

Human-Likeness and Empathy in AI Avatars:

Enhancing Passenger Experience in Autonomous Public Vehicles

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Introduction

- Automated public transport vehicles (APTVs) can enable more sustainable, efficient public transport (European Commission, 2025).
- No driver: the **absence of drivers** requires alternatives for information, orientation, and accessibility.
- Suggestion: a robot or **avatar to support passengers** (Schmalfuß et al., 2026; Schuß et al., 2022)
- A digital companion (DC) improved perceived **security, trust, comfort and user experience**; appearance/persona matter (Schuß, Pizzoni, et al., 2024; Schuß, Röhr, et al., 2024).
 - Human-like DC was perceived more positive than the robot-like DC.
 - *Open question: Is a human-like visualization necessary?*

Hypothesis 1: Human-like avatars increase perceived safety/security and trust compared with minimalistic visualization.

- Canales, Roble and Neff (2024) found avatar stylization (incl. empathy) improved avatar evaluation.

Hypothesis 2: Empathetic DC increases trust, safety/security, and user experience compared to neutral DC.



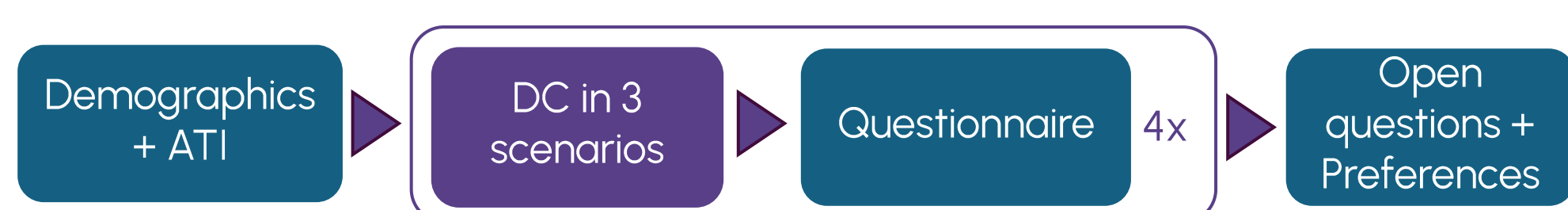
Figure 1. Digital companion: abstract (left), human-like (center), presentation setup in online study (right)

Method

Online study (20 min)

- 104 participants** (74 f, 29 m, 1 d; age: $M = 25.1$ years ($SD = 8.7$ years); PT use: 49% daily; 34.6% weekly; 10.6% monthly; 5.8% yearly or less)
- ATI (Franke, Attig, & Wessel, 2019): $M = 3.73$, $SD = 1.05$, $\alpha = .93$
- 2 (appearance (A): human-like vs. abstract visualization) x 2 (empathy (E): friendly & empathic vs. neutral) within-subject design**

Procedure:



- Each DC in all three scenarios (randomized)**



➔ Ratings via questionnaire after each DC version: Trust, Safety & Security, User experience - UEQS (Schrepp, Hinderks, & Thomaschewski, 2017)

References

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Results

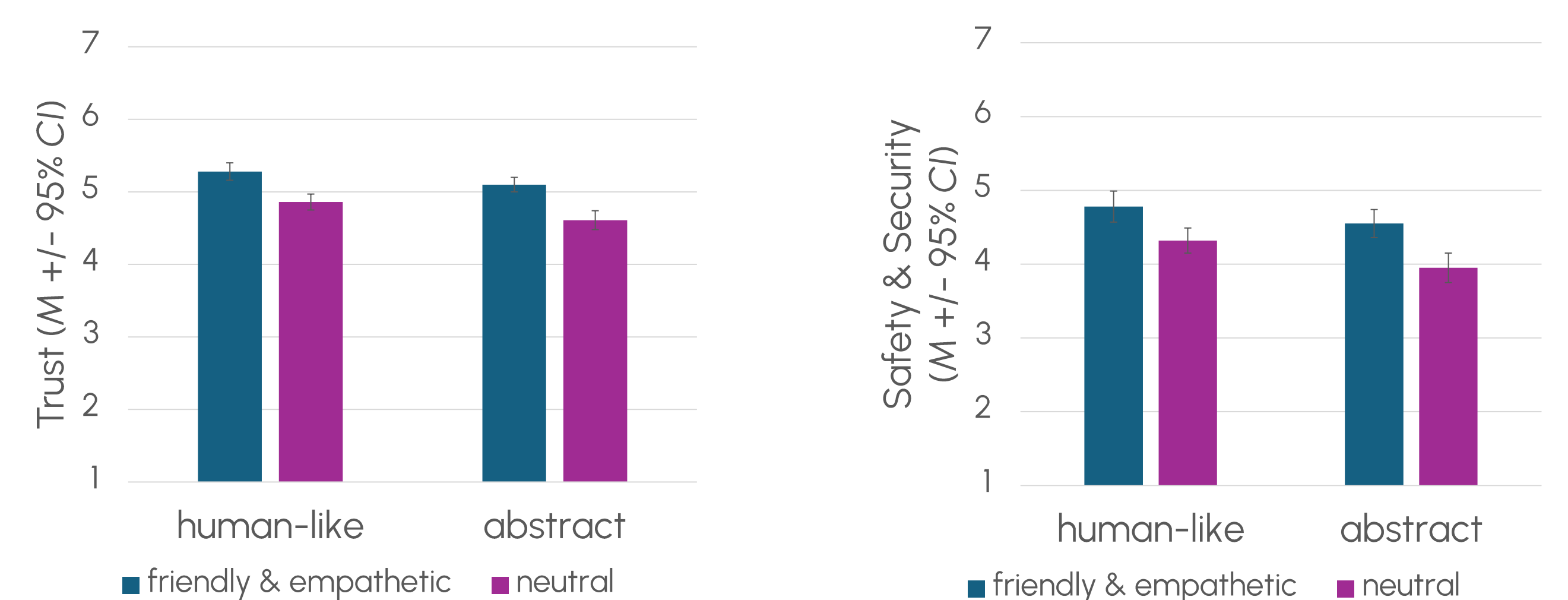


Figure 2. Mean trust and safety ratings by Digital Companion appearance (A) and empathy (E).

Trust

- Higher trust for human-like DC**
 $F(1, 103) = 9.522, p = .003, \eta_p^2 = .085$
- Higher trust for empathetic DC**
 $F(1, 103) = 51.762, p < .001, \eta_p^2 = .334$

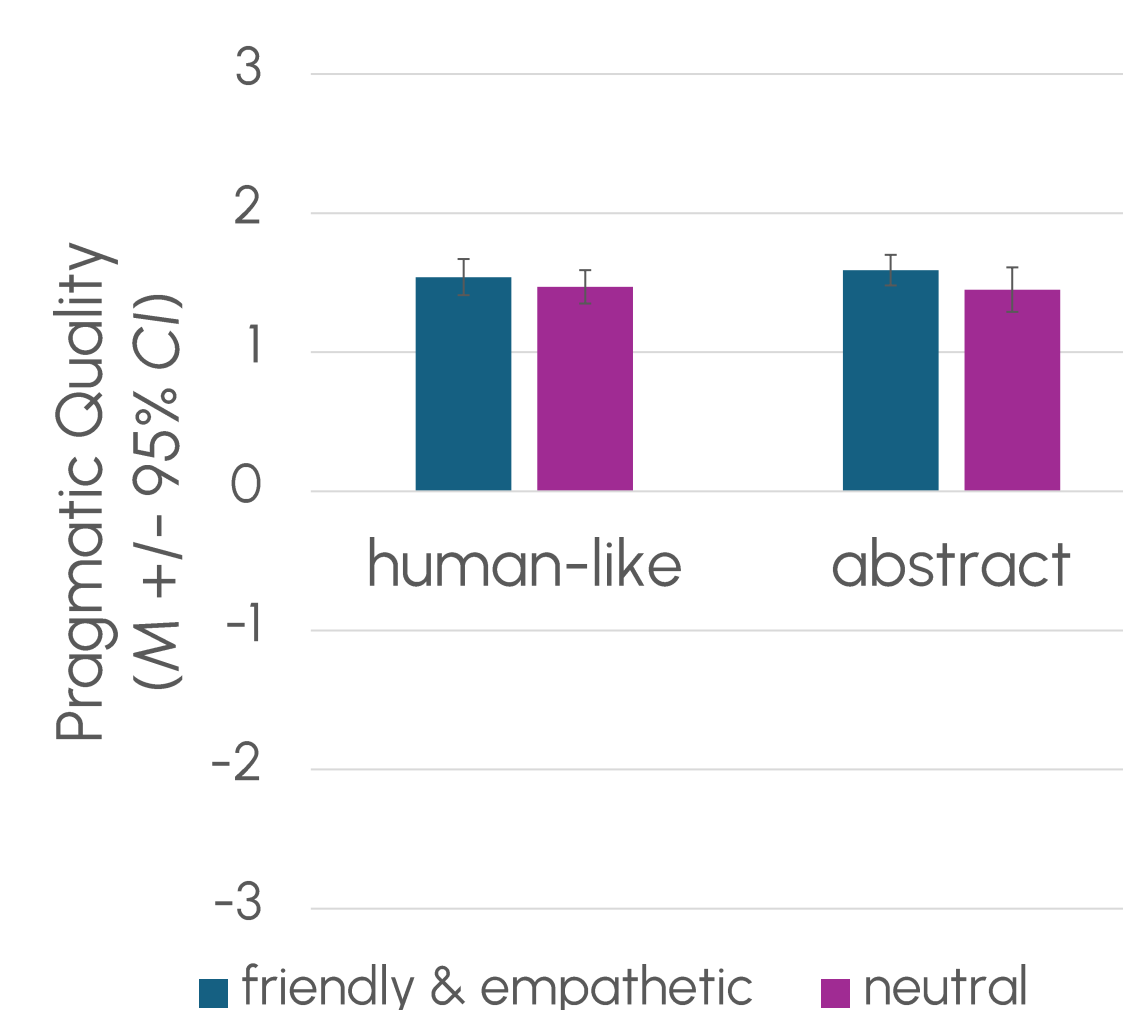


Figure 3. Mean user experience ratings by Digital Companion appearance (A) and empathy (E).

Pragmatic Quality:

- No effect of appearance or empathy
- Interaction not significant

Safety & Security:

- Feeling safer with human-like DC**
 $F(1, 103) = 5.656, p = .019, \eta_p^2 = .052$
- Feeling safer with empathetic DC**
 $F(1, 103) = 43.160, p < .001, \eta_p^2 = .295$

Hedonic Quality (HQ):

- Human-like DC with higher HQ**
 $F(1, 103) = 30.470, p < .001, \eta_p^2 = .228$
- Empathetic DC with higher HQ**
 $F(1, 103) = 13.243, p < .001, \eta_p^2 = .114$

Correlations:

- Gender correlated with all dependent variables—women rated higher ($r = -.25$ to $-.39$, all $p \leq .011$)
- No significant correlations with age, ATI, or PT usage

Discussion

- Visual representation and empathy of DCs** primarily affects trust, perceived safety & security and hedonic quality.
- Empathetic communication** is more critical than visual embodiment for trust and safety & security in APTVs.
- No interaction effects: **visualization and empathy contribute independently** to user judgments.
- Gender effect:** higher ratings by women rated higher; preference for avatars matching in users' age and gender (Ter Sal et al., 2020).
- Implication: Prioritize linguistic style and social behavior:** abstract visuals can still be rated positively with empathetic language

