Expressive Avatars vs. Webcams: Effects on User Experience in Online Meetings

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1. Introduction

Since the COVID-19 pandemic, online meetings have gained widespread popularity and have become one of the primary means of communication. Today, companies conduct business meetings online, schools and universities offer remote classes, and interviews are frequently carried out through video conferencing platforms. These platforms typically rely on live video feeds, which expose users' real faces and physical environments. While this visual presence can enhance social interaction and communication, it may also raise privacy concerns and contribute to increased discomfort and self-consciousness.

In recent years, avatars have gained popularity as a means of digital self-representation, particularly in social media and entertainment contexts. Although this topic has been explored in previous research, most existing studies have been conducted with participants who were already familiar with one another, such as colleagues working in the same workplace. In contrast, our experiment focuses on participants who do not know each other beforehand. This distinction is important, as social dynamics, comfort levels, and communication behaviors may differ significantly when interacting with unfamiliar individuals in an online meeting context.

The objective of this study is to evaluate whether using an expressive avatar instead of showing one's real face can improve the user experience in online meetings involving unfamiliar participants. In particular, we examine its impact on perceived comfort, social presence, and engagement.

2. Related work

Prior research has explored the use of avatars in online interactions by comparing them to other communication technologies. Cummings and Wertz [1] compared avatar-based meetings with hologram-based augmented reality meetings and traditional video conferencing in the context of an object demonstration task. Their results showed that participants in the avatar condition achieved higher average performance scores than those in either the hologram-based or videoconferencing conditions.

Higgins and McDonnell [2] investigated the use of avatars in two separate Mood Induction Procedures (MIP). Their findings indicated that positive affect scores were higher when avatars were used for post-positive conversations, suggesting improved interaction quality. Additionally, participants reported higher levels of friendliness and trust toward the other avatar.

However, these studies were conducted with participants who were already familiar with one another. As a result, the influence of avatars on user experience in meetings involving unfamiliar participants remains underexplored. This gap motivates the present study, which examines the impact of expressive avatars in online meetings between individuals who do not know each other.

3. Methodology

3.1. Apparatus

Figure 1. Expressive virtual avatar created using Animaze.

The avatar software used in this experiment is Animaze [3]. Animaze allows users to create and customize three-dimensional avatars and use them in video conferencing platforms such as Zoom, Microsoft Teams, and Discord through a virtual camera. The avatars are pre-rigged and replicate the user's facial expressions and head movements in real time using webcam-based face tracking as shown in Figure 1. This enables expressive non-verbal communication while preserving the user's visual anonymity.

Animaze was selected because it provides real-time facial tracking, supports expressive avatars, and integrates easily with standard video conferencing platforms without requiring specialized hardware. Participants were able to customize their avatars prior to the experiment to better reflect their preferred digital self-representation. The avatars were capable of displaying basic facial expressions, including smiling, eyebrow movements, and mouth motion synchronized with speech.

3.2. Participants

A total of eight participants took part in the study. All were young adults aged between 20 and 23 years. This age range was selected because participants, as university students, are generally familiar with online meetings and possess the required computer skills. They were divided into four pairs, with participants in each pair being previously unfamiliar with one another. Two pairs were assigned to the avatar condition, and the remaining two pairs were assigned to the webcam (real face) condition. Before the experiment, participants were asked whether they felt comfortable using a webcam, and only those who consented were included in the webcam condition.

3.3. Experimental setup

In the avatar condition, the live video feed of participants was replaced entirely by their virtual avatar. In the control condition, participants used a standard webcam feed showing their real face. Both conditions were presented under otherwise identical meeting settings to ensure consistency.

The experiment was conducted entirely online, with participants joining from their own homes. The meetings took place on Microsoft Teams, and participants completed the tasks using either their real webcam feed or a virtual avatar created with Animaze. To ensure engagement during the meeting, participants completed a modified version of the Desert Survival Problem [4].

We evaluated participants on the following aspects:
  - **Self-reported copresence:** the participant's perception of being together with another user.
  - **Perceived other's copresence:** the participant's perception of the other user's presence and engagement.
  - **Telepresence:** the sense of being immersed in the virtual environment.
  - **Social presence:** the degree to which participants perceived the other as socially and emotionally present.
  - **Proteus effect:** behavioral changes influenced by the characteristics of the participant's avatar [5].

Each aspect was measured using multiple questionnaire items adapted from the social presence framework proposed by K. L. Nowak and F. Biocca [6]. Self-reported copresence was measured using three items, perceived other's copresence and telepresence were measured using four items each, social presence using two items, and the Proteus effect using four items. All items were rated on a 7-point Likert scale (1 = lowest, 7 = highest).

3.4. Hypotheses

The hypotheses of this study were as follows:

- **H1:** Self-reported copresence would be lower in the Avatar condition than in the Webcam condition.

- **H2:** Perceived other's copresence would be higher in the Avatar condition than in the Webcam condition.

- **H3:** Telepresence would be higher in the Avatar condition compared to the Webcam condition.

- **H4:** Social presence would be lower in the Avatar condition than in the Webcam condition.

- **H5:** The Proteus effect would be stronger in the Avatar condition than in the Webcam condition.

3.5. Procedure

Participants were trained on how to use Animaze through a private video call before the experiment. During this session, they were shown how to navigate the software and customize their avatar. After the training, participants were instructed to create an avatar that resembled themselves as closely as possible, with freedom to adjust features such as face shape, hairstyle, and clothing. They then joined a meeting, moderated by one of the experimenters, on Microsoft Teams. For participants assigned to the webcam (real face) condition, the avatar creation step was skipped, and they used their live video feed instead.

The experiment consisted of three phases:

Phase 1 - Individual Ranking. Each participant first ranked the 15 items independently, without discussion. Participants were instructed to assign a unique number from 1 to 15 to each item, indicating how important each item would be for surviving until rescue.

Phase 2 - Group Ranking. After completing the individual rankings, participants worked together to produce a single, agreed-upon ranking of all 15 items. They had 5-10 minutes to discuss and were instructed that both participants must agree on the final ranking. Each item in the group ranking was assigned a unique number from 1 to 15.

Phase 3 - Questionnaire. Finally, participants completed a questionnaire using a 7-point Likert scale to assess self-reported copresence, perceived other's copresence, telepresence, social presence, and aspects related to the Proteus effect.

4. Results

To account for the small sample size and the ordinal nature of our questionnaire data, we conducted a Mann-Whitney U test [7] to compare the Avatar and Webcam conditions for each measured aspect. As shown in Figure 2, the average scores and the test scores for each aspect in the Avatar and Webcam conditions were as follows:

- **Self-reported copresence:** Avatar mean = 5.33, Webcam mean = 5.67 (U = 58.0, p = 0.411)

- **Perceived other's copresence:** Avatar mean = 6.50, Webcam mean = 6.00 (U = 160.0, p = 0.190)

- **Telepresence:** Avatar mean = 4.88, Webcam mean = 4.25 (U = 151.0, p = 0.363)

- **Social presence:** Avatar mean = 4.88, Webcam mean = 5.75 (U = 22.0, p = 0.303)

- **Proteus effect:** Avatar mean = 6.25, Webcam mean = 4.50 (U = 212.0, p = 0.001)

Only the Proteus effect showed a statistically significant difference between conditions ($p < 0.05$). The other aspects did not reach significance, indicating comparable scores across the two conditions for self-reported copresence, perceived other's copresence, telepresence, and social presence.
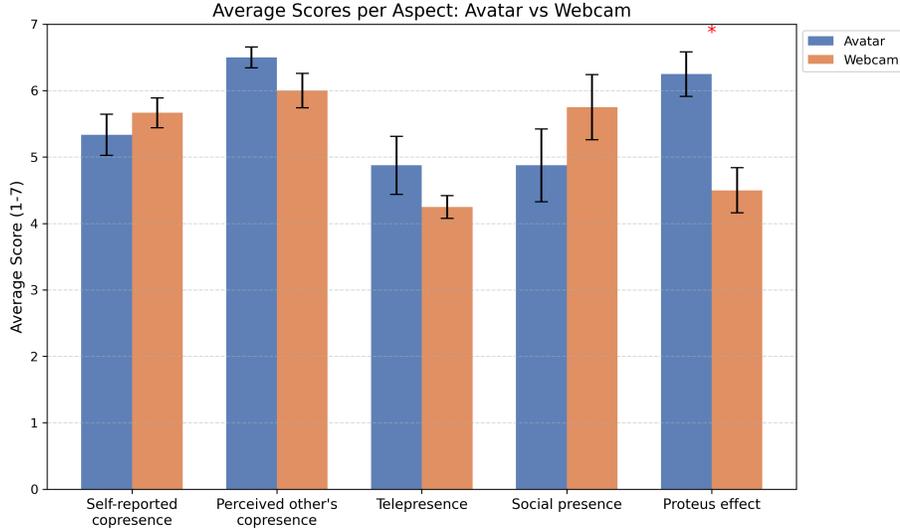
Figure 2. Average scores for each measured aspect in the Avatar and Webcam conditions. Error bars represent the standard error of the mean. The red star indicates a statistically significant difference ($p < 0.05$).

5. Discussion

The results of this study indicate that the type of self-representation in online meetings can influence different aspects of the user experience.

For **self-reported copresence**, participants in the Webcam condition reported slightly higher scores than those using avatars (M = 5.67 vs M = 5.33). This suggests that seeing a real face may provide subtle visual and social cues, such as eye contact and micro-expressions, which enhance the feeling of being co-present with another participant.

In contrast, **perceived other's copresence** was higher in the Avatar condition (M = 6.50 vs M = 6.00). Expressive avatars may amplify gestures, facial expressions, and other non-verbal cues, making the other participant appear more engaged or attentive.

Telepresence scores were slightly higher in the Avatar condition (M = 4.88) compared to the Webcam condition (M = 4.25), indicating that using an expressive avatar may provide a marginal increase in the sense of immersion in the virtual meeting.

Regarding **social presence**, the Webcam condition received higher scores than the Avatar condition (M = 5.75 vs M = 4.88). Real faces appear to convey more nuanced social and emotional information, which avatars may not fully replicate.

Regarding the **Proteus effect**, participants in the Avatar condition scored higher than those in the Webcam condition (M = 6.25 vs M = 4.50). This suggests that using an expressive avatar can influence participants' behavior or attitudes during the meeting, consistent with the theory that digital representations can affect user behavior.

Additional questions revealed that while avatars may support engagement and expressive interaction, they are less effective than webcams in conveying the sense of realness and familiarity with an unfamiliar participant. For example, participants rated Webcam higher when asked how "real" their partner seemed (M = 7.0 vs M = 4.75) and how well they felt they could get to know someone (M = 7.0 vs M = 3.75).

5.1. Relation to Hypotheses

We now relate these findings to our initial hypotheses:

- **H1:** A trend in the expected direction was observed, with Avatar scoring slightly lower (M = 5.33) than Webcam (M = 5.67), but the difference was not statistically significant (U = 58.0, p = 0.411).

- **H2:** A trend consistent with the hypothesis was found, as Avatar scored higher (M = 6.50) than Webcam (M = 6.00), but the difference did not reach statistical significance (U = 160.0, p = 0.190).

- **H3:** The Avatar condition showed a slightly higher mean (M = 4.88) compared to Webcam (M = 4.25), but this difference was not statistically significant (U = 151.0, p = 0.363). Therefore, H3 was not supported.

- **H4:** Avatar scored lower (M = 4.88) than Webcam (M = 5.75), consistent with the hypothesis, but the difference was not statistically significant (U = 22.0, p = 0.303), indicating only a non-significant trend.

- **H5:** Fully supported. Avatar scored significantly higher (M = 6.25) than Webcam (M = 4.50), showing a clear behavioral influence of using an expressive avatar (U = 212.0, p = 0.001).

Overall, these findings suggest that while avatars can enhance behavioral engagement and perceived attentiveness (Proteus effect), they do not significantly change self-reported copresence, perceived other's copresence, social presence, or telepresence compared to real webcams. Avatars may offer expressive advantages, but webcams remain more effective for conveying social realism and familiarity with an unfamiliar participant.

6. Limitations and Future Work

This study has several limitations that should be considered when interpreting the results.

First, the avatar software, Animaze, replicates facial movements but is not perfect. Some participants experienced minor issues, such as the avatar's eyes twitching or the mouth not opening properly while speaking. These imperfections may have affected participants' perceptions of their avatar, potentially reducing social presence and the naturalness of interaction.

Second, conducting the experiment at participants' homes introduced variability in environmental conditions, including lighting, background, and webcam quality. Poor lighting or low camera resolution occasionally affected avatar tracking, which could have influenced participants' ability to express or perceive non-verbal cues accurately.

Third, Animaze only tracked facial expressions. Hand gestures, body posture, and other non-verbal communication channels were not captured. In real meetings, these cues play an important role in conveying engagement, attentiveness, and social presence. Limiting tracking to the face may therefore underestimate the potential advantages of avatars for richer communication.

Fourth, the study sample was small and consisted of young adults who may be familiar with digital technologies. This limits the generalizability of the results to broader populations, such as older adults, participants with less digital experience, or professional meeting contexts.

Future work could address these limitations in several ways. First, recruiting larger and more diverse samples, including participants across different age groups, cultural backgrounds, and professional experience, would help improve the generalizability of the findings. Second, using enhanced avatar systems that support full-body tracking, more natural facial expression rendering, or richer customization could provide a more realistic sense of presence and better support non-verbal communication. Finally, conducting studies in controlled experimental environments with standardized lighting and equipment would reduce variability and help isolate the effects of avatars from environmental factors.

7. Conclusion

This study investigated whether using an expressive avatar, instead of showing one's real face, improves the user experience in online meetings with unfamiliar participants. Our results indicate that the type of self-representation influences different aspects of the experience. Avatars enhanced perceived engagement and behavioral changes associated with the Proteus effect, which was the only statistically significant difference between conditions. Other aspects, such as self-reported copresence, perceived other's copresence, telepresence, and social presence, showed trends in line with the hypotheses but did not reach statistical significance.

These findings suggest that expressive avatars can be a viable alternative to webcams in online meetings, particularly when the goal is to encourage engagement or reduce self-consciousness. At the same time, webcams may be preferable when maintaining direct social connection and conveying subtle social cues is important. Future studies with larger and more diverse samples, as well as more advanced avatar systems, could further clarify the contexts in which avatars are most beneficial.

References

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