

Paired Non-Anthropomorphic Robots as Tangible Interfaces to Alleviate Loneliness: A Co-Design and Evaluation Study

AUTHORS

Miss. Ghofran Mhd Alnabelsi
gma4@hw.ac.uk

Supervisor: Assoc. Prof. Mauro Dragone
M.Dragone@hw.ac.uk

AFFILIATIONS

Heriot-Watt University, National Robotarium, Edinburgh Centre for Doctoral Training in Dependable and Deployable AI for Robotics
Edinburgh, Scotland, United Kingdom

THE PROBLEM:

- **Loneliness Epidemic:** High prevalence in young adults (20-45), linked to depression and physical health decline [1-5].
- **Ethical Gap:** Traditional social robots focus on replacing human contact (deception, over-reliance) [6-8, 14].
- **Proposal:** A "Robotic Bridge" design that mediates human-human touch rather than replacing it.

METHODOLOGY:

Co-design workshops (N=10):

- Two 2-hour sessions with adults aged 20-45 who experience loneliness.
- Identified emotional triggers and comfort behaviours (e.g., purring, crawling).

User study (N=23, 20-45 y.o.):

- Comparative study between two groups:
- **Group 1:** Standalone robot.
- **Group 2 (Figure 2):** Connected paired robot using Wizard-of-Oz [11].

THE CONCEPT: MEDIATED SOCIAL TOUCH (MST)

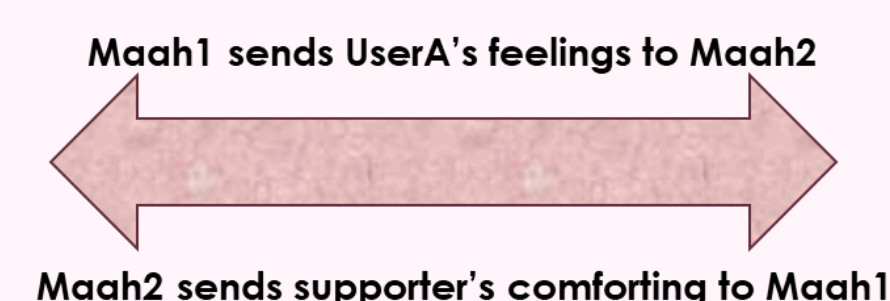
- **Robot:** Maah (Figure 1), Non-anthropomorphic, cushion-like [9, 10].
- **Mechanism:** Paired robots connected across distances.
- **Interaction:** User A's touch (e.g., a hug) is relayed as movement/sound to User B's robot, fostering embodied communication.



Figure 1: Maah Robot



Lonely User A hugging Maah1



Supporter petting Maah2

Figure 2: Paired MAAHs mediation scenario

RESULTS

Quantitative:

- **Almere questionnaire [12]:** connected robot saw a 15% increase in overall technology acceptance compared to the standalone version (Figure 4).
- **Godspeed questionnaire [13]:** users perceived the connected robot as more engaging and human-like overall, with a 7.9% increase in perception scores (Figure 5).

Qualitative & behavioural:

- Tactile feedback (purring/crawling) fostered immediate comfort; participants across both groups compared MAAH to a real pet.
- Group 2 users reported feeling understood and perceived the robot as a conduit for genuine human touch.
- The connected condition triggered higher physical hugging and kissing (Figure 3), and verbal ("I love you") affection compared to standalone use.

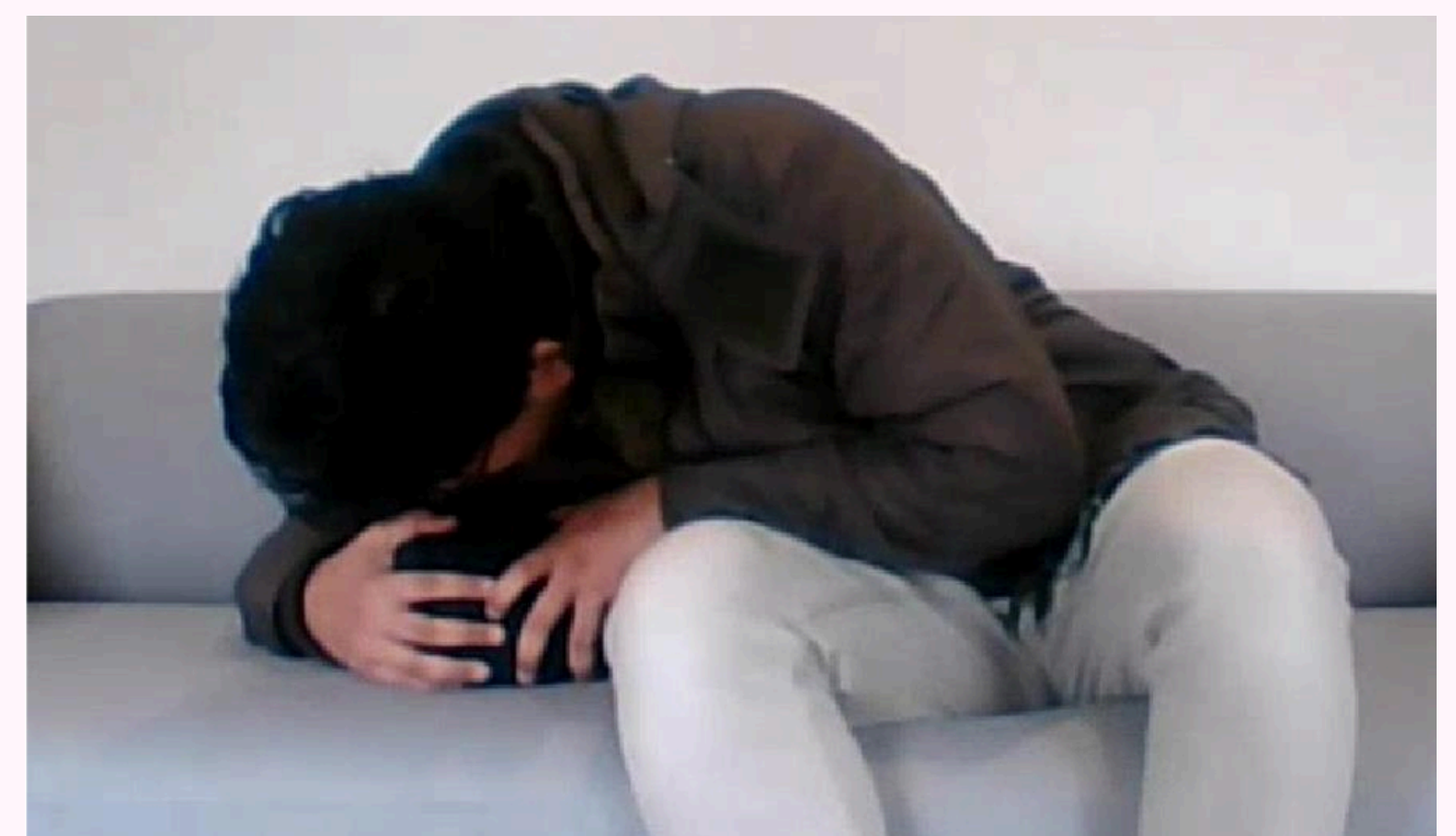


Figure 3: Group 2 participant kissing MAAH

Almere Questionnaire

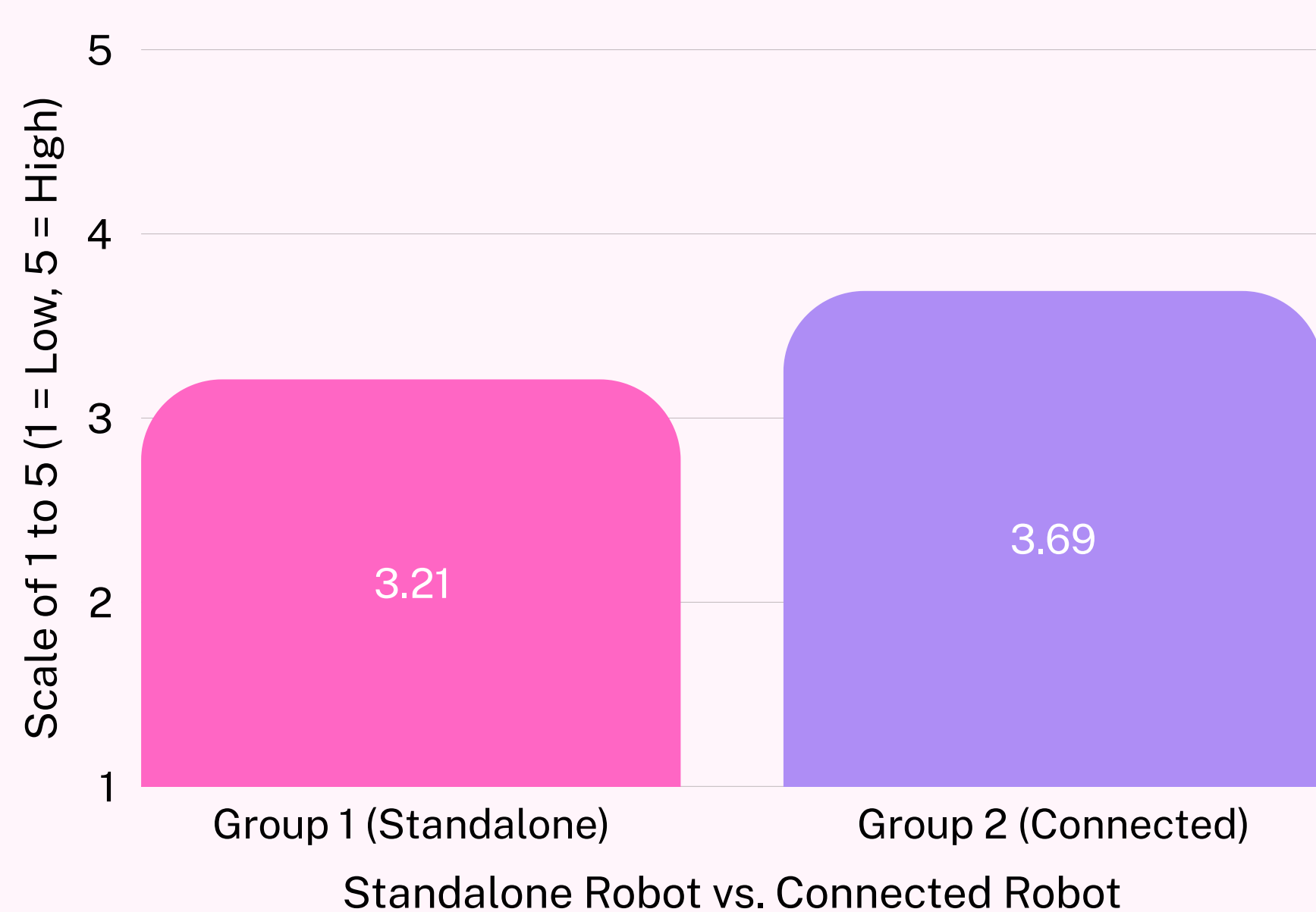


Figure 4: Almere Questionnaire mean scores in both groups

Godspeed Questionnaire

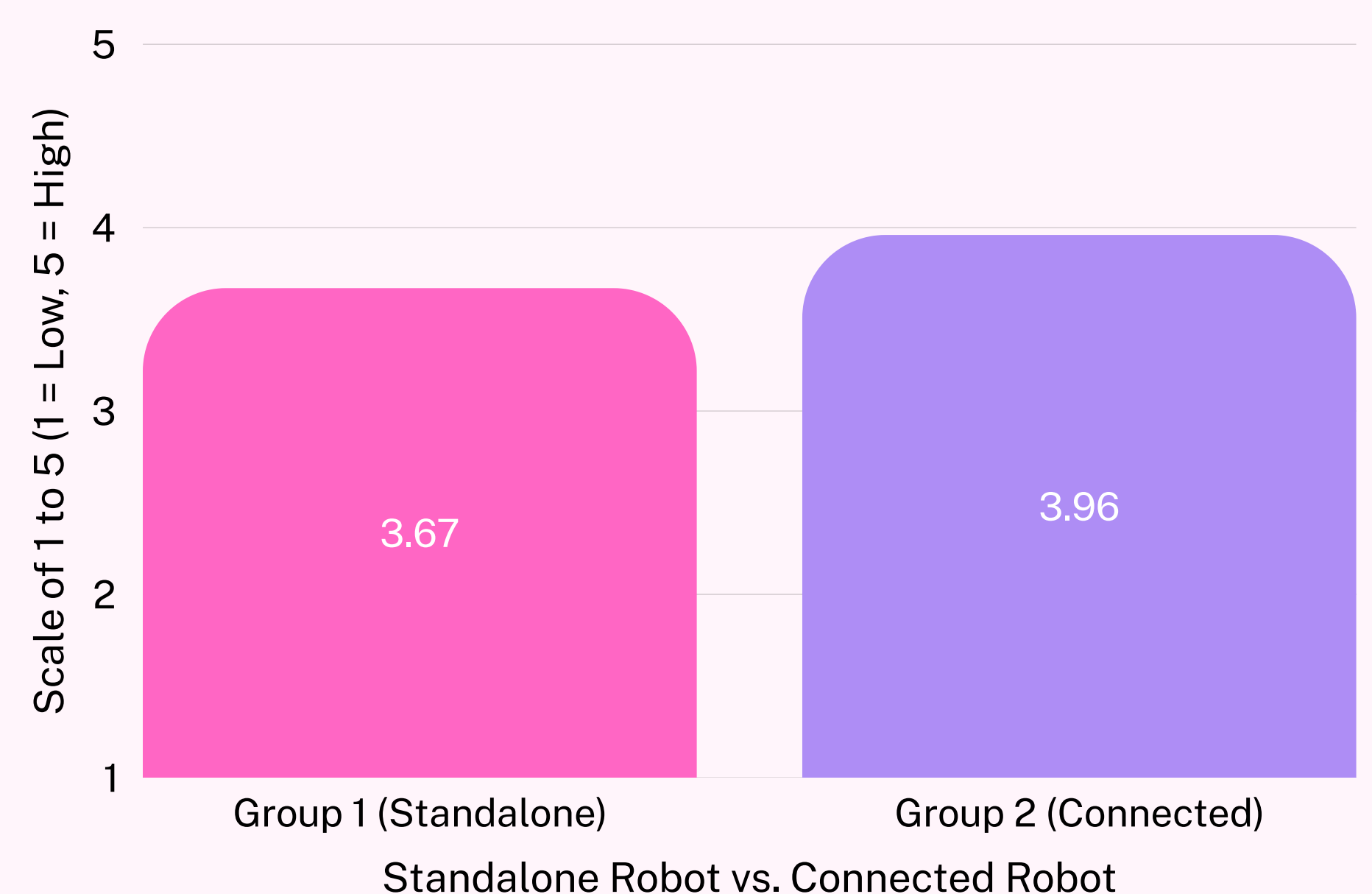


Figure 5: Godspeed Questionnaire mean scores in both groups

CONCLUSION

- Connected robots can act as an emotional bridge across physical distances
- Perceived connectivity enhances both acceptance and emotional perception of social robots.
- **Future Work** includes enhancing emotional expressiveness, moving to longitudinal (long-term) home studies, and developing Emotion-Aware algorithms to allow the robot to interpret and relay specific affective states autonomously.

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