a study on Survey Monkey.

2.3 Participants

In the first study, participants were recruited by an experimenter by word of mouth, asking them if they would be willing to answer a few questions. In the second study, participants were recruited via a University electronic bulletin board, Gumtree, Facebook, and word of mouth. Neither set of participants were compensated, though for the online study participants could enter a raffle for a $20 gift certificate to Amazon.com.

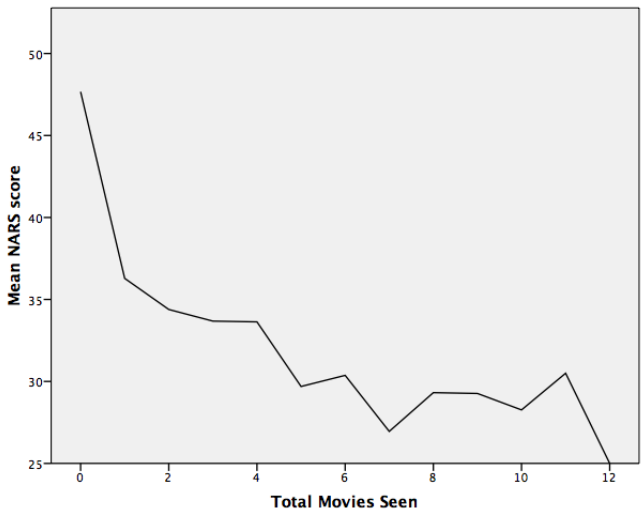

Figure 2: Overall, the more robot films one saw, positive or negative, the more positive their attitudes toward robots.

287 people participated in our two studies, 132 in the in-person study and 155 in the online study. In terms of reported nationality, the largest group was British (39%) followed by American (24%), and the rest came from all over the world, including Bulgaria, China, Brazil, Taiwan, Turkey, Israel, Latvia, Korea, Romania, and many others. Nearly all respondents considered themselves fluent in English (97%). 114 participants were male and 173 female, and their ages ranged from 19-73 (s.d. = 7.65).

3. RESULTS

3.1 Overall movie watching

We first looked to see if overall movie watching was associated with lower NARS scores, and used Pearson's correlation to compare these normally distributed variables. We found a significant relationship - more movies seen is associated with lower NARS scores (thus, more positive attitudes toward robots), r = -.281, $p < .001$.

3.2 How particular films affect NARS scores

To determine how individual films related to negative robot attitudes, we ran a univariate factorial ANOVA with our 12 films as fixed factors, and NARS score as our dependent variable. Because these films only had two levels, watched or didn't watch, we did not run any planned contrasts or post hoc tests. (Thus, this was effectively a regression).

Three movies that portray robots in a positive light had a significant main effect on NARS Score; seeing them led to lower score (i.e., more positive attitudes). These films include: *Bicentennial Man*, $F(1, 274) = 4.97$, $p < .05$, r = .13, *Moon*, $F(1, 274) = 4.19$, $p < .05$, $r = .12$, and *Wall-E*, $F(1, 274) = 3.87$, $p = .05$, $r = .12$. All reported tests are Bonferroni corrected.

No other films, with positive or negative robot portrayal, had a significant impact on NARS score.

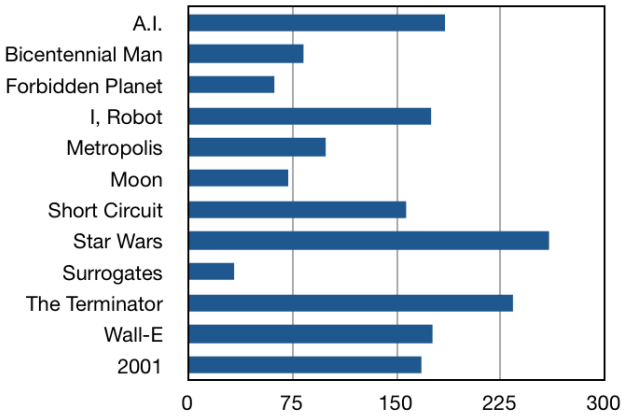

Figure 3: Frequency of films seen across all participants.

4. DISCUSSION

We presented an exploratory study with 287 participants that examined how seeing particular films might influence attitudes toward robots. Our findings suggest that seeing more films portraying robots (whether positive or negative) is negatively correlated with NARS scores. Thus, seeing more of these films tends to be associated with more positive attitudes towards robots. We also found significant relationships between three films in particular that are significantly inversely proportional to NARS scores: *Bicentennial Man*, *Moon*, and *Wall-E*, though with small effect sizes.

In this work we did not control for how recently someone saw a particular film, how many times they saw it, if they watched it in its entirety, and so on. Also, it is likely that people who enjoy watching science fiction films are more able to envision a future with robots among us, due to being interested in technology in the first place.

Despite these limitations, we believe these results are of interest, in that they offer some support for Allport's Contact Theory - the more exposure people have to "out-group" members (i.e., robots), the more positive their attitudes toward them [**?**]. It also lends support to Bartneck et al. [**?**] who found that previous exposure to robots has a positive effect on a person's attitude toward robots. This suggests further work is warranted in exploring how exposure to fictional robots may influence interaction.

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Title	Year	Plot Description	Role of Robots
2001: A Space Odyssey	1968	When the computer running the spaceship malfunctions, the two astronauts onboard become its targets as it tries to cover its mistake.	The spaceship's computer tries to kill its passengers.
AI: Artificial Intelligence	2001	A grieving couple adopt and then subsequently abandon a sentient robot boy that has been programmed to love its "mother" unconditionally.	Generally robots are depicted in a dystopian way.
Bicentennial Man	1999	A family buys a domestic android butler who slowly learns how to feel emotions and think creative thoughts.	The robot becomes even more human-like with the help of a scientist. The viewer is made to empathize with the robot protagonist.
Forbidden Planet	1956	When his spaceship disappears on an exploratory mission, a philologist is the only survivor and creates his own Eden-like world that is protected by his robot.	Robby the robot is the unwaveringly obedient protector of the philologist.
I, Robot	2004	A robot-hating homicide detective investigates a case where the prime suspect of the murder is a robot.	Robots perform menial tasks and are programmed to be unable to harm humans, yet they are often feared and hated by humans.
Metropolis	1927	A city where a large population of working class people support the luxurious lives of the city's elite is thrown into chaos when the master of the city replaces an influential working class leader with a duplicate robot to incite the workers to violence.	The evil robot twin of the working class leader is indistinguishable from the real leader and is used to deceive the workers.
Moon	2008	A human is along on a lunar station, and his only companion is GERTY, a robot.	GERTY is programmed to look out for the human's well-being, and generally serves as a companion to the human.
Short Circuit	1986	A robot escapes from an military experimental firm and finds safety with a human who teaches the robot about pop culture.	Advanced mechanical-looking robots built as soldiers are able to update their own electronics to experience "emotions".
Star Wars	1977	A farm boy sets out on a quest to rescue a princess from the ruling Empire and Darth Vader.	While the film has some "evil robots", in general R2D2 and C3PO are beloved robot protagonists in the film.
Surrogates	2009	Humans wire themselves up and live, work and play through android robotic surrogates.	Ultimately robots surrogates are viewed unfavorably, and portrayed in a very dystopian way.
The Terminator	1984	Humans are under the rule of machines. One human and one machine are sent back in time with opposite goals: the human must save a woman from assassination and the machine must ensure that she is killed.	Robots are destructive machines bent on ruling over humans and will kill anyone that gets in their way.
Wall-E	2008	When humans have disappeared from the Earth, one robot remains to clean up the mess - and falls in love with a new generation robot in the process.	Robots are depicted as overwhelmingly friendly and helpful to humans.

Figure 4: A list of the films used in the study. Six films portrayed their robot protagonists generally in a positive way (*Bicentennial Man*, *Moon*, *Short Circuit*, *Star Wars*, and *Wall-E*); and six generally in a negative way (*Artificial Intelligence*, *I, Robot*, *Metropolis*, *Surrogates*, *Terminator*, and *2001: A Space Odyssey*).