

Design and Evaluate Embodied Agents

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Research Summary

This research is intended as an effort towards a progressive and inclusive approach for gender representations in virtual agents.

- Researched and identified problem space of AI conversation system through user testing, qualitative and quantitative study and secondary research.
- Ideate and created new design solution for 3D embodied agents
- Validated and iterated design with two quantitative and qualitative study
- Evaluated the research assumption by quantitative research method

Virtual Agent

Virtual Agents (VA) are AI agents created for user (human) interaction like:

- Chatbots
- Voice only agents
- Embodyed agents
- Embodyed conversational agents (ECA)

(Cassell et al., 2000)



Virtual AI Agent (ivizlab)

Issues with past studies

(From literature review)

01 Questionable findings: any embodied agent type

02 Additional confounding factors of agent characters

Some examples of embodied agents from past studies

Issues with past studies

From literature review

03 No studies on gender stereotypes, examining the core reason

04 Only binary notion of gender to validate the gender stereotype assumption

Half body (Baylor, 2005)

Portrait, 2D, Illustration (Khan et al., 2009)

Portrait, 2D, Illustration (Gulz et al., 2007)

Portrait, 2D, Illustration (Louwerve et al., 2005)

Some examples of embodied agents from past studies

Research Objectives

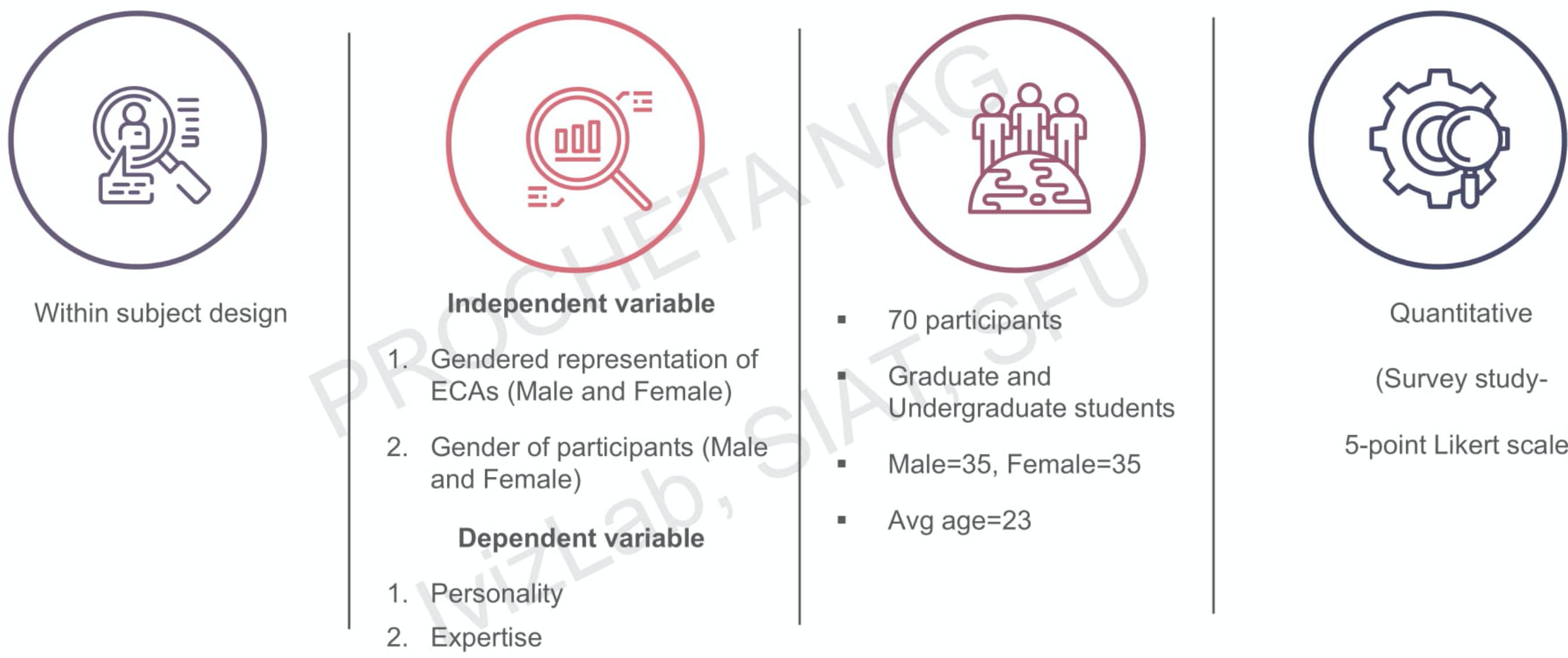
- Objective #1**
Examine the effect of gender during a user's conversation with the embodied conversational agent (ECA).
- Objective #2**
Examine the user experience on perceiving realistic 3D ECA characters, where all other factors are kept as uniform as possible, to measure for differences in ECA visual gender cues only.
- Objective #3**
Examine the effect of the agents' gender-related appearance: male, female and androgynous, on user perception in terms of gender stereotype traits and roles.

Research Questions

- Question #1**
When only varying with binary gender related appearance of embodied virtual agents (ECAs), how does the experience of the user change?
- Question #2**
Moving past binary distinctions of male and female, how does the more fluid notion of gender (or even gender neutral) affect a user's experience with ECAs?
- Question #3**
How does the gender-related appearance of male, female and androgynous agents impact the user perception in terms of gender stereotype traits?

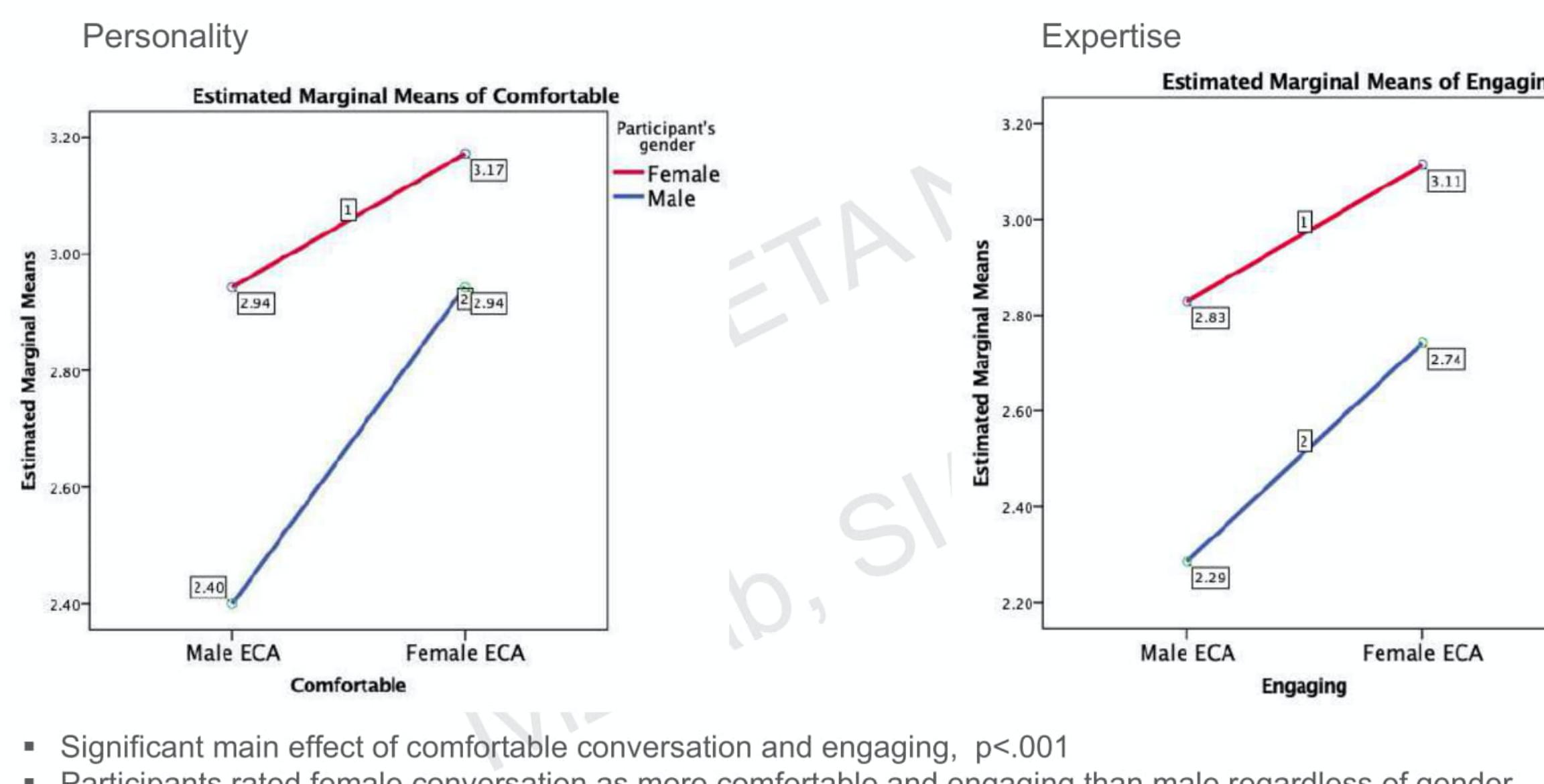
Study Design

Study 1 description



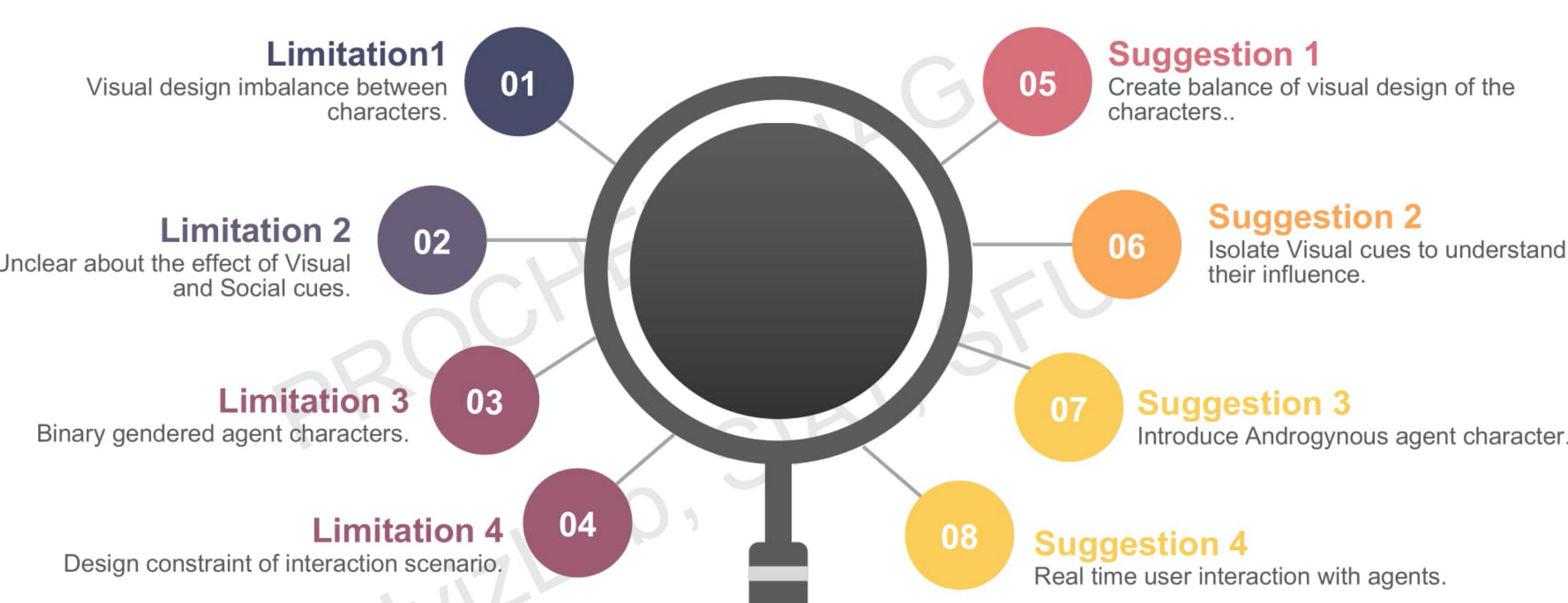
Results

Used Two way 2 (ECAs gender: male or female) *2 (participant's gender: male and female) mixed ANOVA with repeated measures



Discussion

Lessons learned from study 1 applied to study 2 and 3

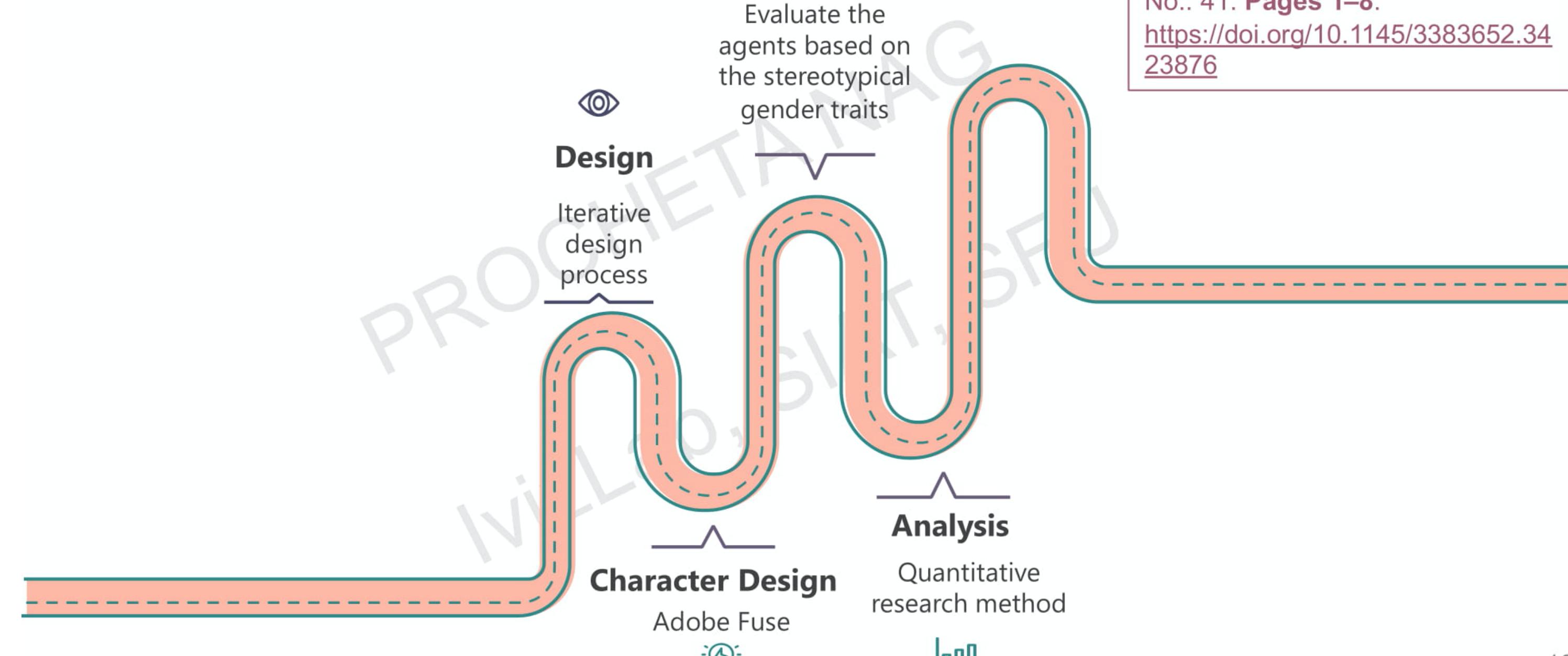


Methodology

Methodology of study 2 and 3

Evaluation

Evaluate the agents based on the stereotypical gender traits



Publication: Proceedings of the 20th ACM International Conference on Intelligent Virtual Agents (IVA'20), October 2020. Article No.: 41. Pages 1–8.
<https://doi.org/10.1145/3383652.3423876>

Hypothesis

Combined hypothesis of study 2 and 3

Following the recent findings of Eagly and colleagues (Eagly et al., 2020) ...

Hypothesis 1

Communication traits would be rated significantly higher for the agents that are perceived as female, followed by androgynous and male agents.

Hypothesis 2

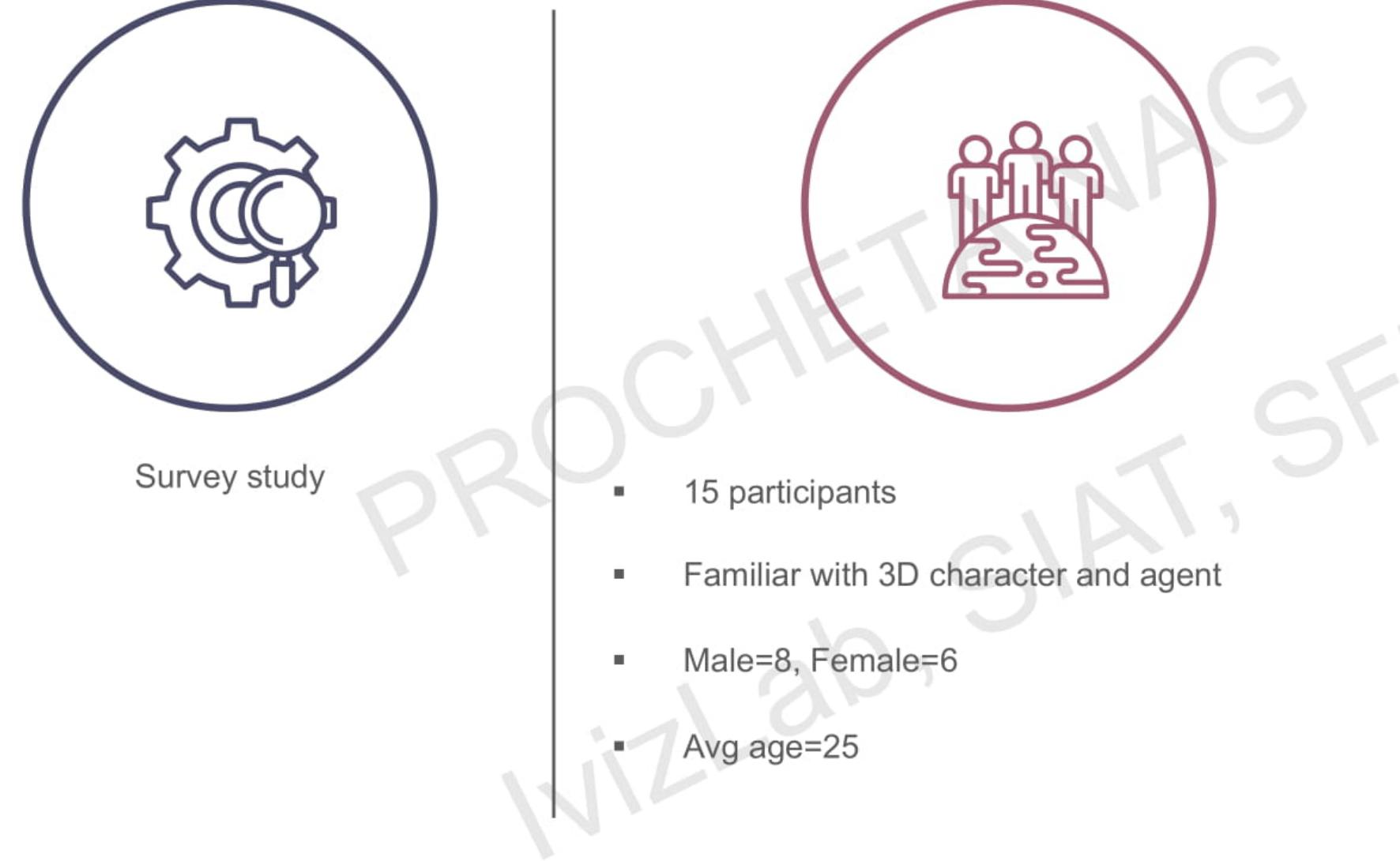
Agency traits would be rated significantly lower for the agents that are perceived as female, followed by androgynous and male agents.

Hypothesis 3

Competence traits would not be significantly different between agents that are perceived as more female, androgynous and male.

Design Evaluation

First Iteration of Character Design



STUDY 2

Design Character

First Iteration of Character Design

Avoided Clothing, Skin, hair and eye color, Body type and height, Facial expression differences.



Male (M1,M2), Female (F1,F2) and Androgynous (A1,A2) characters design



17

Redesigned Male, Female and Androgynous Characters

Second Iteration of Character Design (A...=Androgynous, M...=Male, F...=Female)

Removed overlooked features Adam's apple, wide neck and fuller eyelashes



20

Study Procedure

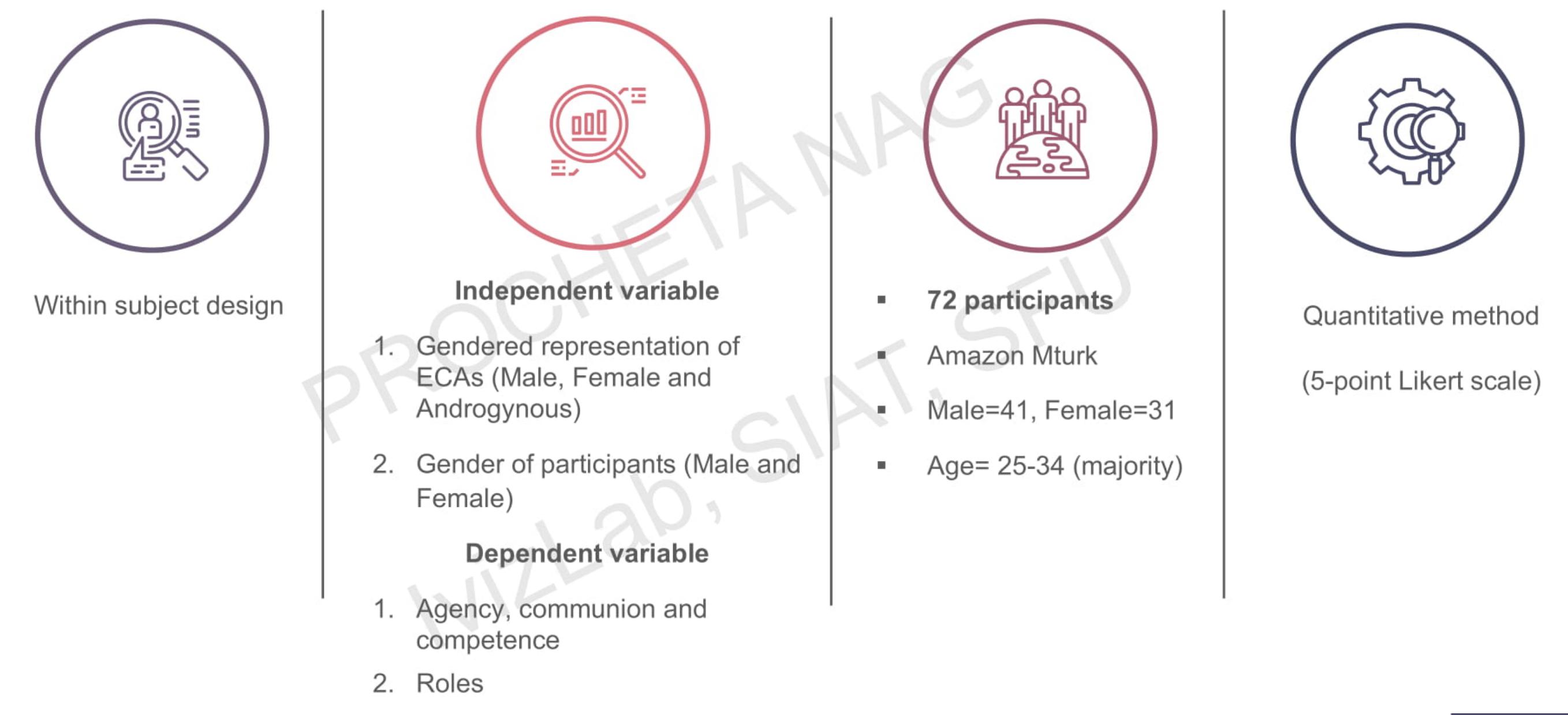
Conducted survey on Amazon Mturk with a link to a survey prepared in the Survey Monkey platform.



STUDY 3

Study Design

Study 3 design

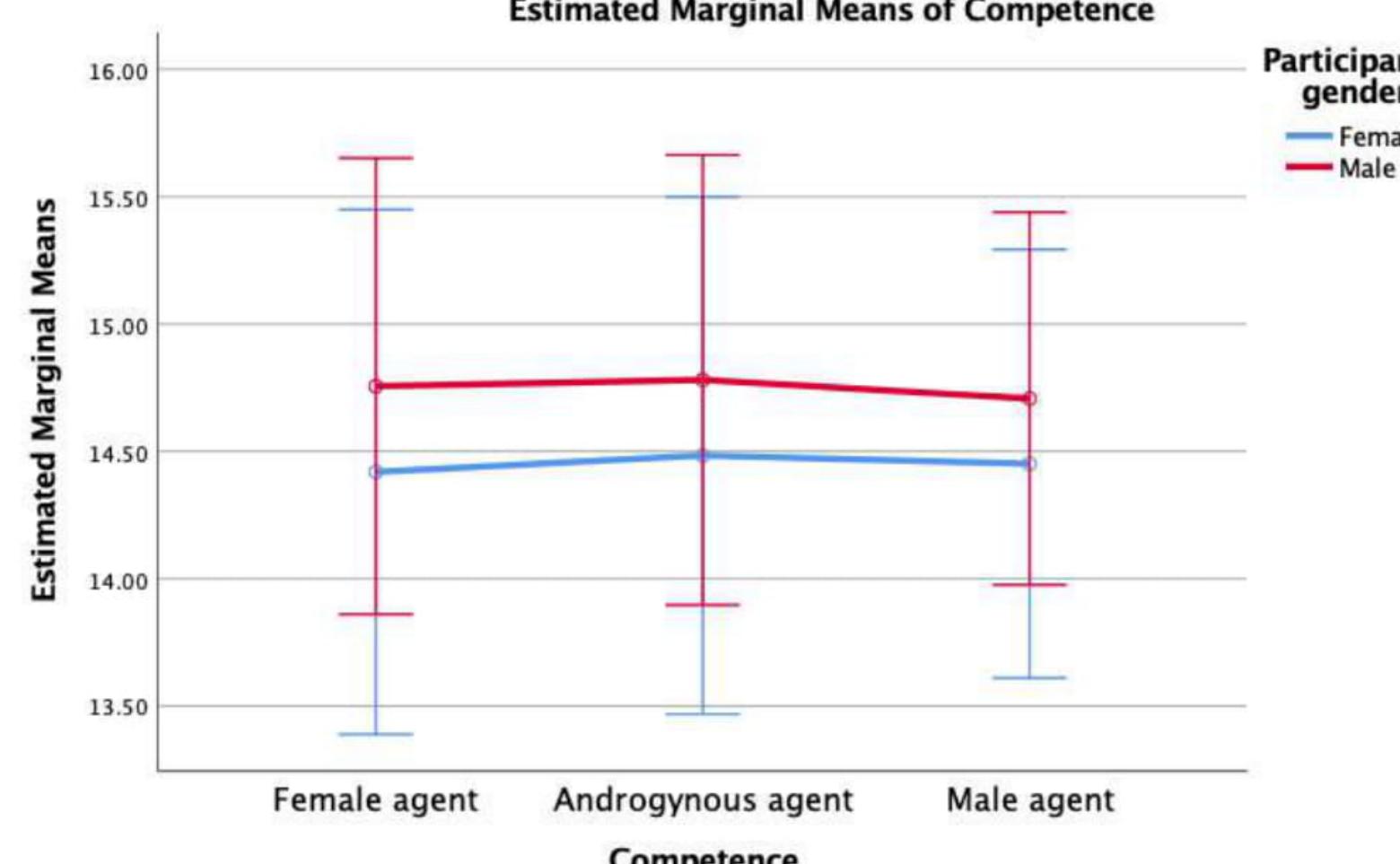


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STUDY 3

Results

Agents gender related appearance and its correlation with the stereotype traits score based on participant's gender.



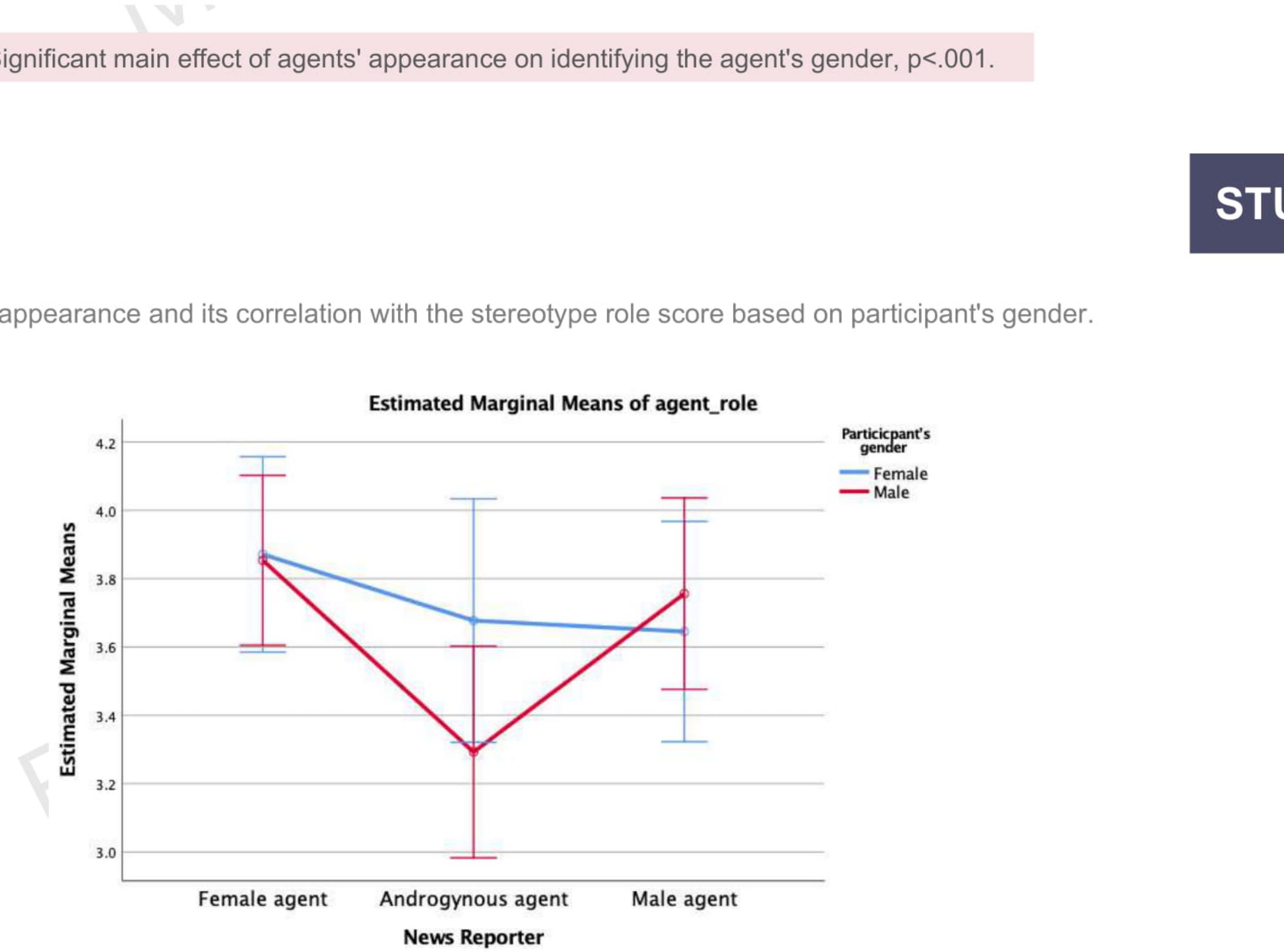
✓ Significant main effect of agents' appearance on identifying the agent's gender, $p < .001$.

25

20

Results

Agents gender related appearance and its correlation with the stereotype role score based on participant's gender.

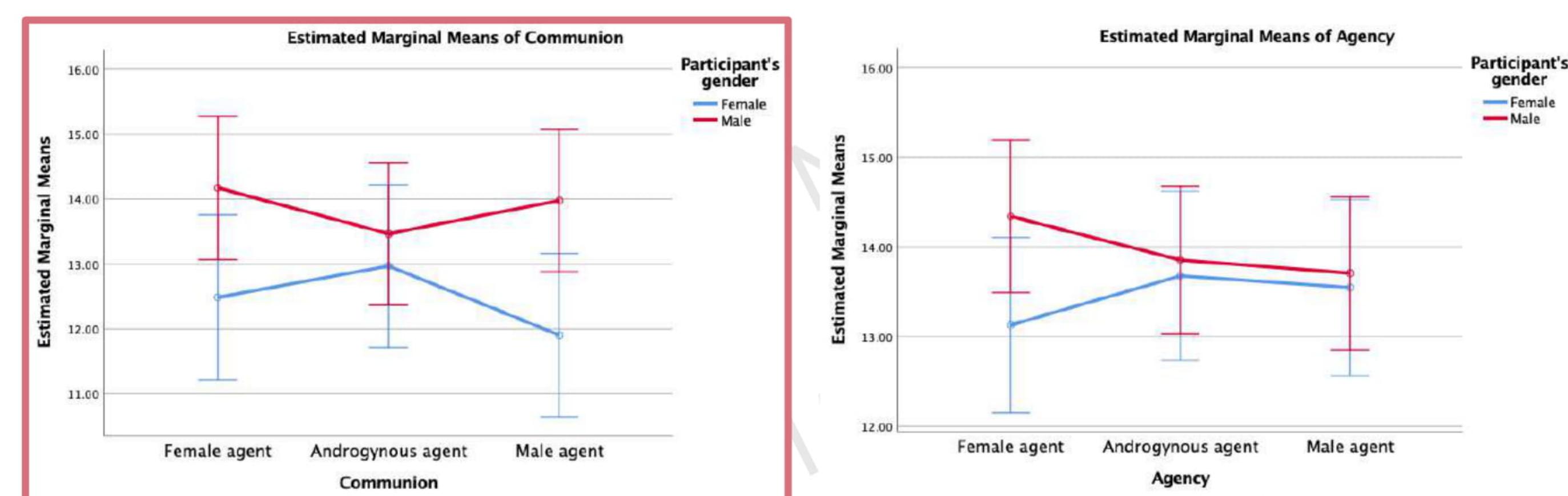


✓ Significant main effect of agents' appearance on news reporter role scores, $p < .05$.

STUDY 3

Results

Agents gender related appearance and its correlation with the stereotype traits score based on participant's gender.



Significant interaction between agents' gender and gender of the participants for communication scores, $p < .05$.

No significant main effect of agents' appearance, participant's gender on agency and communication scores, $p > .05$ (H1 and H2 rejects).

28

STUDY 3

Discussion

Findings of study 3

Discussion #1

Representative of male, female and androgynous agents with minimal differences.

Discussion #2

Androgynous agents could be used to achieve a middle ground of the male and female gender.

Discussion #3

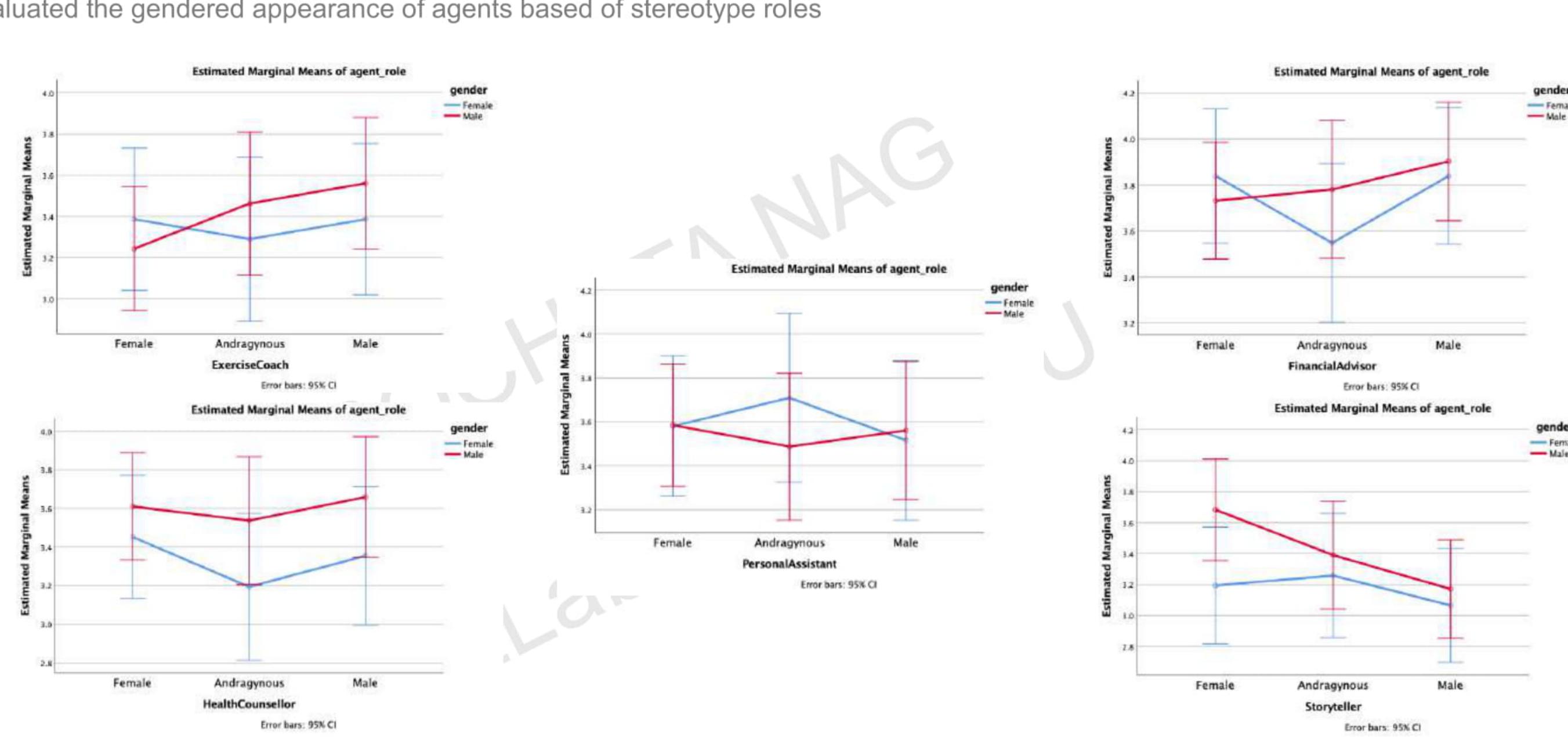
Gender-balanced view of agency, communion, competence traits.

Discussion #4

Roles could be used interchangeably, even with androgynous agents.

Results

Evaluated the gendered appearance of agents based on stereotype roles



Agents gender related appearance and its correlation with the gender score based on participant's gender.

30

29

STUDY 3

Discussion

Findings of study 3

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Discussion #3

Gender-balanced view of agency, communion, competence traits.

Discussion #4

Roles could be used interchangeably, even with androgynous agents.

I have done this work in collaboration with:

Professor Steve DiPaola, Simon Fraser University

Dr. Ozge Nilay Yalcin, Post doc, UBC

iVizLab - Research Lab, Simon Fraser University

32