From Core to Chords: Transforming Vocal Performance with Core-cardio Exercise

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ABSTRACT

This study investigates the impact of core-cardio exercises on the vocal performance of choral group members, aiming to enhance singing abilities through improved breath control, posture, and overall physical fitness. The research involved an experimental group that engaged in core-cardio exercises alongside vocal warm-ups and rehearsals for eight weeks, while a control group participated only in short vocal warm-ups. Initial assessments showed comparable vocal performances in both groups. The post-intervention evaluations revealed that the experimental group demonstrated significantly greater vocal proficiency than the control group ($t(71) = 50.156$, $p < .001$). Also, statistical analyses confirmed the positive effects of core-cardio exercises on vocal performance across different time intervals ($\chi^2(3) = 137.988$, $p < .001$). The findings underscore the value of integrating physical training into vocal education, as core-cardio exercises enhance cardiovascular health and improve vocal stamina and strength. These results suggest that choral conductors, choir members, educators, and performing arts organizations should incorporate core-cardio exercises into their training programs to optimize vocal capabilities and enhance overall performance. Future research is recommended to explore qualitative insights from choral directors and to investigate additional physical training modalities, such as high-intensity interval training (HIIT) and Pilates, to diversify further and enrich vocal training methods. By adopting a holistic approach that combines physical fitness with vocal training, this study contributes to a deeper understanding of effective practices for developing choral singers' vocal abilities.

Keywords: core-cardio exercise, vocal performance, Seventh-day Adventist academy

INTRODUCTION

Core-cardio exercises have been shown to enhance the vocal performance of choral group members by improving breath support and control, essential for powerful singing (Friedlander, 2013). Increased core strength contributes to better posture, which enhances resonance and pitch accuracy (Menehan, 2013). Furthermore, the physical fitness gained from cardio exercises boosts energy levels, facilitating more dynamic performances (Deva, 2018). Incorporating these exercises into rehearsals fosters better vocal technique and promotes cohesion and vitality within the choir (Baker, 2020).

Conductors strongly support incorporating movement into choral rehearsals (Friedlander, 2013). This enthusiasm has resulted in various studies, presentations, and articles emphasizing the efficacy of incorporating movement as a pedagogical technique (Johnson, 2021). These resources encourage choir directors and vocal coaches to promote the inclusion of movement into their rehearsal practices (Deva, 2018). Choral groups are utilizing movement to facilitate singers in realizing their maximum capabilities (Menehan, 2013). They are adopting diverse practices and techniques, frequently in combination, to accomplish several objectives: enhancing bodily awareness, strengthening breath support, enhancing concentration, fostering camaraderie among choir members, reinforcing articulation and rhythmic skills, and establishing a connection with the meaningful essence of the musical content (Baker, 2020).

This study seeks to investigate the effects of core-cardio exercises on vocal performance in choral group members, addressing several key questions: (a) What are the baseline vocal performance metrics—breathing, tone quality, and sound intensity—of the control and experimental groups before the intervention? (b) How does the vocal performance of the control group compare to that of the experimental group in the post-test concerning these metrics? (c) What changes occur in vocal performance over the course of the study? (d) Is there a statistically significant impact on vocal performance attributable to core-cardio exercises across different time intervals? (e) How does the duration of core-cardio exercises contribute to vocal performance enhancement?

The study utilized an experimental research design to systematically investigate the effects of core-cardio exercises on the vocal performance of choral group members. The sample consisted of 73 junior academy choral group members, who were divided into two groups: 37 participants in the control group and 36 participants in the experimental group. Participants were selected through a random lottery method to ensure unbiased assignment to each group. This approach enhances the validity of the findings by minimizing potential selection bias and allowing for a more accurate assessment of the impact of core-cardio exercises on vocal performance.

The findings of this study provide a framework for choral conductors to create strategies to improve the vocal performance of their choral group members. Also, it can present a different approach to vocal training incorporating physical activity, which can assist in expanding and diversifying performing arts practices. Overall, the study results can give additional resources for music, arts, physical education, and health (MAPEH) teachers to integrate music into physical education and vice versa.

LITERATURE REVIEW

Core Exercises. Core exercises are integral to a well-rounded fitness routine, which targets key muscles' stabilization, endurance, and strengthening. These exercises specifically engage the abdomen, lower abdomen, hips, obliques, stabilizing muscles, spine, back muscles, and buttocks. By fostering harmonious coordination among these muscle groups, core exercises contribute to maintaining optimal balance, agility, posture, and movement, promoting efficient bodily motion and injury prevention.

Alp et al. (2014) found that engaging in core stabilization exercises is beneficial for alleviating pain, improving endurance, enhancing overall functionality, and promoting daily living in individuals with chronic low back pain. Additionally, the study highlights the superiority of core exercises over conventional home-based exercises in enhancing the endurance of muscles supporting the spine and addressing physical role limitations.

The study of Coulombe et al. (2017) cited that core stability exercises are widely recognized for their therapeutic benefits, playing a crucial role in restoring proper body movement. Additionally, the research suggests that, in the short term, these exercises prove more effective than general exercise in reducing pain and improving back-specific functional status in individuals experiencing lower back pain.

Cardio Exercise. Cardio exercise, which includes activities that elevate the heart rate, promotes overall health by strengthening muscles and enhancing efficiency. The advantages of such exercise are diverse. For instance, Stanley et al. (2017) found that moderate-intensity aerobic exercise significantly improved the quality of life and CD4 cell counts in HIV seropositive individuals after 12 weeks. Similarly, Demers (2013) reported that engaging in moderate-intensity exercise helps alleviate symptoms of depression and anxiety. Additionally, Vats and Patra (2015) demonstrated that three weeks of moderate-intensity aerobic exercise enhanced vital capacity and quality of life in sedentary individuals, underscoring the effectiveness of aerobic training in improving physical well-being.

Mihailova and Kaminska (2016) found a connection between reduced lung volumes and lower aerobic and physical fitness, indicating that higher lung capacity is associated with improved fitness levels. Waehner (2019) further emphasized that aerobic exercise strengthens the heart and increases lung capacity, which is essential for enhancing vocal performance. Overall, these studies highlight the multifaceted benefits of cardio exercise, including improvements in mental health, physical fitness, and respiratory function, thereby illustrating its critical role in promoting a healthier lifestyle.

Vocal Performance. Singing involves producing musical sounds with the voice, enhancing everyday speech through sustained tonality, rhythm, and various vocal techniques such as controlled breathing, tone quality, and sound intensity. To meet the unique demands of singing, specific respiratory movements in the rib cage and abdomen are employed to regulate breath (Menehan, 2013). Singing requires greater lung pressure compared to speaking, as each sung note or phrase necessitates continuous support from a steady breath stream. A singer must be able to take a full breath quickly and silently, then regulate the pace of exhaled air—known as appoggio—during phonation. This consistent airflow creates a steady tone, ensuring uniform vibrations of the vocal folds and sound quality throughout the note (Friedlander, 2013).

Without proper breath control, a singer's tone can become shaky, thin, or breathy, which negatively affects performance. Inconsistent subglottic breath pressure can distort pitch and tone, making it difficult to sustain longer musical phrases due to excess air loss. The power of the voice comes from exhaling air from the lungs, while phonation—the vibration of the vocal folds in the larynx—generates the fundamental sound of the voice (Deva, 2018). Mastering breath control is essential for singers to achieve a strong, consistent tone and effectively navigate the demands of their art.

Core Exercises and Vocal Performance. Core stabilization exercises that incorporate breathing techniques and global stretching postures effectively enhance pulmonary function

and abdominal fitness (Cavaggiono et al., 2015). Research by Dr. Peter Francis (cited in Geres, 2019) indicates that exercises requiring constant abdominal stabilization and body rotation, such as bicycle crunches and hanging leg raises, elicit the most muscle activity in the obliques. While crunches on an exercise ball produce less activity in some muscles, they are still considered beneficial due to lower activation of the rectus abdominis. Additionally, Martin (2014) found that participants in higher-intensity aerobic exercise experienced more significant short-term physiological gains compared to those in lower-intensity groups, particularly in maintaining cardiorespiratory fitness and motivation.

The roles of pulmonary function, abdominal stabilization, and cardiorespiratory fitness are crucial for vocal health. The Acoustical Society of America (2016) identified a potential connection between pulmonary function and symptoms of voice fatigue. Mohamed and El Magharaby (2014) noted voice changes in patients with chronic obstructive pulmonary disease (COPD) due to symptoms and medications. Furthermore, the decreased pulmonary vital capacity negatively affects voice parameters, leading to vocal changes (Santos, et al, 2013). Therefore, incorporating core stabilization exercises and maintaining respiratory health are essential for optimizing vocal performance and preventing voice-related issues.

Cardio Exercises and Vocal Performance. The vocalization process begins in the pelvic region and progresses to the larynx, highlighting the importance of the entire torso's condition on vocal performance. Proper breath support relies on coordinated muscle engagement in the groin, lower back, sides, and abdominal areas, which are crucial for optimal vocal output (Morgan, 2002). Cardio training offers numerous benefits for vocalists, including improved heart and lung efficiency, reduced energy consumption during performances, and enhanced endurance, ultimately facilitating higher notes and clearer tones (Morgan, 2002). Additionally, soloistic singing, which emphasizes tone production and intonation, is favored by voice teachers and choral conductors for its ability to improve vocal expression, breath support, and projection (Elkholm, as cited in Spavelko, 2010).

Strengthening core muscles is vital for singers, as it aids in breath control and overall vocal management. Recommended core exercises include planks, push-ups, and yoga (Simmons, 2021; Beck et al., 2006). Cardio activities such as swimming, running, biking, and aerobics can further enhance lung strength and support breathing (Woodhull, 2022). Combining core and cardio exercises provides a comprehensive workout routine that benefits soloistic singing by improving breath control, stamina, and vocal power. The literature underscores the significance of core and cardio exercises in developing vocal performance, as core exercises strengthen abdominal muscles for better breath control, while cardio exercises improve cardiovascular strength and overall vocal efficiency.

METHODS

An experimental time-series design was employed in this study to explore cause-and-effect relationships by manipulating independent variables and measuring dependent variables (Almeida et al., 2016). This methodology is suitable for studies involving repeated measurements at consistent intervals, allowing for a detailed analysis of individual subjects over time.

The research was conducted at an Adventist academy in the southern Philippines, known for its strong commitment to music, which plays a vital role in its curriculum and community. The participants were members of the junior academy choral group, a critical period for developing healthy singing habits. Proper vocal techniques introduced early can prevent the formation of detrimental habits (Fonza, 2014; Gebhardt, 2016). The group consisted entirely of new members who had not undergone prior vocal training or exercises, ensuring unbiased results regarding vocal quality.

Five experienced choir directors served as jurors, each with extensive backgrounds in choral engagements at various levels. The study involved 73 choral group members, from which 37 were randomly assigned to a control group and 36 to an experimental group using a simple random sampling technique (Hayes, 2023). The experimental group participated in core-cardio activities three times a week for eight weeks, alternating with vocal warm-ups. These activities were based on established fitness programs, while the control group attended regular choral practices without additional exercises.

Statistical analysis included calculating the mean vocal performance before and after the intervention. A t-test for independent samples compared the vocal performance of both groups, while the Wilcoxon signed-rank test assessed paired differences when data did not meet parametric assumptions. A paired sample t-test evaluated differences between related variables measured at different times. These methods collectively provided a robust framework for assessing the intervention's impact on vocal performance.

RESULTS AND DISCUSSION

Vocal Performance of Control and Experimental Groups during the Pre-Experimental Stage. The respondents were grouped into two: the control and the experimental group. They were evaluated by experts based on the factors of breathing, tone quality, and sound intensity to determine their vocal performance prior to the conduct of the experiment. Table 1 shows the vocal performance of the control and experimental group before the experiment.

Table 1

Vocal performance of the groups before the experiment

	Variable	n	M	SD	Description
Experimental	Breathing	37	2.00	0.00	Beginning
	Tone Quality		2.00	0.00	Beginning
	Sound Intensity		3.00	0.00	Beginning
	Vocal Performance		7.00	0.00	Beginning
Control	Breathing	36	2.00	0.00	Beginning
	Tone Quality		2.00	0.00	Beginning
	Sound Intensity		3.00	0.00	Beginning
	Vocal Performance		7.00	0.00	Beginning

During the pre-experimental stage, both the control and experimental groups exhibited identical means in breathing, tone quality, and sound intensity, indicating similar initial vocal performance levels. Breathing and tone quality each had a mean score of 2.00, while sound intensity showed a higher mean of 3.00, reflecting the respondents' correct pitch, as they had successfully passed auditions.

Research by Amir, Amir, and Michaeli (2005) highlights that sound production precision, particularly singing in tune, is essential for defining vocal ability. Supporting this, Murray (cited in Amir et al., 2005) noted that singers typically demonstrate high accuracy in pitch-matching tasks. Elkholm (cited in Amir, 2005) further emphasized that pitch-matching accuracy is crucial for assessing professional voices. The sound intensity assessments confirmed the respondents' pitch accuracy and proper singing posture, reinforcing their vocal capabilities.

Vocal Performance of Control and Experimental Groups after the Pre-Experimental Stage. Table 2 shows the results of the data gathered from the evaluation of the respondent's performance after the 8-week conduct of the study.

Table 2

Vocal performance of the groups after the experiment

	Variable	n	M	SD	Description
Experimental	Breathing	37	6.74	0.36	Excellent
	Tone Quality		6.63	0.32	Excellent
	Sound Intensity		6.98	0.39	Excellent
	Vocal Performance		20.35	0.90	Excellent
Control	Breathing	36	3.59	0.31	Developing
	Tone Quality		3.15	0.39	Beginning
	Sound Intensity		3.55	0.21	Developing
	Vocal Performance		10.29	0.80	Beginning

After the study, the experimental group's vocal performance significantly improved, achieving a mean score of 20.35 (SD = 0.90), classified as excellent, compared to the control group's mean of 10.29, categorized as beginning vocal performance.

Vocal performance scores were based on averages in breathing, tone quality, and sound intensity. The experimental group scored higher in breathing, with a mean of 6.74 versus the control group's 3.59, indicating significant improvement from their pre-test mean of 2. Breathing is the second most important factor contributing to excellent vocal performance.

In tone quality, the experimental group had a mean score of 6.63, while the control group scored 3.15, slightly above their pre-test mean of 2.00. The experimental group also excelled in sound intensity, with a mean of 6.98 compared to the control group's 3.55, which was an increase from their pre-test mean of 3.00.

Gul (2018) emphasized the importance of breathing and vocal exercises in singing to ensure effective voice use. This study incorporated these exercises into singing instruction to enhance voice production, control, clarity, and communication.

Comparison of Vocal Performance After Experimentation. A t-test for independent samples examined the equality of means between the control group, with 36 respondents, and the experimental group, with 37 respondents. Table 3 shows the results of the t-test for independent samples.

Table 3

Comparison of the vocal performance after the experiment

Variable	Group	n	M	SD	t	df	p	Interpretation
Vocal Performance	Experimental	37	20.346	.904	50.156	71	< .001	Significant
	Control	36	10.289	.805				

At a 0.05 level of significance

A t-test for independent samples examined the equality of means between the control group (n = 36, M = 10.289, SD = 0.805) and the experimental group (n = 37, M = 20.346, SD = 0.904). The t-test revealed a significant mean difference between the control and experimental groups, t (71) = 50.156, p < .001. The mean score for the experimental group (M = 20.346) was significantly higher than that of the control group (M = 10.289), suggesting a substantial impact of the experimental intervention.

These findings suggest that the experimental intervention has a meaningful positive impact on the dependent variable. The practical implications include the potential applicability of the intervention in relevant contexts, such as educational settings. However, it is essential to consider potential limitations in study design and confounding variables.

According to a study by Stark, as referenced in Winnie (2014), singing necessitates precise coordination of the laryngeal, respiratory, and articulatory muscles. This coordination is crucial for achieving distinctive qualities in timbre, maintaining an even scale and register, controlling breath, and exhibiting flexibility, tremors, and expressiveness. Consequently, enhancing physical well-being has a favorable influence on the vocal performance of individuals.

Effect of Core-Cardio Exercises on Vocal Performance. Table 4 shows that the median of differences between pre- and weeks 1-2 equals 0; the Wilcoxon signed-rank test indicated a statistically significant improvement in vocal performance after cardio exercise (z = 5.346, p < .001). The result indicates that the median vocal performance score increased from 7.00 (pre-experimentation) to 7.30 (post-experimentation), suggesting a notable enhancement in respondents' vocal abilities. The findings of this study support the hypothesis that engaging in cardio exercise can lead to improved vocal performance.

Table 4

Difference in Vocal Performance (Pre and Week 1-2)

Vocal Performance	**n**	**Mdn**	**Z**	**p**	**Interpretation**
Pre	37	7.00	5.346	.000	significant
Week 1-2		7.30			

At a 0.05 level of significance

Likewise, the Wilcoxon signed-rank test indicated a statistically significant improvement in vocal performance after cardio exercise ($z = 5.366$, $p < .001$) considering the hypothesis: the median of differences between pre-experimentation and weeks 3-4 equals 0. Table 5 reveals that the median vocal performance score increased from 7.00 (pre-experimentation) to 10.00 (post-experimentation), suggesting a notable enhancement in respondents' vocal abilities. The findings of this study support the hypothesis that engaging in cardio exercise can lead to improved vocal performance.

Table 5

Difference in Vocal Performance (Pre and Week 3-4)

Vocal Performance	n	Mdn	Z	p	Interpretation
Pre	37	7.00	5.306	.000	significant
Week 3-4		10.00			

At a 0.05 level of significance

Similarly, a paired-sample t-test was conducted to examine the impact of cardio exercise on vocal performance from pre-experimentation to weeks 1-2 among 37 respondents. As shown in Table 6, descriptive statistics revealed a statistically significant increase in mean scores from pre ($M = 7.000$, $SD = .000$) to post ($M = 14.138$, $SD = .724$), with a mean difference of 7.138 ($SD = .724$). The t-test statistic was 59.975 with 36 degrees of freedom, resulting in a p-value of .000.

Table 6

Difference in Vocal Performance (Pre and Week 5-6)

Vocal Performance	n	Mdn	SD	Mean Diff	SD	t	df	p	Interpretation
Pre	37	7.00	.000	7.138	.724	59.975	36	.000	significant
Week 5-6		14.138	.724						

At a 0.05 level of significance

The results indicate a highly significant difference in vocal performance after cardio exercise, $t(36) = 59.975$, $p < .001$. It suggests a substantial improvement in vocal capabilities following the cardio exercise intervention.

Finally, a paired-sample t-test was conducted to examine the impact of cardio exercise on vocal performance from pre-experimentation to weeks 1-2 among 37 respondents (table 7). Descriptive statistics revealed a statistically significant increase in mean scores from pre-experimentation ($M = 7.000$, $SD = .000$) to post-experimentation ($M = 19.443$, $SD = .724$), with a mean difference of 12.443 ($SD = .806$). The t-test statistic was 93.899 with 36 degrees of freedom, resulting in a p-value of .000.

Table 7
Difference in Vocal Performance (Pre and Week 7-8)

Vocal Performance	n	Mdn	SD	Mean Diff	SD	t	df	p	Interpretation
Pre	37	7.00	.000	12.443	.806	93.899	36	<.001	significant
Week 7-8		19.443	.806						

At a 0.05 level of significance

The results shown in Table 7 indicate a highly significant difference in vocal performance after cardio exercise, $t(36) = 93.899$, $p < .001$. It suggests a substantial improvement in vocal capabilities following the cardio exercise.

Similar to the results of this study, a research study examining the effects of various core exercises on breathing and abdominal strength found that core stabilization exercises, specifically those centered on controlled respiration and comprehensive stretching positions, prove more efficient in enhancing pulmonary function (Cavaggioni et al., 2015).

Significant Impact of Core-Cardio Exercises on Vocal Performance. The current investigation aims to reinforce the significance of incorporating core-cardio exercises to impact vocal performance positively. In order to emphasize the valuable role played by exercises targeting both the core and cardiovascular system in enhancing overall vocal abilities, a Kruskal-Wallis test was performed.

The Kruskal-Wallis test was conducted to examine the impact of core-cardio exercises on the vocal performance of choral group members across four distinct time intervals: weeks 1-2, weeks 3-4, weeks 5-6, and weeks 7-8.

The assumption of normality and homogeneity of variances was not met. It indicates that the data did not exhibit a normal distribution, and the variances across different groups or conditions were inconsistent.

Table 8 revealed a statistically significant difference in vocal performance across the time intervals, $\chi^2(3) = 137.988$, $p < .001$. Post hoc analyses were conducted to explore pairwise differences in vocal performance across four distinct time intervals (weeks 1-2, 3-4, 5-6, and 7-8) following core-cardio exercises.

Table 8
Significant impact of core-cardio exercises on vocal performance

Vocal Performances	n	Mdn	X^2	df	p	Interpretation
Week 1-2	37	7.30	137.988	3	.000	significant
Week 3-4	37	10.00				
Week 5-6	37	14.00				
Week 7-8	37	19.60				

Dunn's procedure with Bonferroni correction was applied. The following significant differences were observed:

Week A (1-2) compared to Week B (3-4): z = -3.715, p = .000.
Week A (1-2) compared to Week C (5-6): z = -7.429, p = .000.
Week A (1-2) compared to Week D (7-8): z = -11.144, p = .000.
Week B (3-4) compared to Week C (5-6): z = -3.715, p = .000.
Week B (3-4) compared to Week D (7-8): z = -7.429, p = .000.
Week C (5-6) compared to Week D (7-8): z = -3.715, p = .000.

All reported p-values were adjusted for multiple comparisons using the Bonferroni correction. These findings suggest statistically significant differences in vocal performance between each pair of time intervals, highlighting the potential impact of core-cardio exercises on choral group members' vocal abilities across the studied weeks.

The statistically significant differences in vocal performance across the studied time intervals suggest that core-cardio exercises may have a measurable impact on the vocal abilities of choral group members.

The observed differences between specific pairs of time intervals (e.g., Week A to Week B, Week A to Week C) indicate that the effects of core-cardio exercises on vocal performance may vary at different stages of the intervention.

Recognizing the significant variations in vocal performance across weeks underscores the importance of individualized training programs. Choral directors or vocal coaches may consider tailoring exercise routines based on the specific needs of their performers at different phases of the training cycle.

Significant Contribution of the Duration of Core-Cardio Exercises to Vocal Performance. The study identified a significant relationship between the duration of core-cardio exercises and vocal performance (see Table 9). Results from the regression analysis generated a highly significant relationship between the duration of cardio exercises and vocal performance, as evidenced by the substantial F-statistic ($F(1,146) = 3748.899$, $p < .001$).

Table 9

Significant contribution of the duration of core-cardio exercises to vocal performance

	df	F	P	Interpretation
Regression	1			
Residuals	146	3478.899	.000	significant
Total	147			

At a 0.05 level of significance, $R^2 = .963$

The data in Table 6 shows a remarkably high R-squared value of .963, indicating that approximately 96.3% of the variability in vocal performance can be explained by the duration of cardio exercises. It implies a robust and practically meaningful association, highlighting the substantial impact of cardio exercise duration on vocal performance. In essence, individuals or groups aiming to improve vocal abilities may find value in dedicating time to cardio exercises,

as the findings suggest that such efforts account for a significant proportion of the observed variations in vocal performance.

The findings of this study support Grotowski's "Physical Actions" theory, as mentioned in Kimbrough (2011). According to this theory, a key rule is that physical activity should come before vocal expression. Practically, it suggests that engaging in physical exercises should precede vocal training. The underlying idea is that when the body is active, well-conditioned, and fully operational, it paves the way for good vocal quality.

In simpler terms, Grotowski's theory emphasizes the importance of warming up the body through physical activities before diving into vocal exercises. By giving priority to physical readiness, individuals are more likely to experience improved vocal performance. This principle highlights the connection between physical and vocal aspects, indicating that a well-prepared and conditioned body forms the basis for achieving optimal vocal quality.

CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

The Study Indicates That The Experimental Group Experienced A Significant Improvement In Vocal Performance, Reaching An Excellent Level. In Contrast, The Control Group Remained At The Initial Performance Level After An Eight-Week Intervention. This Demonstrates That The Experimental Intervention Had A Meaningful Positive Impact On The Vocal Capabilities Of Choral Group Members. The Results Also Show A Statistically Significant Increase In Vocal Performance From Pre- To Post-Experiment, Highlighting The Effectiveness Of The Cardio Exercise Intervention.

Furthermore, The Study Found Significant Differences In Vocal Performance Across Various Time Intervals, Suggesting That Core-Cardio Exercises Positively Influence The Vocal Abilities Of Choral Group Members Throughout The Intervention Period. The Effects Of These Exercises Were Shown To Vary At Different Stages Of The Study. Lastly, There Was A Highly Significant Relationship Between The Duration Of Cardio Exercises And Vocal Performance, Indicating A Strong And Practically Meaningful Association Between The Length Of Cardio Workouts And Improvements In Vocal Performance.

Based on the given conclusion, several implications can be drawn. Vocal training programs should incorporate structured cardio and core exercises to enhance vocal performance. The significant improvement observed in the experimental group suggests that these physical activities can effectively support vocal development, making them a crucial component of vocal training curricula. Also, given the varying effects of core-cardio exercises at different stages of the intervention, vocal training programs should consider tailoring exercise regimens to match the specific needs and progression of singers. This personalized approach can help maximize vocal improvements over time. Finally, the strong relationship between the duration of cardio exercises and vocal performance indicates that longer, consistent exercise sessions may yield better results. Vocal instructors and choral conductors should encourage regular and sustained cardio workouts as part of their training routines.

The study may have a limited sample size, which can affect the reliability of the results. A small or homogenous group may not represent the broader population of vocalists, limiting the generalizability of the findings to other choral groups or individual singers with different backgrounds, skill levels, or physical conditions. Moreover, the eight-week experimental period may not be sufficient to observe the long-term effects of core-cardio exercises on vocal performance. Longer interventions could provide more comprehensive insights into the sustained impact of physical training on vocal capabilities.

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