Effects of Fresh Rose Inhalation and Imagined Rose Inhalation on Singer Tone Quality

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ABSTRACT

Instructors of voice have long used imagery as a tool to elicit change in vocal sound. Rose imagery is common in singing literature. The purpose of this study was to determine what effect scent inhalation prior to singing will have on singers' tone quality. Experimental conditions included: sing as if you are performing (control), inhalation of the aroma of a fresh rose (fresh), inhalation of the aroma of one drop of 100% rose essential oil (oil), and inhalation of the aroma of an imagined rose (imagine). Singers ($N = 31$) enrolled in choral ensemble and/or in a performance studio at a major university were recorded performing a five-note major scale sung on /a/ under four experimental conditions (randomized order). Audio was analyzed for Singer Power Ratio (SPR). Expert judges ($N = 3$) ranked extracted sound clips of singers according to perceived tone quality. Singers completed a post-hoc questionnaire collecting data on vocal and olfactory health, perception of rose, and perception of singing. Initial findings indicate singers believed their tone quality was best, when compared to the other experimental conditions, as follows: oil 29.0%, fresh 25.5%, imagine 22.6% and control 12.9%. Judge perceptions were found to be not significantly different. Potential implications of the present study include how teachers think about pedagogical imagery and language use in the music classroom.

INTRODUCTION/BACKGROUND

- Rose imagery is common in literature on singing (Albrecht, 2003; Bozeman, 2015, 2017; Daniel, 1993; Hines, 1982; McKinney, 1994; Miller, 1996, 2002; Rundus, 2009; Sway, 1958).
- Odorants have also been documented as influencing body function and psychological behavior (Angelucci et al., 2014).
- Fresh rose flowers and rose oil have been reported to influence parasympathetic nervous activities (Igarashi et al., 2014; Hongratanaworaki, 2009).
- A spectrogram can be used to calculate SPR which "reflects the amplification or suppression in the vocal tract of the harmonics produced by the sound source," (McCoy, 2020; Watts et al., 2004, p. 82).
- Researchers (Cesari et al., 2012; Gunjawate et al., 2018; Omori et al., 1996) have reported a positive correlation between singing experience, tone quality, and SPR level.
- A lower dB level coincides with more energy in the higher harmonics. This higher harmonic range 2-4kHz is associated with perceptual ring in the voice.
- The human ear can notice a change in one dB level

RESEARCH QUESTIONS

1. Will acoustic differences in tone quality be found between experimental conditions as measured by Singer Power Ratio?

2. Will perceptual differences in tone quality be found between experimental conditions as measured by expert panel perceptions?

3. Will perceptual differences in tone quality be found between experimental conditions as measured by singer self-perceptions?

Table 1

Judge ranking preferences

Judge ranking frequency table & descriptive statistics												
Control			Imagine			Rose			Oil		
Rank	*N*	%	Rank	*N*	%	Rank	*N*	%	Rank	*N*	%
1	21	22.58%	1	28	30.43%	1	23	24.73%	1	21	22.83%
2	32	43.40%	2	17	18.47%	2	23	24.73%	2	21	22.83%
3	20	21.50%	3	20	21.73%	3	29	31.18%	3	22	23.91%
4	20	21.50%	4	27	29.34%	4	18	19.35%	4	28	30.43%
Chi-Square 4.42[c]			Chi-Square 3.74[d]			Chi-Square 2.61[c]			Chi-Square 1.48[d]		
df		3	*df*		3	*df*		3	*df*		3
p		0.22	*p*		0.29	*p*		0.46	*p*		0.69

Note. All p-values are greater than .05 for Chi-Square. Missing judge ranking for participant 23 (n = 2).

Table 2

Singer ranking preferences

Singer ranking frequency table & descriptive statistics												
Control			Imagine			Rose			Oil		
Rank	*N*	%	Rank	*N*	%	Rank	*N*	%	Rank	*N*	%
1	4	12.90%	1	7	22.60%	1	11	35.50%	1	9	29.00%
2	4	12.90%	2	13	41.90%	2	10	32.30%	2	4	12.90%
3	7	22.60%	3	9	29.00%	3	10	32.30%	3	5	16.10%
4	16	51.60%	4	2	6.50%	4	0	0.00%	4	13	41.90%

Note. Sample size not large enough to run Chi-Square analysis.

Table 3

Singer power ratio (SPR): ANOVA

Mean SPR (dB)				
	Control	Imagine	Rose	Oil
Mean	28.50	28.33	29.15	27.81
Std. Deviation	5.60	5.20	6.35	5.88
Minimum	16.73	15.93	13.83	14.93
Maximum	39.73	40.4	42.17	39.73

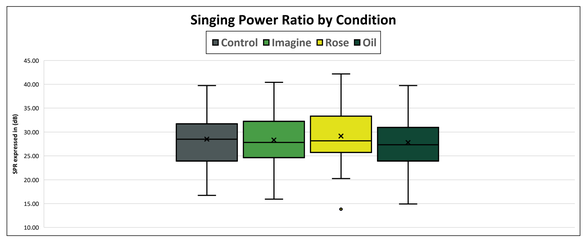
Mean SPR (dB) pairwise comparisons				
Pairs	Mean difference	*SD*	Std. Error	*p*
Control - Imagine	0.16	3.47	.62	1.00
Control - Rose	-0.66	3.89	.70	1.00
Control - Oil	0.68	3.90	.70	1.00
Imagine - Rose	-0.82	3.19	.57	.99
Imagine - Oil	0.52	3.27	.59	1.00
Rose - Oil	1.33	2.90	.52	.09

ANOVA					
	Value	*F*	Hypothesis *df*	Error *df*	*p*
Wilks' lambda	.817	2.10	3.00	28.00	.12

Note. Adjustment for multiple comparisons: Bonferroni.

Figure 1

Singer Power Ratio average across three performances in each experimental condition.



Note. X denotes mean. Singers (N = 31) performed each condition three times. A lower dB level coincides with more energy in the higher harmonics. This higher harmonic range 2-4kHz is associated with perceptual ring in the voice. One dB difference is noticeable to the human ear.

METHOD

Table 4

Participant demographics

	Age (years)	Experience: voice lessons (years)	Experience: choir (years)	Vocal Health (1 Unhealthy – healthy 7)
Range	18-34	0-11	3-28	2-7
Mean	22.35	3.82	10.16	5.13
SD	4.18	3.21	5.84	1.30

Singers (N = 31) enrolled in a choral ensemble and/or performance studio at a major university were recorded performing a five-note major scale on /a/ under four conditions (control, fresh, oil, and imagine). The order of the experimental conditions was randomized for each participant. Audio was analyzed for Singer Power Ratio (SPR). Expert judges (N = 3) ranked extracted sound clips of singers according to perceived tone quality. For the purposes of this study, good tone quality was defined as consistent, clear, free, rich, ringing, and resonant tone. Expert judges were blind to the randomized experimental conditions. Singers completed a post-hoc questionnaire collecting data on vocal and olfactory health, perception of rose, and perception of singing.

Figure 2

Judge ranking placements (1st, 2nd, 3rd, 4th): Tone quality

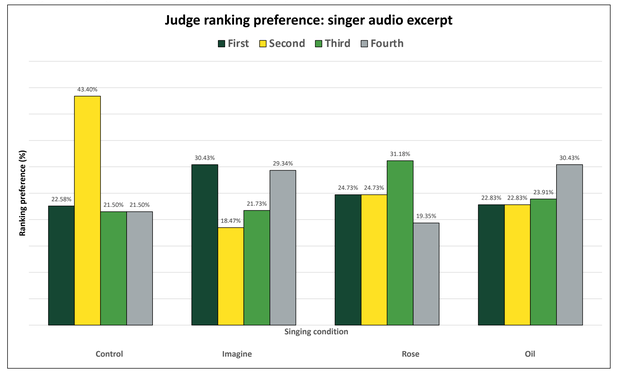
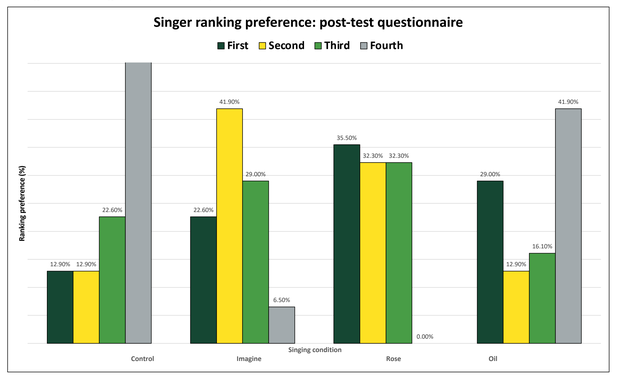


Figure 3

Singer ranking placements (1st, 2nd, 3rd, 4th): Tone quality



RESULTS

Singer Power Ratio

- Acoustic differences in tone quality between conditions were not statistically significant in all pairings.
- Sound pressure level differences: rose and oil 1.33 dB, rose and imagine .82 dB.

Expert judge panel perceptions

- Expert panel perceptions were found to be not significantly different.

Singer perceptions

- Zero singers ranked the rose condition as last.
- Singers displayed mixed preferences for the oil condition with 29% of singers ranking it first and 41.90% ranking it last.
- 51.6% of singers ranked the control condition as last.

Singer post-test questionnaire

- Yes response from singers that the condition affected tone quality: 93.50% rose, 90.32% imagine, and 83.90% oil.
- Singers believed their tone quality was best as follows: fresh rose 35.5%, rose oil 29.0%, imagine 22.6% and control 12.9%.
- The imagine condition was rarely ranked the lowest (6.5%).
- Singer comments yielded the following words to express perceived effects of conditions: "breath" "inhale" "relaxed" "deep" "soft palate" and "open."

IMPLICATIONS

- Potential implications of the present study include changing how teachers think about pedagogical imagery and language use in the music classroom.
- Experimental conditions were not significantly different therefore voice teacher might consider how the experimental conditions, particularly the rose imagery, might be interpreted differently by singers.
- Future research on tone quality could examine singers' perceived affect of experimental conditions in relation to emotional valence.
- It is recommended that future researchers use a 10% rose essential oil dilution instead of the 100% essential oil.

RESOURCES

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