

Effects of Virtual-Agent Gender and Gaze While Waiting in a Confined VR Space

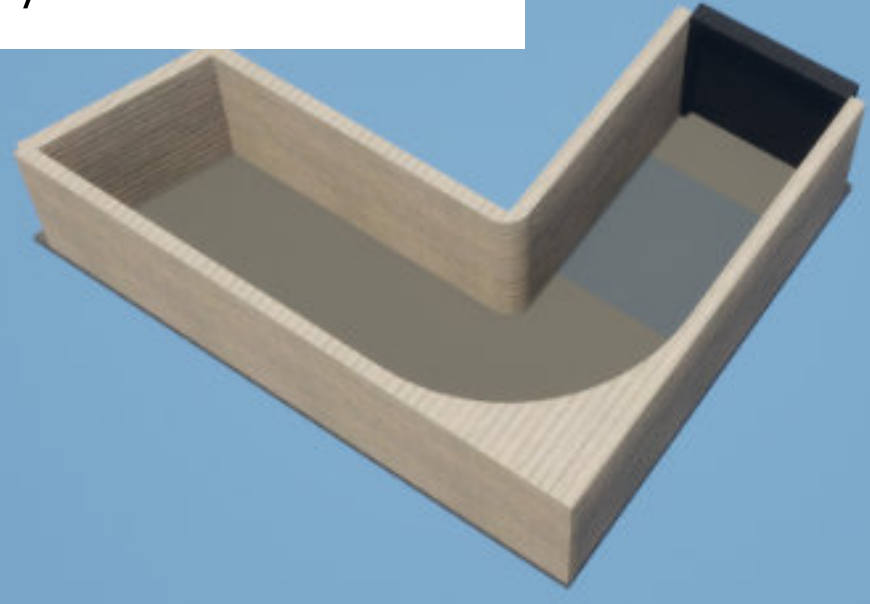
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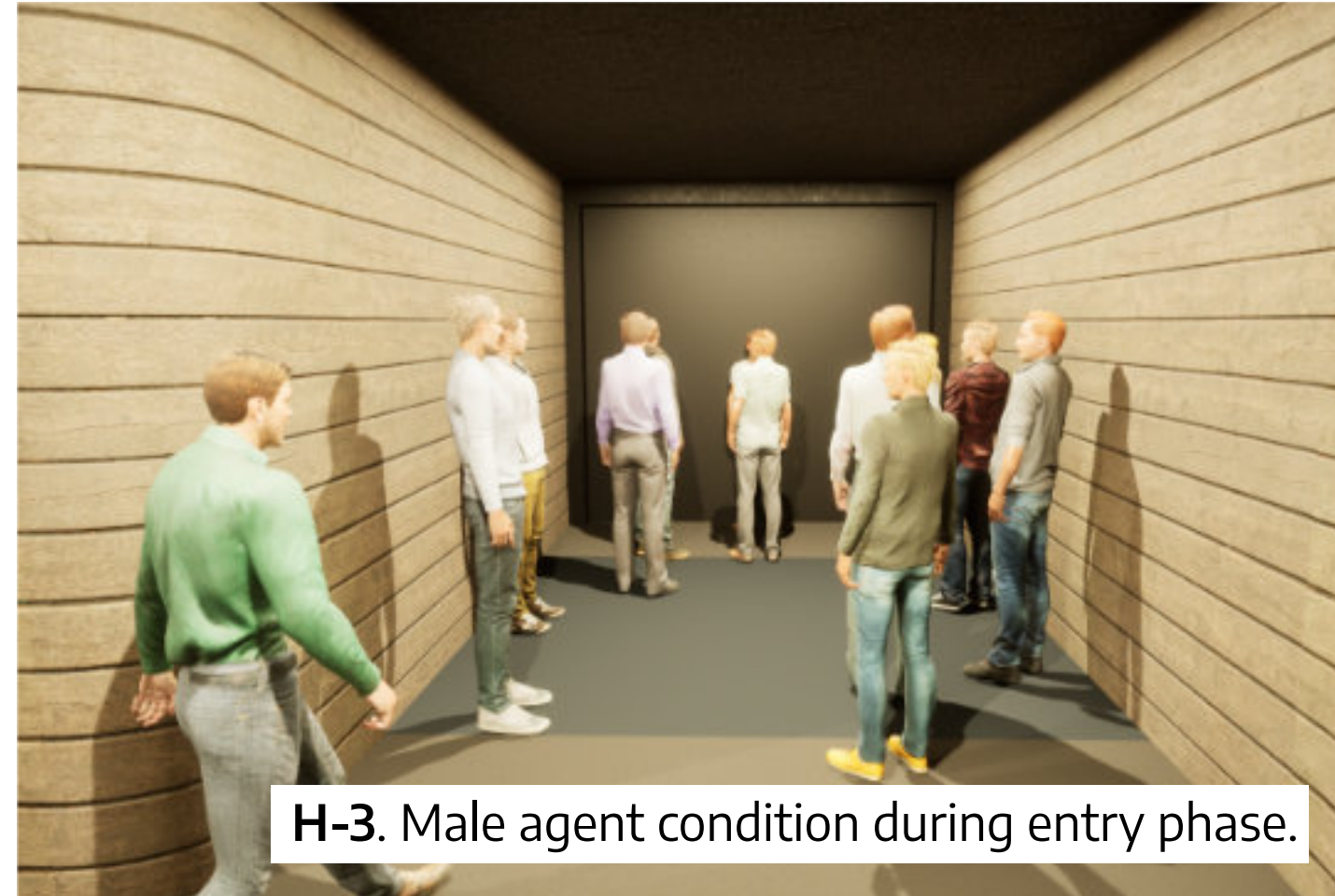
Header. Visual impression of the study's environments.



H-1. Third-person layout view of the waiting area.



H-2. Familiarisation area.



H-3. Male agent condition during entry phase.



H-4. Visible venue area when doors are open.

1. Introduction

Background

- Human gaze is a fundamental non-verbal cue for navigation, safety, comfort and non-verbal space negotiation
- VR reliably reproduces social-psychological phenomena such as *Civil Inattention* (CI) [Goffman1963] and *Intimacy Equilibrium* (IE) [Argyle1965]
- Gaze already studied in open-crowd dynamics

Research Gap

No work on gaze effects while waiting in confined spaces with Virtual Agent crowds.

Research Questions

RQ1 How do virtual agents' (VAs) gender (male/female) and gaze behavior (directed/averted) influence participants' proxemic and gaze behavior?

RQ2 What is the effect of VA gaze direction on user experience and perceived social presence?

3. Preliminary Results

Trajectory (Proxemic) Findings

- Participants kept ≥ 60 cm from VAs, most stayed in the central zone (60–80 cm) or between agents (40–60 cm)
- Initial waiting spot rarely changed later
- C_M : female participants chose the most central spots (>70 cm) or moved behind agents
- C_{FD} : both genders followed tighter paths and kept larger distances

Gaze-Behavior Findings

- Fixation: ≥ 150 ms on an area-of-interest [Manor2003]
- Environment-to-VA fixation ratio: $\approx 7:3$ (male) vs $\approx 9:1$ (female) $\rightarrow$ focus mainly on surroundings (see Fig. 3)
- Female participants: more fixations in opposite-sex conditions ($C_M \approx 213$ vs $C_F \approx 188$) but longer fixations in same-sex conditions ($C_M \approx 0.60$ s vs $C_F \approx 0.74$ s)

Self-Report Highlights

- Overall low perceived social interaction & crowd awareness
- Female participants reported lower comfort with male VAs, especially in C_{MD}

2. Pilot Study Setup

Environment Setup (see Fig. 1 and header images)

- Analogue to an entrance to a small local concert
- 12 stationary VAs mimic real-world roles (small groups, early arrivers, observers, bouncer) [Hoogcarspel2026]
- Subtle idle animations, damped ambient sounds
- VA placement forms a an empty area that encourages participants to "fill-in" the space

Experimental Conditions

- 2×2 factorial:
VA gender (male/female) $\times$ gaze direction (averted/directed)
- Four conditions: C_{MA} , C_{MD} , C_{FA} , C_{FD}

Participants

- Within-subjects pilot
- $n = 8$ (5M, 3F, age: 24.63 ± 4.66 years)

Study Flow

- 3 min familiarisation
- Each participant runs all four conditions à 3 min
- Order $C_{FA} \rightarrow C_{FD} \rightarrow C_{MD} \rightarrow C_{MA}$
- For every condition:
 - Start at marked position
 - Walk into area
 - Wait 3 min
 - Door opens + initial crowd motion

Entry (see Fig. 2 and H-3)
Waiting
Release

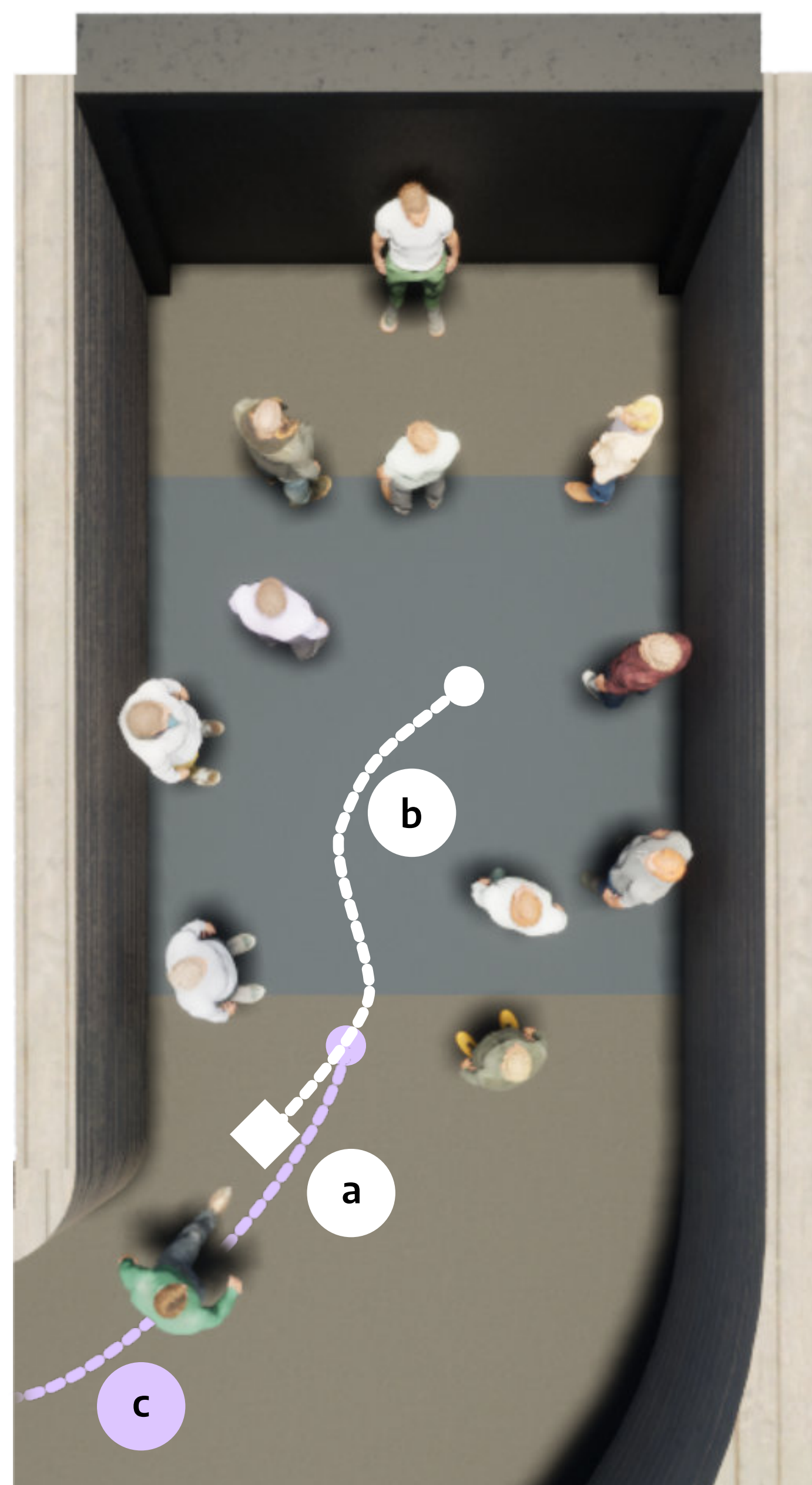


Fig 2. Sketch of the entry phase in a study condition. Participants start at the initial position (diamond next to (a)), facing the door, and are tasked to walk to their preferred waiting location (b). Meanwhile, VA1 (see Fig. 1) walks around the corner (c) to its defined location, closing the area after participants entered it, thus preventing participants to escape the area by social proximity means.

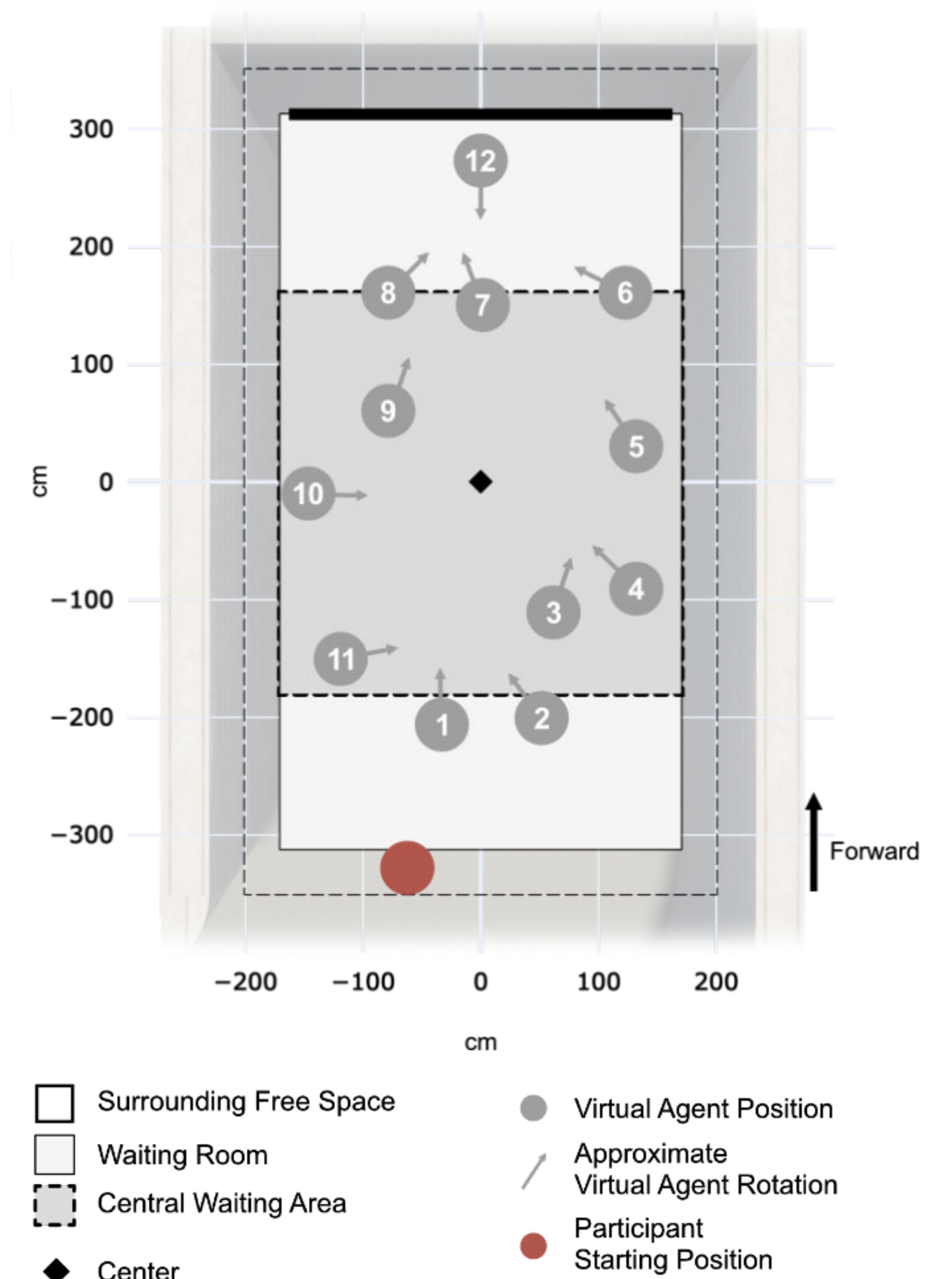


Fig 1. Sketch of environment setup (6.4 m $\times$ 3.4 m). The inner gray square (3.4 m $\times$ 3.4 m) is the real waiting area. Numbered circles and attached arrows represent VA waiting positions and rotations.

QR-Code to video showcase:



4. Take-Aways

Preliminary data suggests that ...

- VA gender (opposite-sex) increases interpersonal distance and fixation counts, confirming the proxemic effect (RQ1).
- Changing VA' gaze direction shows no consistent impact on comfort or social presence (RQ2).
- A larger, properly balanced study is needed to validate these preliminary findings

5. References

- Argyle1965. Eye-Contact, Distance and Affiliation
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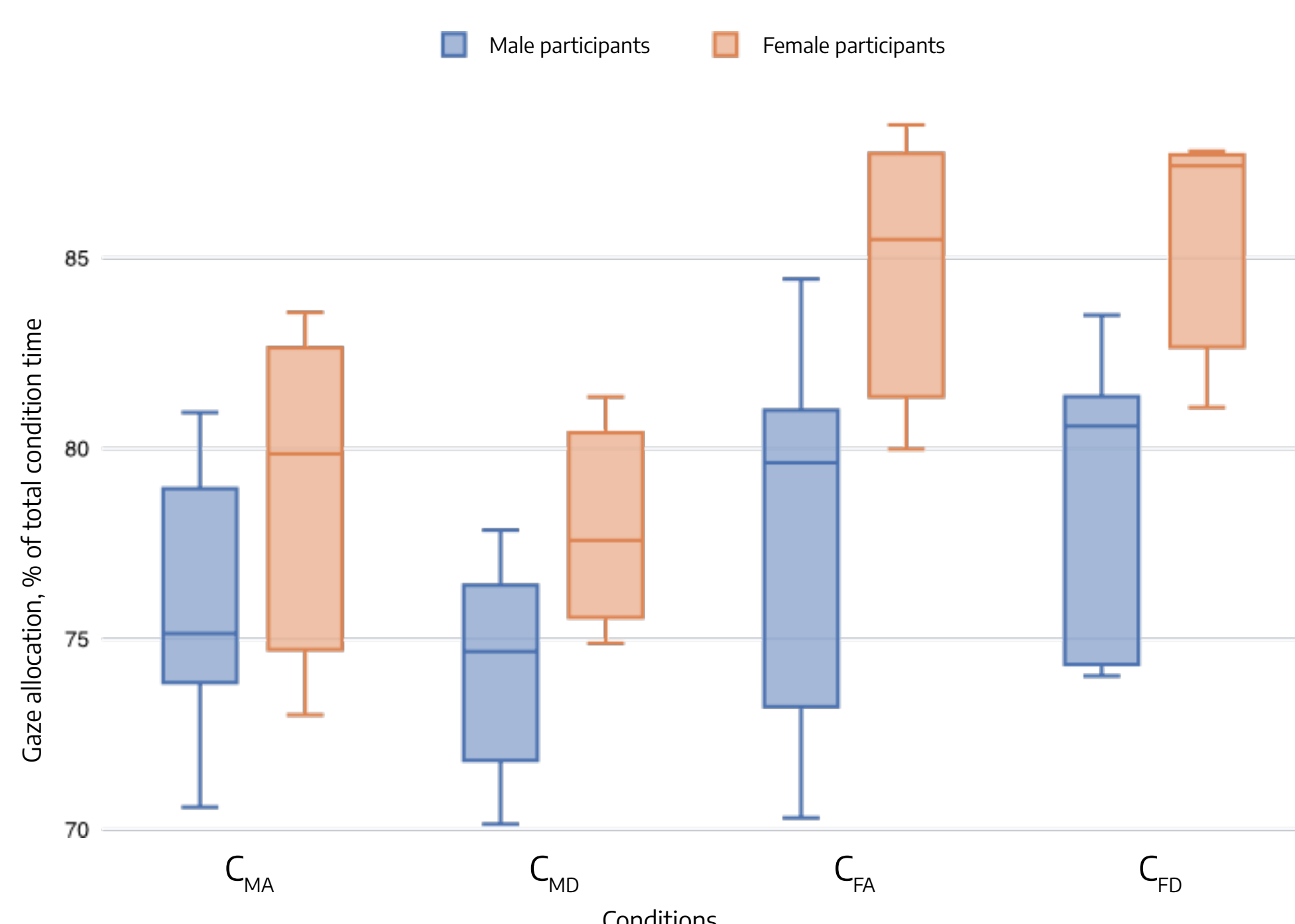


Fig 3. Gaze allocation results per participant gender in all four conditions.