Effect of VR simulations on MPA level & breath control of voice major students

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ABSTRACT

A form of art that is created through a performance by one or an ensemble of performers, shown in front of an audience is called the performing arts. Despite having its appeal, performing in front of many people can lead to "performance anxiety". Performance anxiety is especially very concerning for singers and voice students. This can lead to diminished performance quality and impair the control of their vocal technique, with the most affected one being their breath control, which is considered one of the most crucial techniques in singing. A survey conducted on voice students of Pelita Harapan University Conservatory of Music has found this as a phenomenon that's been experienced by students, noticed by the voice lecturers, but yet to be effectively addressed. Previously, the use of VR simulations has been found effective in helping treat and decrease the symptoms and occurrence of social anxiety, which includes performance anxiety. However, a very limited amount of research has been done on the impact of VR on music-related performance anxiety (MPA), and even less specifically on singing performances. Through a mixed-method approach and by adopting the within-subject research design, this study aims to study the effects of VR simulation implementation on nineteen voice major students of Pelita Harapan University Conservatory of Music's MPA level and breath control. Results found that the method was effective in treating the MPA symptoms and did improve the students' breath control but was not conducted long or frequently enough to take a long-term or permanent result.

INTRODUCTION

One of the most popular and oldest forms of art is the performing arts, which can be defined as a live event or activity by one or a group of artists or performers (Bezrucka, 2011). This also means that the artist would showcase their art and performances in front of an audience. One of those performing arts branches is a musical performance, which includes singing. Fundamentally, the human voice is a wind instrument, consisting of the lungs working to provide the air, the vocal cords creating vibrations that create the sound, and the mouth, nose, and upper throat as the chamber that creates resonation in our voices (Devi, 2021). In the world of vocal pedagogy, vocal technique is something that is always elaborated, as it is a very crucial part of building a healthy and long singing career (Rosine, 2018), as well as training the singers on how to make a pleasant sound and delivering

the message of the song itself. Thus, although it is based on physical principles, singers and voice students must have an understanding and be able to feel exactly what happens in their bodies when they are singing.

Summarizing from vocal pedagogy textbooks and scientific journals, vocal technique is divided into four aspects (Peckham, 2010; Christy & Paton, 2006; Agheana, 2022; Kovalsky, 2021). First, proper breath control starts with holding the right posture when we sing, as this opens up our bodies and allows a good amount of air to come in and out and allows us to be more relaxed when singing. The right singing posture happens when vertically, the whole body, from head to toe, is in one straight alignment, steady but not tense, balanced, and flexible. The chest is in an upright and tall position, but not forced. The knees are relaxed, and the feet are opened shoulder-wide to provide the singer with a good balance. Once a singer is in the correct posture, to execute the correct breath control technique he/she can inhale through the nose and/or mouth whilst expanding the ribs and abdominal muscle around the waist, allowing the diaphragm to contract. This singer should then sustain this contracting abdominal and diaphragm position while singing is taking place, and finally, once the sentence or phrase is done, the singer can then exhale and release all contractions happening in the abdominal part of the body. This cycle is to be repeated all over again in every sentence or phrase the singer is singing (Devi, 2021; Peckham, 2010). Second, the voice production aspect is an essential process of creating an efficient, varied, balanced, and expressive sound. The right voice production should create a steady and clear sound, stay on the right pitch, and be flexible, as well as help the singer control the volume and dynamics when they're singing (Christy & Paton, 2006). Third, the use of vocal resonance impacts the way we sound and the color of our voices. Fourth, the articulation. The articulator organs in our bodies consist of our mouth, teeth, and tongue, as well as our soft and hard palates. These organs give us the ability to form words or lyrics clearly, hence making it a very important part of singing due to their impact on the song delivery and ability to be able to be perceived and understood well by the audience.

Other than its benefit towards the singing itself, the execution of a good vocal technique, especially breath control, can be a tool for relaxation during the performance itself. The constant cycles of inhaling and exhaling help relax our joints and muscles, regulate our thoughts, and give us a sense of calmness and consistency. With all this in mind, it is crucial to make sure that this breathing technique is well integrated with the other singing techniques. It is also very important to note the fact that each singer is different and that there is always the possibility that different ages, genders, and body types might also bring slight differences in the way we conduct this breathing technique in singing. In other words, what works for one singer might not work for the other (Watson, 2014).

Despite having the skill and ability needed to sing well and execute the performance, more often than not, singers and performers would experience something called "performance anxiety". Performance anxiety falls under the umbrella of social anxiety disorder (SAD) and goes beyond shyness or feelings of unease. Performance anxiety happens when someone experiences persistent and extreme distress before or during a performance or a public event, with the fear of failing the performance or other disastrous outcomes (Barbeau & Mantie, 2018). Furthermore, performance anxiety usually happens when unfamiliar people are involved, such as in work interviews, tests, auditions, debates, or during an art performance, like music. Despite often being perceived as something negative, the feeling of anxiousness is something mankind needs in their lives, as this can help us respond and prepare ourselves better for the possibility of threats or danger (Saleh, 2019). However, when the level of response someone makes is not appropriate to the actual threat, this can cause problems. When this happens anxiety can very much appear without a tangible presence of the threat and can be very hard to address or control. Simply put, when it is in the right and appropriate amount, anxiety is beneficial, but when it is excessive, persistent, uncontrolled, and irrational, and if this has caused symptoms, something must be addressed.

During a singing performance, performance anxiety can manifest as feelings of anxiety, tension in the body, panic, being easily distracted, tremors, breathing problems, an increase in heart rate, and even hormone imbalances due to excessive production of epinephrine and cortisol in the body (Kenny, 2011). While all symptoms mentioned above can also occur, the other added signs of someone experiencing MPA are a highly critical and self-evaluative manner before, during, or after the performance, as well as memory failure, suddenly misreading the score despite knowing the

materials well, failures of techniques, loss of posture and excessive production of the adrenaline and stress hormones, epinephrine and cortisol (Osborne & Kirsner, 2022). There may also be the occurrence of behavioral symptoms, such as having the urge to cancel or avoid the performance, or even thoughts of leaving the stage mid-performance. These symptoms presented would almost definitely diminish the quality of the performance and the confidence of the performer. This condition can show up in musicians of all ages and stages of experience, despite the amount of preparation, practice, and training they do. It is likely that having music as the musician's career also added to the amount of persistent stress, therefore even causing a more severe MPA.

Since singing itself is both a physical and mental process, unaddressed performance anxiety can impair the singing performance. This can cause difficulty in controlling a singer's breathing, and this can lead to diminished quality of sound and ability to hit certain notes, as well as affecting a singer's vocal timbre, tone, and projection (Watson, 2019), and, if done too often, might also lead to vocal injuries. A survey was conducted in November 2022 to the majority of third and fourth-year Pelita Harapan University Conservatory of Music voice students. Students filled out a questionnaire regarding their singing experiences, whether or not they have experienced performance anxiety, and if they felt like it limited them from performing to the best of their abilities. 83% of respondents claimed that they feel a significant amount of difference in anxiety level when they perform compared to when they practiced, in a way that affected their performance and their vocal techniques, specifically their breath control. This was also confirmed by the campus' voice lecturers' survey where 80% of them claimed to have seen their students experience this condition and that this highly affects the students' vocal technique, especially their breath control.

Virtual Reality Exposure Therapy (VRET) specifically has been one of the most used VR interventions for dealing with anxiety. It has been used for occupational-related therapy, public speaking therapy, anxiety related to phobias, as well as MPA for instrument players. The idea is to introduce guided exposure to the anxiety-inducing situations gradually, to gain familiarity and therefore decrease the level of anxiety. VR is considered the perfect tool for this, due to how practical and easy it is to simulate said anxiety-inducing situations and cater to different kinds of needs (Donelly et al., 2021). Essentially, VR is made for the users to experience the design, which with creativity, can mean anything one could imagine. It is made to artificially stimulate our senses, may it be visually or auditory, and to "fool" the users to some extent, into feeling a natural sense of presence in a not-so-natural man-made world (Lavalle, 2019; Bruno et al., 2022; Christou, 2010).

The existence of VR provides the possibility of creating a set of experiences that is measured, controlled, flexible, can be created and modified on-demand, and most importantly, safe. In some cases of severe occupational anxiety, it has even been proven that the incorporation of VR in this case allows the clients to receive a more impactful and earlier effect of the therapy compared to the traditional rehabilitation method (Urrely & Martoral, 2023). Gagne, through her article based on the Berklee Teachers on Teaching discussion back in 2015, highlighted how singing in itself is as much of a mental process as it is physical. Thus, a singer's job is also to manage his or her thoughts, which can be a very hard thing to do when someone is too occupied by fear, worry, and anxiousness that can yet be controlled. As of the time this very research was written, there has not been any research specifically on the impact of VR intervention on breath control in singing. However, it was proven through two different studies by Zhang et al., (2021) and Zhang et al., (2022) that the use of VR training has had a positive impact on the overall singing technique, and this includes the breath control technique. In the research Zhang et al., (2021), she studied how the use of VR training impacted a singer's emotions in singing compared to when the singer is only using self-imagination. The study found that because of the emotional activation occurring due to the VR training, the overall singing performance has improved significantly in many areas, including the use of breath control. This finding was then re-confirmed by another study Zhang and her team conducted in 2022, where 35 first and second-year voice major students. Results showed that VR training has brought improvements in the elements of singing technique in general. This is why, the use of VR can be very strategic and impactful for singers and/or voice students, especially towards the breath control itself.

VR can also be used to enhance the teaching-learning process. The use of VR can help students understand certain concepts better, as well as create experiential learning. These days, education is no longer merely about transferring knowledge, but about making sure that students can experience first-hand the concepts that they need to understand. In a teaching-learning experience, technology can be used to help students learn materials that cannot necessarily be brought into the classroom (Endrayanto et al., 2023). Using VR creates a more immersive and interactive learning experience for students, giving a boost to students' motivation and curiosity. The help of immersive media has also been proven to help lower students' cognitive load (Campos et al., 2022). Furthermore, the fact that simulations would also be used created an even further opportunity that allows students to learn in a controlled environment based on a real-life experience. The idea of simulation-based learning can very well be used to maximize the traditional teaching-learning approach, making it even more impactful for the students (Shaw & Switky, 2018).

Thus, using VRET as a tool for controlled and paced simulation for voice students with MPA can get them used to regulating their anxiety while singing, whilst also giving them the opportunity of experiential learning in performing. This method opens an endless opportunity for all kinds of performing situations and conditions that the students might need without direct exposure to an audience or the risk of failing the performance. However, it is also important to note that the steps and methods used in this research cannot be exactly considered as VRET, as it was not consulted with psychologists and medical professionals and was not used to possibly treat the MPA itself. Rather, the interventions were inspired by the steps and systems of VRET and were used to help lessen the symptoms of the MPA.

Other than virtual reality-related treatments, breathing techniques have also been used as a form of exercise to help decrease anxiety. Deep diaphragmatic breathing has been considered one of the best and most effective ways to lessen the feeling of anxiety (Hamasaki, 2020). Interestingly enough, although slightly different in practice, this deep diaphragmatic breathing exercise (DDBE) is also quite similar to the breathing technique used in singing. Therefore, when used correctly and intentionally, the DDBE can also be used to decrease the level of MPA a singer's feeling during a performance, killing two birds with one stone. The idea is to make sure that one breathes deeply and slowly, avoiding shallow breaths and hyper-ventilations which usually make the chest and shoulders rise and cause tension in the body, resulting in a lack of oxygen going into the lungs and can increase the feelings of anxiety (Clinic, 2022; Yau & Loke, 2021; Tompkins, 2010).

The DDBE is done by lying down or sitting down comfortably and placing one hand on the upper chest and the other hand on the person's belly just below the ribcage. This body and hand position will let the person feel the diaphragm move as they breathe in and out. The participants will then be asked to breathe in slowly through the nose and out slowly through their mouths. It is important to note that the hand placed on the chest needs to remain as still as possible, which ensures that the person is fully contracting the diaphragm muscle instead of raising the chest. As the diaphragm contracts, participants engage the stomach or core muscle, therefore when they breathe out the stomach position should go back inwards. The exercise is then to be repeated for a few cycles. The motion of expanding the rib cage and abdominal area, as well as contracting the diaphragm, as well as the repeated cycles of breathing in and out is what makes the DDBE quite similar to the breath control we use in singing (Clinic, 2022; Mirgain et al., 2016).

Up until the moment this research was written, there is very little previous research that studies the impact of VR simulations on MPA, and even fewer studies talk about the impact it may bring on a singer's MPA. While the DDBE has been commonly used to help lessen the general symptoms of anxiety, there is very little to no research that studies the DDBE's impact on a singer's MPA and if this can also bring a positive impact on a singer's breath control technique. This became the heart behind the implementation of this research. The reason why the DDBE is also implemented in addition to the VR simulation is because every singer is different, physically, psychologically, and mentally. This means that there may never be a one-size-fits-all solution to solve this problem, which is why it felt necessary to add another form of tool to the research. Should this study and method be beneficial, this can be a very tangible and impactful way of performing practice, especially in music or art institutions. Thus, this research aims to find out the relationship between VRET simulations on Pelita Harapan University Conservatory of Music's voice-major students' MPA level and breath

control while performing, as well as to see the impact of the DDBE on the students' MPA and breath control while performing.

This research was conducted to study the effect of VR simulation implementation on the MPA level and breath control of Pelita Harapan University Conservatory of Music's voice-major student, as well as the impact of the deep diaphragmatic breathing technique on the MPA level and breath control of the students. It is also to find out the voice-major students' appreciation of the VR simulation intervention. It is hoped that the discovery of this research can further contribute to and motivate the use of VR intervention in singing studies.

METHOD

This research adopts the mixed-method approach, more specifically, the explanatory sequential design type. This means that the data collection and analysis first started with the quantitative approach, and followed by qualitative. While quantitative focuses on analyzing numerical data, finding patterns, and making predictions based on statistical evidence, the use of a qualitative approach gives meaning to those findings. The findings and results of both approaches are then to be interpreted to determine the deeper explanation of the research (Creswell & Creswell, 2017). This research also uses the within-subject research design. In the within-subject design, all participants are given the same interventions. However, the interventions are done in three cycles and on different levels to ensure the authenticity of the data result. This type of experimental research also does not require the presence of a control and experimental group. Instead, each participant becomes their standard, since a comparison is made to the result of each cycle (Simkus, 2023). The sample must also come from a relatively same background, and when the sample of research comes from a similar background. This design has been used mostly in psychological or behavioral-related studies, where the purpose of the research is to study certain methods or ways of treating an illness or certain symptoms (Steingrimsdottir & Arntzen, 2015).

Each intervention consists of three sections: preparation, simulation, and assessment; with a total of three intervention cycles. What differs each cycle is the amount of audience and the size of the performance space, as well as the DDBE intervention that was only given in the third cycle. Below is a detailed explanation of each intervention cycle.

Intervention 1

Figure 1. VR Simulations of Cycle 1
(The Left Picture is the Preparation Section, Right Picture is the Simulation Section)

First, in the preparation section, which lasts for 3-5 minutes, the participants were already asked to wear the VR headset and be shown the visual of a green room or a waiting room where singers would typically prepare themselves before going on stage. Second, the simulation section, in which the visual changes into 3 cycles of performance simulation. The first cycle simulation took place in a small room with 8-15 people in the audience. Third, the assessment section, where voice experts observe and score the participants' breath control for all three cycles using a breath control

assessment rubric. After the performance was done, all participants were asked to fill out the data collection instruments.

Intervention 2

Figure 2. VR Simulations of Cycle 2

(The Left Picture is the Preparation Section, Right Picture is the Simulation Section)

The second cycle, which was done a week after the first one, started the same as the first cycle. The participants were already asked to wear the VR headset and were shown the visual of a waiting room. The simulation section of this cycle took place in a bigger concert hall, with approximately 20-30 people watching. The participants were asked to perform a song of their choice as they would usually do. The assessment section was also done the same as the first cycle, with the voice experts observing and giving scores towards the participants' breath control, as well as the participants filling out the data collection instruments.

Intervention 3

Figure 3. VR Simulations of Cycle 2

(The Left Picture is the Preparation Section, Right Picture is the Simulation Section)

In the third intervention cycle, same as the previous cycles, the students were asked to wear the VR headset and were shown the visual of a waiting room. However, this time, the participants were also given and guided through a DDBE intervention. Thus, the DDBE became a part of their preparation section, to see if it helps with reducing their anxiety level and also their breath control when they perform right after doing the exercise. After they were done with the DDBE and ready to perform, they were shown the visual of the last stage. The last intervention cycle took place in an even bigger stage with about 50-100 people in the audience. The participants were asked to perform as they did in the previous cycles. As in the previous cycles, the voice experts observed all the performances and gave scores on the participants' breath control, while the participants were asked to fill out the data collection instruments. Another aspect that was different in the third cycle was the focus group discussion that was only conducted at the very end of the third cycle. After finishing the last simulation cycle individually, participants were divided into groups and given a few open-ended questions regarding the research they had taken part in.

As depicted in Figures 1, 2, and 3, every cycle provides a different visual and a different simulation experience. These simulation videos were all recorded using a 360° camera to create

realistic visual effects during the simulation. This type of camera also allows the participants to be more flexible with the direction of their sight. Simply put, they can look in any direction and the visuals would all still be connected, just like how it is in real life. The VR headset used in this study in particular is the Oculus Quest 2.

The first data collection instrument used in this research is the modified Kenny – Music Performance Anxiety Inventory (K-MPAI) Questionnaire, which consists of a self-assessment instrument made by Dianna T. Kenny, a leading expert in the field of MPA. The original instrument consists of 40 items, however, this research only used 21 items related to the music performance anxiety symptoms. This was done to ensure the relevance of every single item in the questionnaire filled by participants. Items that are considered a part of other factors such as parental support, depression and hopelessness, memory self-efficacy, and generational transmission of anxiety were not included in the final questionnaire used (Philippe, 2022). This is because this research focuses solely on the difference that the intervention may bring to the MPA symptoms. Furthermore, the writer also added four additional items to further study the effect of the VR simulations on certain MPA symptoms, such as breathing. Upon conducting the validity and reliability test of the questionnaire, seven items were found invalid and omitted from the research. This left us with 18 valid items. The Cronbach alpha formula was then used to check the reliability and came back with a score of 0.91, which means that the questionnaire was reliable. This questionnaire is to be scored with a seven-item Likert scale. The modified K-MPAI questionnaire has already been translated into more than 20 languages, and in this research, it is presented to the participants in Bahasa Indonesia and English, so that participants can choose whichever language they feel the most comfortable with.

Table 1. K-MPAI Questionnaire Pearson Correlation Validity Test

No.	Item Nr	r_{count}	Validity Status
1	1	0.527	Valid
2	2	0.687	Valid
3	3	0.738	Valid
4	4	0.758	Valid
5	5	0.043	Invalid
6	6	0.669	Valid
7	7	0.754	Valid
8	8	0.655	Valid
9	9	0.488	Valid
10	10	0.258	Invalid
11	11	0.472	Valid
12	12	0.619	Valid
13	13	0.688	Valid
14	14	0.668	Valid
15	15	0.517	Valid
16	16	0.744	Valid
17	17	0.191	Invalid
18	18	0.610	Valid
19	19	0.580	Valid
20	20	0.456	Valid
21	21	0.279	Invalid
22	22	0.492	Valid
23	23	0.342	Invalid
24	24	0.227	Invalid
25	25	0.507	Valid

Table 2. K-MPAI Questionnaire Reliability Test

No.	Indicator	Mark
1	Variance Sum	48.263
2	Total Variance	352.766

No.	Indicator	Mark
3	Cronbach's Alpha	0.911
4	Reliability Standard	0.7
Conclusion		**Reliable**

During the performance simulation, each participant was observed and examined by the vocal experts using a rubric made specifically on breath control in singing. In making the rubric, statements that are used as parameters to measure out the participants' breath control execution were already discussed with vocal experts, as well as referring back to the theories of breath control used in the literature review of the research, to ensure its relevance and appropriateness to the topic. The rubric consists of seven statements and uses the 5-point Likert scale. All seven items of the rubric were found valid through a validity test with a reliability score of 0.98, meaning that the test is considered reliable. The item of this rubric aims to measure if the participants have executed the proper breath control, along the different weeks, they have improved their breath control, as well as studies the impact and connection of the proper breath control they do towards other aspects of singing, such as dynamics, vibrato, pitch control and more.

Table 3. Breath Control Rubric Validity Test

No.	Item Nr	r_{count}	Validity Status
1	1	0.884	Valid
2	2	0.958	Valid
3	3	0.965	Valid
4	4	0.982	Valid
5	5	0.962	Valid
6	6	0.974	Valid
7	7	0.956	Valid

Table 4. Breath Control Rubric Reliability Test

No.	Indicator	Mark
1	Variance Sum	10.357
2	Total Variance	65.895
3	Cronbach's Alpha	0.993
4	Reliability Standard	0.7
Conclusion		**Reliable**

The last form of data collection in this research is focus group discussion (FGD), where participants were divided into small groups and were given questions to which they could respond and discuss within a controlled environment. Since the research is conducted in class settings and each participant is using the same simulation video each cycle, it is safe to say that they would share a common experience. However, despite the shared experience, it is still possible for their experiences to have small differences. Therefore, it is quite appropriate for this research to utilize this method of data collection. This also allows the participants to suggest feedback in a more comfortable way, as well as making the process easier to organize and much more effective than if the research used one-on-one interviews (Ugwu & Eze, 2023). The data would then be analyzed with the thematic analysis technique, which is a method commonly used in qualitative research where each data set is systematically organized and analyzed by searching for themes and patterns (Dawadi, 2020). This research specifically used the inductive approach, meaning that the data of this research was coded without actually trying to fit it into a coding framework that was previously determined. Instead, the data found was analyzed, categorized, and interpreted according to the number of occurrences and the need of the research questions (Dawadi, 2020). For something to be considered a theme, it has to occur for a significant number of time and has an interesting contribution to the data (Maguire & Delahunt, 2017). In this study, the patterns and themes that will be further discussed are only those with an occurrence of more than 50%.

This research was conducted at Pelita Harapan University Conservatory of Music, with a total of 19 participants (F=10, M=9) who are all active voice students in the faculty, with ages ranging

from 17-21. Every single cycle was implemented as a part of the participants' Performance and Practice Evaluation (PPE) class. PPE Class is a mandatory class for all voice students of Pelita Harapan University Conservatory of Music that focuses on teaching the students how to perform and sing well on stage. Compared to their voice major class where they would focus more on learning certain techniques and how to interpret a song, PPE class is where the students would typically learn how to handle themselves in front of an audience, how to use and maximize a stage, how to present themselves well as a singer, and more. All in all, the class focuses more on stage presence and performing in itself. Thus, it is very fitting that this research was held as a part of the class temporarily. It is also important to note that since all participants are voice students, they have already learned the basic singing techniques that are being observed in this research.

RESULTS AND DISCUSSION

Results

The results found in this study will be presented in four sections according to the research questions (RQ).

RQ 1 – to what extent does the use of VR Simulation Influence the Music Performance Anxiety Level of Pelita Harapan University Conservatory of Music's Voice Students?

This specific research question uses repeated measures ANOVA, a quantitative data analysis that is commonly used for within-subject research to specifically measure the difference between three or more cycles. For F statistics results to be considered significant, the p-value has to be below the significance standard of 0.05. However, the p-value found was 0.357, suggesting data results that lean toward the null hypothesis. This result means that the difference found was not significant due to the limitation of the data collection.

Table 5. Repeated Measures ANOVA

No.	Source	SS	df	MS	F
1	Time	55.586	2	27.293	0.918
2	Error	1453.719	46	30.286	
3	P-value	0.357			

To explain this further, we refer to the qualitative Data found through the forum group discussion. Through the process of thematic analysis, finding themes, and patterns, and creating codes to further categorize the qualitative data findings, it was found that most participants had positive perceptions, but with a few notes and inputs. Participants agreed that despite knowing that they were using VR, to some extent, the simulation still did feel like performing. This allowed them to practice using a tool that helps them manage their anxiety without the risk of actually embarrassing themselves or panicking in the middle of a performance. However, a lot of participants also rightfully mentioned how anxiety is typically not something you can fix in a short period, and so is a singer's MPA. Some participants also suggested that in the future, this can be done more frequently or for a longer period, to fully maximize the potential this method may bring.

The findings of both data analyses suggest that the hypothesis in favor of the research question was rejected, and instead is to accept the null hypothesis (The implementation of VR simulation did not improve the participants' MPA level significantly). In conclusion, there were some changes and improvements found, however it was just not significant enough statistically.

RQ 2 - to what extent does the use of VR Simulation Influence the Breath Control of Pelita Harapan University Conservatory of Music's Voice Students?

To determine if there was improvement in the breath control score of the participants, we first need to find the score mean and standard deviation of each cycle. The mean is used to see the overall improvement of the score, while the standard deviation is used to determine the dispersion of the

data towards the mean. The result of the standard deviation would then be used in the Coefficient of Variation (CV) formula to tell if the value of the standard deviation compared to the mean is big or small. Results showed that there were improvements in the overall mean score (Cycle 1 = 22.158, Cycle 2 = 23.026, = 25.803). Results also showed that the CV value found was considered low (below <1), meaning that there was a similarity in the data gathered in each cycle and that the data were not dispersed far from the mean (Cycle 1 = 0.167, Cycle 2 = 0.129, Cycle 3 = 0.129). Thus, it is safe to conclude that the improvement shown in the result happened to the majority of the participants.

Table 6. Mean & Standard Deviation Comparison of Cycles

No.	Variable	Cycle 1	Cycle 2	Cycle 3
1	Mean	22.158	23.026	25.803
2	St. Dev	3.690	2.971	3.320
3	CV	0.167	0.129	0.129
4	Level of St. Dev	Low	Low	Low

Forum group discussion findings showed that a lot of the participants realized that theoretically, this can very much impact their breath control positively. The fact that by using the VR simulation they can get to practice handling their anxiety level towards the audience as well as maintain their breath control at the same time was the reason most of the singer stated that although it has not impacted them very significantly, they believe if this is to be done for a longer period or more frequently, this can be very impactful towards their breath control too. With this in mind, it is safe to reject the null hypothesis and accept the alternative hypothesis, suggesting that there was an improvement in the participants' breath control. However, this improvement can be even more significant if it is conducted for a longer period or more frequently.

RQ 3 - to what extent does the use of the Deep Diaphragmatic Breathing Technique in Singing Influence the Music Performance Anxiety Level of Pelita Harapan University Conservatory of Music's Voice Students?

Further analysis was done to analyze whether the results of DDBEs impact the participants' MPA levels. Upon comparing the mean score difference of Cycle 1 – 2 (no DDBE) and Cycle 2 – 3 (with DDBE), it was found that Cycle 2 – 3 had larger differences, meaning that there were more improvements. However, paired t-test results suggested that the difference was still not significant enough (p-value = 0.665). Interestingly, the results found in this area of the research were not linear with the qualitative data. Almost every single participant was excited to elaborate on how the exercise truly helped them relax and feel less anxious. They discussed how it helped them regulate their anxiety level, as the exercise would also help lower their heart rate. Despite the exercise only being conducted for 1-2 minutes, participants stated that this truly impacted them positively.

Table 7. Mean Difference of the Cycles

No.	Variable	Cycle 1	Cycle 2	Cycle 3
1	Mean	86.105	85.158	84
2	Mean Difference 1-2		0.947	
3	Mean Difference 2-3			1.158

Upon finding the discrepancy between the results of qualitative and quantitative data analysis, it is possible that, even though the exercise was deemed quite helpful in this study, the lasting effect was not longer than we expected. This may also be due to the possibility of situated anxiety. When a person has consciously or subconsciously associated a certain scenario with worry and nervousness, this may result in them being involuntarily falling into the gap of being anxious every single time he or she is exposed to said scenario, which in this case, is performing. Again, this is an assumption made to possibly explain the contradictory result, however further tests are needed in this area to further study these preliminary new findings.

Secondly, taking the effect of the DDBE on the participants' breath control into further consideration. The results suggested that there was quite a difference in mean score between Cycle 1-2 (0.868) compared to Cycle 2-3 (2.776). Furthermore, the paired samples t-test found that both

the changes in Cycle 1-2 and Cycle 2-3 were significant. However, the p-value of Cycle 2-3 (0.0001) was considerably a lot smaller than the p-value of Cycle 1-2 (0.009), meaning that the improvement found in Cycle 2-3 was much more significant.

Table 8. Mean Difference of the Cycles

No.	Variable	Cycle 1	Cycle 2	Cycle 3
1	Mean	22.158	23.026	25.803
2	Mean Difference 1-2		0.868	
3	Mean Difference 2-3			2.776

Forum group discussion results showed that at least half of the participants felt that the application of DDBE helped participants refresh their minds and muscle memory towards the breath control technique that they use in singing. This also explained the significant improvement that occurred in the result of the paired samples t-test of Cycle 2-3. Thus, we can reject the null hypothesis and accept an alternative hypothesis, which is that the application of DDBE improved the participants' breath control significantly.

Table 9. Paired Samples T-test

No.	Variable	Cycle 1-2	Cycle 2-3
1	Mean of Difference	0.947	1.158
2	T-tesd	-0469	-0.440
3	P-value	0.645	0.665
4	df		18

RQ 4 – Pelita Harapan University Conservatory of Music's Voice Students' Appreciation Towards the VR Simulation Implementation

This specific research question only used the qualitative approach with data gathered through forum group discussion. The first and one of the most frequently mentioned themes was how the experience was very fun for the participants. They mentioned how it was a completely new and positive experience for them. Furthermore, another common theme was how the participants found that by using the VR simulations, they could truly prepare themselves for the 'real thing'. Most participants stated that the simulation gave them a considerably realistic performing experience. They mentioned that to some extent, they can still feel the anxiousness and the nervousness they usually get when they perform. However, the degree was not the same as when they were performing, meaning that despite being quite realistic, it did not 100% feel like a real performance. Another common theme related to this one is how the blurriness of the video in the VR simulation affected the realistic feeling in the simulation. It was also found that participants saw the VR simulation as something that should be applied in a long-term duration and frequently as a part of their class in the future should this be possible. Despite the imperfections found in the research, none of the participants in this research were against implementing this in class.

Discussion

The insignificant result found through the quantitative data analysis has brought the researchers to do deeper literature research on previous studies. Since this specific approach has never been done on singers or voice students, we cannot be 100% sure whether the findings of the literature review would also apply to this type of research specifically. However, it was found that generally, it takes 6 to 14 weeks for VR-based simulations or therapies to have long-term effects (Hawajri et al., 2023). The implementation of VRET on agoraphobia and social phobia is only effective when performed for 8 to 12 sessions on different weeks for at least 15 minutes per session (Krzystanek et al., 2021). Bellinger et al., (2023) conducted research in 2023 on the application of VRET and relaxation training in MPA and found that VR-based exposure treatment can help encourage musicians and improve their self-efficacy, as musicians would be able to transfer and apply what they experience in the simulation. Furthermore, when only used in a short period and/or

small frequency, VRET could still be a good intervention used to decrease sympathetic activation and lessen the symptoms of anxiety itself. In other words, while the VR simulation helped improve some MPA symptoms, it was not long and extensive enough to be considered as a treatment for the MPA itself.

Despite the discrepancy of the findings, the researcher found that it is important to further highlight the qualitative finding where participants elaborated in unison on how the DDBE helped them feel more calm and relaxed during the performance afterward. Watson (2014) mentioned in his journal, that an ideal singing performance requires a relatively stable and relaxed body and mind. All in all, as previously discussed in the literature review, the uniqueness of a singer's voice character is formed by the difference in anatomy they have, from the way their vocal cords, mouth, nose, and throat area are built slightly different from each other. Thus, there is no one-size-fits-all solution to fix every singer's singing problem. Every singer is built physically, mentally, and psychologically differently, and thus, they may also need different ways to improve their voices (Watson, 2014).

The findings of this study have to be seen in light of some limitations. The limitation of time and funding is considered one of the major factors. This resulted in the finding of the result being not as significant as one may hope or predict. This was also confirmed by how most participants saw the potential of this method, however, they did not quite get the full impact because the intervention was only conducted in a very limited frequency and duration. The second limitation concerns the sample size of the research. Even though the sample of this research was the whole voice student population, it was still considered a small sample size. Should this method be conducted in a bigger population of voice students and/or singers, there may be an even more elaborated and impactful explanation of the questions being asked in this research.

Furthermore, very little to no research has been done to specifically study the impact of VR implementation on a singer's MPA or breath control. This makes it more difficult to plan out a design that may work as well as one may expect. The next limitation of the study touches on the fact that although the simulation was designed and is supposed to imitate real-life performing experiences, quite a few participants brought up how it did not feel 100% real. In reality, there were aspects in performing that this research was not quite able to imitate in the simulation. Some of the factors that contribute to this are the visual and the level of interactivity of the simulation. In conclusion, there is no such thing as perfect research, and this one too, is most definitely not perfect. Findings and analyzation results we see in a research must always be taken with a grain of salt, especially if the reader means to use said research as a reference for their research.

As previously mentioned, this specific research was conducted in the Performance & Practice Evaluation (PPE) Class of Pelita Harapan University Conservatory of Music, whose main purpose is for voice students to be able to learn and practice performing in front of an audience and on a real stage. The VR simulation became the perfect tool for voice students to experience performing in front of an audience and on a real stage when they are just in class. This means that in the long run, it is wise to further incorporate this VR simulation method in class, to enhance the learning experience even more. Findings of this research suggested that this method is applied for a more frequent or longer duration of time. Thus, it might be good to apply this method as a routine way of practicing (once a month, for example), so that students may prepare the performance even better and so that the teachers or lecturers have time to prepare the simulation videos. This method can also be used to cater to whatever needs or topics the class may be discussing at the time. All in all, the flexibility and adjustability of VR simulation allow us to provide all kinds of simulations to the voice students.

With the limited amount of previous studies and references regarding the use of VR simulation designed specifically to help with a singer's MPA level, it is hoped that the findings of this research can contribute theoretically to future research. Not only that, although this was initially designed to be used on singers, with some adjustments and adaptations, this method can be tried on other musicians or instrument players, on different levels of musicality, other aspects of singing techniques, and many more. It is also highly suggested that future researchers conduct this research in a longer duration of time and/or frequency, to ensure the significance of the result. To further prove the effect of VR simulations on a singer's MPA level and breath control, it is also suggested that future researchers attempt to conduct this research whilst applying a different experimental

research approach, where the presence of a control group and the experimental group can be used to simultaneously compare the progress between those who use the VR simulations and those who don't. This research in particular was also very limited in sample size. This research was done specifically on the population sample of 19 voice students of Pelita Harapan University Conservatory of Music. Since the population sample size can be considered quite small, it is highly suggested that fellow researchers with access to singers and/or voice students can try conducting this research on a different set of population samples and with different sample sizes as well.

CONCLUSION

It is safe to say that there were quite a few favorable and valuable findings in this research. Despite all the limitations that occurred, the VR simulations did impact the participants positively, especially in helping them be more familiar with performing situations. In other words, this way of practicing singing and learning allows them to get themselves ready for the real performances they have to face in the future. The fact that this method opened up the possibility and the opportunity of students being able to perform anywhere from the space of their campus, truly showed the potential of this method and what it can do to deepen and enhance the participants' learning experience on campus.

However, it is also important to note that performance anxiety and the mastery of breath control is not something that can really be changed and improved in such a short period, or if not done consistently and continuously. Rather, it is a process that must be done for a longer period for singers to feel a significant change and for listeners to notice the improvements. With this in mind, should this research be conducted again in the future, researchers can consider more on the duration and frequency aspect of the intervention, to further maximize the impact of the intervention and to gain a long-term effect. It is also suggested that future researchers try to expand the sample size towards singers or voice-major students from different institutions or different musical backgrounds. It is hoped that in future studies, researchers will be able to collaborate with not only voice and singing experts but also psychologists, psychiatrists, or any medical professionals who could help review and develop the VR interventions for an even better outcome. All in all, it can be concluded that this study has provided valuable insights and set the stage for future research, especially into the use of VR in music education, vocal studies, as well as anxiety management for singers and voice-major students.

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