Determining the Impact of Virtual Reality on Impromptu Speech Performance of De La Salle University Senior High School Manila Students

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Abstract: As technology continuously evolves, innovations such as wearable technology with virtual reality (VR) capabilities persist to assist in various tasks that are used in different practical applications. One of these applications is in the field of oral communication; an integral aspect of human lives that entails effective verbal communication in both formal and informal settings. Unfortunately, public speaking anxiety (PSA) remains to be a prevalent issue in the field. Symptoms of PSA have continuously negatively affected public speaking performance, whether in informal or formal settings. However, with the rise of new VR technologies, a realm of possibility has opened that can be beneficial in improving oral communication. As such, the study aims to determine the impact of VR on impromptu speech performance in comparison to the traditional setup. To accomplish this, De La Salle University Manila Senior High School students underwent two separate trials of at most 90-second impromptu speeches, wherein the first trial was performed with a live audience, while the second trial utilized *Meta Quest 2™* and *VirtualSpeech™* using a simulated audience. The participants were observed during their impromptu speech, focusing on factors such as the number of filler words used, unnecessary movements, voice projection, long pauses, and the total time of their speech. Results showed that the VR simulation reduced long pauses and unnecessary movements compared to traditional public speaking but had no significant effect on filler words and other factors. To conclude, VR has a positive impact on reducing speech disruptions, such as long pauses and unnecessary movements during public speaking, which potentially alleviates nervousness, suggesting that VR could be an effective practice method especially when combined with traditional practice and in front of live audiences.

Key Words: Virtual Reality; simulations; public speaking; PSA

1. INTRODUCTION

1.1 Background of the Study

As technology innovations continue to emerge, opportunities in developing a person's oral communication are made possible because of evolving technology. The field of oral communication is an integral aspect of human life as it entails effective verbal communication in both formal and informal settings. Studying it is relevant as it equips learners with the appropriate tools and techniques that are crucial to their future professions and their daily lives.

Virtual Reality (VR) refers to a simulated environment that immerses users in a computer-generated reality experienced through headsets and sensory feedback devices (Zheng et al., 1998). Hardware, such as headsets and controllers, and the software that generates the virtual environment are key components of a VR system (Bamodu & Ye, 2013). Its power to create immersive experiences in various fields has opened a realm of several opportunities that can enhance quality of life (Vasey, 2022).

In education, VR has been continuously explored to improve current traditional teaching and learning modalities. The integration of VR in public speaking showed potential in improving presentation skills as several training sessions was conducted using VR where most VR-based training programs evaluate the user's performance after the speech (Fujimoto et al., 2021). It also keeps students motivated, helping in continuously sustaining learning materials compared to the traditional method due to VR's interactive nature which heavily contributes to the students' visualization of the task (Baceviciute et al., 2021).

Several studies have examined the potential of VR in public speaking, aiming to improve overall speech performance of the user and decrease Public Speaking Anxiety (PSA), the fear of public speaking. PSA manifests various physiological indicators such as increased heart rate, stutter, shortness of breath, trembling, and stiffness (Tse, 2012).

With this, studies have attempted to utilize VR to ease the students' PSA in speech delivery. It has been used for exposure therapy since it is effective in alleviating social anxiety disorder (Craske et al., 2023). Moreover, using VR software as preparation for oral presentations alongside in-home and in-class practice helped the participants cope with PSA and increased confidence (Alsaffar, 2021). Additionally, a study requiring participants to practice public speaking using VR resulted in a positive impact as it aided in reducing participants' anxiety during actual speech delivery. Despite positive results in confidence and motivation, these are considered inconsistent due to the lack of studies in the field (Yudintseva, 2023).

Locally, the Philippine K12 curriculum involves the subject, "Oral Communication in Context (OCC)," which instructs students about public speaking by making them perform several types of speeches, such as an impromptu speech. It also aims to produce communicatively competent students prepared to confront literal and communicatory adversities (Guevarra, n.d.). However, PSA remains to be a prevalent issue that is commonly encountered. In terms of delivering an impromptu speech, it proves to be a hindrance as it prevents the students from showing their full potential. With OCC being integrated into the K12 curriculum, their ability to perform a speech as well as their mastery of the course, affects their overall academic performance.

Given that there are potential benefits of utilizing VR in oral communication, it is encouraged that educational institutions incorporate VR as it proves to be advantageous in improving presentation skills and elevating speech performance (Damio & Ibrahim, 2019). Individuals can heavily benefit from using VR especially in the academic context, as it permits individual-learning along with technological and human-computer interaction, enticing the users' eagerness to learn while enhancing their skills along the way (Wang & Mughaid, 2022).

Therefore, studying the utilization of VR in public speaking needs to be further explored; such interventions have yet to produce generalized results and surfaced some disadvantages from different methods, therefore leaving some uncertainties in its overall effectiveness. Hence, this study aims to determine the impact of VR on the impromptu speech performance of De La Salle University Senior High School students and the factors related to delivering an impromptu speech.

1.2 Objectives

The study aimed to explore the application of virtual reality (VR) in the course "Oral Communication in Context (OCC)" and determine the impact of VR on impromptu speech performance of students. Specifically, the study also sought to answer the following questions:

a.) To identify the factors that affect impromptu speech performance
b.) To implement virtual reality on impromptu speech
c.) To determine the impact of virtual reality on impromptu speech performance

1.3 Scope and Limitations

The study was conducted with 35 student participants from De La Salle University (DLSU) Manila – Integrated School, specifically those enrolled in Senior High School (SHS). Selected participants were students who took or were taking OCC to ensure a fair public speaking background.

The participants were tasked to deliver an impromptu speech about personal hypothetical topics which remained the same for every participant. Such questions allowed the participants to answer based on personal interest and experience. Moreover, the experiment consisted of two trials, the first was delivering an impromptu speech traditionally and the second was performing with the *Meta Quest 2™* VR equipment and *VirtualSpeech™* software.

The study did not cover and test other aspects, such as the effectiveness of the virtual reality equipment. This limits the generalizability of the results from other brands or models of VR equipment and software besides the equipment and software. Moreover, the data were limited to the factors observed during the experiments with the specific VR equipment, software, and participants.

2. METHODOLOGY

2.1 Research Design

The study adopted a quantitative analysis approach. Through this, the study was able to determine the impact of VR on impromptu speech performance based on the identified factors. A quantitative experiment was also done to collect numerical and statistical data which aided in comparing the traditional and virtual reality speech variations.

2.2 Product Selection

The *Meta Quest 2™* was used as the VR headset since it is currently the most impressive consumer headset available due to its affordability and versatility (Stein, 2023).

The *VirtualSpeech™* application was used since it is a recognized platform the provides training in essential soft skills, utilizing the power of virtual reality and artificial intelligence. According to Klaassen et al. (2018), *VirtualSpeech™* is utilized at several institutions and based on reports and has been met with favorable outcomes.

2.3 Data Collection

Since there were criteria for being a qualified participant in the study, a purposive sampling method was implemented. This allowed the study to limit the participants into a certain population. Participants were selected through a survey questionnaire disseminated via Google Forms, which collected their basic information, OCC background, and informed consent. These criteria were needed to ensure that all participants were equipped with adequate knowledge regarding impromptu speech performances. The collection of the data remains confidential and was utilized for research purposes only.

In an interview with a DLSU Manila OCC teacher, the identified standard criteria for evaluating impromptu speech performances are visual (unnecessary movements) and vocal (filler words, voice projection, and long pauses) aspects. To ensure objectivity, only the number of filler words used, unnecessary movements, voice projection, long pauses, and the total time of their speech were observed during the experiment.

2.4 Experiment

The participants performed two separate trials of at most 90-second impromptu speeches and were asked a hypothetical question, differing in each trial, as their speech topic. For the first trial, the participants were asked the question, “If you were to eat only one cuisine for the rest of your life, what would it be and why?” While on the second trial, they were asked a different hypothetical question, “If you could visit any country or city, which one would it be and why?” The participants did the traditional impromptu speech for their first trial and utilized *Meta Quest 2™* and *VirtualSpeech™* for the next trial. Before starting their speech, they were given ten seconds of preparation time after the question was asked. Additionally, there was a 3-week interval between the trials so that the first experiment would not influence their performance in the second (Valderama & Oligo, 2021).

To avoid external factors that may affect the data that was collected, the environment and visual aspects of the *VirtualSpeech™* were replicated. As

such, the experiment was conducted in a conference room the that had four audience members, with at least one audience member being a stranger to the participant. This was to minimize any conflict of interest or shared experiences among the researchers and the participants.

During the experiment, the visual and vocal aspects of their impromptu speech performance were observed and tallied, such as the number of filler words used, unnecessary movements, voice projection, long pauses, and the total time of their speech.

Fig. 1. Trial 1 (Traditional) Setup

Fig. 2. Trial 2 (Virtual Reality) Setup

Fig. 3. Setup Inside the Virtual Reality

2.5 Factor Charting

To properly characterize the factors of impromptu speech, the following statistical concepts were used during the experiment:

According to Palmas et al. (2019), filler words should be counted as such when they obstruct effective communication. Moreover, Mortaji (2018) emphasizes the importance of observing, not only verbal, but also non-verbal cues such as unnecessary movement (nervous gestures, mannerisms, and posture). Therefore, frequencies of filler words (see Table 1) and unnecessary movements (see Table 2) were tallied.

Table 1. Filler Words

Filler Words			
You know what I mean	*Right*	*Well*	*Uhm*
You know	*Thing*	*So*	*Like*
As I said	*See*	*Stuff*	

Table 2. Unnecessary Movements

Type of Movement	Criteria
Nervous Gestures	hands shaking; voice trembling; sudden stops, inability to continue the speech; confusion; loss of words; tongue clicks; sighs; unexpected/too serious facial expressions; biting lips
Mannerism	touching hair; touching beard; repeatedly adjusting scarf; scratching face/nose; waving hands; pointing; playing with necklace/bracelet; pulling shirt/dress down; looking through window; chewing gum
Posture	moving back and forth; playing with one foot; leg crossing; bouncing; hands in pocket; crossing arms in front; crossing arms behind back; holding one arm; leaning on one leg; leaning on desk, facial expression

The duration of the participant's speech was timed using a stopwatch timer. The results recorded were evaluated by indicating if they performed under (less than 90 seconds) or over (more than 90 seconds) the given time criteria.

Furthermore, the participant's average volume of voice projection was also evaluated based on

their decibel level using Sound Meter by *Splend Apps™*. Based on the articles of Chris (2023), Riva (2023), and the National Institute on Deafness and Other Communication Disorders (2020), the optimal or average voice projection is between 65 and 75 dB. With this, the results will be categorized into weak (below 65 dB), average (between 65 to 75 dB), and loud (above 75 dB).

Furthermore, the University of Gothenburg (2015) stated that the long pauses the participants would make should be considered and tallied. Saputri (2017) also mentioned that pauses of 4 seconds or more are considered as long pauses.

The gathered data was analyzed using PHstat in Microsoft Excel to determine if a significant difference exists between both trials. To specify, a dependent t-test was used through the mentioned software.

3. RESULTS AND DISCUSSION

3.1 Data Presentation

A total of 35 participants conducted two separate trials of impromptu speeches. The data was compiled using the Google Sheets application. The mean of each factor was computed.

According to the mean of each factor (see Table 3), Trial 2 had slightly higher values of filler words and voice projection compared to Trial 1. On the other hand, Trial 1 had significantly higher values of long pauses, unnecessary movements, and time duration compared to Trial 2. Additionally, both trials 1 and 2 fall under the average voice projection category.

Table 3. Mean Data

Trial #	Filler Words	Voice Projection	Long Pauses	Unnecessary Movements	Time Duration
Trial 1 (No VR)	7.34	65.8 dB	1.14	6	52.72
Trial 2 (VR)	7.89	66.26 dB	0.57	2.51	44.90

Additionally, the following figures (see Figure 4 and 5) were made to facilitate a better comparison of the factors between the two trials:

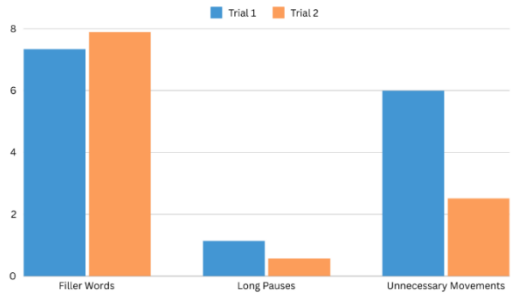

Fig. 4. Means of Filler Words, Long Pauses, and Unnecessary Movements

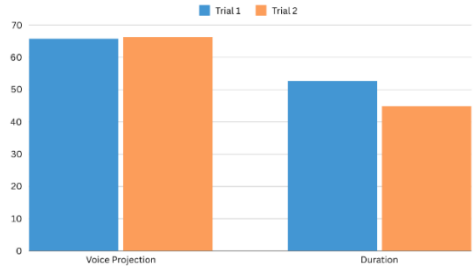

Fig. 5. Means of Voice Projection and Duration

3.2 Data Analysis

To determine if the acquired data is statistically significant, a dependent t-test was implemented to analyze and determine the significance of the difference between Trial 1 and Trial 2. To do this, the PHstat Software was used to calculate and analyze the data gathered from the experiment.

The researchers claim that the observed factors of Trial 1 are greater than Trial 2. Thus, the null hypothesis states that Trial 1 is less than or equal to Trial 2 (H0: Trial 1 ≤ Trial 2) while the alternative hypothesis states that Trial 1 is greater than Trial 2 (Ha: Trial 1 > Trial 2). Furthermore, the values used in all trials for the hypothesized mean difference, level of significance, sample size, and degrees of freedom are 0, 0.05, 35, and 34 respectively.

Based on the calculated values for filler words (see Table 4), at a 0.05 level of significance,

there is not enough evidence to reject the null hypothesis that the filler words of Trial 1 are less than or equal to the filler words of Trial 2.

Therefore, we cannot conclude that the filler words of Trial 1 are greater than the filler words of Trial 2.

On the other hand, according to the obtained values for long pauses and unnecessary movements (see Table 4), at a 0.05 level of significance, there is enough evidence to reject the null hypothesis that the long pauses and unnecessary movements in Trial 1 are less than or equal to those in Trial 2.

Therefore, we can conclude that the long pauses and unnecessary movements in Trial 1 are greater than the long pauses in Trial 2.

Table 4. Trial 1 vs Trial 2

Statistical Measure	Filler Words	Long Pauses	Unnecessary Movements
Standard Deviation	3.5092	0.9482	2.2409
Standard Error	0.5932	0.1603	0.3788
t-Test Statistic	-0.9152	3.5651	9.2022
Upper Critical Value	1.6909	1.6909	1.6909
p-Value	0.8167	0.0006	0.0000

4. CONCLUSIONS

To conclude, the mean of the factors has shown greater values in the filler words and voice projection factors in Trial 2. For the filler words, after statistical computation and comparison, there was insufficient evidence to reject the null hypothesis. This implies that despite the difference in the mean of the first and second trial, there is no assurance that there were more filler words uttered by the participants. A likely reason affecting this was the nervousness of the participants during the trial. Some may have been more comfortable with the VR setup, or the traditional setup based on personal comfort levels.

Conversely, as there was sufficient evidence to reject the null hypothesis for the factors of long pauses and unnecessary movements, as the values obtained for Trial 1 were indeed greater than those of Trial 2. This indicates that VR has a positive impact on impromptu speech performance in terms of reducing long pauses and unnecessary movements, answering the 3rd objective of the study. The number of unnecessary movements could have potentially declined in the second trial due to the presence of the VR controllers that the participants were holding. This might have limited the participants' movement as it forced them to hold it in a certain way, training them to make more purposeful and controlled movements. Another factor for this was the VR headset, as it also obliged the participants to look at the virtual audience in front of them, encouraging them to maintain eye contact. Moreover, participants could have also been more comfortable with the VR headset on. This made them think that the audience in front of them was not real, giving them a sense of isolation or a feeling that they were performing on their own.

On the other hand, long pauses could have been affected by their general nervousness or their interest of the topic provided, potentially because the immersive nature of VR and the presence of a virtual audience creates a more engaging environment, reducing the likelihood of long pauses as the speaker becomes more engaged and focused. Moreover, more knowledge and engrossment on the topic could have encouraged the participants to talk more, therefore reducing their long pauses.

Overall, VR has a positive impact on decreasing the number of long pauses during speech. VR also helps in decreasing unnecessary movements during speech, likely because of the use of controllers and headset in VR environments. However, the same positive impact of VR on reducing filler words cannot be concluded from the data analysis, as filler words are often habitual and deeply ingrained in an individual's speech patterns, and VR may not directly address this aspect, which could require specific training or techniques.

Therefore, utilizing VR for practicing public speaking can be advantageous and beneficial in terms of reducing long pauses and unnecessary movements while speaking, but additional strategies might be

necessary to address the use of filler words.

4.1 Recommendations

Further studies may consider implementing VR as a tool for practicing over a certain period of time to determine its effectiveness. Moreover, utilizing other VR devices may provide a better experience for the user due to increased comfortability, decreased heaviness and induced heat, better accessibility for people wearing glasses, or overall better quality, potentially impacting performance. Additionally, using other VR software may impact the effect of VR on speech performance, especially if the software is more realistic, has better graphics, gives the option to change the environment, or has real people controlling the audience and providing interactivity.

Furthermore, observing and analyzing other factors such as the number of stutters, or speech content may uncover other factors VR has an impact on. Also, utilizing other types of questions that may be easier or more relatable can assess if the question affects the speech performance.

In addition, future works may consider performing the first trial with VR and the second trial traditionally to determine whether the order of trials has an impact on the results.

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