

# Does My Robot Make You Nervous?

## Implications for Long-Term Human Robot Interactions

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### Research Question

What are the long term implications of robots integrating into human society?

### Psychology

Habituation is the return to a stable state after repeated exposure to a stimuli when given a certain stimuli-response pairing (Thompson and Spencer, 1966; Figure 1).

Characteristics of Habituation:	
1. Given a stimuli-response pairing, repeated exposure to the stimulus would result in a decreased response.	5. The weaker the stimulus, the more rapid the habituation will become.
2. If response of this pairing will recover over time if the stimulus is not presented.	6. The effects of habituation training may create a response level that is "below zero".
3. If repeated series of habituation and this recovery are given, the habituation will become more rapid.	7. Habituation can exhibit generalization to other similar stimuli.
4. The more rapid of frequency that the stimuli is given, the more rapid the habituation will become.	8. Presentation of another stimuli may result in dishabituation, or the recovery of the response.
	9. Upon repeated exposure to another stimuli, the amount of dishabituation produced may become habituated.

Figure 1. Characteristics of habituation

Chronic anxiety, fear, and Post Traumatic Stress Disorder (PTSD) have been addressed through the use of exposure therapy and habituation. For example, individuals were exposed to images of spiders and their physical responses were measured. These responses decreased over time, illustrating that repeated exposure to the images lessened anxiety (Matthews et al., 2017; Figure 2).

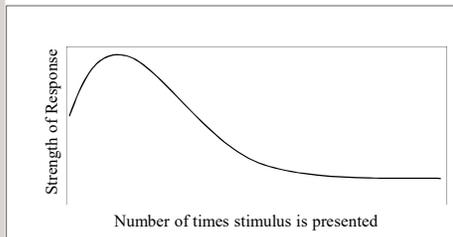


Figure 2. Habituation effects curve.

### Method

We tested social habituation effects among 182 participants. They were separated into groups of 5-7 and participated in a ten week psychological research practicum. Every participant's inclination towards *self-monitoring*, or how much one regulates their behavior according to social contexts, was assessed.

### Hypotheses

1. Participants would habituate to their new social groups and rate themselves as less nervous and less stressed over the period of 10 weeks.
2. High-self monitors will be more stressed and nervous than low self-monitors at each assessment.

### Results

As hypothesized, participants habituated to their social groups and rated themselves as less nervous over time ( $t(155) = -5.91; p < 0.001$  between zero-acquaintance and nine weeks). However there was no significant effect of self-monitoring (Figure 3).

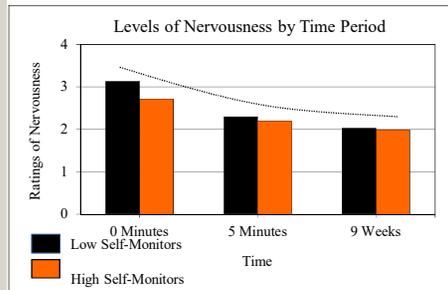


Figure 3. Self-reported nervousness over nine weeks.

Participants also rated themselves as less stressed over time ( $t(141) = -2.63; p < .01$  between zero-acquaintance and 5 minutes; no significant difference after 5 minutes). Again, there was no significant effect of self-monitoring (Figure 4).

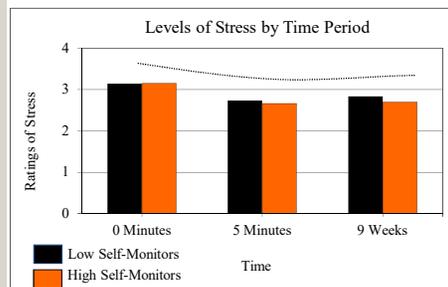


Figure 4. Self-reported stress over nine weeks.

### Robotics

In research looking at human-robot interactions, the term *anthropomorphism* traditionally refers to when human-like features are used to describe robots. It can also be described as "social phenomenon that emerges from the interaction between a robot and an user (Lemaignan et al. 2014)." The curve in Figure 5 closely mimics the habituation curves demonstrated in psychological research.

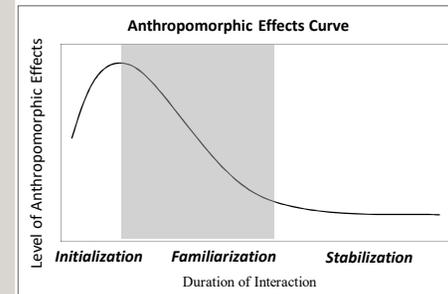
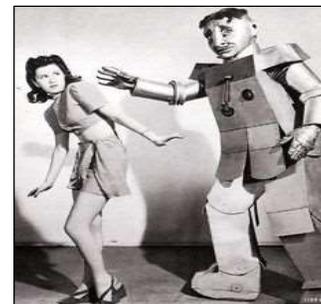


Figure 5. Anthropomorphic curve hypothesis

Habituation has been illustrated in several human-robot interaction studies. Habituation was observed over a period of five weeks, where participants eventually became more comfortable with robots in proximity. Individual preference of the robot's approach decreased over time. This suggests an increase in comfort with the robot and participants interacted with it (Koay et al., 2007).

In another study involving a two-month trial in an elementary school, children were encouraged to engage in personal interactions with a robot. Results illustrated that the number of interactions with the robot over a period of time decreased overall, but remained stable for those individuals who made personal peer-like connections with it (Kanda et al., 2007).



### Implications for Human Robot Interactions (HRI)

Current research in human-robot interactions investigates how robots will integrate and function in our every day lives. Robots have the potential to become social beings within our society, so it is imperative we analyze and assess interactions between humans and the current prototypes of social robots. Applying psychological perspectives and methodology to human robot interaction research may yield results and information that will ease the process of integrating robots into everyday human society.

The current literature within human-robotics suggests that, for long-term interaction, the facilitation of personal interactions with robots may be needed in order to reduce the negative emotions experienced by humans and to increase levels of comfort and interest towards the robot. In our study, we found that individuals became more comfortable (i.e. less nervous and stressed) among strangers over time. It is plausible that individuals would adapt to strange robots similarly.

In the future, our collaborators at Oregon State intend on investigating this very construct by assessing how feelings of privacy invasion change after interacting with robots over long periods of time. Ultimately, we hope to identify exactly what attributes of a robot minimize human discomfort long-term.



### References

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