

THE PERCEPTION OF PHANTOM COSTS IN HRI

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Introduction

- Overly generous offers without sufficient explanation elicit “phantom costs” (e.g., risk, ulterior motives).
 - Reducing the likelihood of accepting the offer [1].
- Robots are socially ambiguous (programmed yet social).



Research Questions

1. Do people perceive phantom costs in HRI?
2. How do phantom costs influence decision-making?
3. Do phantom costs differ from those in HHI?
4. What factors influence phantom costs?

Common methodology

- Offer paradigm: Human vs. Robot agents make offers with or without extra money with no further justification.
- Measures: Phantom cost ratings (Likert) and offer acceptance (yes/no).

Studies 1-3

N = 1,647; in-person and online



Human - Cookie



Human - Cookie + \$2



Robot - Cookie



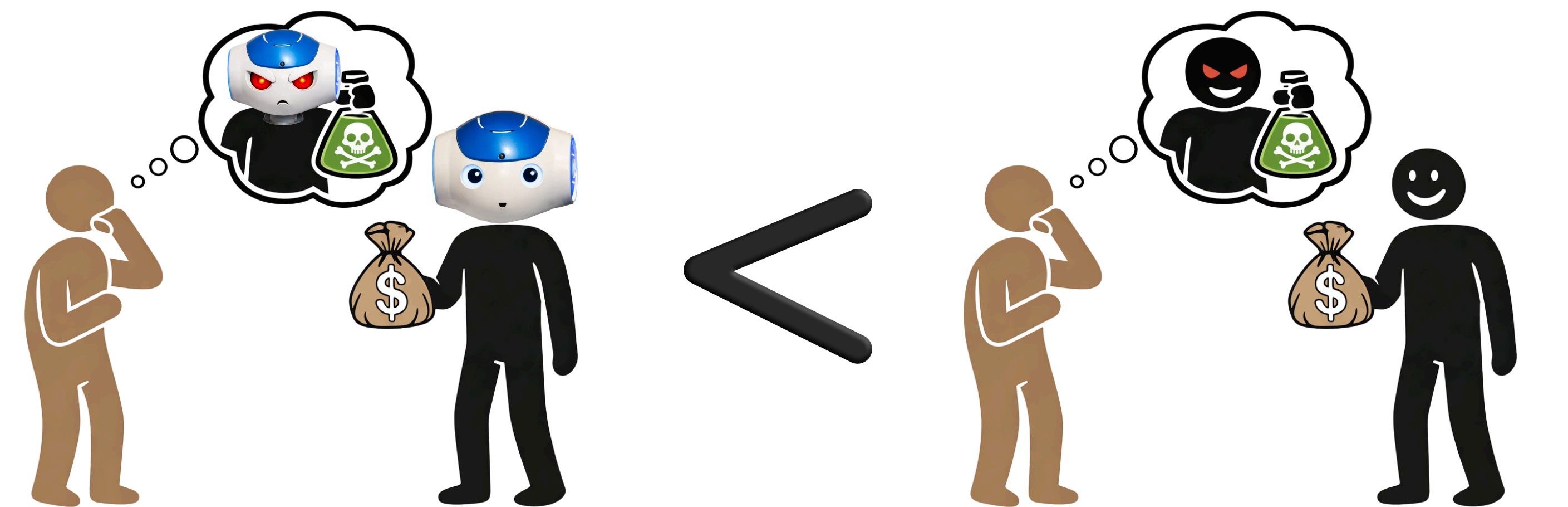
Robot - Cookie + \$2

Offer: Cookie with or without \$2.

Explanation: ate cookies with friends and have leftovers.

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Main findings:



Perceived plausibility of the explanation $\searrow$ PC and $\nearrow$ acceptance.

Study 4

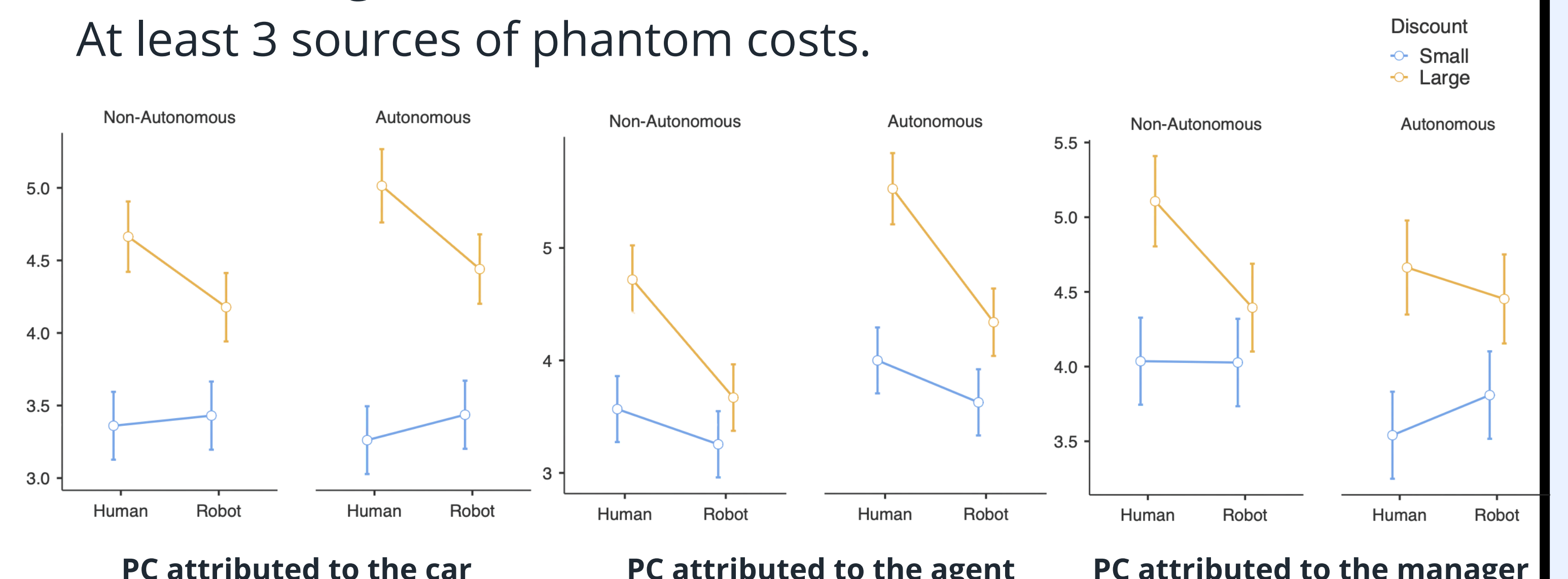
N = 855; online

- Car sales agent offer 5% or 85% discount
- Agent autonomy (decisions made by agent or manager)



Main findings:

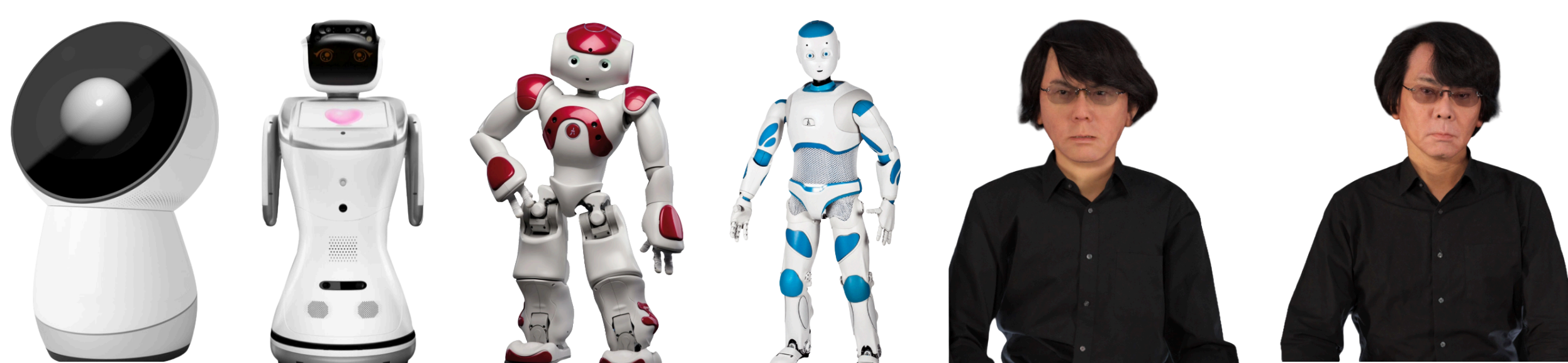
At least 3 sources of phantom costs.



Study 5

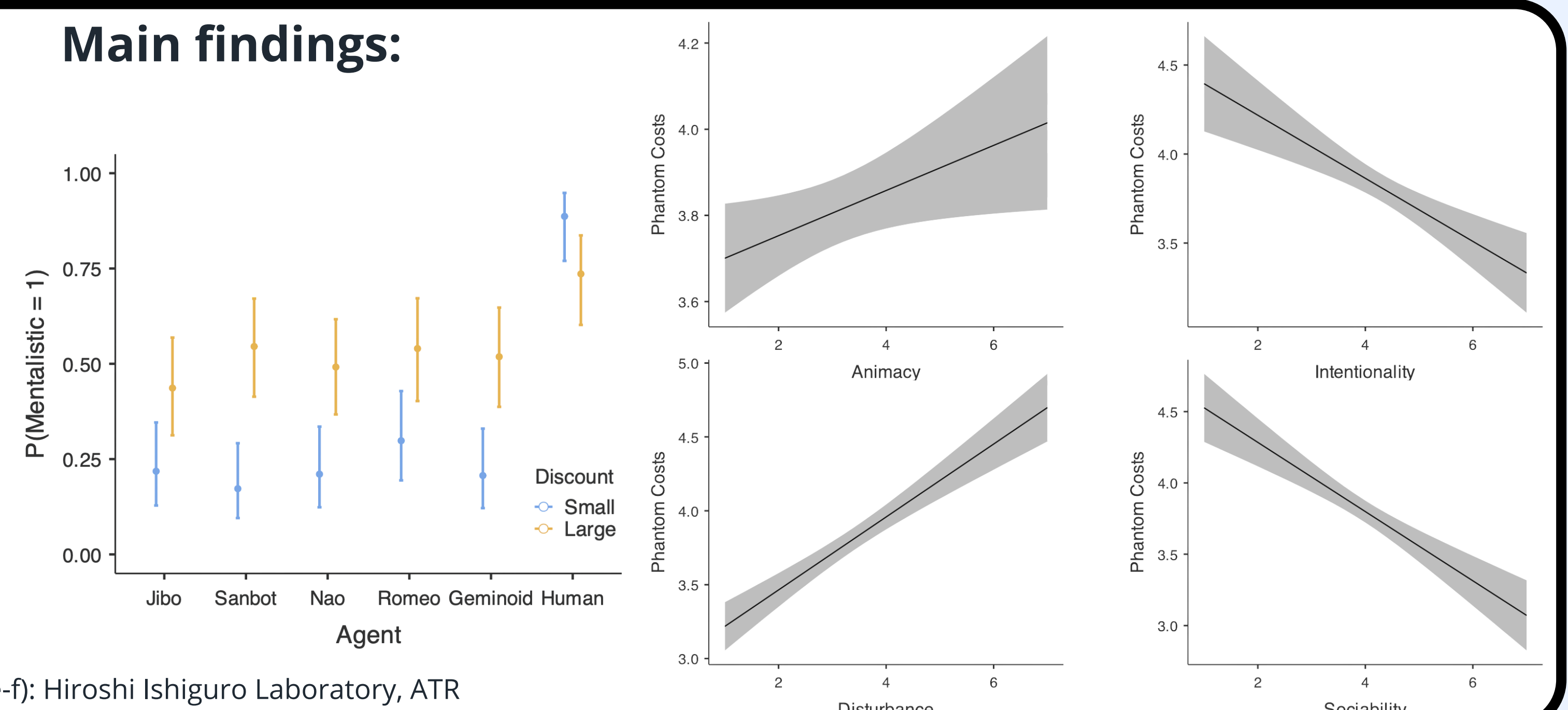
N = 664; online

- Parking spot for free or with unjustified extra \$10
- Anthropomorphism: HRIES questionnaire [3]
- Open-text: Why did the agent make this offer?



(a) Jibo (b) Sanbot (c) Nao (d) Romeo (e) Geminoid (f) Ishiguro

Main findings:



Credit for (e-f): Hiroshi Ishiguro Laboratory, ATR

Conclusion

To reduce phantom costs:

Robots should provide sufficient and plausible explanations for their actions. Designers should carefully control their robot's level of anthropomorphism and autonomy.

[1] A. Vonasch, R. Mofradidoost, and K. Gray. 2024. People Reject Free Money and Cheap Deals Because They Infer Phantom Costs. *Personality and Social Psychology Bulletin* 0, 0 (2024), 01461672241235687. doi:10.1177/01461672241235687

[2] B. Lebrun, C. Bartneck, and A. Vonasch. 2025. Phantom Costs in HRI: A Replication Study. In *Proceedings of the 2025 ACM/IEEE International Conference on HRI (Melbourne, Australia) (HRI '25)*. IEEE Press, Piscataway, NJ, USA, 1037–1041. doi:10.1109/HRI61500.2025.10974228

[3] Nicolas Spatola, Barbara Kühnlenz, and Gordon Cheng. 2021. Perception and Evaluation in Human–Robot Interaction: The Human–Robot Interaction Evaluation Scale (HRIES)—A Multicomponent Approach of Anthropomorphism. *International Journal of Social Robotics* 13, 7 (2021), 1517–1539. doi:10.1007/s12369-020-00667-4