# Improving Interactions with Healthcare Robots:

## The Effect of Attention, Humour, and Empathy Behaviours by a Healthcare Robot on User Perceptions and Behaviours

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# What are Healthcare Robots?

Designed with the goal of enhancing or maintaining the health and quality of life of the human user (Broadbent et al, 2009).

Broadbent, E., Stafford, R., & MacDonald, B. (2009). Acceptance of healthcare robots for the older populations: review and future directions. *International Journal of Social Robotics, 1*(319), 319-330.

# Rationale

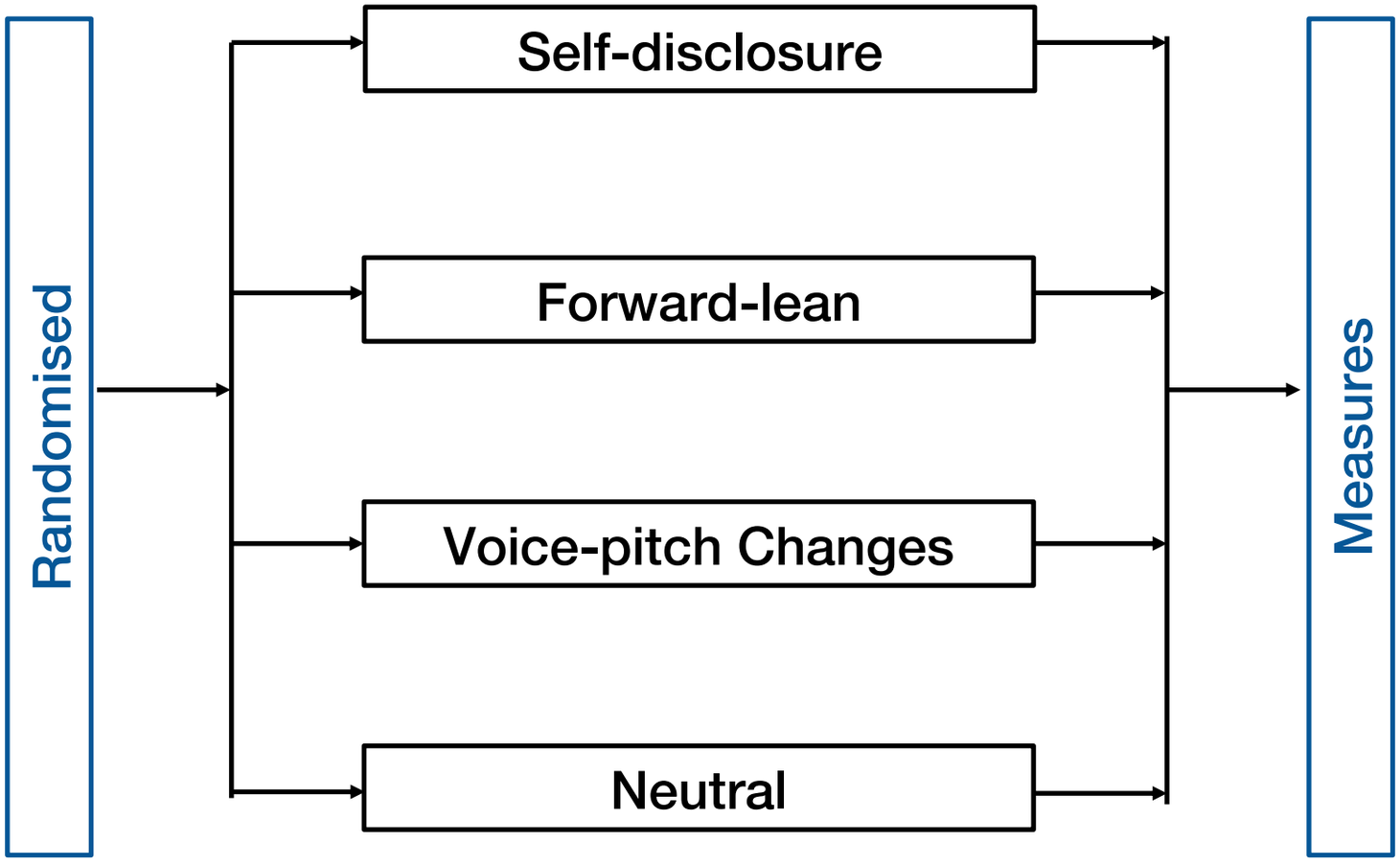
- Healthcare robot interact with potentially vulnerable individuals
- Ethical responsibility to ensure appropriate healthcare robot behaviour

# Study 1

**Aim:** To investigate the effect of a healthcare receptionist robot using attentional behaviours (self-disclosure, voice-pitch changes, and forward-lean) on participant perceptions and behaviour

Johanson, D. L., Ahn, H. S., MacDonald, B. A., Ahn, B. K., Lim, J., Hwang, E., Sutherland, C. J., & Broadbent, E. (2019). The effect of robot attentional behaviours on user perceptions and behaviours in a simulated healthcare interaction: Randomized controlled trial. *Journal of Medical Internet Research, 4*(21): e13667. https://doi.org/10.2196/13667

# Study 1- Method (N=181)




**Measures**

- Engagement
- Perceived robot empathy
- Perceived robot attention
- Participant behaviours

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# Study 1 - Procedure

- Autonomous
- Scenario
- Scripted

# Study 1- Key Findings

- Self-report measures: No significant differences between groups in regards to engagement, perceived robot empathy, or perceived robot attention.

- Individual Engagement Items - Significantly more boring and unstimulating when using voice pitch changes

- Potential explanation - Vast majority (148/181) of participants never interacted with robot in the past:

  Lack of comparison due to use of between subjects design

  Novelty effects – participant engagement and perceived robot attention positively skewed

# Study 1- Key Findings

- Participant behaviours – significant difference between groups
- Forward lean and Self-disclosure groups – increased eye gaze behaviours
- Forward lean group – demonstrating forward lean behaviours towards the robot

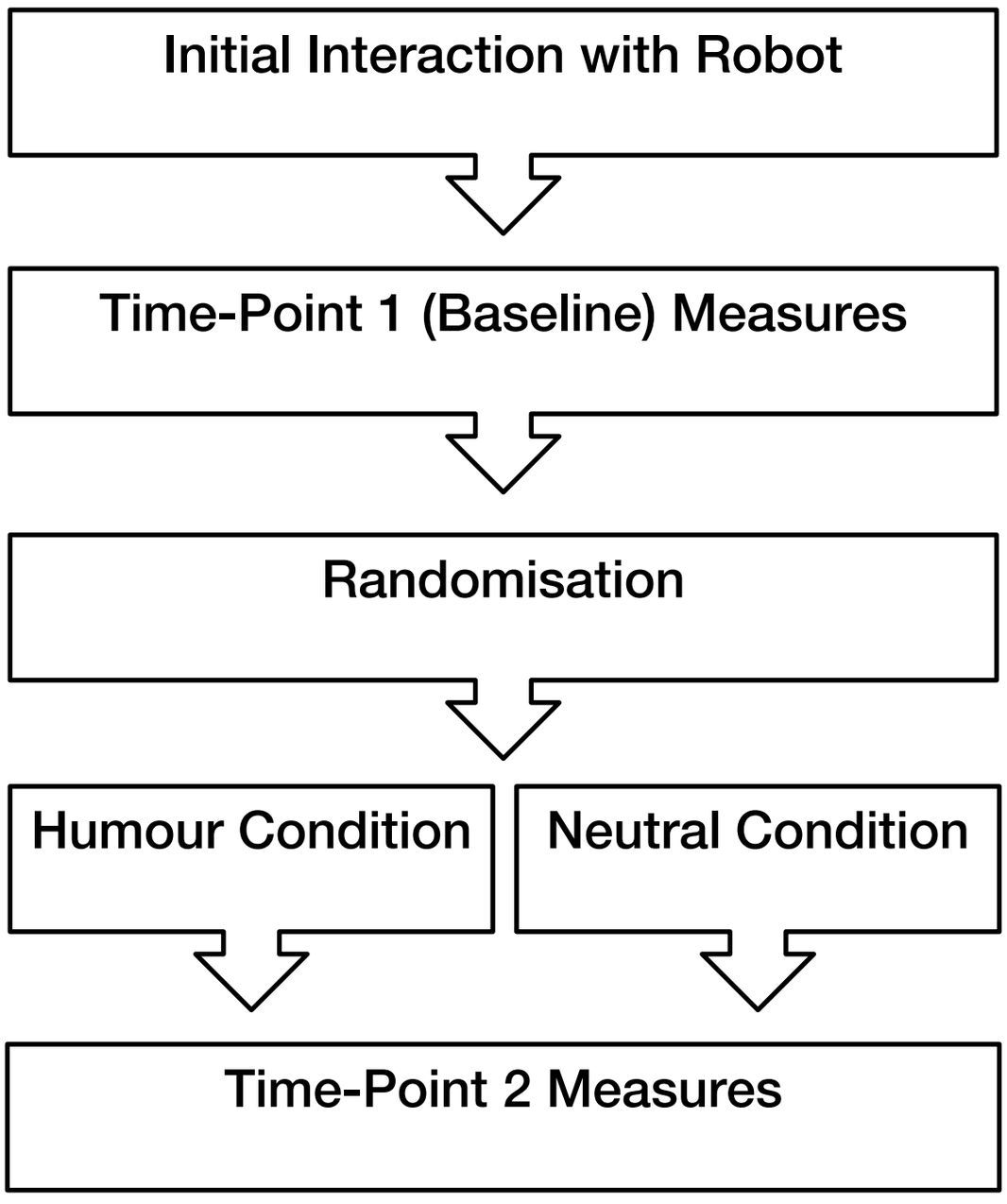
- Self-disclosure – significantly difference in laughing behaviours
- ?Humour

# Study 2

**Aim:** To investigate the effect of a healthcare nurse robot using humour on participant perceptions and behaviour

Johanson, D. L., Ahn, H. S., Lim, J., Lee, C., Sebaratnam, G., MacDonald, B. A., & Broadbent, E. (2020). Use of humour by a healthcare robot positively affects user perceptions and behaviour. *Technology, Mind, and Behaviour, 1* (2). https://doi.org/10.1037/tmb0000021.

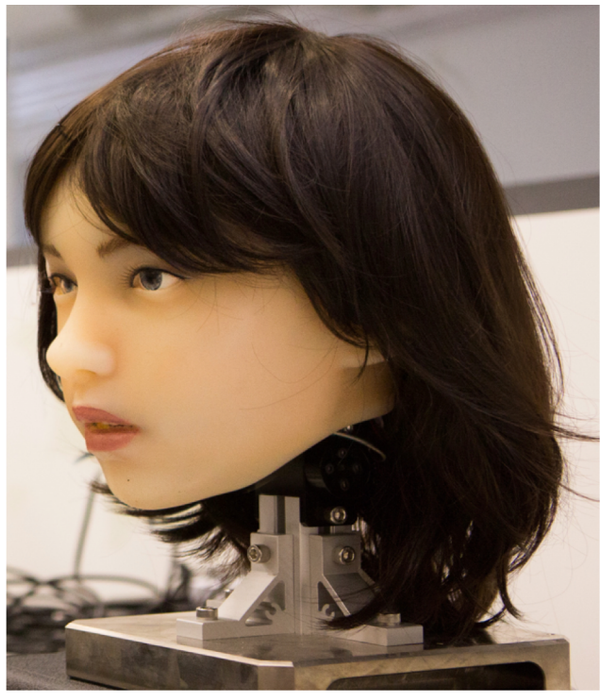
# Study 2 - Method (N= 91)

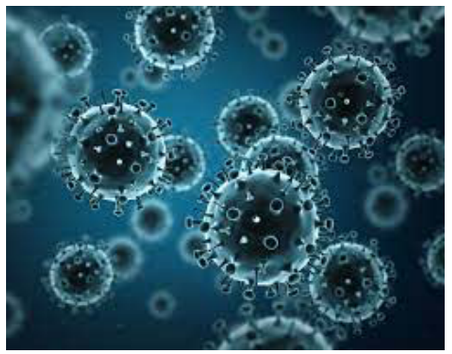



**Measures**

- Intelligence
- Likeability
- Animacy
- Anthropomorphism
- Safety
- Empathy
- Personality
- Participant behaviour

# Study 2 - Procedure



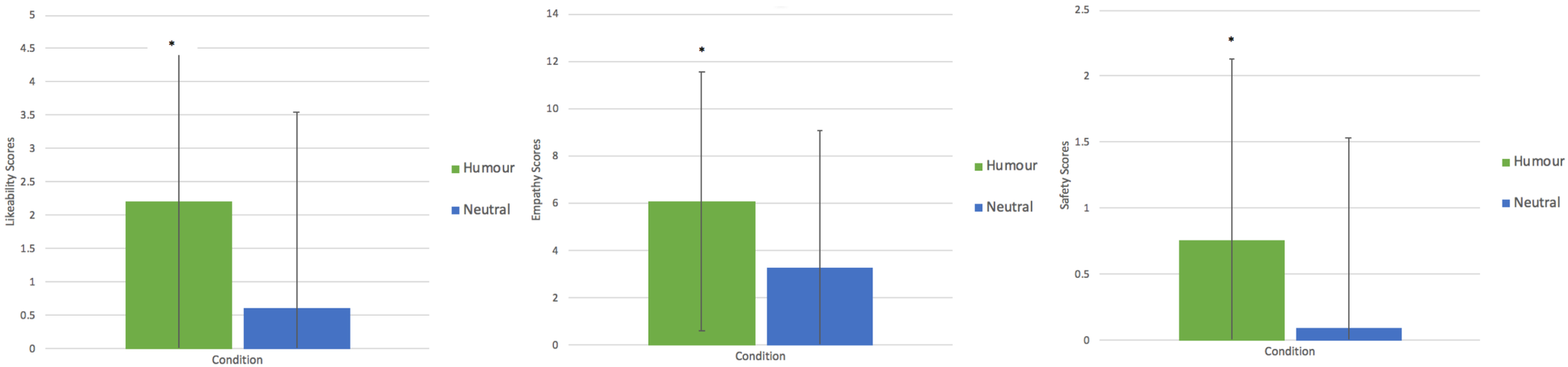


- Autonomous
- Scenario
- Scripted

*“I caught a computer virus once at it was terrible…that’ll teach me to use a strange computers flash drive”*

# Study 2 - Key Findings

- Significant positive effects of humour on participant perceptions




**Likeability** **Empathy** **Safety**

- Animacy – lower animacy scores at time point one
- Personality items – happy, humorous, sociable, talkative, warm, popular, and imaginative….frivolous
- Significant differences in participant laughing behaviours

# Study 3

**Aim:** To investigate the effect of a healthcare nurse robot using verbal and non-verbal clinical empathy behaviours on participant perceptions

Johanson, D. L., Ahn, H. S., Goswami, R., Saegusa, K., & Broadbent, E. (in submission). The effects of robot empathy on trust and satisfaction in a healthcare scenario.

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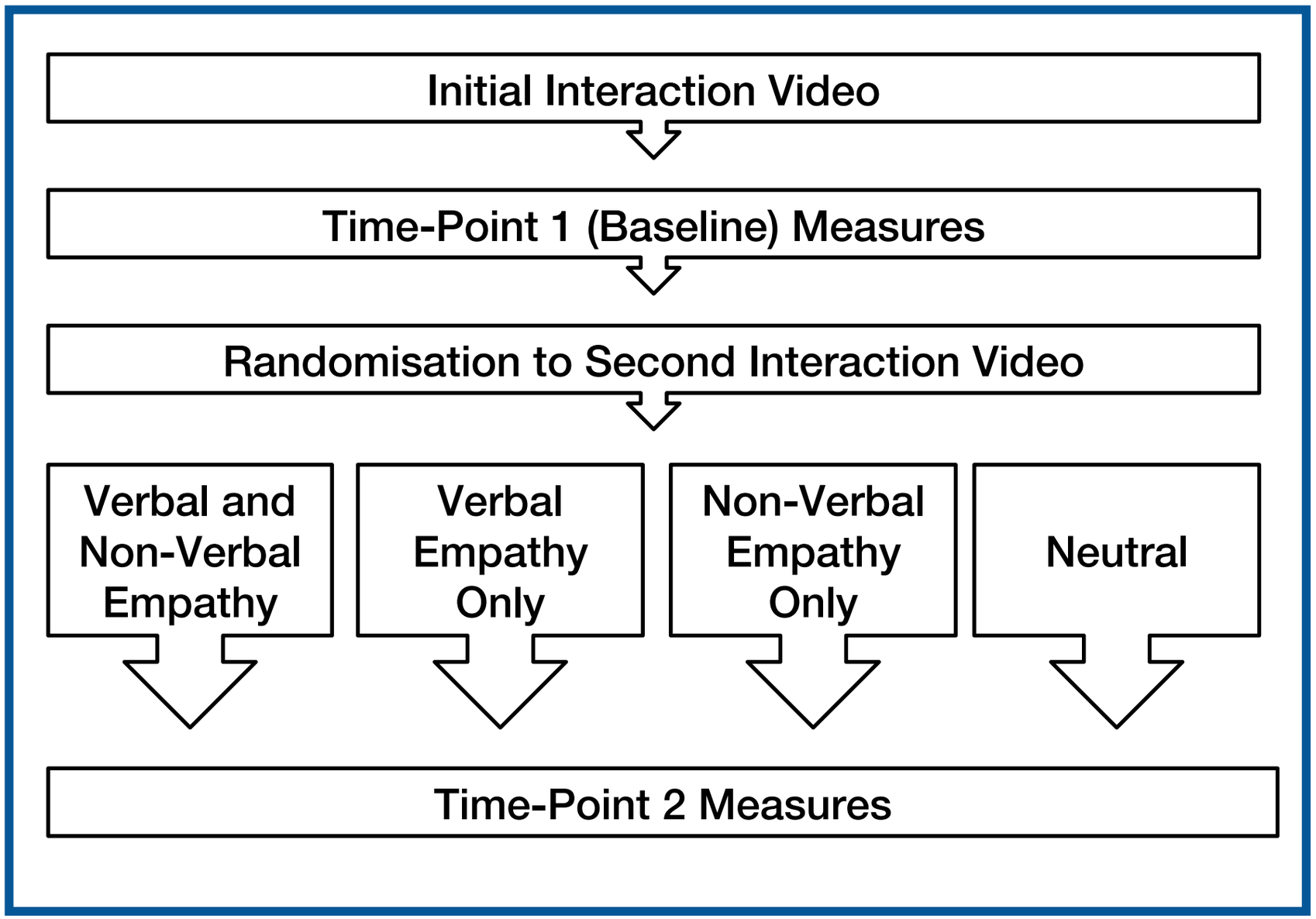
# Study 3- Method (N=100)

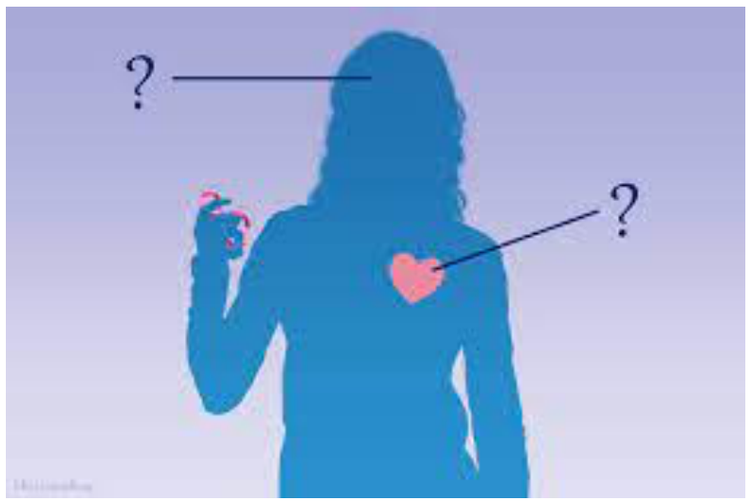



## Measures

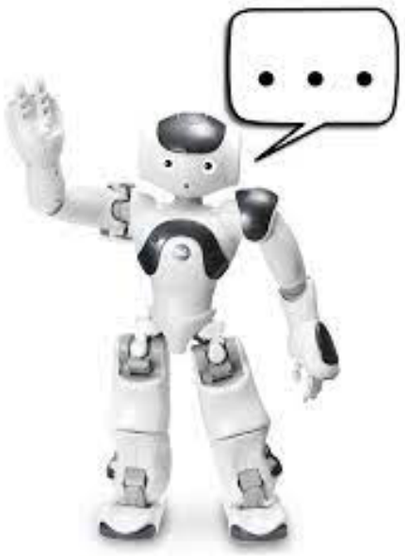
- Empathy
- Trust
- Satisfaction
- Desire to interact with robot face-to-face

# Study 3 - Procedure

?



# Study 3 - Procedure

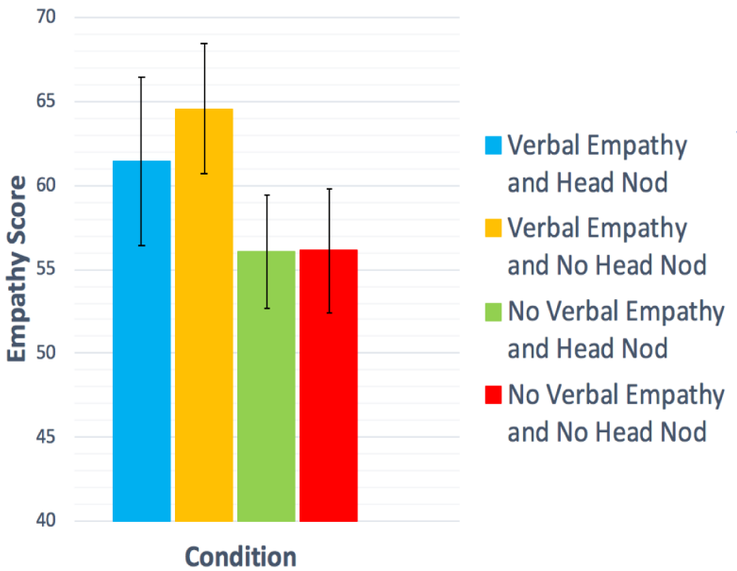


*“That sounds really hard. I can imagine that anyone in your situation would want to get some answers”*

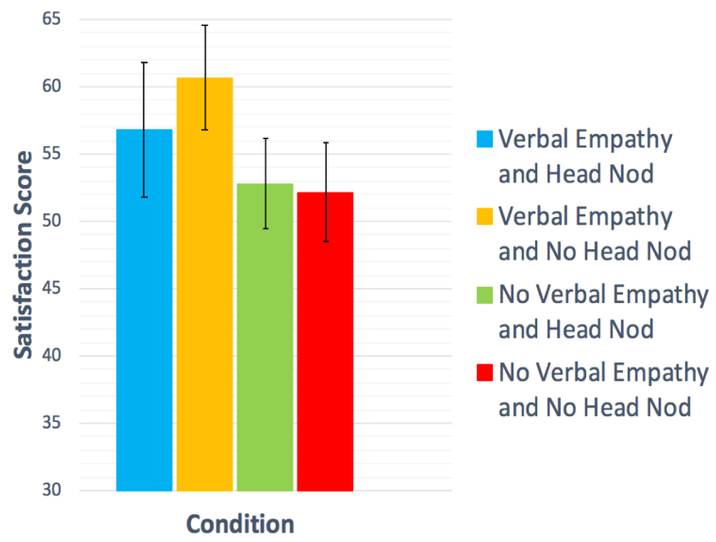
“*A lot of patients experience fatigue and sleep issues”*

# Study 3- Key Findings

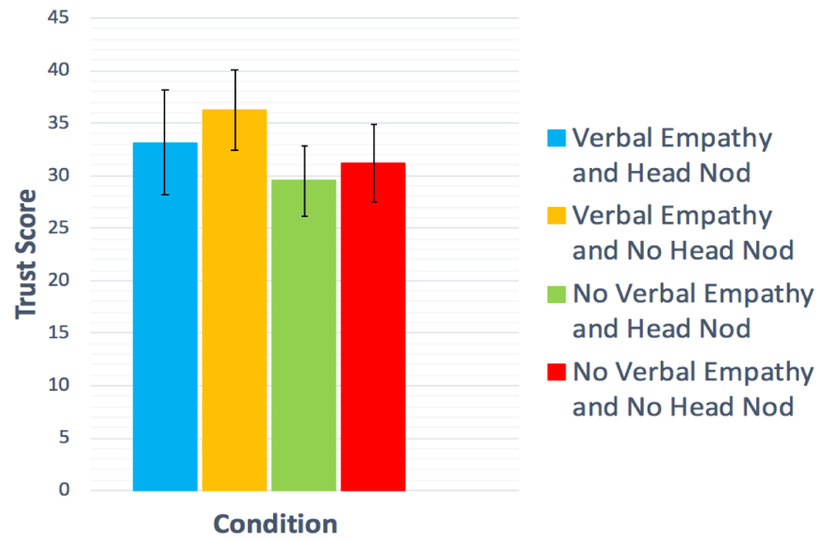
- Significant positive effects of verbal empathy on participant perceptions




**Empathy**




**Satisfaction**




**Trust**

- Robot Verbal empathy - Significantly lower levels of robot distrust
- No significant effect of head nodding on any outcome
- Potential explanation – not exaggerated enough for video format
- No significant interaction effects between head nodding and verbal empathy

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# Thank you