



# PAY ATTENTION!

THE EFFECT OF ATTENTIONAL BEHAVIOURS BY A HEALTHCARE ROBOTIC  
RECEPTIONIST ON USER PERCEPTIONS AND BEHAVIOURS

DEBORAH JOHANSON

PHD CANDIDATE

THE UNIVERSITY OF AUCKLAND

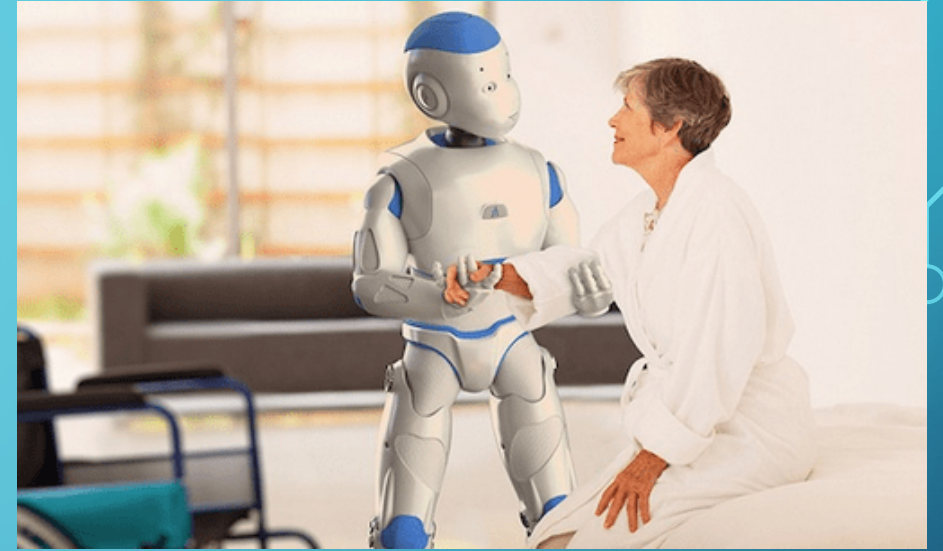
# INTRODUCTION...

- Robots in home and healthcare environments



# OVERVIEW – SOCIAL ROBOTICS

- Technical capabilities
- Behaviours of social robots must be appropriate and acceptable
- Potentially vulnerable individuals
- Discussing private health concerns
- Trust and follow advice, reminders, information



# ATTENTIONAL BEHAVIOURS



# BACKGROUND...

*Attentional behaviours explored in HRI. E.g. Eye gaze, Pointing*

*A number of attentional behaviours that have yet to be explored in the context of human-robot interactions...*

- Self-Disclosure
- Voice Pitch Changes
- Forward Lean



# SELF DISCLOSURE



*Salient aspect of human social interaction*



Mutual eye gaze



Smiling



Perceived friendliness



Rapport

*Central to developing closeness in human relationships [1,2]*

1. Zhao, R., Papangelis, A., & Cassell, J. (2014, September). *Towards a dyadic computational model of rapport management for human-virtual agent interaction*. Paper presented at the International Conference on Intelligent Virtual Agents, Boston, MA.

2. Bronstein, I., Nelson, N., Livnat, Z., & Ben-Ari, R. (2012). Rapport in negotiation: The contribution of the verbal channel. *Journal of Conflict Resolution*, 56(6), 1089-1115.

3. Nomura T, Kawakami K. Relationships between robots' self-disclosure and humans anxiety towards robots. Proceedings of the IEEE International Conference on Web Intelligence and Intelligent Agent Communication: 2011 Aug 22-27; Lyon, France. New York: IEEE Publishing; 2011.

4. Siino R M, Chung J, Hinds P. Colleague vs tool: Effects of disclosure in human-robot collaboration. Proceedings of the IEEE International Symposium on Robot and Human Interactive Communication: 2008 Aug 1-3; Munich, Germany. New York: IEEE Publishing; 2008.



## VOICE PITCH

- Important in Attention
- Attracts attention
- Sustains attention
- Conveys emotion



## FORWARD LEAN

- Way to demonstrate attention
- Clinician-patient interactions – forward lean demonstrates attention or ‘active listening’ [4]
- Physician-patient interactions - forward lean associated with positive patient perceptions of physician empathy [5]

4. Sommers-Flanagan, J. (2012). *Clinical interviewing: 2012-2013 update (4)*. Hoboken, NJ: Wiley.

5. Hall, J. A., Harrigan, J. A., & Rosenthal, R. (1995). Nonverbal behavior in clinician—patient interaction. *Applied and Preventive Psychology*, 4(1), 21-37.





The primary aim of this study was to investigate whether certain healthcare robot behaviours (i.e. self-disclosure, forward lean, voice pitch changes) would facilitate participant attention and positively influence perceptions of robot empathy.

The secondary aim of this study was to investigate whether these same behaviours would positively influence participant perceptions of robot attention.

# METHODOLOGY

- Randomised, between-subjects, experimental study
- 5-minute (approx.) scripted interaction with a robotic medical receptionist.
- Randomised to one of four conditions:

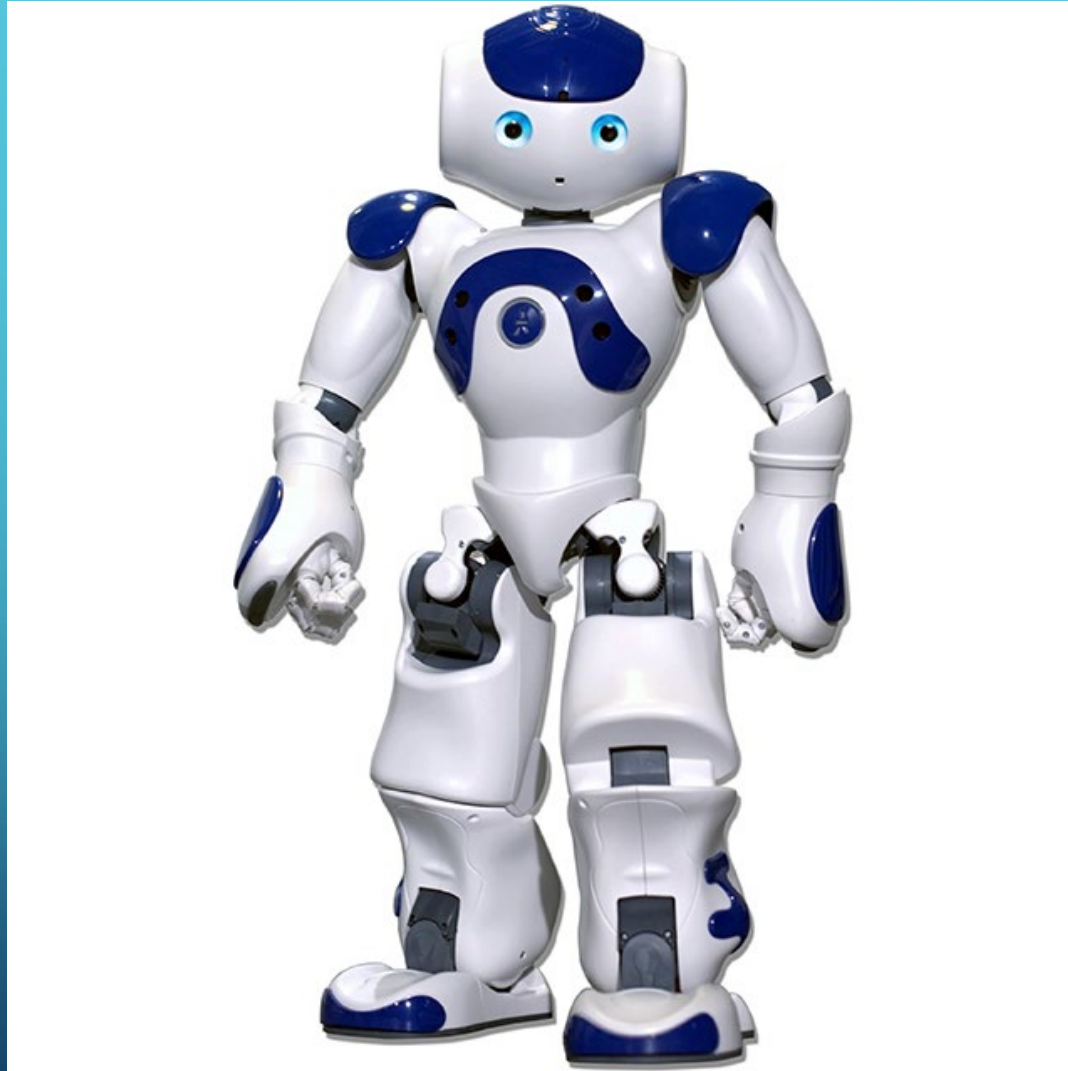
Self-disclosure

Voice pitch

Forward lean

Neutral

# NAO, THE ROBOTIC MEDICAL RECEPTIONIST



# SCRIPT...



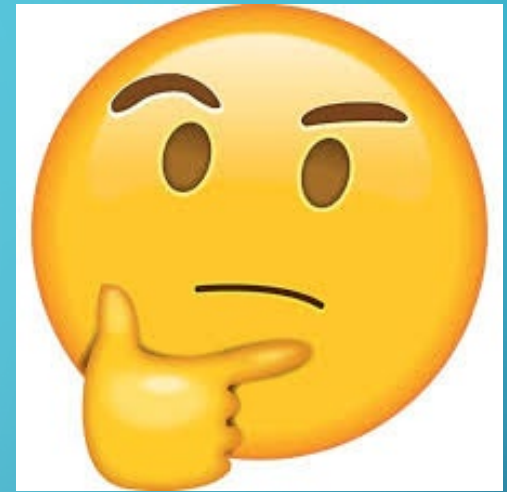
# MEASURES

Participant Engagement Tool

Perceived Robot Empathy

Perceived Robot Attention

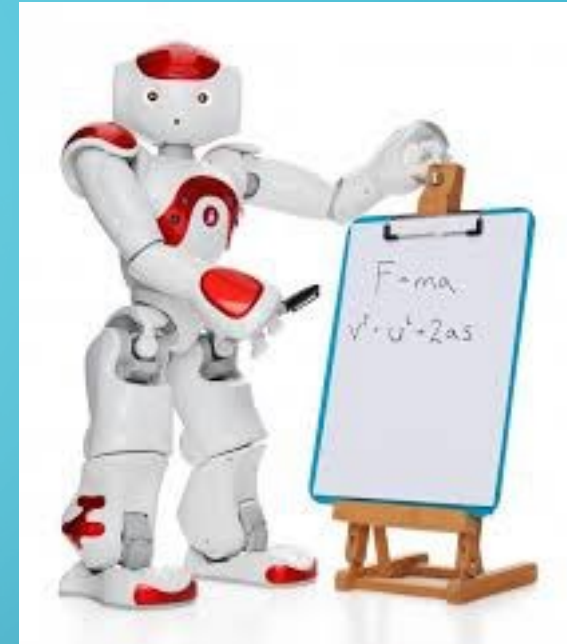
Video-Recorded All Interactions between Participants and the Nao Robot  
(Eye gaze, smiling, forward lean)



# RESULTS

## PARTICIPANTS

- 181 participants
- Female (n=112, 61.9%)
- Students (n=139), Part-time employees (n=20), Full time employees (n=19), and unemployed (n=4).





No Significant differences between groups....

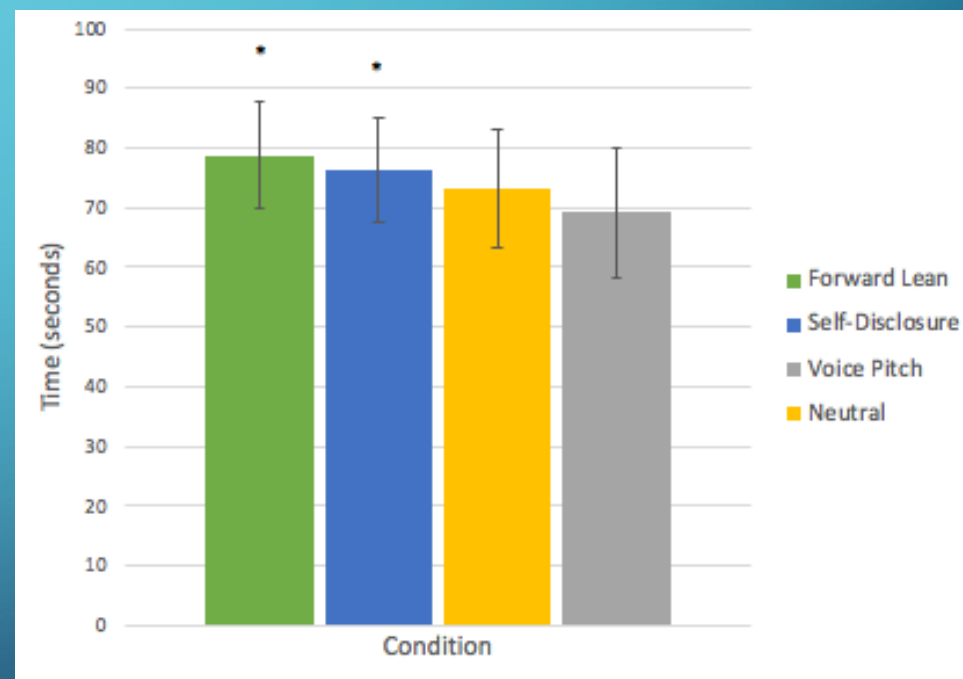
Perceived Participant Engagement  
Perceived Robot Empathy  
Perceived Robot Attention

*Then we looked at participant behaviours...*



## PARTICIPANT BEHAVIOURS – EYE GAZE

- Significant difference in the percentage time participants spent looking at the Nao

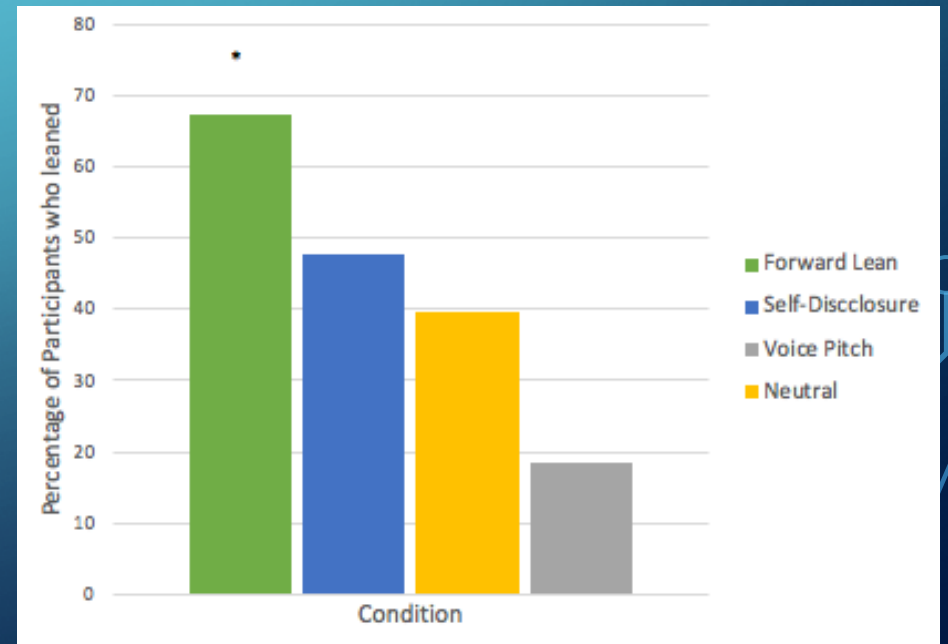






## PARTICIPANT BEHAVIOURS – FORWARD LEAN

Significant difference in leaning behaviours between groups



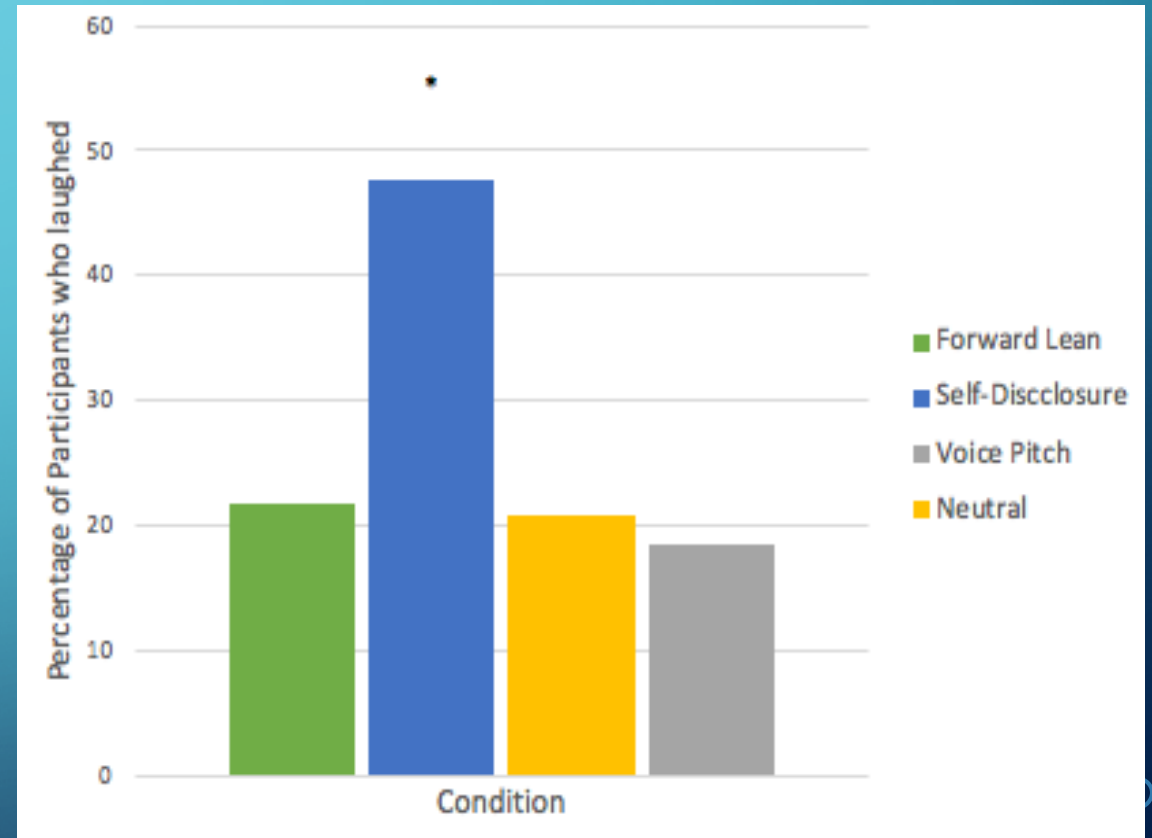


- PARTICIPANT BEHAVIOURS – SMILING
- There were no significant differences in the percentage of time participants spent smiling during the interaction with the robot



## PARTICIPANT BEHAVIOURS – LAUGHING

- There was a significant difference between groups in regards to whether participants laughed or not
- Self-disclosure or humour?



# DISCUSSION

No significant differences were found between the groups in regards to participant perceived engagement, perceived robot empathy, or perceived robot attention

Participants spent significantly more time looking at the robot in the forward lean and self-disclosure conditions

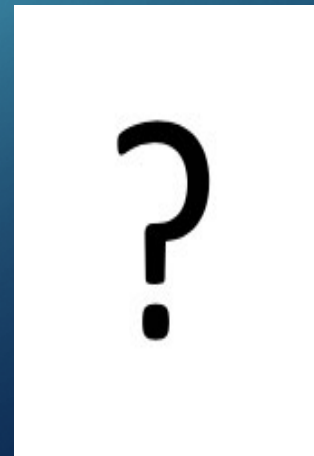
Significantly more likely to lean towards robot in forward lean condition

Significantly more likely to laugh in the self-disclosure condition

- Between Subjects Design
- Lack of comparison
- Majority of participants never interacted with robot (n=148/181)

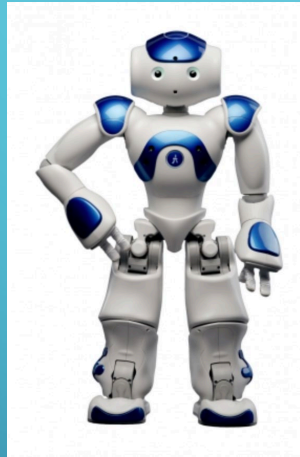


VS



# Further research

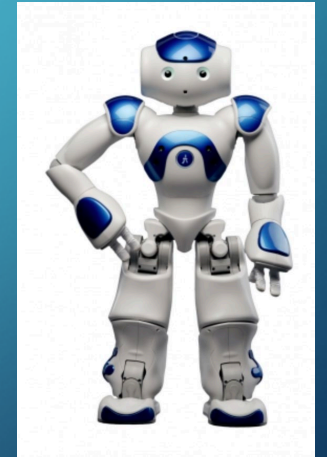
- Within Subjects Design



VS



VS



- Self Disclosure
- Forward Lean
- Neutral

# LIMITATIONS

- Participants relatively young and mostly students

Younger people may be more positive and open in regards to interacting with a robot than older people.

This may limit the generalisability of these results to an older population.

- Laboratory setting
- Scripted interaction

The behaviours and self-reported measures observed may have differed had this experiment taken place in a natural setting with no set interaction script



QUESTIONS?

