

# Psychological Aspects and Opinions about Some Typical Robots and Robots in General

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**Abstract.** It is a well-known challenge for robot designers, developers and manufacturers that certain personalities and characteristics of people can result in resistance towards or outright refusal of human-robot interactions. With this in mind, we conducted qualitative research to collect information about what people think about some typical robots (Spot, Atlas, Lovot). Fifty-eight participants were interviewed during focus group sessions. Based on responses, we could conclude that the Spot robot was considered ugly and primarily useless, the Atlas was regarded neutrally and in Lovot's case participants blamed developers of such robots and societies that encouraged this type of robots. Our main contribution is qualitative data about opinions of these robots, which can be crucial feedback information for developers.

**Keywords.** social robotics; robot attitudes; HRI; HRC

## I. INTRODUCTION

Robots appear in increasing numbers in every context of our lives. First only in our workplaces as industrial robots, the technology evolved and introduced us to cobots, social robots and even to humanoid and etorobots. They become so widespread that even those who don't want to interact with robots are influenced in their behaviour purely out of the fact that they exist [1]. This means that both developers, manufacturers and researchers should take into consideration how people react to certain robots. It is not only important from a humanistic viewpoint, meaning to avoid unnecessary negative effects in people (as emphasised by [2, 3]), but also from social and economic viewpoint as underuse as well as misuse may result in lower productivity and effectiveness [4].

Quite disappointingly the reaction of people to certain technologies are rarely measured and taken into account in the developmental processes and it is also true to robot development (for examples see [5, 6, 7]). Most industrial, social or commercially available robots are mass produced without any preliminary investigations about people's attitudes towards them.

This is a huge overlook as the effectiveness of the increasing number of human-robot interactions (HRI) and human-robot cooperation (HRC) depends not only on the development level of the robots but also on the motivation of the people to get into an interaction with a robot. What it

means is that any technology is only as good as the user is with the given technology. For this reason, this paper intends to cover the major aspects of the psychological background behind HRI and HRC and to give some insight about recent attitudes about robots through the results of our qualitative research.

## II. LITERATURE REVIEW

The first thing developers and researchers must understand about the development of robots is that humans in general have a very strong inherent aversion against anything new or unknown [8]. The reason behind this is that whenever people meet with something new, cognitive and emotional energies are needed to understand and adapt. And as such, every adaptation process inherently involves stress, which in turn motivates us to avoid the source of the stress [9].

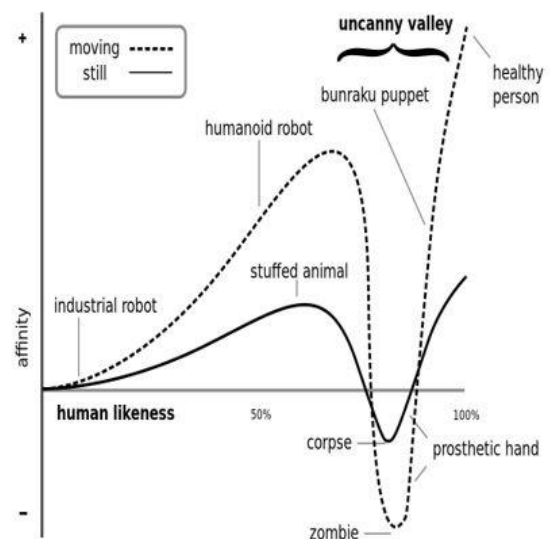


Fig. 1. Figure 1: The Uncanny Valley proposed by Mori [10]. The Figure can be found and was downloaded from Wikipedia. Link: [https://en.wikipedia.org/wiki/Uncanny\\_valley#/media/File:Mori\\_Uncanny\\_Valley.svg](https://en.wikipedia.org/wiki/Uncanny_valley#/media/File:Mori_Uncanny_Valley.svg)

It is not surprising that as far back as in the 1900's it was already noted that new technologies always bring forth disdain

and resistance from the public. Knowing that people are already primed at avoiding the strange and unknown it is pivotal in the design of robots to make them appear and act as likeable as they can. Probably the first proposed concept about how the strangeness or familiarity of a robot affects our perception of them is the theory of Uncanny Valley, proposed by Mori [10] (see Fig.1). This theory builds on the idea that an object's familiarity with humans (or that of any living creature) increases how likeable people perceive that object. The namesake of the theory comes from the notion that even when this is actually true, there is a small part of the curve where the familiarity is almost total and in that part the likeability of the object takes a very steep fall to the extent that it becomes outright unlikeable, revolting or even disgusting.

The Uncanny Valley proposes one of the greatest challenges of designing a robot. On one hand a robot should look less alien and strange to avoid the triggering of the stress of adaptation, while on the other hand it shouldn't appear too familiar as it will trigger the Uncanny Valley effect.

The Uncanny Valley also saw many extensions and revisions. One interesting addition was the two-sided Uncanny Valley, first proposed by Jamais Cascio in an unpublished online article [11] (see Fig. 2). Miklósi, Korondi, Matellán és Gácsi [12] also contributed to this theory by introducing evolutionary explanations to this tendency, suggesting that the evaluation process of an other object or agent probably differs for agents of our own species versus agents of heterospecific agents. Following this idea they propose that robots designed to resemble animals, rather than humans, may have better chances at avoiding falling into the Uncanny Valley.

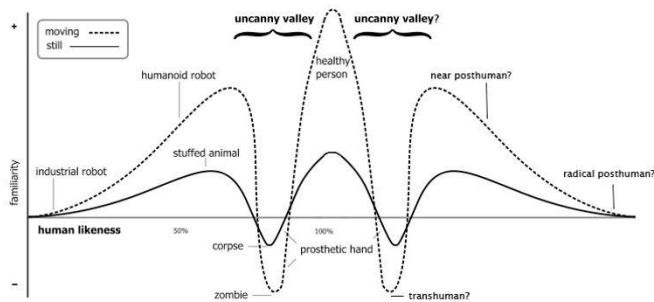


Fig. 2. The Second Uncanny Valley as proposed by Jamais Cascio [11].

Aside from appearance perceived functionality and utility is also an influencing factor in HRI. Venkatesh and Davis [13] proposed the Extended Technology Acceptance Model which doesn't necessarily deal with HRI, but it was one of the earliest foundations of HRI models. In their work they found that perceived usefulness and perceived ease of use were two of the most important factors influencing people's intention to use a given technology.

Regarding these perceptions, it is very important to emphasise that a robot's utility can be far from how useful people see them. One main component of these perceptions is the user interface (for example see [14]). It is a known

problem that developers tend to design interfaces that are highly functional, but ultimately appear useful only to developers, while everyday users or even advanced users find these interfaces messy or hard to navigate [15], which can reduce the utility of the given robot.

A successful HRI largely depends on the robots' abilities to detect and react to humans properly. Unfortunately almost all types of robots' environmental standards are based on that of industrial robots', as highlighted by Farkas, Nádas, Kolossa and Korondi [16]. The authors also present a holistic framework as a guide for creating a more human and robot friendly environment, called Robot Compatible Environment framework.

Lastly it is also crucial to understand that not everyone is willing to accept the existence of robots even if developers do their best to make them likeable. As we can see in the world a lot of influential people, celebrities or famous scientists gave voice to their opinion that artificial intelligence and robotics is way too dangerous to let them evolve and be developed at the same rate they were allowed in the past years. As one example, published in March 22, 2023 an open letter was made public titled 'Pause Giant AI Experiments: An Open Letter' allegedly signed by dozens of famous scientists, researchers or authors, with Elon Musk and George Dyson among them [17]. Therefore, it is not enough to know how to make robots more acceptable, we should also consider the fact that certain level of development is already too much for the public, meaning that sometimes the less is more. It is probably most important is humanoid or social robots, were the advancement of a given robot can backfire in terms of utility and they will fail to fulfil their designated objectives merely out of the fact that they are too good.

### III. METHOD

The main goal of our research was to collect qualitative data about people's perceptions and opinions about different robot types in order to provide useful feedback from potential users to developers. With that in mind our research questions were about people's initial responses when they are asked about robots, the archetypical pictures in their mind about robots, what makes robots more or less acceptable in their opinion and lastly, what are their impressions about some better known robots.

In a previous research of ours some people also had the opportunity to complete an interactive task with a NAO robot. A portion of them were contacted and asked to participate in the recent research as well. Here we would like to state a disclaimer to avoid any misunderstanding: Our previous research is not part of this work, was already submitted to publication as [18], and any result of that research is only mentioned here to help us understand the results of our present work. Participants of the research were invited to collect qualitative data from people who already had at least one encounter with a robot. With that in mind in our next section we would like to briefly summarize the circumstances with which participants met in our previous research.

#### A. *The conditions of our previous research*

In our previous work [18], we conducted a behavioural laboratory test in which participants were tasked with completing an interactive task with a NAO robot which required them to communicate with the robot verbally in English and lasted for about half an hour. The condition of the task was controlled and modified to represent different workplace relations in term of power. In the first condition participants were in a cooperative relation with NAO (they both instructed each other throughout the task), in the second condition participants were in a superior relation (only the participants instructed NAO), and in the last condition no power relation was incorporated into the situation (simple storytelling task). In this previous experiment 106 participants took part whom were contacted to participate in the present research as well, but only 30 were able and willing to do so.

#### B. *Research method*

In our present research we used focus groups to collect qualitative data. Each session lasted for approximately 1 hour with no more than 10 participants at a time. The focus group sessions were conducted between April 2023 and June 2023. A total of 58 participants took part, all of them were university students. To avoid any contamination of opinions participants were designated to separate sessions based on their previous experiences with robots: 10 participants had prior experience from the cooperative condition of our previous experiment, 10 participants had prior experience from the superior condition of our previous experiment, 10 participants had prior experience from the storytelling condition of our previous experiment and 28 participants had no prior experience with any robot. The participants were informed about the ethical guidelines of the research and gave informed approval. Data was collected by note-taking in each session with the pre-informed consent of the participants. The research was conducted with the approval of the Hungarian Psychological Research Ethics Committee (EPKEB) (reference number of the approval: 2023-072).

Each session consisted of 3 main parts. First we asked the participants for their opinions about robots in general, with questions like „What is the first thing that comes to you mind if you hear the word robot?” and „What would you say what aspect of a robot would make it more/less likeable?”. In the second part we showed them promotional videos about Boston Dynamics’ Spot and Atlas robots, as well as Groove X’s Lovot robot. Participants were asked about their impressions about these robots. In the last part participants were given the chance to interact with an Amazon Alexa in the form of an Amazon Echo Dot 4, and an intelligent wristwatch in the form of an Amazfit GTS2. This last part was intended to be a more light-hearted experience in case any participants were stressed by the videos and also to make contrast between the cutting-edge robot technologies and simpler but more accessible intelligent devices. At the end of each session participants were thanked, at this point no participant declared the need for consulting or stated that the experience caused any harm or

distress for them. For the links to the presented videos and the for the script of the focus group interviews see Appendix 1.

## IV. RESULTS

In the next section of our paper we would like to collect our results into distinct categories based on the main parts of our focus group talks. As such, first we will present the general opinions about robots, then we will present participants’ opinions about the aforementioned robots and lastly we will present the participants’ opinions about Alexa and the intelligent wristwatch.

#### A. *General ideas and opinions about robots*

Our first covered topic was about what kinds of robots our participants think about when they hear the word ‘robot’. During these questions the most typical answers were two movies. Namely ‘Terminator’ which was named only in two groups, but the infamous Skynet (the rogue AI trying to exterminate mankind in the movie) was mentioned in all groups, and ‘I, robot’ which was mentioned in three groups by title. In both examples participants reflected to the negative aspects of robots with statements like „Terminator comes to my mind, you know Skynet wiping us out and stuff.” and „That movie with the evil white robots in it... ‘I, robot’ I think.”.

Also very common responses were the mentioning of the ChatGPT. During the sessions we did not correct the participants about ChatGPT not qualifying as a robot (it is an artificial intelligence chatbot) because the notion to mention bots was a common mistake and we deemed it important, as we will reflect to it in the conclusions. It was also noted that in focus groups where participants had prior experience with the NAO robot from our previous experiment NAO was also mentioned by almost everyone, while in groups where they had no prior experience with it no participants mentioned this type of robots.

Aside from these typical answers some scarce mentions were the robots from Star Wars. Out of all the groups only one person mentioned Sophia (which is the only real robot mentioned by any participant) and another one mentioned Miquela.

At this point we could point out that out of the 58 participants only one mentioned a real robot, while the most mentioned entities were bot or AIs instead of robots. As we experienced prior experience with the NAO robot had no effect on this tendency as aside from NAO no other real robots were mentioned by these participants.

#### B. *What should or shouldn’t a robot be like*

During the next questions we explored what appearances and behaviours our participants would or wouldn’t like to see from a robot. In every groups participant agreed with everyone visually reinforcing the opinion (even if not by voice, they all nodded in approval) that mechanical parts (gears and cables as they referred them) shouldn’t be visible in a robot. Many

participants stated that a robot should be small, specifically smaller than a human and that they should be colourful. Two participants even specified this notion with „... they should be colourful, with at least three different colours or shades. But I think more than five colours on them are too much. That would be more toy-like.“. While it is not something that developers and engineers could effectively work with, some participants also stated that a robot should be 'cute' without giving any directions as to what they meant with that.

In all the groups at least one participant said that a robot should also be human-like even if they are not social robots (while not everyone gave visual agreement to this statement, no participant challenged this proposal). Quite interestingly our participants also strongly emphasised that a robot shouldn't be too human-like. To the extent at which they find it acceptable to be human-like but not too human-like no participant could give clear answer and instead reacted like: „I don't know, I'm not a developer. But if I look at a robot a can decide if it is too much or not, so I guess they could too if they want to.“.

Regarding their behaviour participants could really come to consensus, most of the mentioned aspects were important to only one or two of them. Interestingly the groups differed in this regard with those who had prior experience with NAO (from any condition of our previous experiment) stated that a robot should be advanced and intelligent, otherwise it loses it's supposed meaning and that they should be interactive and engaging. On the other hand, in one of the groups with no prior experience participants stated that a robot shouldn't seek interaction on its own. They specified that a robot should only talk if a human talks to it first and that if it wants to signal something (a reminder for example) than it should do it with a beep or like an alarm clock.

#### C. Power relation with a robot

With some questions we explored our participant's opinions about situations in which they would be placed into a cooperative or under a subordinate position with a robot in their workplace. The most common answer was that they wouldn't mind working with a robot if someone shows them how to operate said robot, but if they can choose they'd rather work with other humans. „Robots should be helping devices, but nothing more. I couldn't regard them as co-workers.“ said one participant. Quite interestingly their opinions about being in a subordinate position was somewhat divided. While in every group at least one person stated that they would rather quit their jobs if they would have to follow a robot's orders in both groups with no prior experience with robots some participants also pointed out that they may even like it more than working for a human boss as the robot could be more rational and less biased. It is interesting to point out that not one person from any groups with prior experience said that they would be okay with a subordinate position with a robot.

Regarding the type of asymmetric power position in two groups (one with no prior experience and the one with experience in a superior position) participants clarified that

working in a subordinate position could only be acceptable if the robot is only advising and correcting them, but it would be unacceptable for a robot to give orders or overrule them.

#### D. Opinions about Spot

After watching one of the official promotional videos about Boston Dynamics' Spot robot (see Picture 1, see Appendix 1 for the link to the whole video) participants were asked to voice their opinions about said robot. In all groups it was mentioned and emphasised that they couldn't understand what possible use a robot like this could have. They referred to the information given in the video about its weight carrying capacity and such, but said „...I just can't see the reason why they would be better than using literally anything else for these tasks.“. Regarding its appearance, no participant gave any positive reflection. In fact, in three groups it was mentioned and agreed upon that they look „strange“, „disgusting“ or even „hideous“. When asked why they referred to its body looking more like a giant bug than a robot, especially because of its legs. One participant strongly stated that „It looks absolutely disturbing. Especially when it moves. Its legs gave me the chills.“. In overall, regardless of prior experience all the participants found Spot a bad example of what an acceptable robot should be like.



Pic.1. Picture from the video material shown to participants about the Spot robot.

#### E. Opinions about Atlas

Next we watched another promotional video, this one about Boston Dynamics' Atlas robot (see Picture 2, see Appendix 1 for the link to the whole video). Participants were generally neutral about this one, saying that they can see more potential in Atlas than in Spot, but they still felt that it is mainly unnecessary. One participant with no prior experience said he couldn't decide how to relate to this robot as he wasn't sure how much it was doing on its own in the video, and how much of its behaviour was preprogrammed. Another participant from with prior experience (from the story-telling condition) stated that „It's like developers are doing this for their own entertainment. Like it was cool and all, I guess it is an achievement, but what is the point? How does it make the world better?“. Although he was the only person giving voice to an opinion like this, the rest of the participants in this group non-verbally agreed with him after the statement



Pic. 2. Picture from the video material shown to participants about the Atlas robot.

#### F. Opinions about Lovot

The last video we watched was about the Lovot robot (see Picture 3, see Appendix 1 for the link to the whole video). Lovot visibly provoked the participants as most of them were grimacing and looked shocked after the video. In every group participant quickly arrived at the conclusion that Lovot is a „terrible robot”. It is important to point out that all their reaction was aimed towards the developers and manufacturers of Lovot and not towards the robot itself. Quoting the participants „It is sickening. Like someone in the video said it’s just like a baby. No dude, it is definitely not. I think this direction is madness.”. It was also common to put blame on the society with statements like „I mean I understand that some people are truly lonely, but that robot is not a solution. Yes, if you have a Lovot you may not be lonely anymore, but you are still without connections. It only treats the symptoms, not the problem itself. As a future psychologist I can’t identify to this at all. I mean to this line of development.”. Regardless of prior experiences or not, all participants agreed that „If these type of robots will get widespread in the future that our society fooled itself.”.



Picture 3. Picture from the video material shown to the participants about the Lovot robot.

#### G. Opinions about intelligent devices

In the last section of the sessions we presented an Amazon Echo Dot 4 and an Amazfit GS 2 to the participants and gave them some time to try them out before asking for their opinions about these technologies. Amazon’s Alexa, operating on the Echo Dot was already known to the participants even if most of them have never interacted with one before and the intelligent wrist clock, Amazfit was considered a common accessory.

In both devices’ cases participants reacted positively. They stated many times over that they can see the utility and possibilities with these technologies with one participant stating that „Finally something I can see potential in unlike that robot-dog or whatever.”. With both Amazon’s Alexa and Amazfit participants mentioned no negative aspects or drawback during the sessions although some statements could be considered as disdainful like „It is cool. You can talk with it for like five minutes, then it becomes boring as well.”. One participant also stated that „That is by far enough for me to be honest. It shows the time but is not in my way and doesn’t talk to me.” about Amazfit, with another participant saying that „If it could also do the dishes technology could stop right there in my opinion.”

#### V. DISCUSSIONS

From the focus group interviews we can draw the conclusion that our participants were uninformed about robots and robotics as the majority of them didn’t even mention proper real robots when asked, which was expected as the majority of Hungary’s population doesn’t interact with robots in their daily lives.

Regarding their opinions, we can conclude that with some minor exceptions that are mentioned in the ‘Results’ section prior experience with a robot had little or no effect on the participants’ reactions and opinions.

Based on our results we can conclude that our participants had a fairly negative disposition towards humanoid and eorobots. Lovot and Spot were both viewed negatively. In Spot’s case participants’ main problem was with the perceived lack of utility and its appearance, while in Lovot’s case the source of their resentment was the ideology behind the robot and the majority of their despite was with the developers of such robots and with societies promoting this line of robotic usage. In the case of the Atlas robot our participants were somewhat neutral towards the robot with no clear or precise approval or disapproval. The less complex intelligent devices were generally acceptable.

The main reason for this trend of opinions may be the fact that people who don’t have continuous interaction with a robot find it hard to see their utility. Even if a robot’s increased capabilities are desirable the more functionality a robot has, quite paradoxically, the less useful they may seem to us because they appear less usual, thus invoking the feeling of strangeness. We can see that the less advanced intelligent devices that have limited functionality were more



understandable for our participants both in term of utility and purpose.

## VI. CONCLUSIONS

In conclusion we think our research yielded important feedback. We would also like to emphasise that these results came from people with no expertise in robotics or AI and who have no or only one-time experience with robots. For a better understanding of user opinions and feedback it is important to collect more data, especially in the form of qualitative research. Because the phenomenon of robots is a fairly new one giving guidelines to participants in quantitative researches may restrict them too much and fail to explore the topic to find out the most prominent aspects in the first place.

Overallly believe these results could function as baseline ideas for developers and researchers of robotic technologies. As our research was an exploratory one with qualitative data these findings should be viewed as informative suggestions for future researches and with that we believe we made a valuable contribution to the background literature about the human aspects in HRI.

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## DECLARATION OF CONFLICTING INTERESTS

The authors have no competing interests to declare that are relevant to the content of this article.

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## VII. APPENDIX 1

Script of the focus group interview:

Question 1: What comes first to your minds when you hear the word 'robot'?

Question 2: Do you know any real robots from anywhere in the world?

Question 3: Have you ever seen a robot in real life? If so did you get into any interaction with it?

Question 4: Is there any real robots you would like to meet, or you would definitely wouldn't want to meet?

Question 5: In your opinions what is the most important aspect of a robot that makes people relate to them in a positive way?

Question 6: In your opinions what is the absolute worst thing in a robot that should be avoided by developers and researchers?

Question 7: How would you feel if you had to operate, or supervise a robot in your future jobs?

Question 8: How would you feel if a robot would be a supervisor for you in your future jobs?

Links for the videos shown to the participants (all videos are publicly available on the internet and are accessible freely):

Link 1, Spot robot:

<https://www.youtube.com/watch?v=wIkCQXHEgjA>

Link 2, Atlas robot: [https://www.youtube.com/watch?v=e1\\_QhJ1EhQ](https://www.youtube.com/watch?v=e1_QhJ1EhQ)

Link 3, Lovot robot:

<https://www.youtube.com/watch?v=biXgMiqYBUk>



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