# Reducing Foreign Language Anxiety with Virtual Reality

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Figure 1: A: Character Selection System; B: A classroom with 15 Diverse ethnicities of students; C: VR Experiment

## ABSTRACT

An immersive VR experience was developed to examine the relationship between foreign language anxiety (FLA), virtual audience characteristics, and learners' perceptions of the virtual audience. Seven students studying English as a second language selected their avatars and practised their presentations in front of a virtual audience in a realistic classroom. Results indicated that participants' FLA levels increased when presenting to larger audiences, but decreased after repeated presentations. They were also able to identify the surroundings more readily when presenting in front of smaller audiences, as well as in front of audiences of diverse ethnicity.

**Index Terms:** Applied computing—Law, social and behavioral sciences—Psychology

## 1 INTRODUCTION

Learners of new languages often experience FLA, where they experience worry and negative emotions when using a second language [7]. When giving a speech in public, FLA could be exacerbated by the presence of the audience. Here, we use virtual humans and virtual reality (VR) to simulate a public speaking scenario. We are interested in how different characteristics of the virtual audience would influence participants' performance. Participants were asked to create their own avatars ahead of each session where they had to present in front of a virtual audience in a realistic classroom setting. A $2 \times 2$ within-subject experiment was conducted in which we manipulated the ethnicity (virtual audience's appearance associated with East Asian or mixed backgrounds), and the size (small: 5 or big: 15) of the virtual audience to investigate the relationship between these two factors and FLA.

## 2 RELATED WORK

A virtual audience is "a collection of virtual characters situated in an environment that mimics a public speaking situation" [10]. Computer-generated audiences have been perceived as social actors rather than simple computers [5]. Practising with a virtual audience

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could alleviate public-speaking anxiety and improve participants' public-speaking skills, such as reducing the use of pause fillers, being more confident, and improving overall performance [3]. Chollet et al. reported that the size of the virtual audience could influence participants' level of social anxiety [9], whereas in a study with three, six, and fifteen virtual characters in the audience, participants experienced more stress when the audience size was smaller. Based on the social influence model (SIM) [12], once a group reaches five members, the individual impacts cease to exist, so adding more members has no further impact. This shows that the perception of virtual humans is quite different from real-world perception [9]. Certain aspects of VR technology, such as the limited field of view and low resolution of current headsets, may affect the perception of virtual humans. As a result, more distant virtual humans would appear less realistic due to fewer pixels for displaying their facial expressions or behaviours. It is also important to consider the audience's appearance, especially its gender and ethnicity since participants tend to be more influenced by agents with similar genders and ethnicities [1,2], and agents who look similar to them [1].

## 3 EXPERIMENTAL DESIGN

### 3.1 Scenario and Implementation

The VR application was developed with the Unity 3D engine for Oculus Quest2. Ready Player Me and Mixamo were used to compose and animate the virtual audience. Hand-tracking was used so that participants could use gestures free from controllers. Four conditions were created including audiences with different ethnic mixes and sizes: a classroom with 15 East Asian students, 15 ethnically diverse students, 5 East Asian students, and 5 ethnically diverse students. Their behaviour was programmed using Unity Engine's animation controller. Affective expressions such as nodding, gestures, and forward-leaning postures were used. All virtual audiences paid close attention to the speaker at the beginning of the presentation. As time passed, half of the audience was hard-coded not to pay attention to the presentation (e.g. working on their laptops, chatting to one another, looking in other directions, stretching their arms), which is common in real-life presentations. They were programmed to look toward the microphone where the speaker was located to simulate eye contact with the presenter. In response to the completion of the presentation, all of the virtual audience members applaud and clap.

### 3.2 Measurements and Hypotheses

Five questionnaires were used including: FLA Questionnaire [6], Body Ownership (BO) [13], Social Presence and Co-Presence [11], Focus of Attention (FoA, higher score indicates more focus on self

rather than surroundings) [14], and Memory Assessment (adapted from [4]). Our hypothesis was that as the VR training sessions were repeated, a participant's perception of the audience and their surroundings would improve (**H1**). The size and the appearance of the virtual audience would have an impact on the participant: they will experience higher levels of FLA in front of smaller virtual audiences (**H2**), and presenting in front of ethnically diverse ones (**H3**). FLA was completed before and after the VR experience to capture the change. The appearance of the virtual audience would influence a participant's social presence (**H4**). Also, with a smaller virtual audience, participants would be better at observing the details (e.g., appearance, clothing, or behaviour) than with a larger virtual audience (**H5**). See supplementary files for Questionnaires.

### 3.3 Participants and Procedure

An experiment was conducted in the English Language Department of Lasalle College of the Arts in Singapore, with 7 Chinese native-speaking students (3 women and 4 men, IELTS scores $3.5 \sim 4.5$). After filling the pre-questionnaire on demographics, first language, prior English learning experience, previous VR experience, and FLA prior to the study, they were asked to select their avatars and practice their presentations in front of the virtual audience. All participants went through all four conditions within two weeks' time. Each time, they gave approximately 10 minutes, choosing a different one from the four Topics: (1) self-introduction (2) food (3) a special place, and (4) hobbies. Each participant received a 7*4 Latin square assigned topic order. After each presentation, they were asked to complete a post-questionnaire, followed by a group discussion.

### 4 RESULTS

First of all, a two-way repeated measures ANOVA indicated that participants' FLA was significantly higher when presenting to larger virtual audiences ($M \pm SE$ Large:$33.2 \pm 1.89$; Small: $29.1 \pm 1.78$; $F(1,6) = 22.99$, **p = 0.03**, $\eta^2 = 0.793$). The two-way repeated ANOVA on Memory revealed that participants had a better memory recall when presenting in front of smaller virtual audiences (Large: $7.4 \pm 0.77$; Small: $9.7 \pm 1.11$; $F(1,6) = 17.66$, **p = .006**, $\eta^2 = 0.746$), and interestingly, when presenting to a more diverse group of audience (Asian: $7.6 \pm 0.99$; Diverse: $9.5 \pm 0.88$; ($F(1,6) = 18.43$, **p = .005**, $\eta^2 = 0.754$). Additionally, when comparing their first session to their last, participants reported significantly higher levels of FLA scores ($M \pm SE$, First: $40.14 \pm 1.42$; Last: $31.42 \pm 1.75$; $t(6) = 5.972$, **p = 0.001**), and were significantly more self-focused than being able to pay attention to their surroundings ($FoA\ M \pm SE$, First: $2.71 \pm 1.88$; Last: $-2.85 \pm 1.95$; $t(6) = 4.673$, **p = 0.003**).

### 5 DISCUSSION

A paired samples t-test confirmed **H1** by indicating a significant difference between the FoA in the first and the last sessions. This result indicates that as the session repeated, the participants' FoA shifted from themselves to their surroundings. It is possible that this result may have contributed to the reduction in participants' FLA, as a previous study [4] suggests that speakers with high levels of anxiety tend to be more self-focused. The results of the repeated measure two-way ANOVA did not confirm **H2**. In contrast, the larger the audience size, the more FLA the participants felt. This was strengthened in the group discussion session when participants commented they felt more nervous when presenting to a large group of virtual audiences. Also, the result did not confirm **H3** as the ethnicity of the virtual audience did not affect the participants' FLA. This may be because the participants could not distinguish the ethnicities of the East Asian and the ethnically diverse virtual audiences. In the group discussion session, presenters mentioned they would feel less nervous presenting in front of a virtual audience of similar ethnicity. **H4** rejected that there were no significant differences between the measurements of SP in both conditions of ethnicity and size. A repeated

measure two-way ANOVA confirmed **H5** that when participants present in front of smaller virtual audiences, the individual effect would result in the speaker being aware of the surroundings (i.e. the environment, the virtual audience) more readily than when they are presenting in front of larger virtual audiences. One observation that would merit further research was the ability of some participants to recognise audiences comprising of observers from various ethnicities but not register the virtual audience comprising of people who were designed to look East-Asian, suggesting that realism is important in avatar design. Furthermore, according to the group discussion, some students said they chose a purple bear custom to remain anonymous because they lack confidence in their English skills. But as the session repeated, they customized the avatar to resemble them. This finding supports the study [8] that suggested participants with low self-efficacy are likely to be shielded by their avatars. A further study could be conducted using qualitative data to support this result.

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