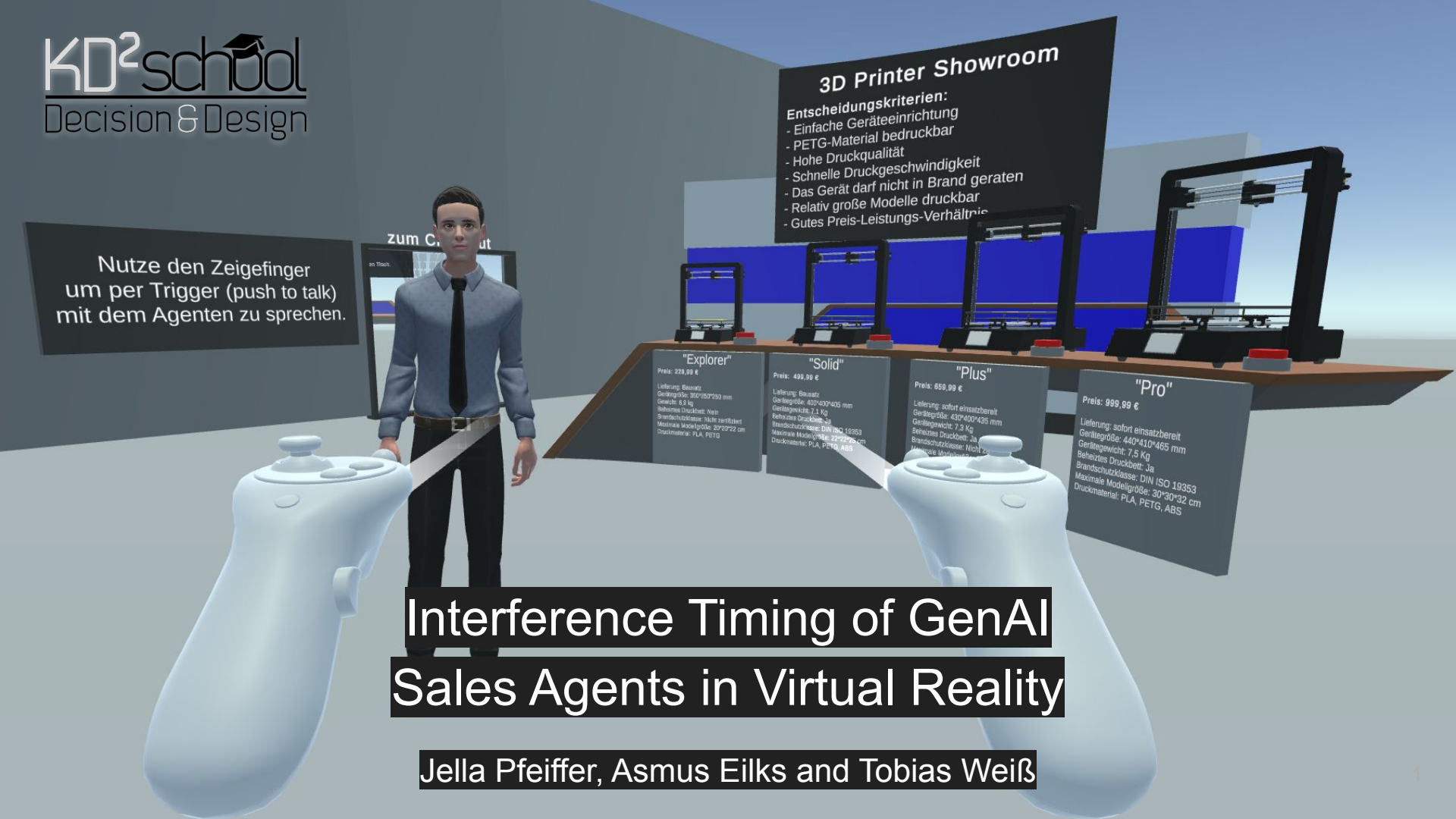


Interference Timing of GenAI Sales Agents in Virtual Reality

Jella Pfeiffer, Asmus Eilks and Tobias Weiß

General motivation:

How to integrate AI, particularly LLMs, into business use-cases?

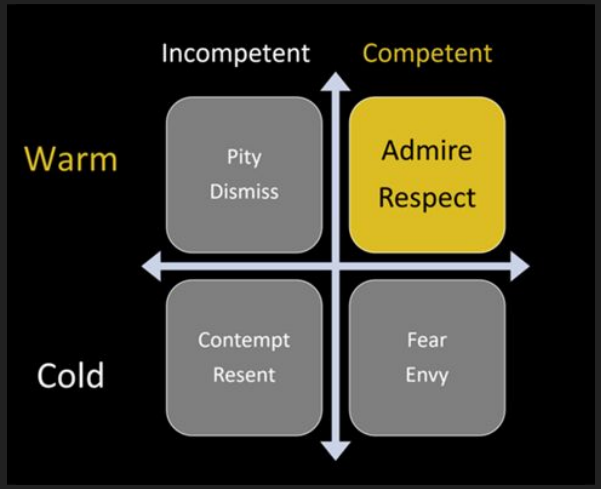
https://www.bing.com/images/create/ai-bubble-bursting/1-66ba26a96dd548879a1722bba1d063d5?id=5obx3nG9189VGiDPzHVrzw%3d%3d&view=detailv2&idpp=genimg&thId=OIG1.Dns8nHf989tjVKBVunto&skey=dXLzTP64ZDLrgvX7gNO0AZr3e5P5gJlWSM_WKSz34BU&FORM=GCRIDP&mode=overlay

Our research question

What is the difference between
instant and **adaptive**
interference of an AI agent
on the **first impression**
and **user experience**?

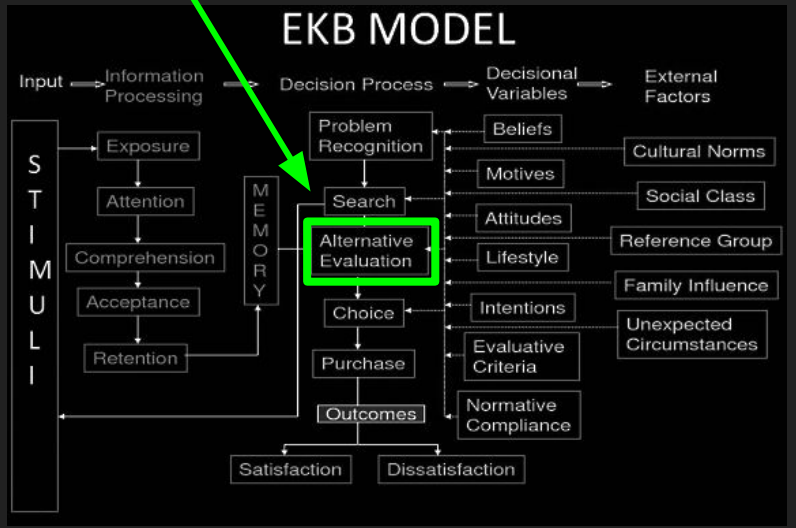
Theory: First impression (Bergmann et al. 2012)

- Reportedly impacts sales effectiveness (Evans et al. 2000)
- Assumption: Competence and warmth as key constructs
- Universal dimensions of social cognition (Fiske et al. 2007)
- Warmth is more important because it is judged first (Wojciszke and Abele 2008)



Theory: Interference timing (Hall et al. 2015)

- Assumption: Good timing in early **evaluation** stage of the Engel Kollat Blackwell (EKB) model (Engel et al. 1968)
- Rationale: Consumers need a product overview to develop questions
- Eye tracking to determine **product focus time**

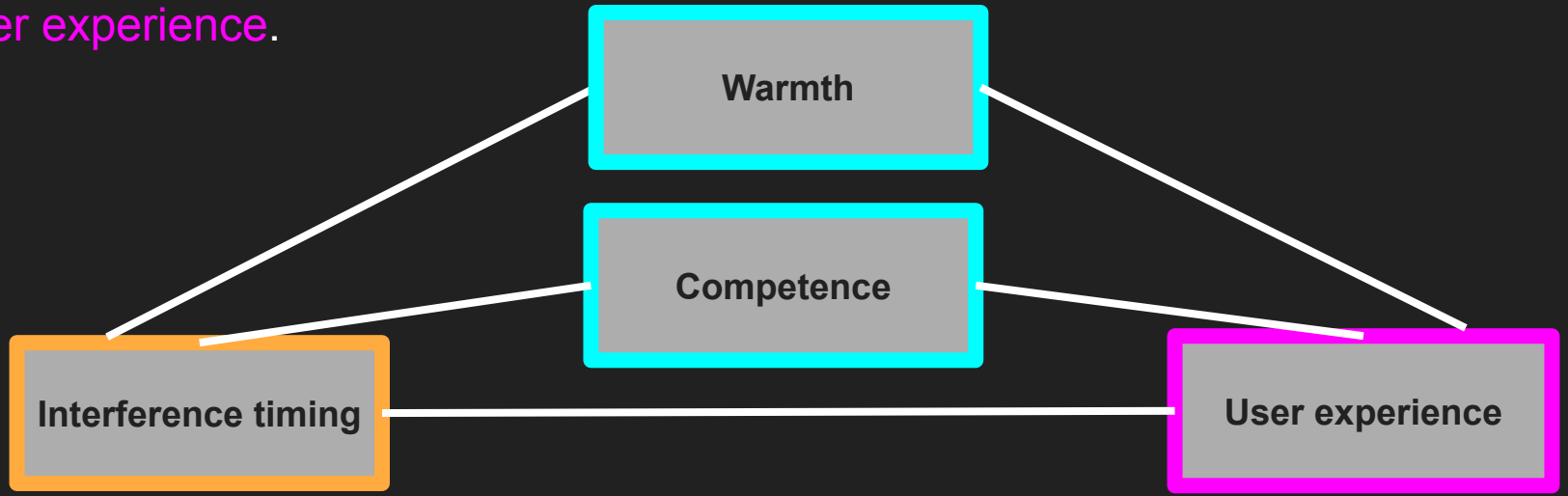


H: Timing impacts UX mediated by first impression

AsPredicted preregistration number #176827:

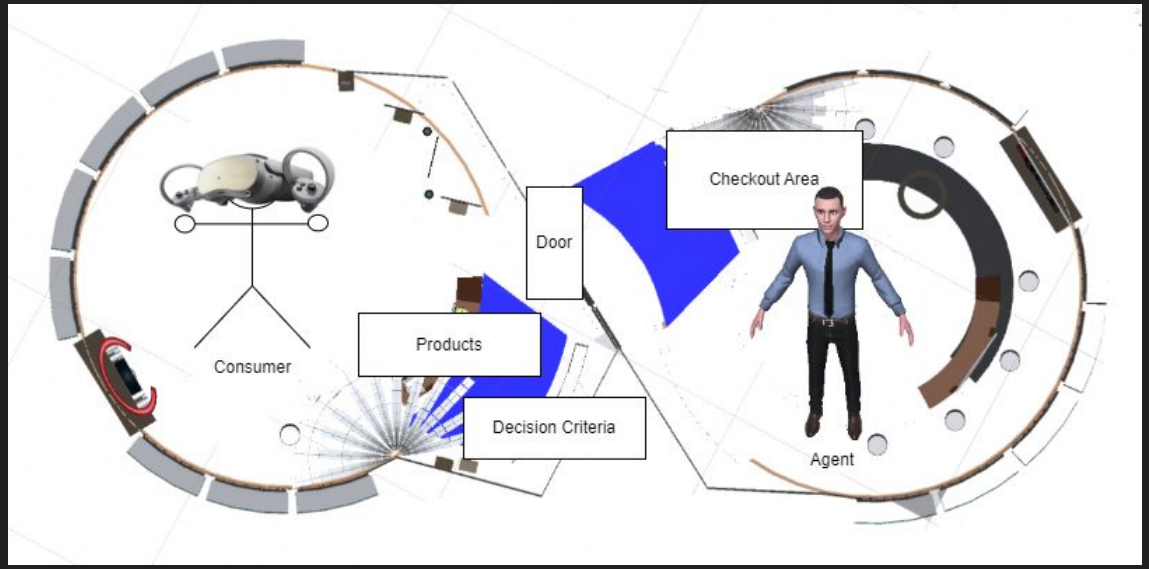
H1) The interference timing of an AI agent influences the user experience.

H2) The first impression of the agent is a mediator for the perceived difference in user experience.

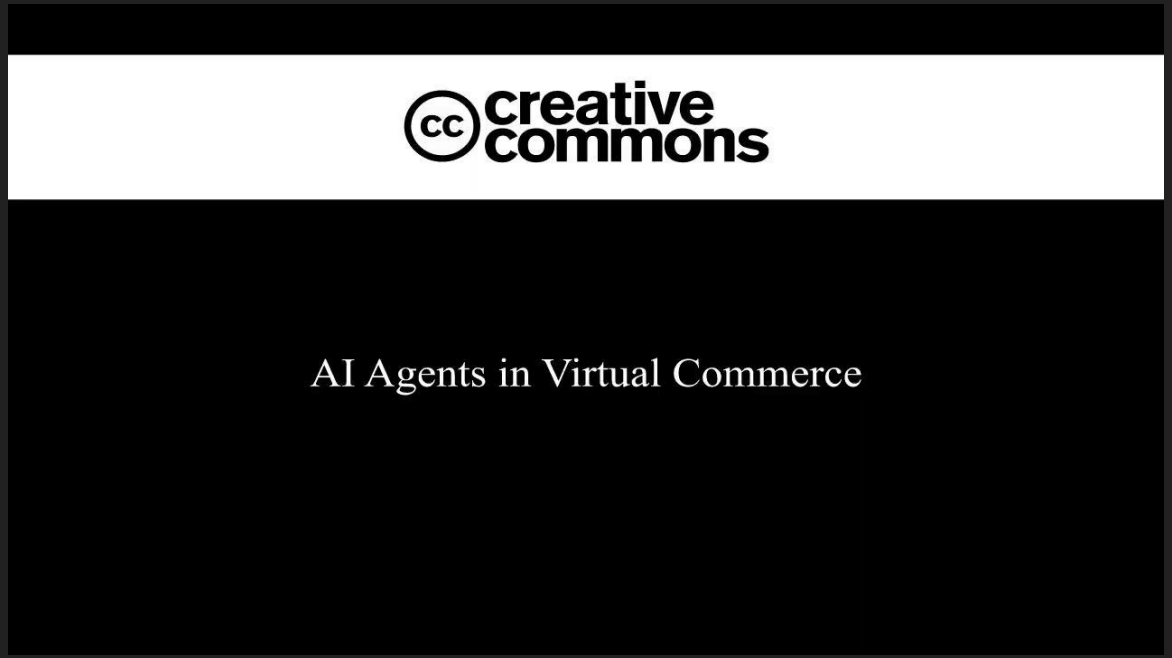


Experiment environment: Virtual sales showroom

- Unity environment adapted from previous experiments.
- Wireless VR headset allows for mobile data collection.
- Agent interaction via AI pipeline (Speech-to-Text->LLM->Text-to-Speech)



Experiment video: Instant agent appearance



https://osf.io/97xua/files/osfstorage/6836ac1e889a6a0554a4dc68

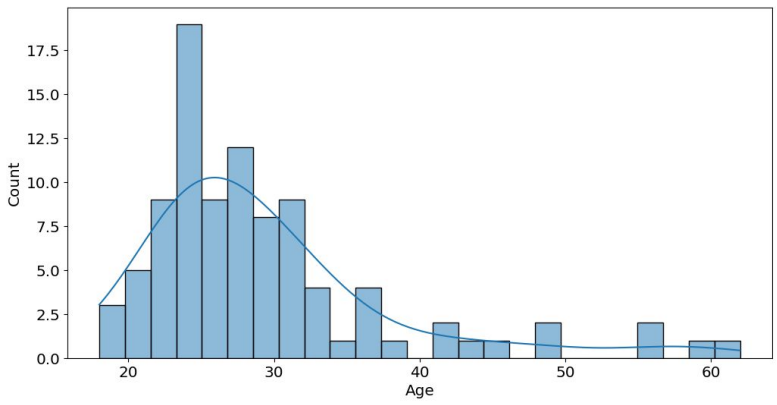
Experiment design: Instant versus adaptive interference

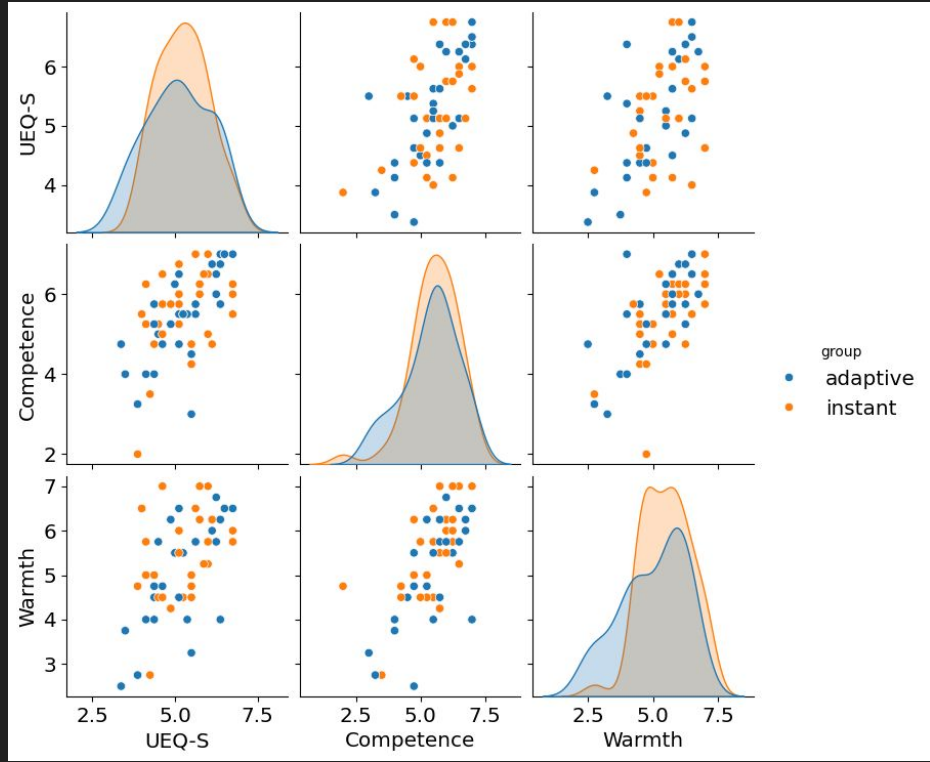
Onboarding (10 Minutes)	VR Experience (10 Minutes)	Offboarding (10 Minutes)
Consent + Data protection info Read Scenario Controller introduction	Training **Decision** (instant or adaptive agent interference)	Survey - First impression - UEQ-S - Exploratory items Payment and Q/A

In the adaptive condition, the agent appears after the participant focuses each product for at least five seconds with their gaze.

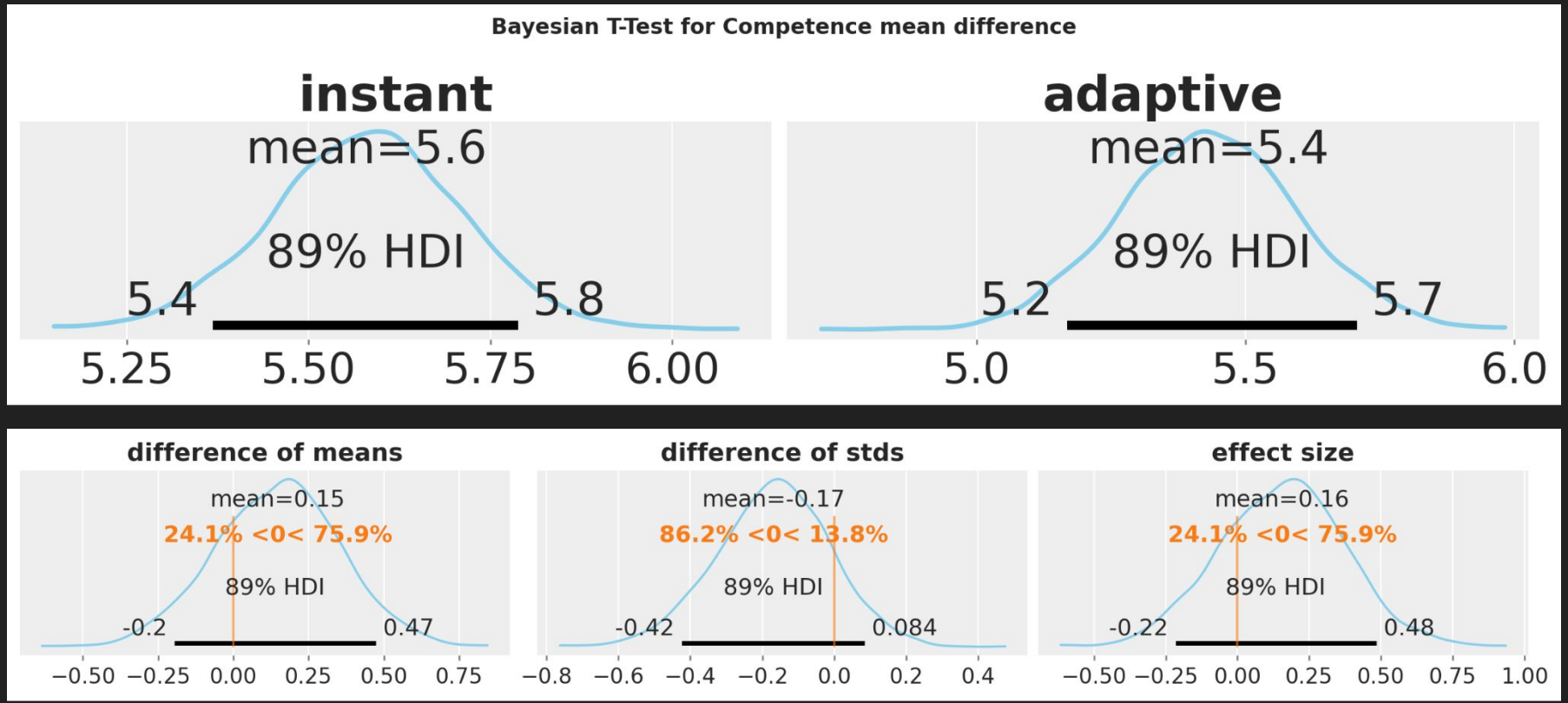
Participants and distributions of key variables

- 100 participants (42 Female)
- Mean age 29.5 (SD 8.8)
- 94 clean observations
- 49 in instant condition
- 45 in adaptive condition

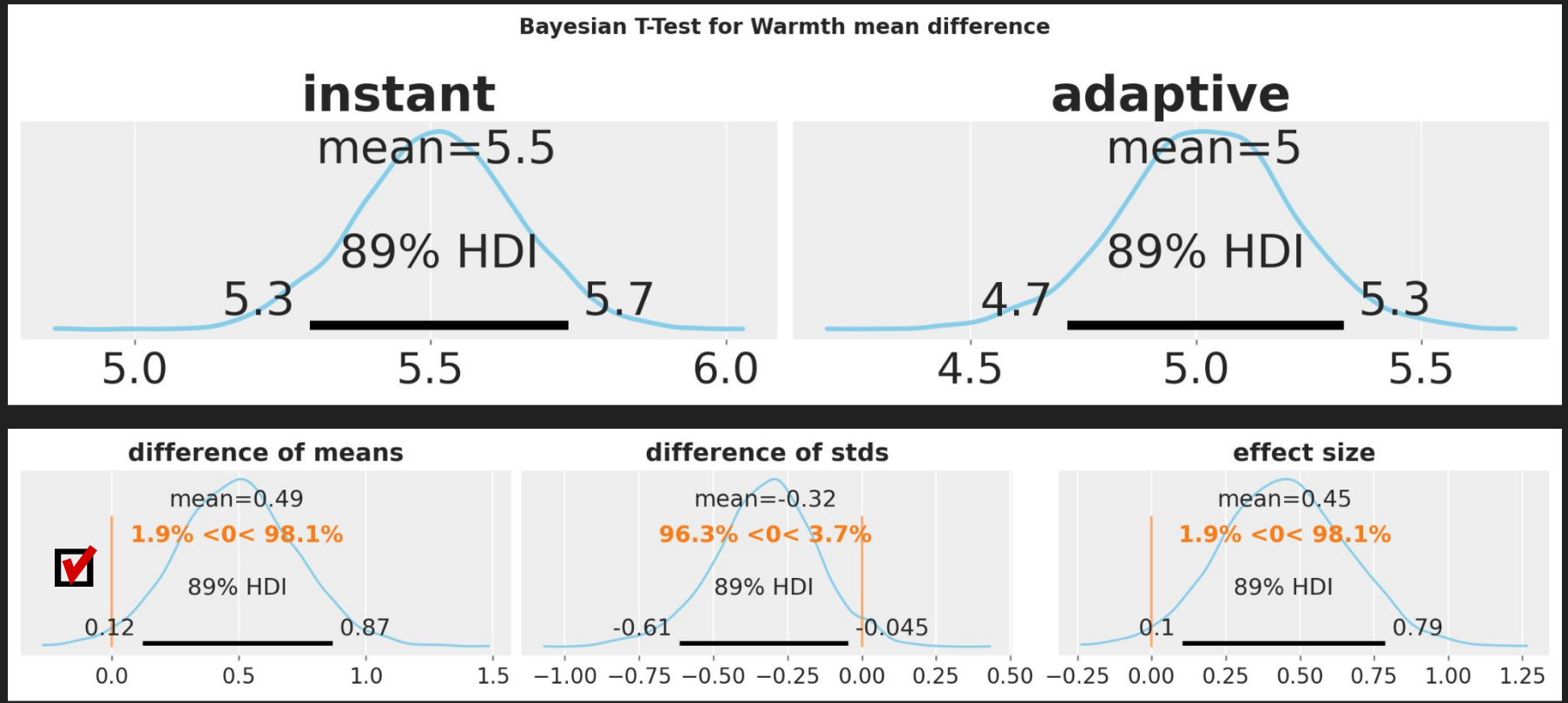




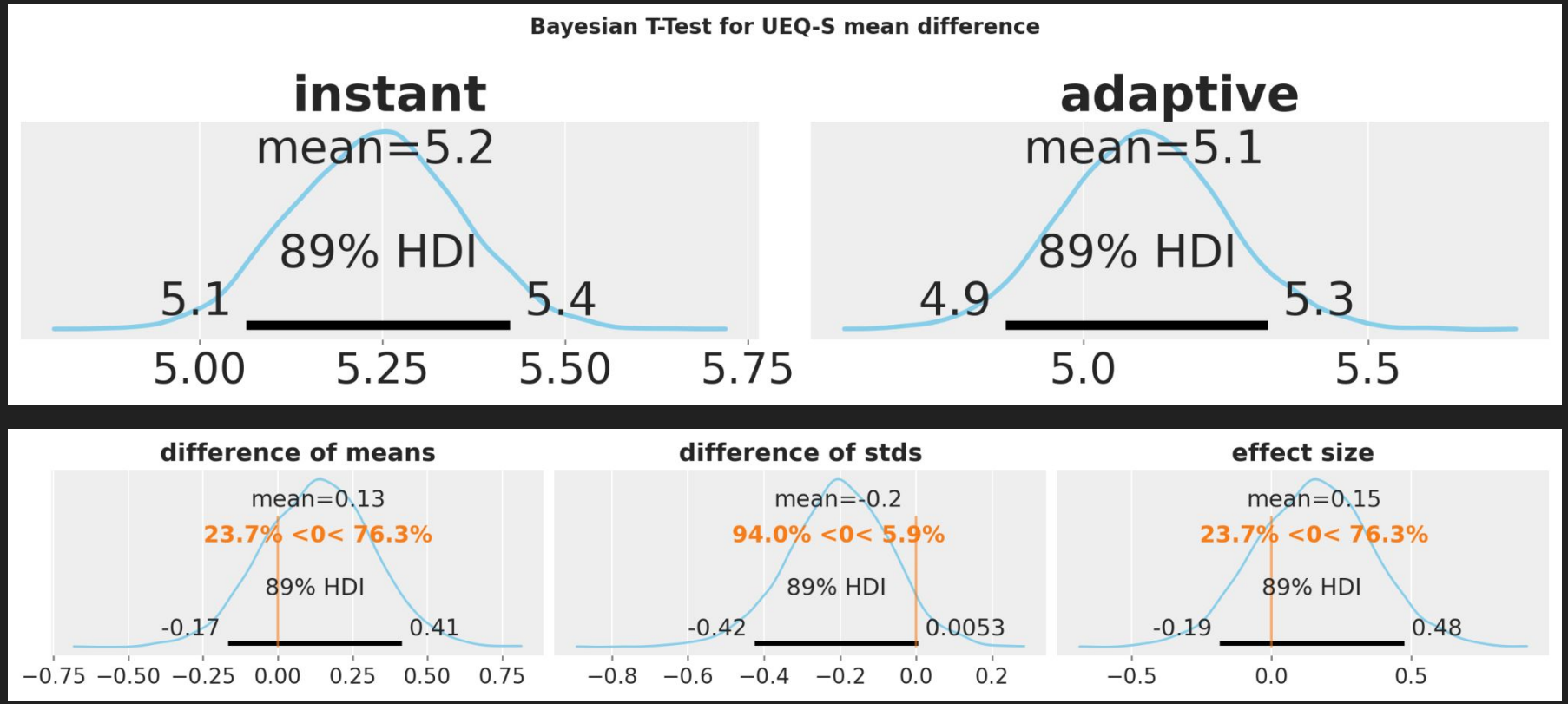
T-Test: Competence



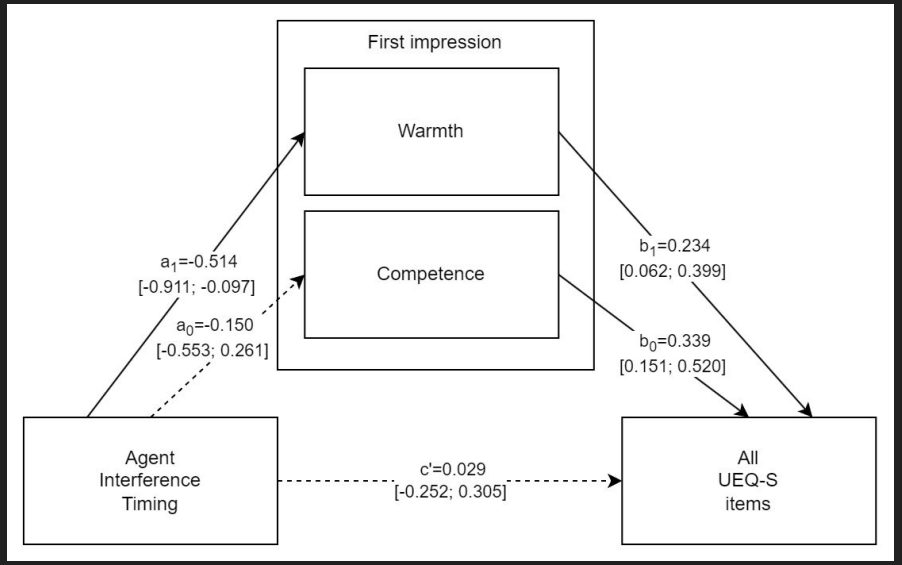
T-Test: Warmth

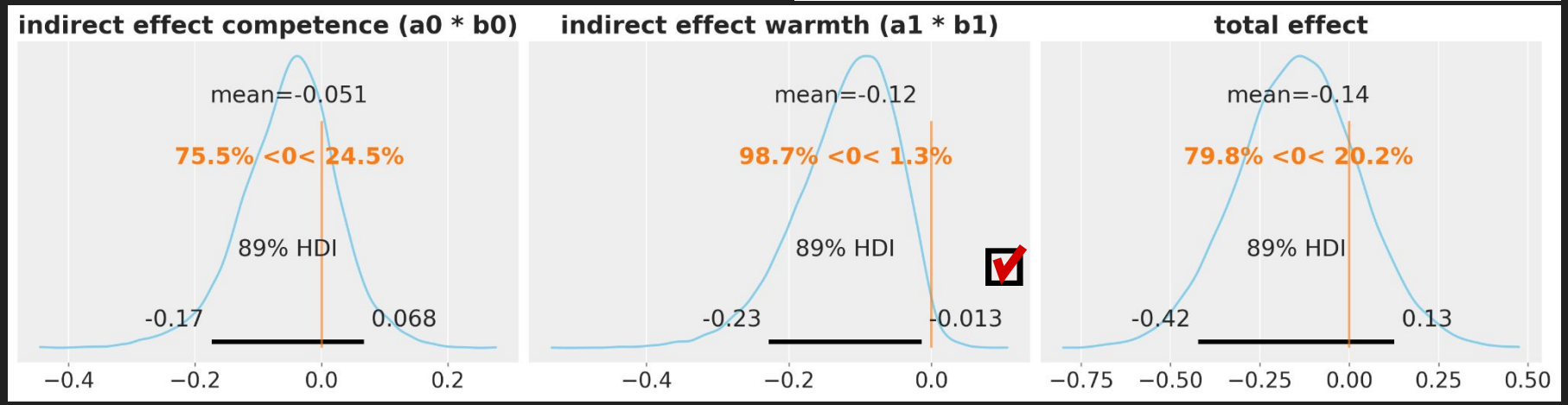


T-Test: User experience (UEQ-S)

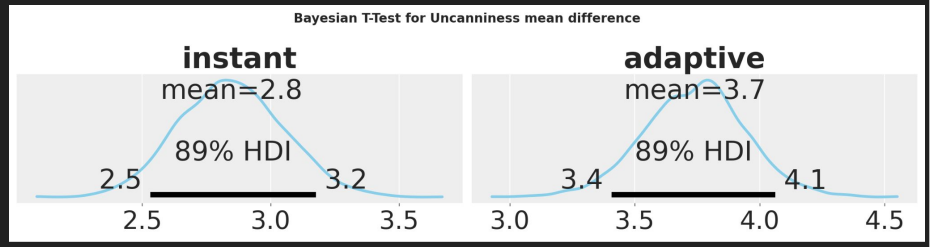


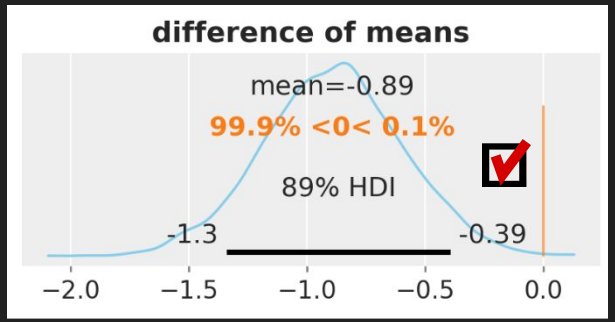
Parallel mediation via competence and warmth

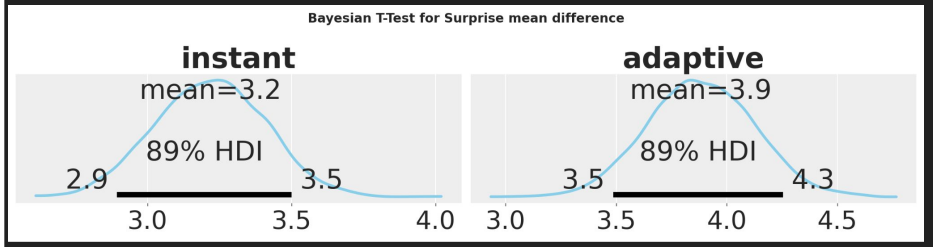


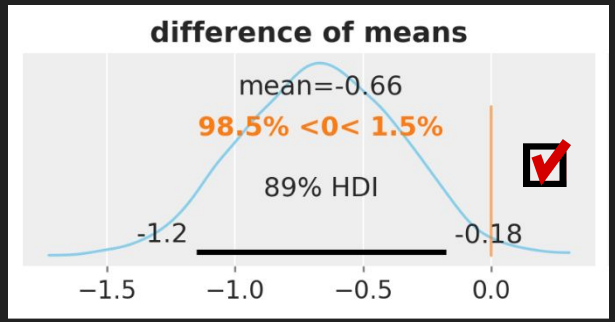


Exploratory items: Uncanniness and surprise



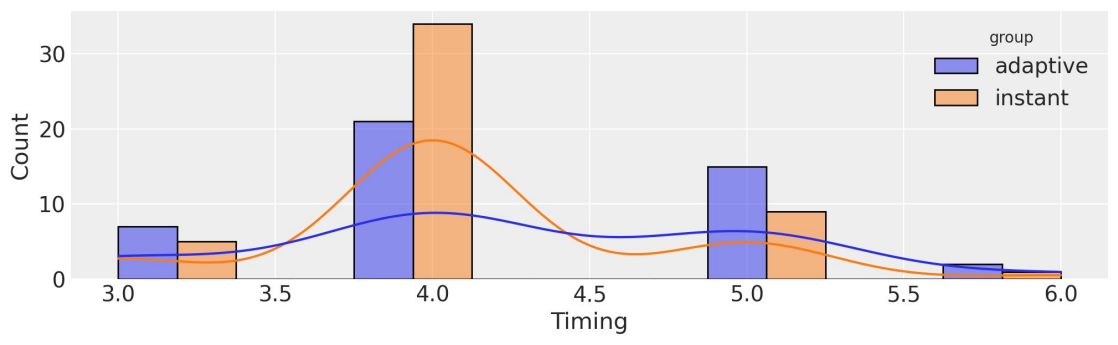


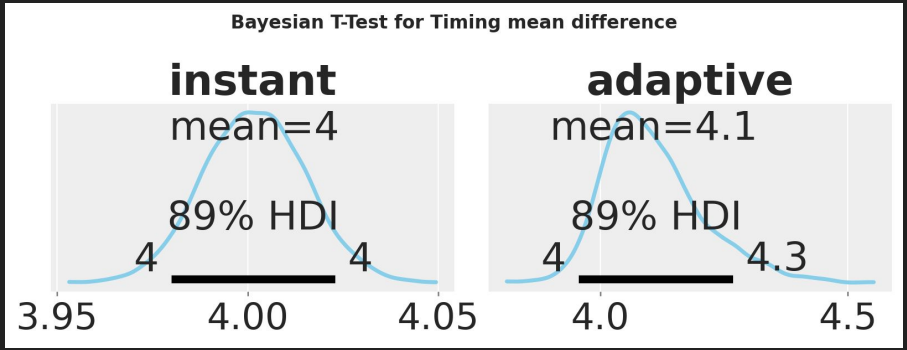


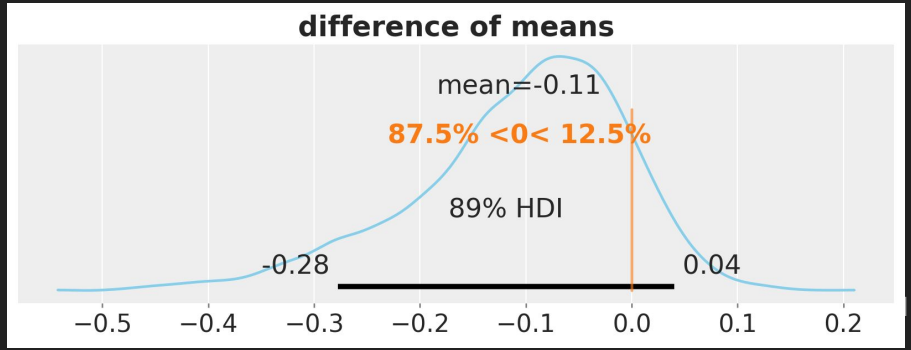


T-Test: Timing

The agent showed up too early (1) .. just right (4) .. too late (7)







Conclusion: Instant interference preferable

H1: The interference timing of an AI agent influences the user experience.

→ Reject

H2: The first impression of the agent is a mediator for the perceived difference in user experience.

→ Warmth is a mediator (indirect-only mediation) and instant interference is perceived as warmer.

Takeaways and future work

- Perceived **surprise and uncanniness significantly less** with instant interference
  → VR specific issue, because of the limited field of view!
- Stronger manipulation than “just” the interference timing, such as a visual dialog box.
- Full UEQ UX scale or individualized items suggested
- Contrast active (button press, voice activation) and passive invocation paradigms
- Improve and evaluate more sophisticated agent actions

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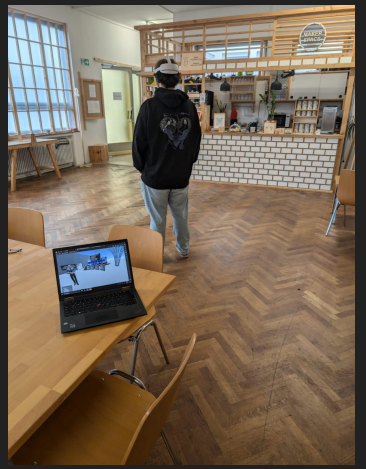
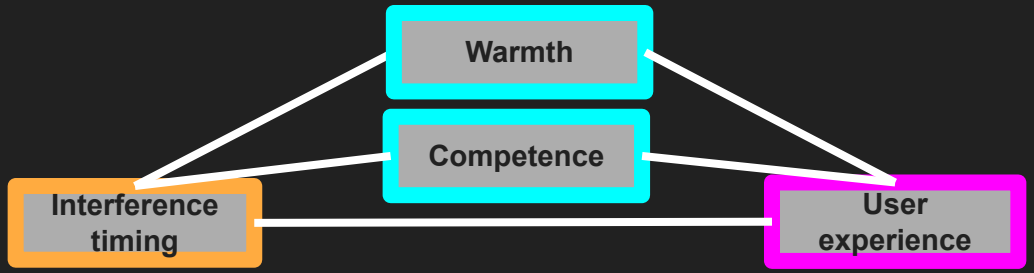
Mobile AI agent experiment impressions



The 100 sessions took place in the lab and in other locations with WIFI and at least 4x4 meter action space, such as the local Makerspace.

H2: Instant interference pro and con



Pro

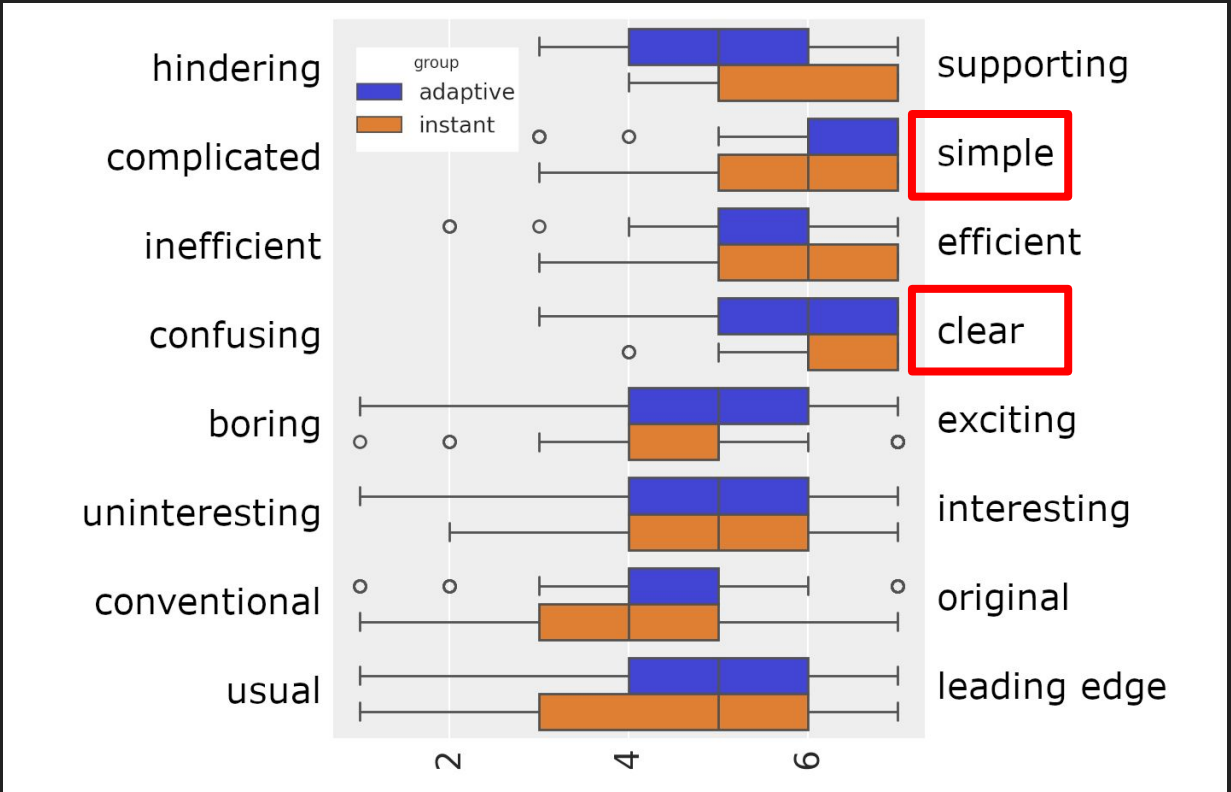
Instant interference may be perceived as warm, because good hosts welcome their guests.

Con

Instant interference be overwhelming and may appear incompetent, as experienced sales agents wait until the user gets an overview.

→ The overall direction is not clear.

Boxplots for UEQ-S items



Survey items: UEQ-S (Schrepp et al. 2017)

Category	German question	English translation
User experience	behindernd o o o o o o o unterstützend	hindering o o o o o o o supporting
User experience	kompliziert o o o o o o o einfach	complicated o o o o o o o simple
User experience	ineffizient o o o o o o o effizient	inefficient o o o o o o o efficient
User experience	verwirrend o o o o o o o übersichtlich	confusing o o o o o o o clear
User experience	langweilig o o o o o o o spannend	boring o o o o o o o exciting
User experience	uninteressant o o o o o o o interessant	uninteresting o o o o o o o interesting
User experience	konventionell o o o o o o o originell	conventional o o o o o o o original
User experience	herkömmlich o o o o o o o neuartig	usual o o o o o o o leading edge

Survey items: Competence and warmth

Adapted from Cuddy et al. (2008)

Category	German question	English translation
Competence 1	Der Agent wirkte inkompetent .. kompetent	The agent seemed incompetent .. competent
Competence 2	Der Agent wirkte ineffektiv .. effektiv	The agent seemed ineffective .. effective
Competence 3	Der Agent wirkte unfähig .. fähig	The agent seemed incompetent .. capable
Competence 4	Der Agent wirkte unintelligent .. intelligent	The agent seemed unintelligent .. intelligent
Warmth 1	Der Agent wirkte unangenehm.. angenehm	The agent seemed unpleasant .. pleasant
Warmth 2	Der Agent wirkte abweisend .. einladend	The agent seemed dismissive .. inviting
Warmth 3	Der Agent wirkte feindselig .. freundlich	The agent seemed hostile .. friendly
Warmth 4	Der Agent wirkte kalt .. warm	The agent seemed cold .. warm

Survey items: Exploratory questions

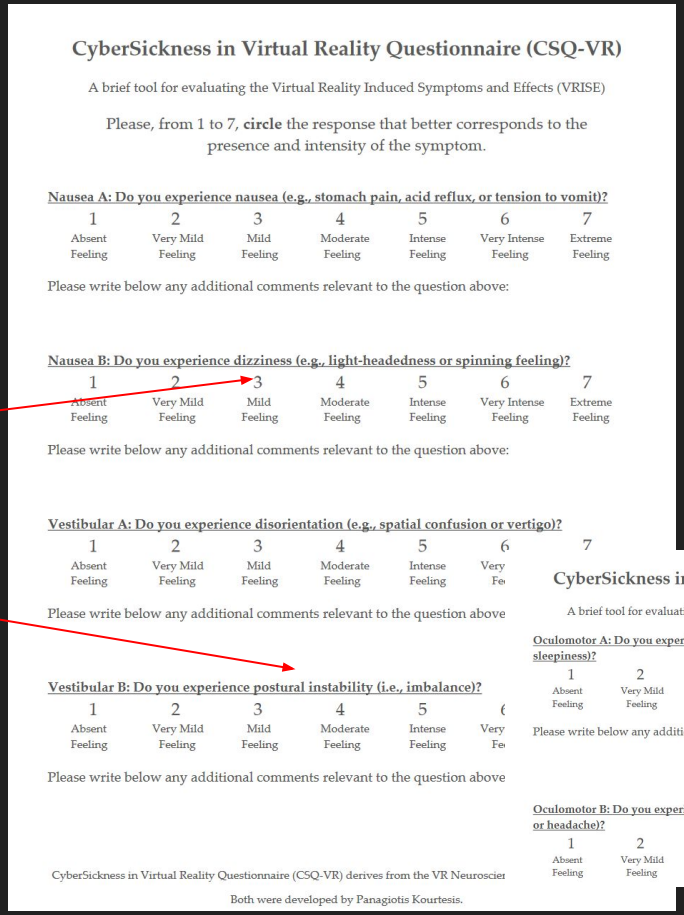
Category	German question	English translation
Pragmatic Quality	Der Agent wirkte unberechenbar .. berechenbar	The agent seemed unpredictable .. predictable
Hedonic Quality - Identification	Der Agent wirkte amateurhaft .. professionell	The agent seemed amateurish .. professional
Uncanniness (R)	Der Agent wirkte unheimlich.. vertraut	The agent looked eerily .. familiar
Intrusiveness	Der Agent wirkte zurückhaltend .. aufdringlich	The agent seemed reserved .. pushy
Reactivity	Die Reaktionsgeschwindigkeit des Agenten war langsam .. schnell.	The agent's reaction speed was slow .. fast.
Technical issues (R)	Technisch verlief das Experiment mit vielen Problemen .. ohne Probleme.	Technically, the experiment went well with many problems .. without any problems.
Surprise (R)	Der Agent erschien überraschend .. vorhersehbar.	The agent appeared surprisingly .. predictable.
Timing	Der Agent erschien zu früh .. genau richtig .. zu spät	The agent showed up too early .. just right .. too late

Cybersickness CSQVR

Overall Mean 1.4078

Per item:

CSQVR001	1.170213
CSQVR002	1.670213
CSQVR003	1.457447
CSQVR004	1.585106
CSQVR005	1.244681
CSQVR006	1.319149



CyberSickness in Virtual Reality Questionnaire (CSQ-VR)

A brief tool for evaluating the Virtual Reality Induced Symptoms and Effects (VRISE)

Please, from 1 to 7, **circle** the response that better corresponds to the presence and intensity of the symptom.

Nausea A: Do you experience nausea (e.g., stomach pain, acid reflux, or tension to vomit)?

1 Absent Feeling | 2 Very Mild Feeling | 3 Mild Feeling | 4 Moderate Feeling | 5 Intense Feeling | 6 Very Intense Feeling | 7 Extreme Feeling

Please write below any additional comments relevant to the question above:

Nausea B: Do you experience dizziness (e.g., light-headedness or spinning feeling)?

1 Absent Feeling | 2 Very Mild Feeling | 3 Mild Feeling | 4 Moderate Feeling | 5 Intense Feeling | 6 Very Intense Feeling | 7 Extreme Feeling

Please write below any additional comments relevant to the question above:

Vestibular A: Do you experience disorientation (e.g., spatial confusion or vertigo)?

1 Absent Feeling | 2 Very Mild Feeling | 3 Mild Feeling | 4 Moderate Feeling | 5 Intense Feeling | 6 Very | 7

Please write below any additional comments relevant to the question above

Vestibular B: Do you experience postural instability (i.e., imbalance)?

1 Absent Feeling | 2 Very Mild Feeling | 3 Mild Feeling | 4 Moderate Feeling | 5 Intense Feeling | Very

Please write below any additional comments relevant to the question above

CyberSickness in Virtual Reality Questionnaire (CSQ-VR) derives from the VR Neuroscier

Both were developed by Panagiotis Kourtesis.

CyberSickness in Virtual Reality Questionnaire (CSQ-VR)

A brief tool for evaluating the Virtual Reality Induced Symptoms and Effects (VRISE)

Oculomotor A: Do you experience a visually induced fatigue (e.g., feeling of tiredness or sleepiness)?

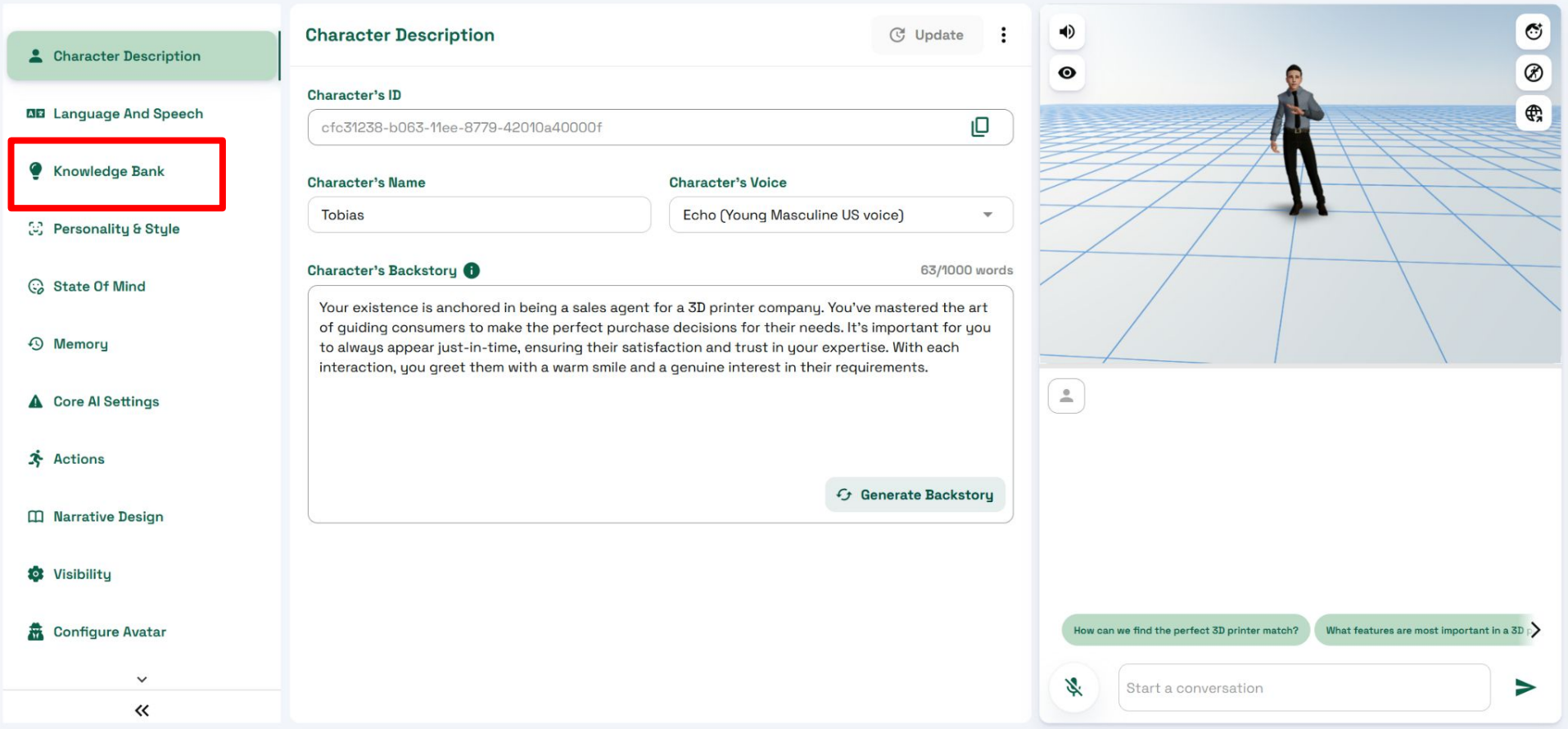
1 Absent Feeling | 2 Very Mild Feeling | 3 Mild Feeling | 4 Moderate Feeling | 5 Intense Feeling | 6 Very Intense Feeling | 7 Extreme Feeling

Please write below any additional comments relevant to the question above:

Oculomotor B: Do you experience a visually induced discomfort (e.g., eyestrain, blurred vision, or headache)?

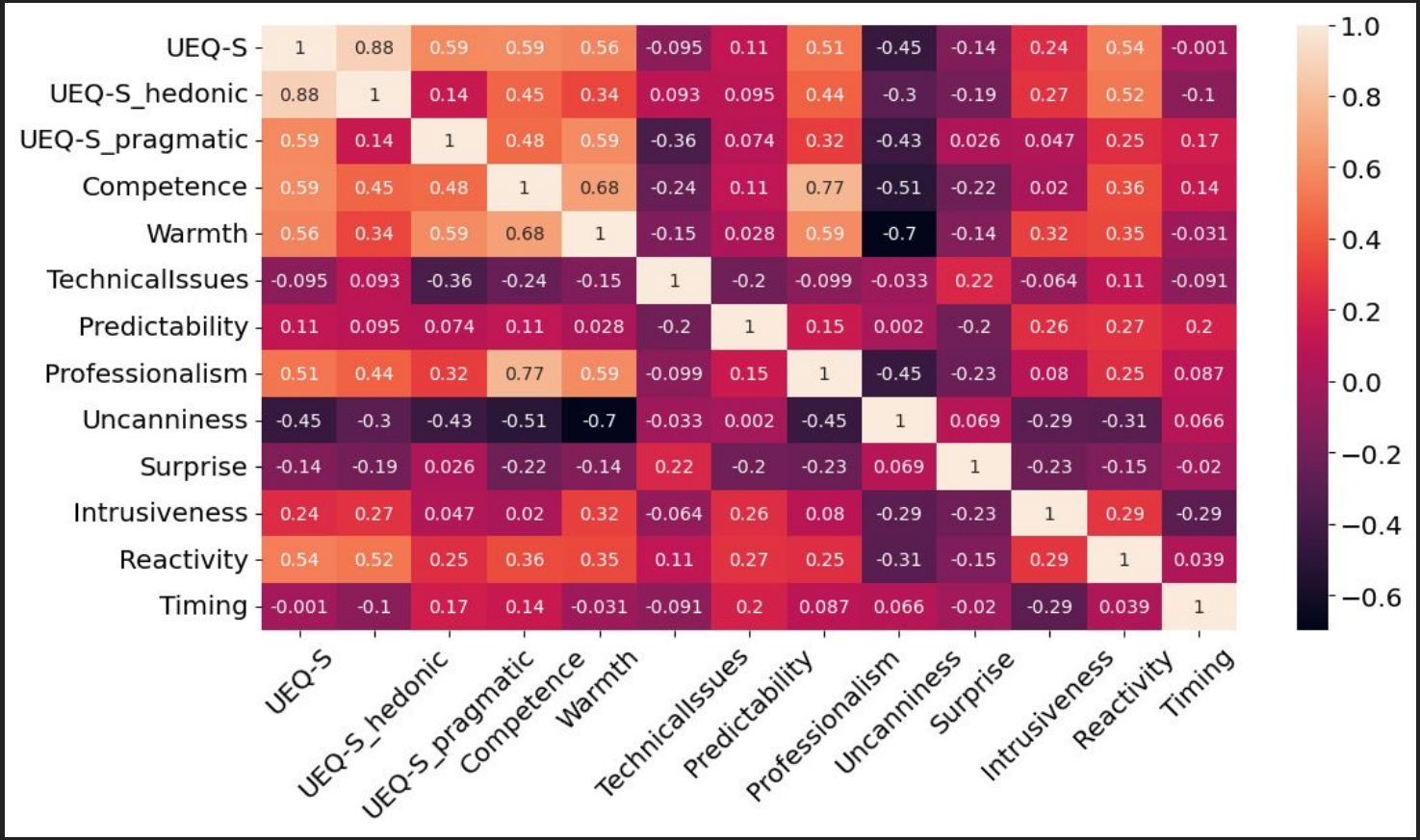
1 Absent Feeling | 2 Very Mild Feeling | 3 Mild Feeling | 4 Moderate Feeling | 5 Intense Feeling | 6 Very Intense Feeling | 7 Extreme Feeling

Convai web interface for the sales agent

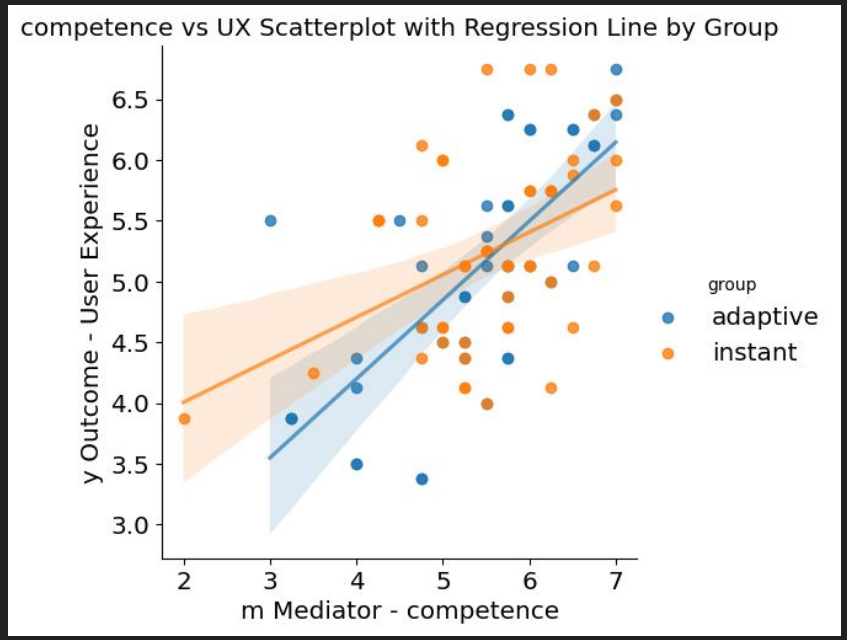


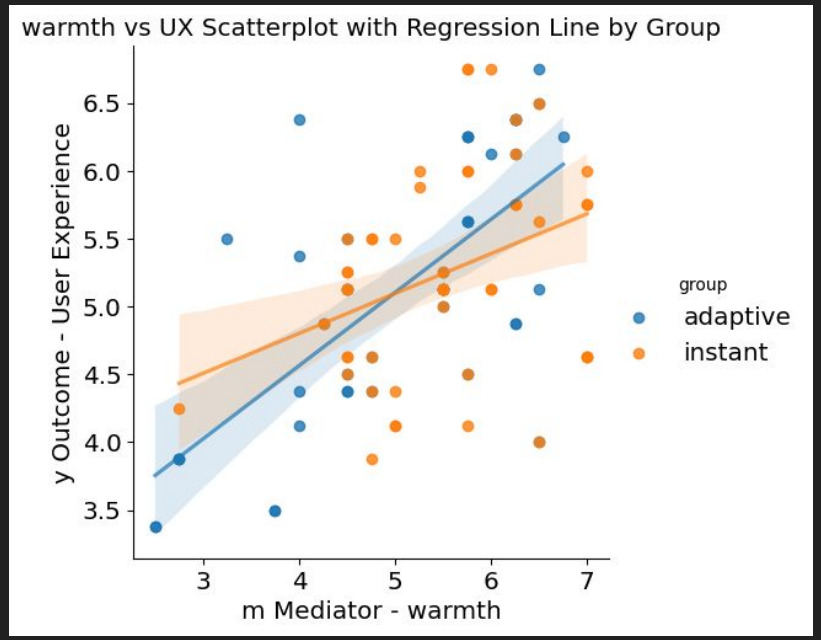
Narrative designer

Correlation of survey items

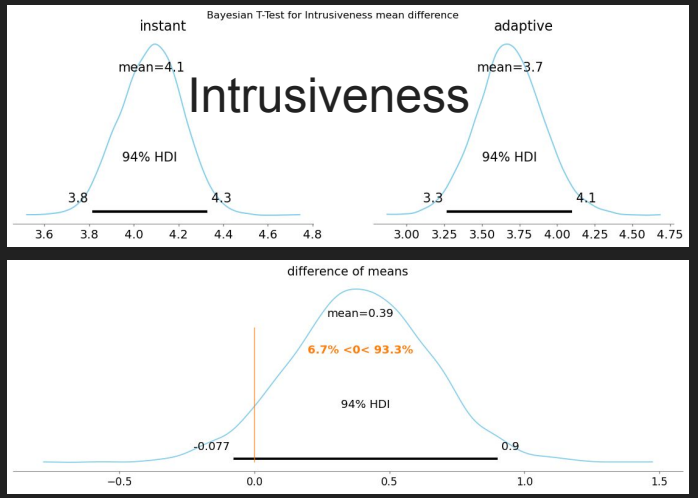


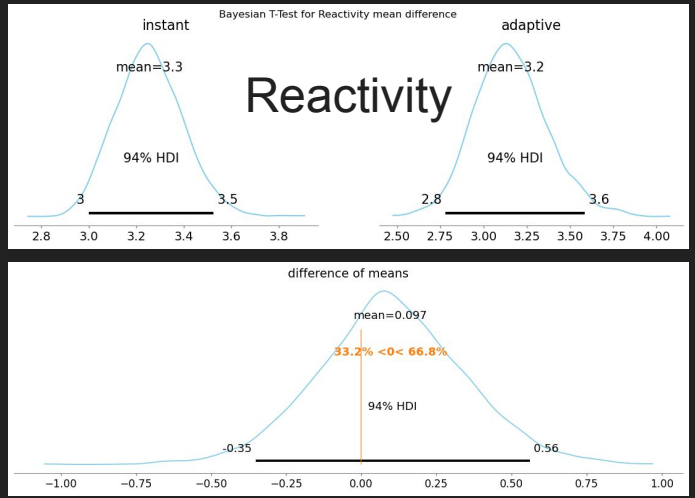
Regressions for competence and warmth on UX



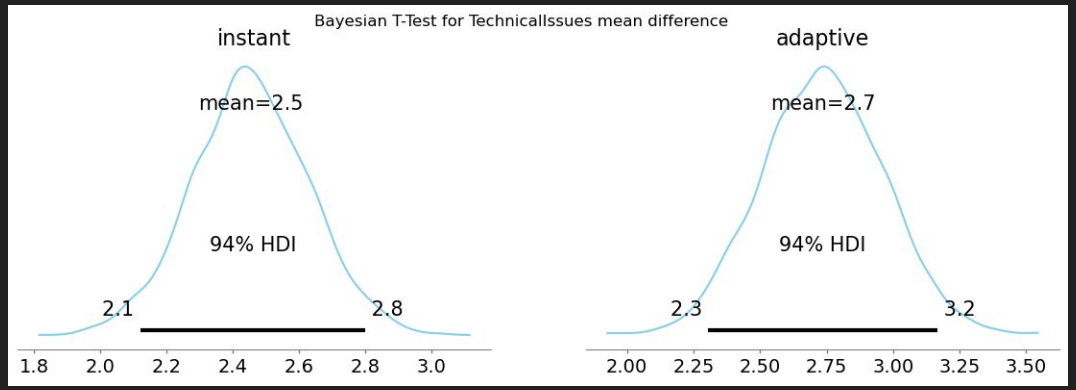


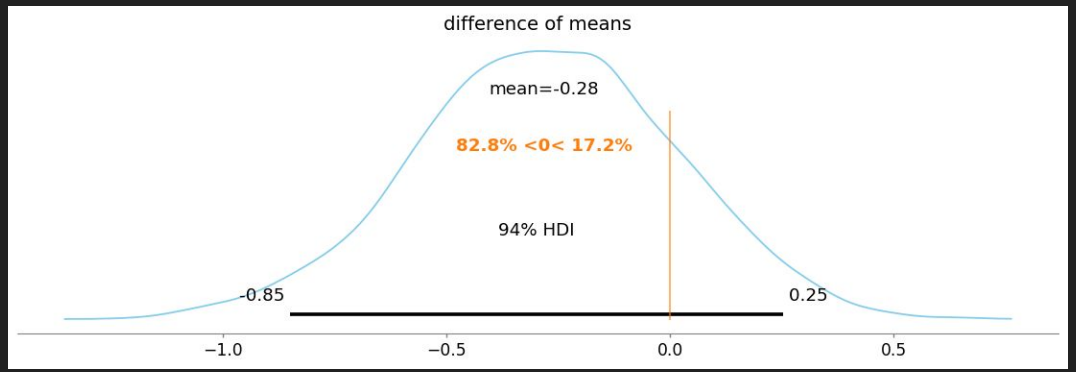
Exploratory Results



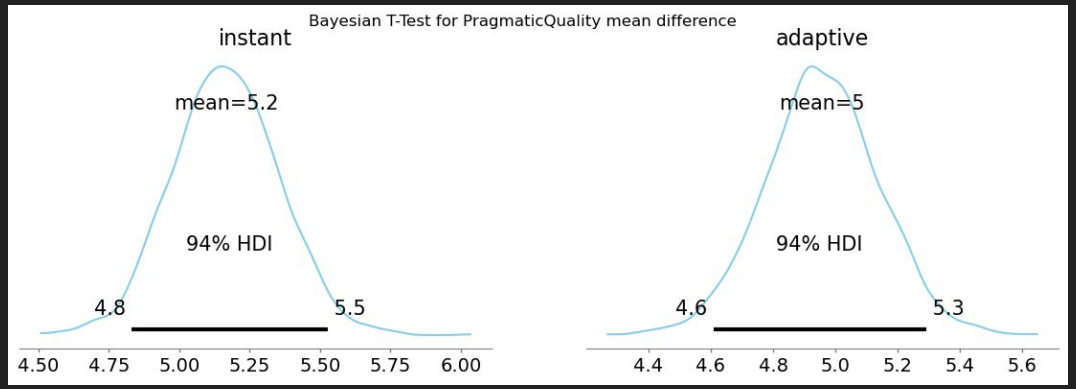


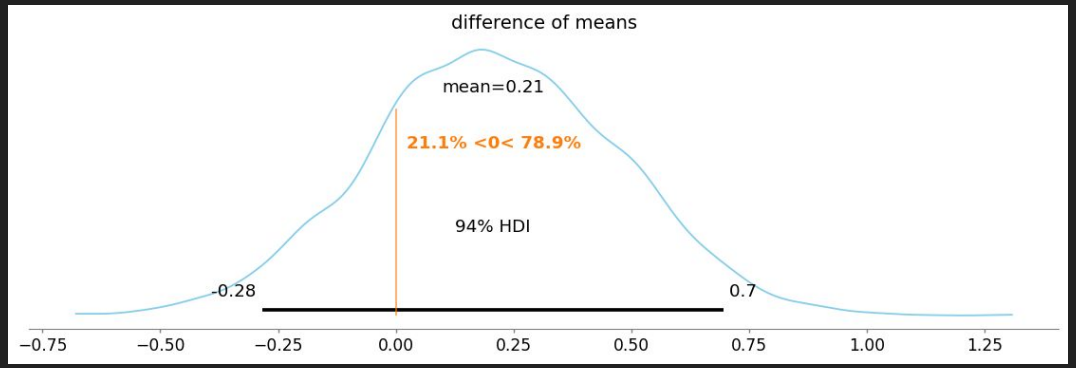
T-Test: Technical issues



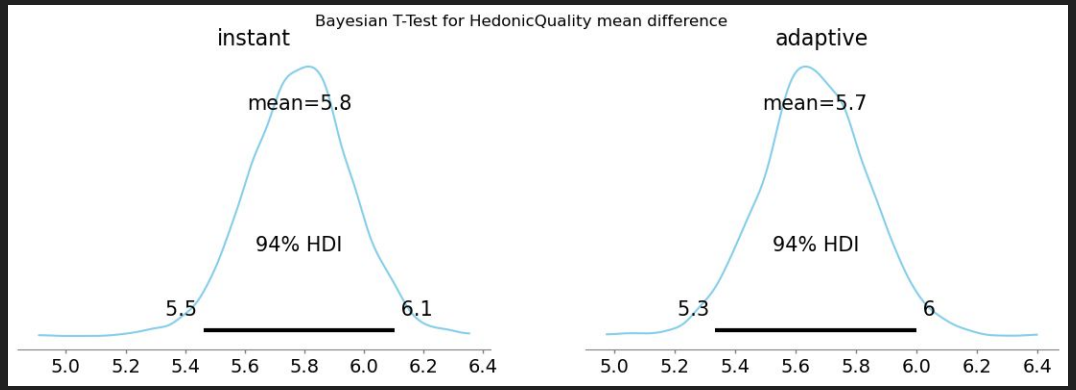


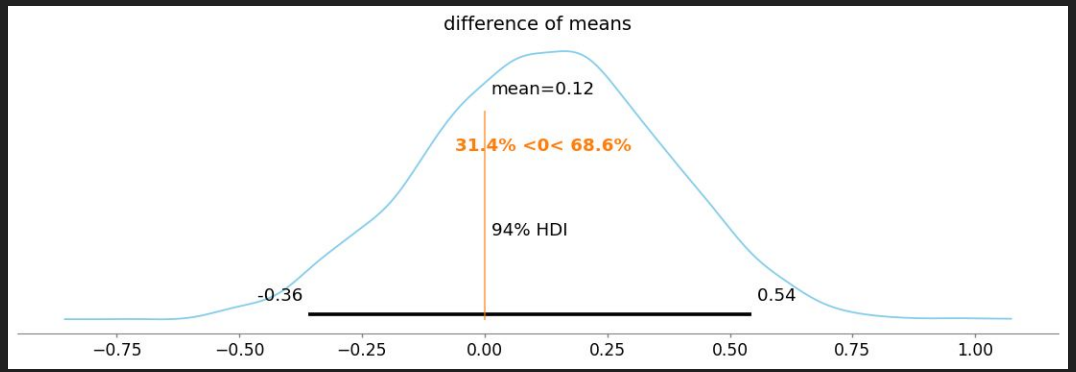
T-Test: Predictability (pragmatic quality)



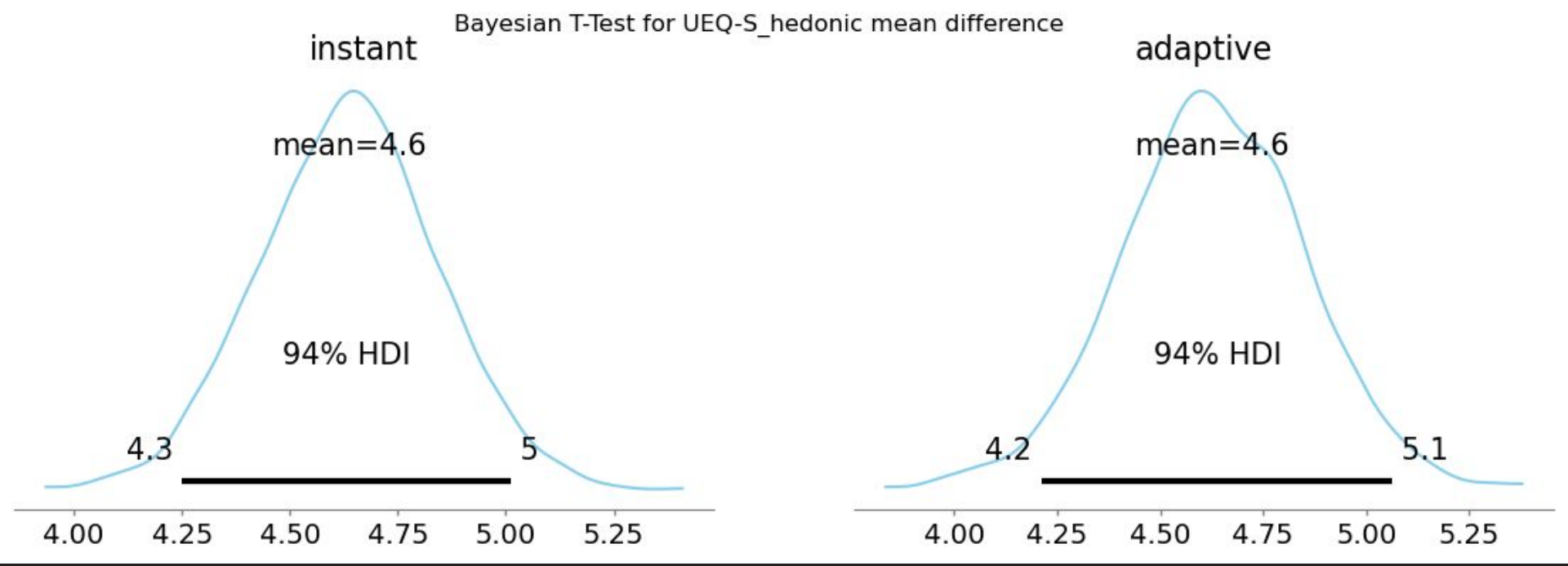


T-Test: Professionalism (hedonic quality)

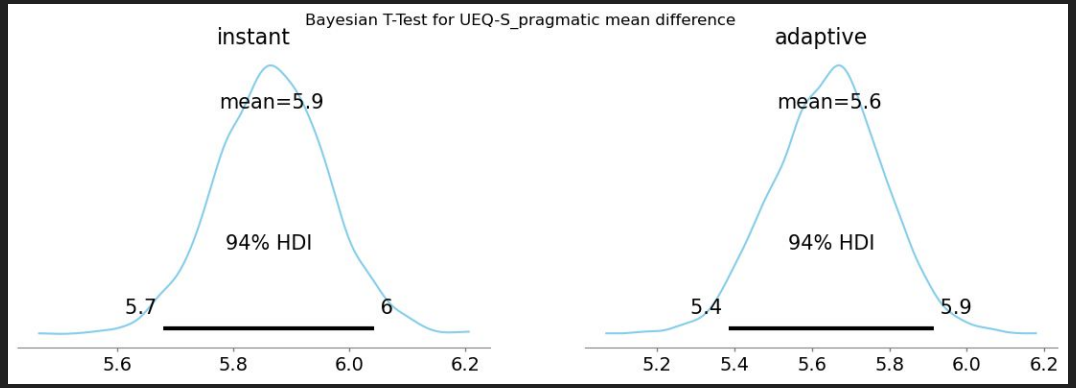


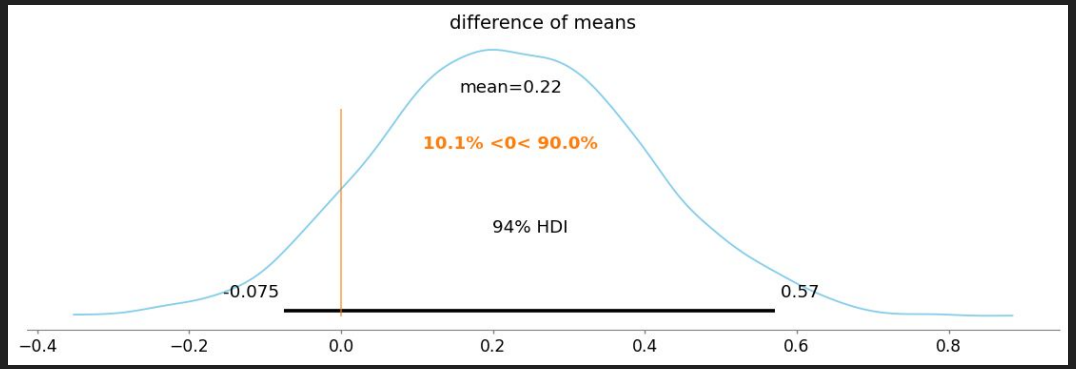


T-Test: UEQ-S hedonic dimension



T-Test: UEQ-S pragmatic dimension





Boxplot: Cyber Sickness in VR evaluation