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CHORISTER FORMATION PREFERENCES IN A WOMEN'S CHOIR

A Thesis
presented in partial fulfillment of requirements
for the degree of Master of Music
in the Department of Music
The University of Mississippi

by

Janna K. Montgomery

July 2011

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ABSTRACT

While conductors and audience members are not committed to a single formation, choristers have a clear preference: sectional or mixed. Why is this? Participants in this study included forty-six members of an auditioned women's choir from a large southern university who completed a survey after singing in sectional and mixed formation. These SSAA results maintain previous research findings by James Daugherty, Debra Atkinson, and Christopher Aspaas, et. al. from female choristers in SATB settings: most women prefer mixed formation. All 46 of the participants (100%) perceived that formation generally affects the choral sound, so they think formation is important. Women's voices also present unique concerns regarding voice distribution, pitch level, and perception. Perhaps if choir members think they are producing a better sound in a certain formation, they set themselves up to actually produce a better sound in performance.

DEDICATION

This thesis is dedicated to everyone who believes in pursuing excellence for women's choirs. In particular, I thank Dr. Debra Spurgeon, who revived my spirit and helped me regain what I thought long lost. I also thank Travis, who put his own plans on hold, and Dr. Alan Spurgeon, both of whom have been most supportive and encouraging every step of the way.

ACKNOWLEDGEMENTS

I express my deepest appreciation to my advisor and women's choir advocate, Dr. Debra Spurgeon, and my committee members, Drs. Alan Spurgeon and Andrew Paney. I could not have completed my studies without the generosity and support of Dr. Donald Trott and the choral music area. The University of Mississippi Interlibrary Loan department also made much of my research possible.

I thank the members of the University of Mississippi Women's Glee who are committed to excellence and quality in women's music. I also thank Joel Blomgren and Vicki Hogan, who ignited my fire and made my first experiences in a women's choir successful.

Lastly, I acknowledge the collegial support from my fellow students and choir members. You made this part of my life enjoyable and enriching.

TABLE OF CONTENTS

ABSTRACT	ii
DEDICATION.....	iii
ACKNOWLEDGMENTS.....	iv
LIST OF TABLES.....	vii
LIST OF FIGURES.....	ix
CHAPTER 1.....	1
INTRODUCTION.....	1
NEED FOR THE STUDY.....	2
DEFINITION OF TERMS.....	5
RELATED LITERATURE.....	9
FACTORS INFLUENCING FORMATION CHOICE.....	9
ACOUSTIC CONSIDERATIONS.....	16
WOMEN’S VOICES.....	24
CHAPTER 2.....	29
METHODOLOGY.....	29
RESULTS.....	32
CHAPTER 3.....	36
DISCUSSION.....	36
CONCLUSION.....	38
BIBLIOGRAPHY.....	40

APPENDIX.....	47
APPENDIX A: NUMERICAL RESULTS.....	48
APPENDIX B: CHORISTER COMMENTS.....	56
APPENDIX C: CHORISTER EVALUATION FORM.....	64
VITA.....	68

LIST OF TABLES

1. Overall (All Parts Combined) Likert Scale Responses Regarding Sectional Formation.....	49
2. Overall (All Parts Combined) Likert Scale Responses Regarding Mixed Formation.....	49
3. Overall (All Parts Combined) Reflective Responses	49
4. Soprano (SI and SII Combined) Likert Scale Responses Regarding Sectional Formation.....	50
5. Soprano (SI and SII Combined) Likert Scale Responses Regarding Mixed Formation.....	50
6. Soprano (SI and SII Combined) Reflective Responses.....	50
7. Alto (AI and AII Combined) Likert Scale Responses Regarding Sectional Formation.....	51
8. Alto (AI and AII Combined) Likert Scale Responses Regarding Mixed Formation.....	51
9. Alto (AI and AII Combined) Reflective Responses.....	51
10. Soprano I Likert Scale Responses Regarding Sectional Formation.....	52
11. Soprano I Likert Scale Responses Regarding Mixed Formation.....	52
12. Soprano I Reflective Responses.....	52
13. Soprano II Likert Scale Responses Regarding Sectional Formation.....	53
14. Soprano II Likert Scale Responses Regarding Mixed Formation.....	53
15. Soprano II Reflective Responses.....	53
16. Alto I Likert Scale Responses Regarding Sectional Formation.....	54
17. Alto I Likert Scale Responses Regarding Mixed Formation.....	54
18. Alto I Reflective Responses.....	54
19. Alto II Likert Scale Responses Regarding Sectional Formation.....	55
20. Alto II Likert Scale Responses Regarding Mixed Formation.....	55

21. Alto II Reflective Responses.....55

LIST OF FIGURES

1. Block Sectional Formation #1.....	5
2. Block Sectional Formation #2.....	5
3. Circumambient Spacing.....	6
4. Close Spacing.....	6
5. Column Sectional Formation.....	6
6. Lateral Spacing.....	7
7. Sectional Formation for the Experiment As Seen from the Conductor's Perspective.....	30

CHAPTER 1

Introduction

When asked what formation choir members prefer, they often answer: “sectional” or “mixed.” Rarely does a choir member say, “I prefer an acoustically placed modified block sectional formation with the altos in the front and circumambient spacing.” In my experience, the singers’ preferences are clear; choristers (especially higher voices) prefer a mixed formation to a sectional one, and research by Christopher Aspaas et. al.,¹ Debra Atkinson,² and James Daugherty³ confirms this tendency. Conductors know, however, that formation decisions involve more than determining student preference, for choosing the right arrangement requires understanding factors such as vocal quality, repertoire style, venue acoustics, visual effect, group dynamics, harmonic balance, etc. Considering such matters, conductors may even change formation several times during a single concert. While singers and conductors have their formation preferences, audience members are indifferent. A number of studies document listener feedback on choral formation, but no clear preference for mixed or sectional arrangement has been established.⁴ These divergent responses are puzzling. While conductors and audience

¹ Christopher Aspaas, Christopher McCrea, Richard Morris, and Linda Fowler, “Select Acoustic and Perceptual Measures of Choral Formation,” *International Journal of Research in Choral Singing* 2, no. 1 (2004): 23. Females expressed a strong dislike for the column sectional formation.

² Debra Atkinson, “The Effects of Choral Formation on the Singing Voice,” *Choral Journal* 50, no. 8 (March 2010): 29. The experienced singers in this chamber ensemble preferred a mixed formation with spread spacing.

³ James Daugherty, “Spacing, Formation, and Choral Sound: Preferences and Perceptions of Auditors and Choristers,” *Journal of Research in Music Education*. 47, no. 3 (Fall 1999): 235. Preference for mixed formation declined from higher to lower voices parts.

⁴ James F. Daugherty, “On the Voice: Rethinking How Voices Work in a Choral Ensemble.” *Choral Journal* 42, no. 5 (December 2001): 71.

members are not committed to a single formation, choristers have a clear preference. Why is this?

Need for the Study

Previous research projects have focused on SATB choirs. Single-gender ensembles have not received equal attention. To illustrate, only two studies – one by James Daugherty⁵ and one by Michael Lister⁶ – address formation in single-gender choirs, and Lister’s research is specific to male ensembles. However, according to Lisa Fredenburgh, women involved in choir often outnumber men more than two to one⁷ (though Marla Butke⁸ and Patricia O’Toole⁹ say three to one), and in “some parts of the country it’s not unusual to find a ratio of ten women to one man signed up for a choral audition.”¹⁰ Though far from complete, women’s choir research has not been totally neglected. Gregory Vancil,¹¹ Alfred Skoog and David Niederbrach¹² as well as Hilary Apfelstadt¹³ offer strategies for developing women’s choirs, David Howard and Graham

⁵ James F. Daugherty, “Choir Spacing and Formation: Choral Sound Preferences in Random, Synergistic, and Gender-Specific Chamber Choir Placements,” *International Journal of Research in Choral Singing* 1, no. 1 (2003): 48-59.

⁶ Michael C. Lister, “Male Choristers’ Perceptions of and Preferences for Choral Formations Based on Individual Singer Placement within the Ensemble,” (DA diss., Ball State University, 2009).

⁷ Lisa Fredenburgh, “Status and Competition: Perception of Women’s Choirs,” *Choral Journal* 48, no. 2 (August 2007): 38.

⁸ Marla Butke, “Choral Education” in *Women and Music in America Since 1900: An Encyclopedia*, Vol. 1 (A-K), ed. Kristine H. Burns (Westport: Greenwood Press, 2002), 94.

⁹ Patricia O’Toole, “A Missing Chapter from Choral Methods Books: How Choirs Neglect Girls” *Choral Journal* 39, no. 5 (December 1998): 23.

¹⁰ Frank S. Albinger, “Male Choirs and Male Singers,” in *Teaching Music through Performance in Choir*. Vol. 3., ed. Heather J. Buchanan and Matthew W. Mehaffey (Chicago: GIA Publications, 2011), 7.

¹¹ Gregory Vancil, “‘No Guts, No Glory’ Suggestions for Building a Vital Women’s Chorus,” *Choral Journal* 25, no. 5 (December 1985): 13-18.

¹² Alfred Skoog and David Niederbrach, “The Organization, Development, and Function of the Female Choir,” *Choral Journal* 24, no.1 (September 1983): 19-27.

¹³ Hilary Apfelstadt, “Practices of Successful Women’s Choir Conductors,” *Choral Journal* 39, no. 5 (December 1998): 35-41.

Welch¹⁴ provide a longitudinal study on the development of girls' voices, and Lynne Gackle¹⁵ presents and outlines research regarding the adolescent female voice change. Social implications have been explored primarily by Jill Wilson,¹⁶ Laya Silber,¹⁷ Dee Gauthier,¹⁸ and Patricia O'Toole¹⁹ with supplementary information from Roberta Jackson,²⁰ Lisa Fredenburgh,²¹ Leslie Guelker-Cone,²² and Sarah Bartolome.²³ Iris Levine,²⁴ Terry Gates,²⁵ Sophie Drinker,²⁶ Karen Pendle,²⁷ and Christine Ammer²⁸ provide historical overviews of women's choirs, and Lisa Fredenburgh,²⁹ Raymond Sprague,³⁰ and Catherine Roma³¹ recommend quality women's repertoire. Though social implications, historical overviews, and repertoire choices for women's choirs have been explored recently, studies concerning the actual women's choral sound are

¹⁴ David M. Howard and Graham F. Welch, "Female Chorister Voice Development: A Longitudinal Study at Wells, UK," *Bulletin of the Council for Research in Music Education* 153, no. 4 (Spring & Summer 2002): 63-70.

¹⁵ Lynne Gackle, *Finding Ophelia's Voice, Opening Ophelia's Heart: Nurturing the Adolescent Female Voice* (Dayton: Heritage Music Press, 2011). See pages 17-18 for the outline of previous research.

¹⁶ Jill Marie Wilson, "Practices and Attitudes Toward High School Treble Clef Choral Ensembles," (DMA diss., Boston University, 2010).

¹⁷ Laya Silber, "Bars Behind Bars: The Impact of a Women's Prison Choir on Social Harmony," *Music Education Research* 7, no. 2 (July 2005): 251-271.

¹⁸ Dee Gauthier, "I'm Only in Women's Chorus: A Need for Positive Image Building," *Choral Journal* 46, no. 2 (August 2005): 42-47.

¹⁹ Patricia O'Toole, "A Missing Chapter from Choral Methods Books: How Choirs Neglect Girls," *Choral Journal* 39, no. 5 (December 1998): 9-32.

²⁰ Roberta Q. Jackson, "Always a Bridesmaid, Never a Bride!" *Chor Teach* 2, no. 3 (Spring 2010): 1-2.

²¹ Lisa Fredenburgh, "Women's Choirs: Status and Competition: Perception of Women's Choirs," *Choral Journal* 48, no. 2 (August 2007): 38.

²² Leslie Guelker-Cone, "Women's Choirs: Women's Choirs – Invisible Presence or Visible Force?" *Choral Journal* 37, no. 7 (February 1997): 27.

²³ Sarah J. Bartolome, "Girl Choir Culture: An Ethnography of the Seattle Girls' Choir" (PhD diss., University of Washington, 2010). Though this study involves a girls' choir, it provides valuable insights for the women's choir environment.

²⁴ Iris S. Levine, "Women's Choirs: Giving Women Voice," *Choral Journal* 51, no. 7 (February 2011): 81-83.

²⁵ J. Terry Gates, "A Historical Comparison of Public Singing by American Men and Women," *Journal of Research in Music Education* 37, no. 1 (Spring 1989): 32-47.

²⁶ Sophie Drinker, *Women and Music* (New York: Feminist Press, 1995), 246-262.

²⁷ Karen Pendle, ed., *Women and Music: A History*, 2nd ed. (Bloomington: Indiana UP, 2001).

²⁸ Christine Ammer, *Unsung: A History of Women in American Music* (Portland: Amadeus Press, 2001).

²⁹ Lisa Fredenburgh, "Women's Choirs," *Choral Journal* 42, no. 9 (April 2002): 88.

³⁰ Raymond Sprague, "Literature of Quality for the Treble Choir," *Choral Journal* 25, no. 2 (October 1984): 5-8.

³¹ Catherine Roma, "Women's Choral Literature: Finding Depth," *Choral Journal* 44, no. 10 (May 2004): 29-37.

scant. In fact, Daugherty is the only scholar to address formation in women's choirs, and his research is based on an antiphonal setting.³² With few SSAA studies available, scholars must turn to SATB research to examine women's inclinations. In the research exploring SATB chorister (singer) preferences for spacing and formation, men and women have different opinions. According to studies by Christopher Aspaas, et. al.,³³ James Daugherty,³⁴ and Sten Ternström,³⁵ women tend to prefer mixed formations and circumambient spacing while men are partial to sectional formations and lateral spacing. Sopranos in SATB choirs have more definite predilections for mixed formation and circumambient spacing,³⁶ but are those preferences as defined within a women's group? Will the previous preferences remain the same within a single-gender ensemble? Do certain choral sections (voice parts) tend to prefer one formation? Do these preferences relate to pitch level and proximity? Further exploration could provide insight into grouping options for conductors of gender-specific choirs.

³² Daugherty, "Choir Spacing and Formation: Choral Sound Preferences in Random, Synergistic, and Gender-Specific Chamber Choir Placements," 49.

³³ Christopher Aspaas, Christopher McCrea, Richard Morris, and Linda Fowler, "Select Acoustic and Perceptual Measures of Choral Formation," *International Journal of Research in Choral Singing* 2, no. 1 (2004): 23.

³⁴ James F. Daugherty, "Choir Spacing and Formation: Choral Sound Preferences in Random, Synergistic, and Gender-Specific Chamber Choir Placements," *International Journal of Research in Choral Singing* 1, no. 1 (2003): 53.

³⁵ Sten Ternström, "Choir Acoustics: An Overview of Scientific Research Published to Date," *International Journal of Research in Choral Singing* 1, no. 1 (2003): 4.

³⁶ Aspaas, McCrea, Morris, and Fowler, 19.

Definition of Terms

Acoustic Placement – positioning of individual singers based on vocal qualities and vocal compatibility (may also be referred to as “voice matching”)

Block Sectional – individuals are arranged according to voice part and grouped in blocks or rows (such as in Figures 1 and 2)

B	T
S	A

Figure 1. Block Sectional Formation #1.

B
T
A
S

Figure 2. Block Sectional Formation #2.

Choral Spacing – the space between singers in an ensemble, a subject primarily explored by James Daugherty

Chorus Effect – as defined by Sten Ternström, an extraordinary choral phenomenon which “magically dissociate[s] the sound from its sources and endow[s] it with an independent, almost ethereal existence of its own” so that “[w]e are unable to hear the individual singers in a choir”³⁷

Circumambient Spacing – as defined by James Daugherty (see Figure 3), “intentional spacing” all around each individual singer, specifically 24 inches shoulder to shoulder with an empty riser row between each row of singers (“i.e. when the second riser step is vacant, and when the first row of the choir stands 18 inches in front of the choristers on the first riser step”)³⁸

³⁷ Sten Ternström, “Physical and Acoustic Factors that Interact with the Singer to Produce the Choral Sound,” *Journal of Voice* 5, no. 2 (June 1991): 141.

³⁸ James Daugherty, “Spacing, Formation, and Choral Sound: Preferences and Perceptions of Auditors and Choristers” (PhD diss., Florida State University, 1996), 6.

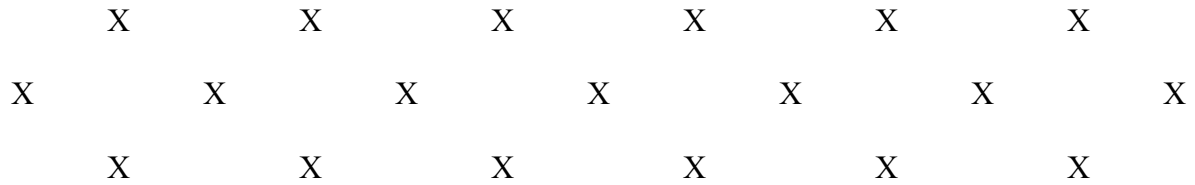


Figure 3. Circumambient Spacing.

Close Spacing – as defined by James Daugherty (see Figure 4), a “comfortable shoulder to shoulder stance,” specifically less than one inch between the shoulders of individual singers in a choir and no extra space front to back (vertical) because every riser row is occupied³⁹

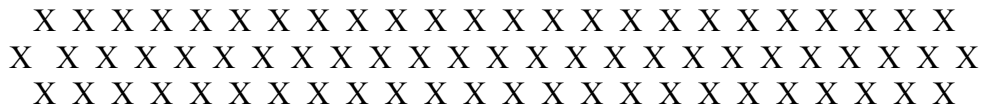


Figure 4. Close Spacing.

Column Sectional – individuals are arranged according to voice part and grouped in vertical columns (See Figure 3 - Choral/orchestral performances usually use some form of this formation.)

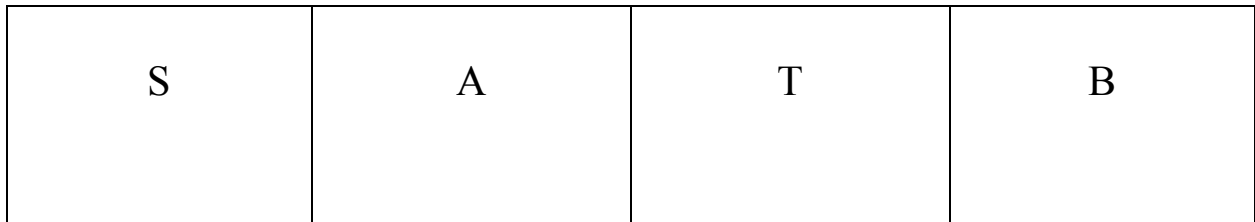


Figure 5. Column Sectional Formation.

Difference Tone – also known as “Tartini tone” or “combination tone;” the difference between the frequencies of two tones sounded together which produces an acoustical phenomenon

³⁹ Ibid, 5.

(discovered by Giuseppe Tartini) in which an audible tone sounds below two pitches sung (or played) in tune and reinforces pitches in lower voice parts⁴⁰

Feedback – regarding Self-to-Other Ratio (hereafter SOR – see definition below), the decibel level of surrounding sound an individual chorister hears while singing

Formation – placement of musicians within an ensemble

Lateral Spacing – as defined by James Daugherty (see Figure 6), “side to side spacing,” specifically 24 inches shoulder to shoulder (horizontal) but no extra space front to back (vertical) between individual singers in a choir because every riser row is occupied⁴¹

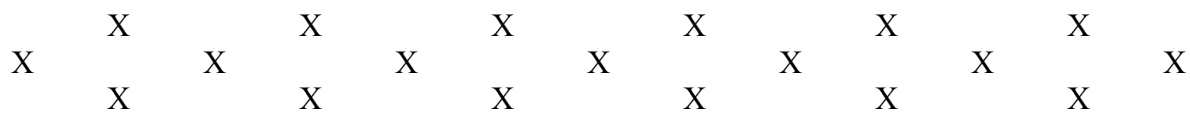


Figure 6. Lateral Spacing.

Lombard Effect – as applied to the choral situation, the “innate tendency” to sing louder when surrounding sounds are louder “regardless of the musical demands,”⁴² which can cause singers to push or force, even damage, their voices

Macro-arrangements – as defined by James Daugherty, “positioning the choir and each of its voices’ sections as a whole”⁴³

Micro-arrangements – as defined by James Daugherty, “positioning individual singers within the choir or voice section”⁴⁴

Mixed – individuals are surrounded by people singing other voice parts and can be either randomly or selectively placed, but each voice part is scattered throughout the choir

Random (or Scattered) – singers are permitted to place themselves or they are placed with no regard for vocal quality or voice matching

Reference – regarding SOR, the decibel level at which a chorister hears his/her own voice

⁴⁰ Betty Jane Grimm, “Treble Choral Acoustics,” *Choral Journal* 21, no. 8 (April 1981): 24; Louis H. Diercks, “The Individual in the Choral Situation...with Mathematical Justifications by E. Milton Boone” *The Bulletin – The Official Magazine of the National Association of Teachers of Singing* 17, no. 4 (May 1961): 8-10.

⁴¹ *Ibid.*, 5.

⁴² Steven E. Tonkinson, “The Lombard Effect in Choral Singing,” *Journal of Voice* 8, no. 1 (March 1994): 24.

⁴³ James Daugherty, “Spacing, Formation, and Choral Sound: Preferences and Perceptions of Auditors and Choristers” (PhD diss., Florida State University, 1996), 21.

⁴⁴ *Ibid.*

Sectional – individuals are grouped according to voice part

Self-to-Other Ratio (SOR) – as defined by Sten Ternström, the difference between the decibel level of a singer's own voice and the decibel level of the surrounding chorus as heard by the individual singer⁴⁵

Spread Spacing – see “lateral spacing”

Tartini Tone – see “difference tone”

Voice Matching – process of placing individual singers developed by Weston Noble, also known as “acoustic placement”

Women's Choir – a vocal ensemble composed of “high school aged women and older”⁴⁶

⁴⁵ Sten Ternström, “Preferred Self-to-Other Ratios in Choir Singing,” *Journal of the Acoustical Society of America* 15, no. 6 (June 1999): 3563.

⁴⁶ Lisa Fredenburgh, “Women's Choirs,” *Choral Journal* 42, no. 9 (April 2002): 88.

Related Literature

Factors Influencing Formation Choice

Many believe that formation affects sound quality, and conductors, who are eager to improve choral sound, often choose their formations carefully. For this reason, choral formation has long been a popular topic in education materials and journal articles, which offer a vast array of placement options. There are many factors to consider when choosing a formation, such as a desired sound ideal, macro-arrangements, micro-arrangements, spacing, acoustics, and issues specific to women's voices.

The conductor's sound ideal is one consideration. This desired sound can be affected by past listening experiences as well as established philosophies regarding choral tone and blend. Directors may want to develop a distinctive sound such as the full-bodied, soloistic style associated with John Finley Williamson and the Westminster Choir, an approach which encourages "the physical and emotional development of each singer" as individuals.⁴⁷ Another alternative is the characteristically unified blend associated with F. Melius Christiansen and the St. Olaf Choir in which singers have "a primary responsibility to subordinate [their] own ideas concerning tone production, rhythmic stress, and pronunciation to the blended and unified sound made by the total ensemble."⁴⁸ Roger Wagner's "pyramid of sound" with "extra emphasis on the lower sections of the chorus" may also appeal to conductors.⁴⁹ Perhaps Fred Waring's approach to pronunciation and articulation is preferred or Father William J. Finn's development of singers' tone to mirror the colors of orchestral instruments. Robert Shaw's rhythmic drive, phrase shaping, and vocal energy are desirable qualities, as is the "perfectly executed coordination of

⁴⁷ Howard Swan, "The Development of a Choral Instrument," in *Choral Conducting Symposium*, 2nd ed., eds. Harold A. Decker and Julius Herford (Englewood Cliffs: Prentice Hall, 1988), 12.

⁴⁸ Ibid.

⁴⁹ Donald Neuen, *Choral Concepts* (Belmont: Shirmer, 2002), 50.

the entire vocal mechanism” encouraged by Joseph J. Klein, Douglas Stanley, and John C. Wilcox.⁵⁰ Then again, conductors may want to tailor sound to the piece in order to develop “a variable type of choral sound...flexible enough to perform literature from a variety of styles” and time periods and utilize historically informed performance practice.⁵¹ Conductors may even be developing their own sound ideal with time and experience.

External considerations may also influence a conductor’s choice of formation. The structure of the music is something to examine. Whether the piece is homophonic, polyphonic, or antiphonal determines physical areas of focal interest for the audience. Antiphonal or polychoral pieces require a certain arrangement of voices to “enhance the aural effect.”⁵² A sectional formation is generally considered best for polyphonic music because “the clarity of each line is enhanced by the distribution of voices into discrete sections,”⁵³ and a mixed arrangement is used for a “more cohesive sound” in homophonic music.⁵⁴ The vocal line and chordal foundation of the piece affects musical focal points and how choir members relate to each other’s sound. Conductors may also opt for sectional arrangements to ease cuing and

⁵⁰ Ibid.

⁵¹ Brian J. Knutson, “Interviews with Selected Choral Conductors Concerning Rationale and Practices Regarding Choral Blend” (PhD diss., Florida State University, 1987), 119.

⁵² Lloyd Pfautsch, “The Choral Conductor and the Rehearsal” in *Choral Conducting Symposium*, 2nd ed, eds. Harold A. Decker and Julius Herford (Englewood Cliffs: Prentice Hall, 1988), 76. See also Wilhelm Ehmann, *Choral Directing* (Minneapolis: Augsburg Publishing, 1968), 8-14; Lewis Gordon, *Choral Director’s Rehearsal and Performance Guide* (West Nyack: Parker Publishing, 1989), 112-113; Colin Durrant, *Choral Conducting: Philosophy and Practice* (New York: Routledge, 2003), 131-132.

⁵³ John B. Hylton, *Comprehensive Choral Music Education* (Englewood Cliffs: Prentice Hall, 1995), 40.

⁵⁴ Lewis Gordon, *Choral Director’s Rehearsal and Performance Guide* (West Nyack: Parker Publishing, 1989), 110. See also Arthur Ray Lambson, “An Evaluation of Various Seating Plans Used in Choral Singing,” *Journal of Research in Music Education* 9, no. 1 (Spring 1961): 52-54; Gordon H. Lamb, *Choral Techniques* (Dubuque: Wm.C. Brown Company Publishers, 1974), 14; Hylton, 42; Daniel L. Kohut and Joe W. Grant, *Learning to Conduct and Rehearse* (Upper Saddle River: Prentice Hall, 1990), 127; James Bruce Lesley, “An Investigation of Factors Used in Determining Choral Seating Arrangements of Selected High School Choirs in Mississippi,” (DA diss., University of Mississippi, 1999), 33-35; Sandra Willetts, *Beyond the Downbeat: Choral Rehearsal Skills and Techniques* (Nashville: Abingdon Press, 2000), 66-68; Colin Durrant, *Choral Conducting: Philosophy and Practice* (New York: Routledge, 2003), 132; Patricia Madura Ward-Steinman, *Becoming a Choral Music Teacher: A Field Experience Workbook* (New York: Routledge, 2010), 94.

phrase shaping, especially with larger choirs.⁵⁵

Other external (and potentially limiting) formation factors to consider include the amount of rehearsal time available as well as physical attributes of the choir and performance venue(s). The sheer number of singers and the distribution of voices will affect volume, strength, and placement.⁵⁶ The size and shape of the performance (and rehearsal) space affects the position of the choir, the amount of room available to each singer, and the efficiency of movement if the formation changes between (or even during) pieces during a performance. A semicircle or “U” shape is recommended if space permits as well as spreading out the singers.⁵⁷ Though choral sound is enhanced “only to the extent to which the physical characteristics of a room allow the sound to develop, exist, and decay,” the acoustical aspects of the venue “cannot improve the musical quality,” musical ability, or musicality of an ensemble.⁵⁸ In addition to the venue, individual chorister height (and size) is of great importance, and visual balance is something to consider. Not only must the singers be able to see the conductor, but they also “hear better and sound better when they stand next to someone of approximately the same height.”⁵⁹ Visual appeal also creates “a positive impression on the part of the listener, before a sound is heard.”⁶⁰ However, once a formation for the performance has been determined, conductors should allow

⁵⁵ Gordon, 110.

⁵⁶ Donald Neuen, *Choral Concepts* (Belmont: Shirmer, 2002), 173-177. See also Lesley, 34; Kenneth H. Phillips, *Directing the Choral Music Program* (New York: Oxford UP, 2004), 177-181.

⁵⁷ Wilhelm Ehmann, *Choral Directing* (Minneapolis: Augsburg Publishing, 1968), 7-8; Sandra Willetts, *Beyond the Downbeat: Choral Rehearsal Skills and Techniques* (Nashville: Abingdon Press, 2000), 65-66; James Jordan, “The Choral Rehearsal: Planning, Evaluating, Sight-Reading, and Singer Placement” in *The School Choral Program: Philosophy, Planning, Organizing, and Teaching*, eds. Michele Holt and James Jordan (Chicago: GIA Publications, 2008), 162.

⁵⁸ Joel Kramme, “Applications of Acoustical Principles to Selected Problems Arising During Choral Rehearsals,” *Choral Journal* 18, no. 7 (March 1978): 12. See also Tocheff, 72-75; Sten Ternström, *Acoustical Aspects of Choir Singing* (Stockholm: Royal Institute of Technology, 1989), 16-18, 26-29.

⁵⁹ Hylton, 43. See also Gordon, 111; Robert L. Garretson, *Conducting Choral Music*, 8th ed. (Upper Saddle River: Prentice Hall, 1998), 293; Lesley, 34; Brenda Smith and Robert T. Sataloff, *Choral Pedagogy*, 2nd ed. (San Diego: Plural Publishing, 2006), 185.

⁶⁰ Hylton, 43.

sufficient time to rehearse in that formation (in the performance venue, if possible) so the singers will be “accustomed to their surroundings” and “have time to adjust vocally to others around them.”⁶¹

In addition to external considerations, micro-arrangements are determined by internal factors such as the vocal qualities, abilities, and personalities of individual choir members. Qualities such as “loud vs. soft volume[,] mature vs. immature tone,” heavy vs. light sound as well as warmth, vibrato, stridency, and vibrancy need to be taken into account.⁶² Experience and training as well as reading ability, “hearing” ability, individual intonation, rhythmic accuracy, independence, and part security also contribute to decisions regarding the placement of individuals in the choir.⁶³ Donald Neuen and Lynne Gackle encourage the “opposites attract” concept.⁶⁴ Placing “strong readers next to weaker ones, bigger voices next to smaller ones, experienced singers next to inexperienced ones, wider vibratos next to straighter voices,” “heavy” voices next to “light” ones, “breathy” voices “with those which are more pure,” etc. promotes a better blend and a more “homogenous tone.”⁶⁵ Conductors must also prevent potential problems for the rehearsal environment by separating choristers with personality clashes or tendencies to talk.⁶⁶ These kinds of disruptions in rehearsal can detract from the most effective sound and are easily avoided.

Another major convention to consider for micro-arrangements includes Weston Noble’s

⁶¹ Gordon, 111. See also Willetts, 66.

⁶² Neal W. Woodruff, “The Acoustic Interaction of Voices in Ensemble: An Inquiry into the Phenomenon of Voice Matching and the Perception of Unaltered Vocal Process” (DMA diss, University of Oklahoma, 2002), 48. See also Lesley, 34.

⁶³ Weston Noble, *Achieving Choral Blend through Standing Position*, DVD (Chicago: GIA Publications, 2005). See also Lamb, 14; Gordon, 110; Garretson, 288; Kenneth H. Phillips, *Directing the Choral Music Program* (New York: Oxford UP, 2004), 175-176.

⁶⁴ Donald Neuen, *Choral Concepts* (Belmont: Shirmer, 2002), 173; Lynne Gackle, *Finding Ophelia’s Voice, Opening Ophelia’s Heart: Nurturing the Adolescent Female Voice* (Dayton: Heritage Music Press, 2011), 34.

⁶⁵ Ibid.

⁶⁶ Hylton, 43; Noble; Lamb, 11; Lesley, 34.

method of voice matching (also known as “acoustical placement” or “compatibility placement”). Noble has demonstrated the voice matching process in many conference presentations and in a video entitled *Achieving Choral Blend through Standing Position*.⁶⁷ David Giardiniere⁶⁸ and James Jordan⁶⁹ have also joined the effort to explain this method in depth, a practice which brings together voices that compliment each other and which has worked well for over fifty years.⁷⁰ Neal Woodruff even asserts that such placement “is the crucial factor in...choral blend.”⁷¹ However, the process is complex and does take time.⁷² “No two groups are the same... what works well one year may come to naught the next,” and voice matching is difficult to achieve (or practice) when choir attendance is spotty.⁷³ Even when the conductor makes every effort to encourage a natural, colorful, and vibrant sound, an unintentional “compromise of the vocal instrument can never be eliminated,” and voice matching may subconsciously encourage a training effect as the task progresses.⁷⁴ Perhaps the singers unconsciously “start to shape their vowels more uniformly,” “sing more in ‘chorus mode,’” or “limit vibrato somewhat” in order to speed up the process.⁷⁵ However, when conductors invest the requisite time, voice matching has even helped fix problems as serious as pitch matching troubles.⁷⁶

Besides micro-arrangements of choristers, several authors present different macro-

⁶⁷ Noble.

⁶⁸ David Carmine Giardiniere, “Voice Matching: A Perceptual Study of Vocal Matches, Their Affect on Choral Sound, and Procedures of Inquiry Conducted by Weston Noble,” (PhD diss, New York University, 1991).

⁶⁹ James Jordan, “The Choral Rehearsal: Planning, Evaluating, Sight-Reading, and Singer Placement” in *The School Choral Program: Philosophy, Planning, Organizing, and Teaching*, eds. Michele Holt and James Jordan (Chicago: GIA Publications, 2008), 164-172. Repeated in James Jordan, *The Choral Rehearsal*, Vol. 1: Techniques and Procedures (Chicago: GIA Publications, 2007), 63-71; James Jordan, *The Choral Warm-Up: Method, Procedures, Planning, and Core Vocal Exercises* (Chicago: GIA Publications, 2005), 125-133.

⁷⁰ See also Bradley Thomas Barrett, “Chorister Placement: The Criteria, Procedures, and Methods Used in Placing the Chorister Within the Mixed Ensemble” (DMA diss., University of Arizona, 2003).

⁷¹ Woodruff, 154.

⁷² Neuen, 173; William Dehning, *Chorus Confidential: Decoding the Secrets of the Choral Art* (San Pedro: Pavane Publishing, 2003), 96.

⁷³ Dehning, 96.

⁷⁴ Giardiniere, 6.

⁷⁵ Debra Spurgeon, e-mail message to author, June 9, 2011.

⁷⁶ Noble.

arrangements to place entire voice parts including mixed, sectional, random (or scattered), quartet, row, and column choices. Lori Keyne claims that mixed formations promote “group trust” as well as the choristers’ “overall perception of a choral work and . . . level of personal responsibility.”⁷⁷ However, Robert Tocheff advocates the use of a sectional formation, and his research indicates that “a mixed formation appears to show very little advantage at all.”⁷⁸ Weston Noble and James Jordan encourage a horizontally-based arrangement with the “altos in the front” to “take the edge off of the soprano sound.”⁷⁹ Gerald Langner also points out that the conductors may want to consider who is placed in the front row since these voices may, to an extent, “mask” the rest of the choir.⁸⁰

Other scholars provide historical background and specific variations for macro-arrangements. Ray Robinson and Allen Winold provide a comprehensive historical list of arrangements used by prominent choirs and conductors.⁸¹ In *Beyond the Downbeat: Choral Rehearsal Skills and Techniques*, Sandra Willetts presents over thirty variations with a rationale for each.⁸² Robert Tocheff proffers similar information with a scholarly list of advantages and disadvantages for sectional and mixed formations.⁸³ Advantages of sectional formation include part security, cuing ease, “consistency of interpretation,” “control of dynamics and articulation,”

⁷⁷ Lori Valerie Keyne, “Choral Seating Arrangements and Their Effects on Musical and Social Elements,” (DMA diss., University of Arizona, 1992), 27-28.

⁷⁸ Robert Dale Tocheff, “Acoustical Placement of Voices in Choral Formations” (PhD diss., Ohio State University, 1990), 152.

⁷⁹ James Jordan, “The Choral Rehearsal: Planning, Evaluating, Sight-Reading, and Singer Placement,” 163-164. Repeated in James Jordan, *The Choral Rehearsal*, Vol. 1: Techniques and Procedures, 61-63; James Jordan, *The Choral Warm-Up: Method, Procedures, Planning, and Core Vocal Exercises*, 124-125.

⁸⁰ Gerald Langner, “The Placement of Singers in a Mixed Choir,” *Canadian Music Educator* 43, no. 4 (Summer 2002): 28.

⁸¹ Ray Robinson and Allen Winold, *The Choral Experience: Literature, Materials, and Methods* (New York: Harper’s College Press, 1976), 162-165, 177-192. See also Brian J. Knutson, “Interviews with Selected Choral Conductors Concerning Rationale and Practices Regarding Choral Blend” (PhD diss., Florida State University, 1987).

⁸² Willetts, 55-69.

⁸³ Tocheff, 50-72.

“music learning,” and “individual voices are less likely to be noticed” while disadvantages entail more difficulty in achieving a good “blend, balance, and intonation,” individual voices are “more likely to pull the entire section off pitch,” and block sections encourage “dependence [of weaker singers] on more capable singers.”⁸⁴ In contrast, advantages for mixed formations include “[a]n overall richer tone, better blend, and improved intonation,” development of “confidence, individuality, and vocal independence,” “one singer having a bad day” is less likely to “negatively affect an entire voice part,” experience of the “whole rather than the part,” the ability to strategically place “best quality voices for key positions,” enabling “singers to eventually read more accurately and quickly,” improvement in tone quality from “average singers,” improvement in morale due to the “increased responsibility and challenge,” and mixing parts psychologically “liven up the group.”⁸⁵ Disadvantages of mixed formations are as follows: male voices with “more carrying power” are “more easily heard,” there is a “greater risk for the prominence of individual voices,” one quartet’s consistency may be “inconsistent with other units,” and cuing and the “[c]ontrol of dynamics and articulation is more difficult.”⁸⁶ Block sectional formations and modifications with partial rows, double-quartets, etc. are also used to simulate the mixed formation sound while maintaining some of the advantages of a sectional formation.

Bearing in mind all of the factors previously mentioned, chorister preference may not be considered supremely important, but it may contribute to the quality of choral sound. Choral singing requires the cooperation of many individual voices in conjunction with training and instruction from the conductor. Therefore, conductors “must be uniquely aware of the issues that

⁸⁴ Ibid, 54-55.

⁸⁵ Ibid, 65-67.

⁸⁶ Ibid, 65, 67-68.

the individual singer faces in the choral setting and employ appropriate techniques that allow greater health and freedom of expression...while preserving standards of excellence that are essential to the development of choral technique.”⁸⁷ Dallas Draper asserts that quality choral singing depends not only on physical activity but also “must be dominated by the will and the desire of the performer and motivated by [the performer’s] emotional state.”⁸⁸ Robert Tocheff made a point to include the singers’ reactions in his study because “singers need to feel good about themselves and the sound they are producing individually and as a choir.”⁸⁹ Colin Durrant claims that singers are “unlikely to be able to give their best” if they “feel alone in new surroundings” and that they “can gain much confidence and self-esteem when they feel they contribute to the overall sound independently.”⁹⁰ Put simply, how choristers feel about the sound they are making is important.

Acoustic Considerations

A large part of chorister perception is comprised of how well the singers hear themselves and how well they hear fellow choir members. Only recently has choral formation been addressed through the lens of acoustical science. Though conductors strategically place the “singers so that they are able to hear each other [so the choir will] develop as a cohesive musical unit,”⁹¹ considerations for whether the singer can hear his/her own voice in the midst of the ensemble sound have not received much study. Factors affecting choral acoustics include Self-to-Other Ratio, spacing (proximity), formation, venue, and pitch level.

⁸⁷ Michael C. Lister, “Male Choristers’ Perceptions of and Preferences for Choral Formations Based on Individual Singer Placement within the Ensemble,” (DA diss., Ball State University, 2009), 2.

⁸⁸ Dallas Draper, “The Solo Voice as Applied to Choral Singing,” *Choral Journal* 12, no. 9 (May 1972): 13.

⁸⁹ Tocheff, 149-150.

⁹⁰ Colin Durrant, *Choral Conducting: Philosophy and Practice* (New York: Routledge, 2003), 130-131.

⁹¹ Robinson and Winold, 162.

Optimal choral conditions allow the singers to hear themselves as well as others.

According to Sten Ternström, singers need to be able to hear their own voices “as well as the rest of the choir” to avoid problems with “pitch,” “vowel timbre,” and/or “timing.”⁹² Yet, there is little singers can do to influence the personally perceived proportion of their own voices to the rest of the choir. “Raising one’s own voice is rarely permissible” and may even be harmful.⁹³ Margaret Olson claims that the Lombard Effect (a condition which creates a very low to negative Self-to-Other Ratio) contributes to vocal fatigue and can be damaging – especially for the solo singer in choir.⁹⁴ Because of the possibility of vocal damage, Olson recommends that singers develop the “ability to perceive one’s own voice by a sensation rather than sound,”⁹⁵ and Steven Tonkinson advises awareness training so singers will start “regulating the intensity of their [own] voice[s] in a healthy manner.”⁹⁶ However, this learning process varies from one individual to another and takes time. Though these concepts are addressed in private voice, not all choir members have the luxury of private lessons, and a more immediate solution might be preferable, especially in an educational choral setting. Until the sensation skills are developed, being able to hear one’s own voice among other choir members is essential.

Singers rely on three components of personal feedback: “direct airborne sound,” “reflected airborne sound,” and “bone-conducted sound.”⁹⁷ Both direct and reflected airborne sound are affected by the environment. Direct airborne sound travels directly from one singer’s

⁹² Sten Ternström, “Preferred Self-to-Other Ratios in Choir Singing,” *Journal of the Acoustical Society of America* 15, no. 6 (June 1999): 3563.

⁹³ Ibid.

⁹⁴ Margaret Olson, “Acoustic Issues and the Choral Singer,” *Choral Journal* 45, no. 1 (August 2004): 46.

⁹⁵ Ibid.

⁹⁶ Steven E. Tonkinson, “The Lombard Effect in Choral Singing” (DMA diss., University of Missouri – Kansas City, 1990, 28-29. See also Johan Sundberg, “To Perceive One’s Own Voice and Another Person’s Voice” in *Research Aspects on Singing: Autoperception, Computer Synthesis, Emotion, Health, Voice Source* (Stockholm: Royal Swedish Academy, 1981), 82.

⁹⁷ Sten Ternström, “Hearing Myself with Others: Sound Levels in Choral Performance Measured with Separation of One’s Own Voice from the Rest of the Choir,” *Journal of Voice* 8, no. 4 (December 1994): 294. See also Johan Sundberg, *The Science of the Singing Voice* (Dekalb: Northern Illinois UP, 1987), 159.

mouth to that same person's ears while reflected airborne sound, or the sound reflected by the room and surroundings, depends upon circumstantial acoustics.⁹⁸ Sound from other singers, particularly at ear level, may substantially mask or even block direct airborne sound, and reflected sound may also be absorbed by the bodies of surrounding choristers. Bone-conducted sound, however, depends upon an individual's physical constitution. This component of personal feedback contains the sensed vibrations of flesh and bone of the individual singer, and this component is practically impossible to measure accurately or completely.⁹⁹

Direct airborne sound is also experienced more efficiently in lower registers than in higher registers. Higher frequency components and overtones "cannot radiate backwards [from the mouth to the ear] as efficiently as low frequency components," and therefore, direct airborne sound has a "somewhat more dull timbre" than the actual sound produced.¹⁰⁰ High "overtones are normally provided by the reverberation of the sound in the room."¹⁰¹ Not only is one's perception of direct airborne sound improved on lower pitches, bone-conducted sound is also "particularly rich in low frequencies" and is increased when phonating closed vowels such as [u].¹⁰² Compare the sound of your own voice when singing high and low pitches on the open vowel [a] while plugging both ears (with your fingers or earplugs) and then without plugging them. Then try the same experiment while singing a closed vowel such as [u].¹⁰³ Plugging your

⁹⁸ Ibid.

⁹⁹ Ibid.

¹⁰⁰ Johan Sundberg, "To Perceive One's Own Voice and Another Person's Voice," in *Research Aspects on Singing: Autoperception, Computer Synthesis, Emotion, Health, Voice Source* (Stockholm: Royal Swedish Academy, 1981), 82.

¹⁰¹ Ibid.

¹⁰² Ternström, "Hearing Myself with Others: Sound Levels in Choral Performance Measured with Separation of One's Own Voice from the Rest of the Choir," 294; Georg V. Békésy, "The Structure of the Middle Ear and the Hearing of One's Own Voice by Bone Conduction," *The Journal of the Acoustical Society of America* 21, no. 3 (May 1949): 220.

¹⁰³ Sten Ternström and Duane Richard Karna, "Choir" in *The Science and Psychology of Music Performance: Creative Strategies for Teaching and Learning*, eds. Richard Parncutt and Gary E. McPherson (New York: Oxford UP, 2002), 273.

ears decreases personal feedback received by direct airborne sound and actually amplifies bone-conducted sound a bit.¹⁰⁴ Closed vowels also slightly increase bone-conducted sound, but higher pitches will not be powerfully resonant internally. To experience differences in the quality of reflected airborne sound for high and low pitches, repeat the same experiment in the shower and in the closet. Though you may not notice as much difference with lower pitches, higher pitches sound quite different. The harder reflective surfaces of the shower bring out higher partials of the sound that would be absorbed by the softer surfaces of clothes hanging in the closet.¹⁰⁵ Reflected airborne sound depends partly upon the venue but may be also be affected by formation and spacing. As previously mentioned, other singers' bodies will absorb and mask an individual's perceived sound contribution. All three of these sound components, direct airborne sound, reflected airborne sound, and bone-conducted sound, affect how well the singer is able to hear his/her own voice.

Self-to-Other Ratio (SOR) is a concrete measurement of how well one can hear one's own voice and has a great impact on the choral sound.¹⁰⁶ SOR is a positive number when a singer hears his/her own voice any given number of decibels above the sound of the surrounding chorus, and it is a negative number when the singer's own voice is blanked out by surrounding sound.¹⁰⁷ An SOR of 0 dB "reflects silence of the subject."¹⁰⁸ According to research conducted by Sten Ternström testing exact numerical SOR preferences, individuals are able to reproduce personal SOR preferences with remarkable accuracy. Basses tended to prefer lower SOR values,

¹⁰⁴ Békésy, 219. See also Ternström, "Physical and Acoustic Factors that Interact with the Singer to Produce the Choral Sound," 133.

¹⁰⁵ Sundberg, "To Perceive One's Own Voice and Another Person's Voice," 81-82.

¹⁰⁶ Ternström, "Preferred Self-to-Other Ratios in Choir Singing," 3563.

¹⁰⁷ Ibid.

¹⁰⁸ Svante Granqvist, "The Self-to-Other Ratio Applied as a Phonation Detector for Voice Accumulation," *TMH/QPSR, KTH* 45 (2003): 30.

and sopranos tended to prefer higher SOR values.¹⁰⁹ Due to room absorption, extreme spacing, repertoire demands, and vocal power, opera singers often experience SOR levels so high (approximately +15 dB for sopranos, +10 dB for the mezzo sopranos and tenors, and +14 dB for baritones) that they cannot hear the other singers on stage and must rely on conducting gestures rather than auditory cues.¹¹⁰ For solo singing, room-reflected sound is important auditory feedback, but in choral singing, room-reflected sound is virtually canceled out by other voices. Thus, choir members are forced to rely upon mouth-to-ear sound and internal bone-conducted vibrations. In addition, one's own airborne mouth-to-ear sound is often minimized by the sound from surrounding choristers. Environmental sound in a choir, especially at ear level, creates a very low SOR, particularly when the choir members are standing close together.¹¹¹ When "the SOR is too low, the singers may be able to hear their own voices only by making mistakes" and intonation is likely to suffer.¹¹² However, when the SOR is too high (the individual has trouble hearing other voices) and "the rest of the choir is masked, timing [and harmonic synchronization] becomes a problem."¹¹³ As determined by Ternström, the average SOR preferred by most singers (+6.1 dB) is higher than typical choral performance conditions produce (which is around +3.9 dB), and "singers often find they cannot make out the sound of their own voice" in choir.¹¹⁴ One way to increase SOR levels, especially for higher voices, is to add space between each

¹⁰⁹ Sten Ternström, "Preferred Self-to-Other Ratios in Choir Singing," *Journal of the Acoustical Society of America* 15, no. 6 (June 1999): 3569.

¹¹⁰ Sten Ternström, Densil Cabrera, and Pamela Davis, "Self-to-Other Ratios Measured in an Opera Chorus in Performance," *Journal of the Acoustical Society of America* 118, no. 6 (December 2005): 3907, 3910.

¹¹¹ Sten Ternström, "Hearing Myself with Others: Sound Levels in Choral Performance Measured with Separation of One's Own Voice from the Rest of the Choir," *Journal of Voice* 8, no. 4 (1994): 299.

¹¹² Sten Ternström and Duane Richard Karna, "Choir," in *The Science and Psychology of Music Performance: Creative Strategies for Teaching and Learning*, ed. Richard Parncutt and Gary E. McPherson (New York: Oxford UP, 2002), 274.

¹¹³ Ternström, "Preferred Self-to-Other Ratios in Choir Singing," 3563.

¹¹⁴ *Ibid.*, 3572; Ternström, "Hearing Myself with Others: Sound Levels in Choral Performance Measured with Separation of One's Own Voice from the Rest of the Choir," 301.

singer so choir members are no longer singing directly into another choir member's ears.¹¹⁵

However, due to sound absorption by the bodies of other choir members, large choirs, in particular, are likely to require more space *per singer* than smaller choirs, though spreading out large choirs is not usually practical due to the size of the performance space and/or the size of the risers used.¹¹⁶

Choral spacing has become an area of interest in choral research. James Daugherty has conducted extensive research regarding the acoustical effects of choral spacing. His 2003 study with a university chamber choir confirmed a significant chorister, auditor, and director preference for spread spacing. Auditors and choristers preferred men with only lateral spacing (more space from side-to-side) but preferred circumambient spacing (more side-to-side and front-to-back space) for women. This study also indicated that 80% of the choristers, including 100% of the females, reported vocal tension in close spacing and that 100% of sopranos and tenors noticed a tendency to “push or sing louder” when in close spacing.¹¹⁷ Placing choir members too close together on risers does not promote musicality. Leon Thurman, Sharon Hansen, and Axel Theimer claim that “[c]lose bodily proximity in seated or standing choir formations produces a reflexive and protective contraction or withdrawing of the body [which] results, inevitably, in a constriction of respiratory, larynx, and vocal tract function, which limits vocal abilities, diminishes musical expressiveness, and teaches singers to sing that way.”¹¹⁸ Close proximity causes tension of which singers may be unaware. Furthermore, doubling the size of the choir, which also limits spacing options, only increases the sound level of the choir by

¹¹⁵ Ibid.

¹¹⁶ Ibid.

¹¹⁷ James F. Daugherty, “Choir Spacing and Formation: Choral Sound Preferences in Random, Synergistic, and Gender-Specific Chamber Choir Placements,” *International Journal of Research in Choral Singing* 1, no. 1 (2003): 53-55.

¹¹⁸ Leon Thurman, Sharon Hansen, and Axel Theimer, “The Cart, the Horse, and a Ride in the Choral Countryside,” *Choral Journal* 41, no. 7 (February 2001): 53.

three decibels at most.¹¹⁹ Spread spacing is preferable. In Daugherty's 1999 study involving an SATB high school choir, both auditors and choristers overwhelmingly preferred spread spacing. This study also adds that weak singers prefer close spacing while strong singers preferred spread spacing.¹²⁰ Debra Atkinson confirms the chorister preference for spread spacing with the use of a university SATB chamber group.¹²¹ In her study, auditors, choristers, and directors all definitely preferred a reasonable amount of space between singers for a better sound.

When space is limited, and even when it is not, formation affects choral acoustics, especially for the singers. Though "five studies to date that included choir formation as a variable, [in which] auditors reported virtually no statistically significant sound differences between sectional and mixed formations,"¹²² Daugherty suggests that "mixed formation and compatibility placement are essentially smaller scale manifestations of the spacing phenomenon."¹²³ He also acknowledges that "experienced singers in close spacing may prefer a mixed formation to a sectional formation."¹²⁴ Ternström and Karna recommend mixed formations when adequate spacing is not possible.¹²⁵ In fact, choristers generally seem to prefer mixed formation. Daugherty's 1999 study shows that choristers, especially females, prefer mixed formation and auditors significantly prefer mixed formation when spacing is close.¹²⁶

¹¹⁹ James F. Daugherty, "On the Voice: Rethinking How Voices Work in a Choral Ensemble," *Choral Journal* 42, no. 5 (December 2001): 72.

¹²⁰ James F. Daugherty, "Spacing, Formation, and Choral Sound: Preferences and Perceptions of Auditors and Choristers," *Journal of Research in Music Education* 47, no. 3 (Fall 1999): 235-236.

¹²¹ Debra S. Atkinson, "The Effect of Choir Formation on the Acoustical Attributes of the Singing Voice" (DA diss., University of Mississippi, 2006), 74-77.

¹²² James F. Daugherty, "On the Voice: Rethinking How Voices Work in a Choral Ensemble," *Choral Journal* 42, no. 5 (December 2001): 71.

¹²³ Daugherty, "On the Voice: Rethinking How Voices Work in a Choral Ensemble," 72.

¹²⁴ Ibid.

¹²⁵ Sten Ternström and Duane Richard Karna, "Choir," in *The Science and Psychology of Music Performance: Creative Strategies for Teaching and Learning*, ed. Richard Parncutt and Gary E. McPherson (New York: Oxford UP, 2002), 271.

¹²⁶ Daugherty, "Spacing, Formation, and Choral Sound: Preferences and Perceptions of Auditors and Choristers," 233-235.

Atkinson confirms this chorister preference finding.¹²⁷ According to another SATB study conducted by Christopher Aspaas, Christopher McCrea, Richard Morris, and Linda Fowler, men prefer sectional formation while women (especially sopranos) prefer mixed formations.¹²⁸ Sandra Peter suggests use of a mixed formation for women's choir once the music has been learned since the "singers love it" and report that "they can hear all the parts, are more independent, accountable, try harder, and meet somebody new."¹²⁹ Mixed formation apparently appeals to singers, especially women.

Other factors to consider for chorister comfort include acoustical space, pitch level, and voice classification. "Ternström found that choristers tended to raise their larynxes in more absorbent rooms and to lower them in more reverberant venues."¹³⁰ A simple reflex caused by the reverberance of the venue may be enough to consider placing the singers in a formation they favor and in which they feel most comfortable. In addition, conductors may find it difficult "to accurately assess choral tone and address healthy balance issues when reactions and diagnoses are based on the acoustical environment of a less than ideal rehearsal space."¹³¹ Pitch level is another consideration. According to Elizabeth Ekholm, sopranos indicate "vocal discomfort and difficulty reaching notes at the extremes of their range" when attempting to blend in sectional formation¹³² while "[a]ltos and basses did not indicate any decrease in vocal comfort."¹³³ Higher voices have a harder time hearing their own voices when in close proximity to each other.

¹²⁷ Atkinson, 74-77.

¹²⁸ Christopher Aspaas, Christopher McCrea, Richard Morris, and Linda Fowler, "Select Acoustic and Perceptual Measures of Choral Formation," *International Journal of Research in Choral Singing* 2, no. 1 (2004): 19.

¹²⁹ Sandra Peter, "Mixing It Up: Voicing and Seating a Women's Choir," *Choral Journal* 50, no. 11 (June/July 2010): 36.

¹³⁰ Daugherty, James F. "On the Voice: Rethinking How Voices Work in a Choral Ensemble." *Choral Journal* 42, no. 5 (December 2001): 70.

¹³¹ Brian Galante, "On the Voice: Vibrato and Choral Acoustics: Common Voice Science Issues for the Choral Conductor," *Choral Journal* 51, no. 7 (February 2011): 74.

¹³² Elizabeth Ekholm, "The Effect of Singing Mode and Seating Arrangement on Choral Blend and Overall Choral Sound," *Journal of Research in Music Education* 48, no. 2 (Summer 2000): 130.

¹³³ Ibid.

Therefore, a greater effort to blend is required from higher voices than from lower voices. According to Daugherty, “especially mature sopranos singing at higher frequencies typically require more space to hear themselves in a balanced way with the sound of the whole choir.”¹³⁴ Voice classification is another factor to consider. Ideal voice classifications are rarely possible (at least in a non-professional situation) for every member of any given choir. According to Ingo Titze, biological voice classification “follows a normal bell curve...that would assign about two-thirds of all voices to the intermediate categories.”¹³⁵ In other words, well over half of SATB choirs would ideally be classified as mezzo-sopranos or baritones. Since such an arrangement would cause problems with balance, many choral singers end up singing just above or below their most comfortable range most of the time.¹³⁶

Women’s Voices

Women’s voices and women’s choirs also present unique concerns regarding voice distribution, pitch level, and perception. According to Titze, if balance among voice parts was not an issue, most women would ideally be classified as mezzo sopranos.¹³⁷ Therefore, for four-part women’s music (SSAA), two-thirds of all women in any given ensemble would naturally fall in the upper middle part of the music. That leaves only one third of the singers to cover first soprano and both alto parts. (Therefore, the opposite is true for men’s choirs. Men’s voices are concentrated on the lower end of the range spectrum for TTBB music.) In any given women’s choir, some of the natural mezzo sopranos must be assigned to first (maybe even second) alto in order to balance the sound, creating a small but significant group of women singing just below

¹³⁴ James F. Daugherty, “On the Voice: Rethinking How Voices Work in a Choral Ensemble,” *Choral Journal* 42, no. 5 (December 2001): 73.

¹³⁵ Ingo R. Titze, “Getting the Most from the Vocal Instrument in a Choral Setting,” *Choral Journal* 49, no. 5 (November 2008): 38.

¹³⁶ *Ibid.*, 39.

¹³⁷ *Ibid.*, 38.

their most comfortable range. If the conductor desires a true pyramid of sound, even more singers must be moved to lower parts. These singers are more likely to push their voices for volume,¹³⁸ and to complicate matters, their lower pitches will not carry as easily as high ones do.¹³⁹

Obviously, women's choirs will generally be singing pitches an octave higher than male choirs typically sing. Higher pitches are significantly louder than lower pitches and provide singers with very little internal feedback (chest wall vibrations or bone-conducted sound).¹⁴⁰ Singers in an SATB choir are exposed to sounds "around the 80 dB sound pressure level," which is high enough to be painful, but soprano sections are frequently exposed to 115 dB sound pressure levels.¹⁴¹ (Since lower voices produce lower decibel levels, altos often feel the need to work harder than sopranos to be heard over an orchestra.¹⁴²) If you were standing directly in front of a soprano singing at this level, your hearing would be damaged, but choir members do not have trouble because "a muscle in the middle ear reflexively contracts so that the level reaching the inner ear is reduced" during phonation.¹⁴³ Part of the ear shuts off to protect itself. This protective measure by the ear also affects SOR levels. SOR is still generally high in the soprano section, but tuning poses "special complications for sopranos" because they hear themselves and "immediate neighbors to be louder than the rest of the choir."¹⁴⁴ When SOR levels are too high in a soprano section, which would be more of a problem in sectional formation, the tendency to go flat or sharp increases because they cannot hear the rest of the

¹³⁸ Titze, 38-39.

¹³⁹ Johan Sundberg, *The Science of the Singing Voice* (Dekalb: Northern Illinois UP, 1987), 140.

¹⁴⁰ Ibid; Sundberg, "To Perceive One's Own Voice and Another Person's Voice," 87.

¹⁴¹ Ibid.

¹⁴² Michelle Evans, "Vocal Qualities in Female Singing," (PhD diss., University of York, 1995), 68.

¹⁴³ Evans, 68; Békésy, 218.

¹⁴⁴ Ternström, "Physical and Acoustic Factors that Interact with the Singer to Produce the Choral Sound,"

choir well enough to tune.¹⁴⁵ A block of sopranos singing in unison and in close spacing would compound this problem.¹⁴⁶ Then they tend to either start vocally competing with one another or start trying to sing softer at a high pitch level. However, “[i]mproperly produced soft singing,” especially in that range, “causes strain on the vocal mechanism that is very similar to pushing” to sing too loud¹⁴⁷ and results in a reduced amount “of upper partials present in soprano tones.”¹⁴⁸ Music folders can be tilted to reflect the sound back to the singer, but then that sound does not reach the audience, and too much of a tilt covers faces and causes visibility problems.¹⁴⁹ Daugherty reports that 100% of sopranos and tenors “tended to push or sing louder” in close spacing, and 100% of all females “experienced moderate to minor body tension and strain of vocal production” in close spacing.¹⁵⁰ Altos are still singing higher than tenors most of the time. Pitch level may be one reason why all women in the Aspaas, McCrea, Morris, and Fowler study tended to prefer mixed and block formations with a “strong dislike for the sectional in columns formation.”¹⁵¹ Moreover, the “difference tone” or “Tartini tone” acoustical phenomenon augments lower choral pitches when the upper parts are singing in tune.¹⁵² As opposed to an overtone which sounds above sung pitches, a difference tone sounds below two pitches sung in tune and may serve to boost the sound of lower voice parts (namely second altos or basses) in a

¹⁴⁵ Ibid.

¹⁴⁶ Ibid.

¹⁴⁷ Paul Kiesgen, “Rehearsal Break: Warning! Soft Singing May Be Harmful to Your Health!” *Choral Journal* 38, no. 1 (August 1997): 30.

¹⁴⁸ Allen W. Goodwin, “An Acoustical Study of Individual Voices in Choral Blend,” *Journal of Research in Music Education* 28, no. 2 (Summer 1980): 126.

¹⁴⁹ James F. Daugherty, “On the Voice: Rethinking How Voices Work in a Choral Ensemble,” *Choral Journal* 42, no. 5 (December 2001): 73.

¹⁵⁰ James F. Daugherty, “Choir Spacing and Formation: Choral Sound Preferences in Random, Synergistic, and Gender-Specific Chamber Choir Placements,” 54, 58.

¹⁵¹ Aspaas, Christopher, Christopher McCrea, Richard Morris, and Linda Fowler. “Select Acoustic and Perceptual Measures of Choral Formation.” *International Journal of Research in Choral Singing* 2, no. 1 (2004): 23.

¹⁵² Betty Jane Grimm, “Treble Choral Acoustics,” *Choral Journal* 21, no. 8 (April 1981): 24; Louis H. Diercks, “The Individual in the Choral Situation...with Mathematical Justifications by E. Milton Boone” *The Bulletin – The Official Magazine of the National Association of Teachers of Singing* 17, no. 4 (May 1961): 8-10.

choir. Betty Jane Grimm claims that difference tones bring “a truer quality” to the choir, “minimize the possible danger of forcing the voice” for altos, and contribute a “factor which makes [women’s choirs] sound distinctive.”¹⁵³

Women’s choirs are still striving for positive perceptions regarding their distinctive sound. We have made many positive steps since the 1998 publication of Patricia O’Toole’s “Missing Chapter,” but all of those problems are not yet solved.¹⁵⁴ Women’s choirs have definitely, as Iris Levine claims, “garnered a steady growth, generating interest on all continents,” but the battle against negative perception continues.¹⁵⁵ According to a study by Dee Gauthier in 2005,

The students believe if you are in a female choir, you would be there only as a second choice. The female choir has the least status or prestige of any choir, your friends will not be impressed that you are singing in a female choir, and your choir will not be able to draw much of an audience. In addition, you are not good enough to get into the mixed choir, males singing in the mixed choir are more talented than you, your experience in a female choir will be less rewarding and less challenging, there is not as much music for female choirs, and it is of poor quality. The sound your choir produces will have less color and depth, in fact, the choir may sound screechy and out of tune, and you must be a lesser musician and have less musical experiences than those who sing in a mixed choir.¹⁵⁶

In 2007, Lisa Fredenburgh confirms this image,¹⁵⁷ and in 2010, Roberta Jackson¹⁵⁸ and Jill Wilson¹⁵⁹ do the same. Not only do women’s choirs still run the risk of being perceived as second-rate or training choirs, women often outnumber men in choir programs, as previously

¹⁵³ Grimm, 24.

¹⁵⁴ Patricia O’Toole, “A Missing Chapter from Choral Methods Books: How Choirs Neglect Girls,” *Choral Journal* 39, no. 5 (December 1998): 9-32.

¹⁵⁵ Iris S. Levine, “Women’s Choirs: Giving Women Voice,” *Choral Journal* 51, no. 7 (February 2011): 82.

¹⁵⁶ Dee Gauthier, “I’m Only in Women’s Chorus: A Need for Positive Image Building,” *Choral Journal* 46, no. 2 (August 2005): 46.

¹⁵⁷ Lisa Fredenburgh, “Women’s Choirs: Status and Competition: Perception of Women’s Choirs,” *Choral Journal* 48, no. 2 (August 2007): 38.

¹⁵⁸ Roberta Q. Jackson, “Always a Bridesmaid, Never a Bride!” *Chor Teach* 2, no. 3 (Spring 2010): 1.

¹⁵⁹ Jill Marie Wilson, “Practices and Attitudes Toward High School Treble Clef Choral Ensembles,” (DMA diss., Boston University, 2010), 146.

mentioned.¹⁶⁰ This proportion problem alone “affects young women who audition for collegiate scholarships, especially sopranos,” who are often overlooked to attract less-talented male singers for balance.¹⁶¹ Furthermore, despite the prominence of women’s choirs in choral programs, research is lacking. According to Randi Carp’s 2004 study, 92 of the 101 (91%) choir directors surveyed conduct one or more women’s choirs,¹⁶² and Jill Wilson corroborates this finding.¹⁶³ Yet relatively few materials suggest specific formations for women’s choirs, and many of those are simply modified SATB formations without much supporting evidence.¹⁶⁴ This study will seek to expand the knowledge base available to women’s choir conductors regarding formation.

¹⁶⁰ Lynne Gackle, *Finding Ophelia’s Voice, Opening Ophelia’s Heart: Nurturing the Adolescent Female Voice* (Dayton: Heritage Music Press, 2011), 116.

¹⁶¹ Ibid.

¹⁶² Randi Sue Carp, “Single Gender Choral Ensembles, Attitudes and Practices: A Survey of Southern California High School Choir Directors” (DMA diss., University of Southern California, 2004), 28.

¹⁶³ Jill Marie Wilson, “Practices and Attitudes Toward High School Treble Clef Choral Ensembles,” (DMA diss., Boston University, 2010), 150. Though Wilson claims to corroborate Carp’s findings, only 21 of the 110 (19%) choirs surveyed were women’s choirs, and only four of those women’s choirs were auditioned.

¹⁶⁴ Louis H. Diercks, “The Individual in the Choral Situation... with Mathematical Justifications by E. Milton Boone,” *The Bulletin – The Official Magazine of the National Association of Teachers of Singing* 17, no. 4 (May 1961): 7; Robert L. Garretson, *Conducting Choral Music*, 8th ed. (Upper Saddle River: Prentice Hall, 1998), 290-291; John B. Hylton, *Comprehensive Choral Music Education* (Englewood Cliffs: Prentice Hall, 1995), 248-250; Gackle, 34-36; James Jordan, “The Choral Rehearsal: Planning, Evaluating, Sight-Reading, and Singer Placement,” in *The School Choral Program: Philosophy, Planning, Organizing, and Teaching*, eds. Michele Holt and James Jordan (Chicago: GIA Publications, 2008), 164. Reprinted in James Jordan, *The Choral Rehearsal*, Vol. 1: Techniques and Procedures (Chicago: GIA Publications, 2007), 63; James Jordan, *The Choral Warm-Up: Method, Procedures, Planning, and Core Vocal Exercises* (Chicago: GIA Publications, 2005), 125.

CHAPTER 2

Methodology

The purpose of this study was to compare sectional and mixed formation within a women's choir situation while minimizing the number of variables such as formation choices, spacing choices, and conductor deviation. To reduce vocal fatigue and to improve the subjects' memory of aural nuances, only two formations were used instead of four (or more). A column sectional formation (see Figure 4) was the first formation used because it concentrates the sectional sound and provides the greatest contrast to the mixed formation to be used subsequently. Random placement was employed for both formations, allowing the choristers to place themselves. The choir was asked to sing Guy Forbes's "O Magnum Mysterium,"¹⁶⁵ a largely homophonic piece that the choir already knew. This SSAA divisi piece includes a pitch range from high B-flats for some first sopranos to low Fs for the second altos. In order to eliminate conductor variance, a video recording of the conductor was shown on a forty-two inch high definition flat-panel screen placed in front of the choir.

Choristers were asked to stand in a curved pattern (only the ends curved in rather than forming a full "U" shape) of nine sections of standard three-step Wenger TourMaster risers, each unit of which was four feet, seven inches long, and each step was twenty-four inches deep. Each step was eight inches higher than the previous one (first step was eight inches high, second step was sixteen inches high, and third step was twenty-four inches high). To create four rows, one row of singers was placed on the floor. During the warm-up, the choristers were allowed to

¹⁶⁵ Guy Forbes, "O Magnum Mysterium" (TC-288), Chapel Hill: Treble Clef Music Press, 2007.

stand where they pleased. Then, without any instruction, they sang through “O Magnum Mysterium” once with the video conductor. Each singer was given the first two pages of the survey (see Appendix C). One page was for sectional formation and the other was for mixed formation, and these inquiries were based on a Likert scale of one to five with one being the least desirable option (“tension” or “not very well”) and five being the most desirable (“freedom” or “very well”) with a section for comments on each formation. Singers were asked to read through the questions before singing in the first grouping and then reminded not to confer with their neighbors while completing the survey.

Then the singers were asked to place themselves in a column sectional formation as seen in Figure 7. Their placement choice was checked by having the choristers in each section raise

S I	S II	A I	A II
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Figure 7. Sectional Formation for the Experiment As Seen from the Conductor’s Perspective.

their hands. Then they were instructed to place themselves in “windows” (so that they were not standing directly in front of or behind another chorister). In order to improve visual connection with the monitor as well as to give the singers a practical amount of circumambient space, they were given eighteen inches of lateral space, measured with dowel rods cut to eighteen-inch lengths. The front row was asked to take a step forward (approximately 18 inches) as well. Then the choir sang through “O Magnum Mysterium” in this formation. Once the piece was completed, the singers were given approximately ten minutes to complete the “sectional” page of their questionnaires (See the first page of Appendix C). Then the singers were asked to place

themselves to be sure they were not standing adjacent to anyone singing the same voice part, these choices were again checked by a show of hands, and the spacing measurement procedure was repeated. Once the choir sang through the entire piece again in this new formation, they were given approximately ten minutes to complete the “mixed” side of their questionnaires. Then they were asked to complete a page of follow-up questions and were given as much time as they needed. Finally, the singers were asked to turn in their surveys.

Limitations of the experiment include a slightly uneven number of singers on each part (ten first sopranos, fourteen second sopranos, twelve first altos, and ten second altos), singer comfort with the piece, singer skills and abilities, the shape and quality of the acoustical space, singer comfort with a recorded conductor, and the use of only one choir. Delimitations include a relatively short questionnaire, the use of only one homophonic piece, the use of only two formations, and the use of choir members from one university only. Another important delimitation was the implementation of consistent lateral (18 inches) and vertical (“windows”) space since responses could have been quite different for either formation if the singers had been standing closer together. To discover whether the singers actually preferred one formation over another, the survey includes the options of “sectional,” “mixed,” or “either.” The main purpose of this study is to compare formation preferences among women in an SSAA setting, especially positional preferences among higher and lower voices. An ancillary goal is to discover reasons for these preferences (self-perceived SOR, pitch level, voice classification, etc.).

Results

For reader convenience, the numerical survey results are compiled in the tables in Appendix A, and all comments are presented in Appendix B. The first table combines the results from all of the choir members in order to ascertain overall trends (Tables 1, 2, and 3). All results from Soprano I and Soprano II singers are combined in Tables 4, 5, and 6 to indicate any trends among sopranos. To present any trends among altos, the results from Alto I and Alto II singers are combined in Tables 7, 8, and 9. The final tables list numerical results for each voice part (Tables 10, 11, and 12 for Soprano I; Tables 13, 14, and 15 for Soprano II; Tables 16, 17, and 18 for Alto I; and Tables 19, 20, and 21 for Alto II).

For the Likert scale results, most of the singers concentrated their responses around a 3, which would indicate moderate to no preference for either end of the scale. In sectional formation, most singers responded to “I felt more” tension (1) or freedom (5) with a mode of 3 (five second sopranos, six first altos, and six second altos), which would indicate little to no preference toward either, but first sopranos indicated a mode of 4, inclining toward freedom. In mixed formation, all but the first sopranos (four singers for a mode of 3) reported a mode of 4 or 5 (five second sopranos chose 4, five second sopranos chose 5, six first altos chose 4, and four second altos chose 5), inclining toward freedom. However, a more pronounced difference between formations was evident when asked how well the singers could hear themselves. On a scale from 1 (not very well) to 5 (very well), in sectional formation, many singers responded to “I could hear myself” with a mode of 3 (four first sopranos, four second sopranos, and five first altos), though just as many second sopranos indicated a 4 or 5 and second altos (six of them) indicated a mode of 5. In mixed formation, all four voice parts indicated a mode of 5 (nine first sopranos, eight second sopranos, six first altos, and six second altos), meaning they could hear

themselves very well in mixed formation. As expected, most singers (twenty-three overall for a mode of 5) indicated that they could hear their own section or voice part “very well” in sectional formation, and most (also twenty-three overall for a mode of 5) said they could hear other sections or voice parts “very well” in mixed formation.

The reflective responses show a general preference for mixed formation. These responses were divided into two sections: 1) responses regarding this particular experiment and 2) responses regarding choral experiences in general. Four questions were posed regarding this particular experiment. When asked, “did you perceive that formation affected the choral sound?” all ten first sopranos, thirteen second sopranos, ten first altos, and all ten second altos said “yes.” Only nine of the total singers (one first soprano, one second soprano, five first altos, and two second altos) said sectional was better. All of the others said mixed was better. When asked, “did you notice a difference in choral blend?” all ten of the first sopranos, all fourteen of the second sopranos, eleven of the first altos, and nine of the second altos said “yes.” All but one first soprano, one first alto, and one second alto indicated that the mixed formation produced a better choral blend. When asked, “did you notice a difference in choral tuning?” the majority of the singers (eight first sopranos, twelve second sopranos, eleven first altos, and nine second altos) said “yes.” However, of that group which noticed a difference in tuning, most sopranos (six first sopranos and ten second sopranos) said mixed formation was better, but most altos (seven first altos and five second altos) said sectional formation was better. When asked “which formation do you prefer?” twenty-nine singers (five first sopranos, eight second sopranos, eight first altos, and eight second altos) prefer mixed formation, eight singers (one first soprano, two second sopranos, three first altos, and two second altos) prefer sectional formation, and nine

singers (four first sopranos, four second sopranos, and one first alto) indicated no preference for either formation.

After the reflection questions regarding this particular experiment, four additional questions followed regarding the choristers' preferences for formation in a general context. The first asked: "Which formation do you prefer for performance?" The majority of the singers (seven first sopranos, twelve second sopranos, nine first altos, and five second altos) prefer mixed formation while a few (one first soprano, one second soprano, three first altos, and two second altos) prefer sectional formation or either formation (two first sopranos, one second soprano, and three second altos). When asked, "which formation do you prefer for rehearsal?" most selected sectional formation (five first sopranos, eleven second sopranos, seven first altos, and four second altos) while some still prefer mixed formation (two first sopranos, one second soprano, one first alto, and three second altos) or either formation (three first sopranos, two second sopranos, four first altos, and three second altos). When asked, "do you perceive that formation affects the choral sound?" all forty-six singers said "yes." When asked, "In general, which formation do you prefer?" only seven of the singers preferred sectional (two first sopranos, one second soprano, three first altos, and one second alto). All of the others preferred mixed (six first sopranos, eight second sopranos, seven first altos, and seven second altos) or either formation (two first sopranos, five second sopranos, two first altos, and two second altos).

In the comments section(s) of the survey, choristers reinforced many of the positive and negative aspects of each formation as listed by Tocheff. According to the choir members, sectional formation provides confidence, security, support, a "more unified sound within the section," "enhanced the quality," and tuning advantages (especially for this piece). However, for the singers, the sectional arrangement also made it "harder to shape" phrases and lines, made it

“harder to hear” one’s own voice, and caused a tendency to “oversing.” Mixed formation caused other problems: “distance,” “solo voices” sticking out, tuning issues, inaccurate pitches, and the ability to hear one’s own section. Of the total comments received, approximately 60% of them included positive statements about mixed formation. Specific advantages of mixed formation cited by choir members include accountability, independence, better pitch, better balance, stays in tune, better blend, “more freedom to sing out,” better dynamics, better tone quality, “smoother,” “allows the group to excel,” attention to chord progressions, sense of where individual parts fit within the ensemble, ability to critique oneself, “more enjoyable,” “more free,” ability to hear the Alto II part, “allows more musicality,” “working more as a group,” “more interesting,” ability to hear oneself, and “forces the group to concentrate and work harder.” One person indicated that she “liked the spacing.” Another person expressed a desire to perform “using the formation in which [the choir] rehearsed,” and according to a different choir member, “whichever [formation] is best should depend upon the choir.” According to the comments received, the choristers preferred mixed formation.

CHAPTER 3

Discussion

Rather than soliciting auditor or conductor perceptions, this study explores perceptions of a women's choir sound from the choral singers themselves. Though results regarding this particular experiment could be affected by several uncontrollable factors (chorister mood, vocal health, age, skill level, comfort with the conductor recording, etc.), these results still provide useful information. All of the sopranos (100% of Soprano I and II) noticed a difference in choral blend between the two placements, and all sopranos except one second soprano indicated that mixed formation produced a better blend than sectional in columns. However, twelve of the twenty-two altos, 54.5% of Alto I and II (as opposed to 20.8% of Soprano I and II), perceived that tuning was better in sectional formation for this experiment. Though most of the singers thought mixed formation produced a better choral sound (90% of Soprano I, 85.7% of Soprano II, 50% of Alto I, and 80% of Alto II), this preference was not as pronounced for the first altos, only half of whom favored mixed arrangement. Perhaps the first altos were not as secure because this part of "O Magnum Mysterium" was especially difficult to tune.

In the more specific portion of the survey, singers were asked to rate feelings of tension/freedom, how well they could hear themselves, how well they could hear their part, and how well they could hear other parts on a scale of 1 to 5, 1 being the least desirable option ("tension" or "not very well") and 5 being the most desirable option ("freedom" or "very well"). Most of the singers reported that they could hear their part better in sectional formation and could hear other parts very well in mixed formation. Overall, choir members indicated that they

could hear themselves very well in mixed formation – 63% gave this area a rating of 5. Most of the sopranos (70.8%) said they could hear themselves very well (rating of 5) in mixed formation, but this preference is not as pronounced for altos. In fact, each of the voice parts produced a mode rating of 5 for being able to hear themselves in mixed formation while sectional formation received a relatively consistent mode of 3. The one exception was the second altos, who seemed to be able to hear themselves equally well in both formations, giving both formations a mode of 5. All but one of the first sopranos scored being able to hear themselves in a mixed formation with a 5, and the one exception chose a 4, which produced a very high mean of 4.9. All choristers also reported a slight inclination toward feeling more freedom in mixed formation with an overall mode rating of 4. However, the tension/freedom results should be considered with the following caveat: some of the singers commented about reporting tension when they were not as confident with their part, so their discomfort probably had less to do with formation. One singer stated that she was “not sure what freedom and tension means,” and she may not have been the only one who needed clarification. Though the Likert scale responses were less conclusive, mixed formation is still positively rated by the majority of the choir in all four of the surveyed areas.

All forty-six of the participants (100%) perceived that formation affects the choral sound in a general context (hereafter “in general” indicates in a general context as opposed to this experiment only), so they thought formation was important. In this experiment, a majority also perceived that formation affected the choral sound (93.5% - all but three singers), noticed a difference in choral blend (95.7% - all but two singers), and noticed a difference in choral tuning (87% - all but six singers). The majority of the singers also thought mixed formation was better regarding the choral sound (76.1%), blend (89.1%), and tuning (52.2%). Sixty-three percent

preferred mixed formation overall for this experiment. Additionally, 60.1% (over half of the singers in each section: 60% of Soprano I, 57.1% of Soprano II, 58.3% of Alto I, and 70% of Alto II) still prefer mixed formation in general – even when given a third option of “either” formation (indicating no particular preference for sectional or mixed). Most of the choir prefers mixed formation for performance (71.7%) and sectional formation for rehearsal (58.7%), but the rehearsal preference is not as pronounced. These SSAA results reinforce previous research findings by Daugherty, Atkinson, and Aspaas, et. al. from female choristers in SATB settings: most women prefer mixed formation.

Conclusion

For future research, I would recommend expanding this project. Using more than one piece of homophonic music may give a broader view of preference rather than judging by the performance of one piece. Auditor feedback for women’s choirs would be interesting since this information is currently limited. I would also be interested in knowing how often mixed formations are perceived as being more sophisticated or more advanced. Perhaps choir members choose mixed formations so they will be perceived as more intelligent or more skilled. Expanding the survey would also provide more useful information as long as the survey does not request so much information that the participants lose interest. On the survey, four of the participants for this study commented about being uncomfortable while conducted by a video recording. Conductor variance could actually help experimental results because the conductor might react to positive and negative responses from the choir. I would also recommend exploring SSAA and TTBB choirs in many of the same ways that SATB choirs have been

studied. Comparing gender-specific choirs with SATB choirs may also produce interesting results.

According to this study, women prefer mixed formation, and future researchers may want to continue testing these findings and further explore reasons for this preference. This study is informative, not prescriptive. There is no quick fix or one right way to position a choir, but informed refinement is always possible. In addition, if choir members think and feel that they are producing a better sound in a certain formation, perhaps they set themselves up to actually produce a better sound in performance. Conductors are accustomed to thinking about many different things at once, and in music, as in life, just when you think you have everything figured out, there is something else to consider, something new to try, or something new to learn.

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List of Appendices

Appendix: A

APPENDIX A

Numerical Results

Table 1. Overall (All Parts Combined) Likert Scale Responses Regarding Sectional Formation

Overall (Sectional) – 46 singers		1	2	3	4	5	
I felt more:	Tension	2	8	19	13	4	Freedom
I could hear myself:	Not Very Well	2	6	16	9	13	Very Well
I could hear my section (voice part):	Not Very Well	1	2	5	15	23	Very Well
I could hear other sections (voice parts):	Not Very Well	2	8	14	18	4	Very Well

Table 2. Overall (All Parts Combined) Likert Scale Responses Regarding Mixed Formation

Overall (Mixed) – 46 singers		1	2	3	4	5	
I felt more:	Tension	1	5	12	15	13	Freedom
I could hear myself:	Not Very Well	0	3	3	11	29	Very Well
I could hear my section (voice part):	Not Very Well	3	12	21	10	0	Very Well
I could hear other sections (voice parts):	Not Very Well	0	1	3	19	23	Very Well

Table 3. Overall (All Parts Combined) Reflective Responses

Overall – 46 singers	Yes	No	Mixed	Sec.	Either
In this experiment, did you perceive that formation affected the choral sound?	43	3	----	----	----
If so, which formation was better?	----	----	35	9	0
In this experiment, did you notice a difference in choral blend?	44	2	----	----	----
If so, which formation was better?	----	----	41	3	0
In this experiment, did you notice a difference in choral tuning?	40	6	----	----	----
If so, which formation was better?	----	----	24	17	0
In this experiment, which formation did you prefer?	----	----	29	8	9
In general, which formation do you prefer for performance?	----	----	33	7	6
In general, which formation do you prefer for rehearsal?	----	----	7	27	12
In general, do you perceive that formation affects the choral sound?	46	0	----	----	----
In general, which formation do you prefer?	----	----	28	7	11

Table 4. Soprano (SI and SII Combined) Likert Scale Responses Regarding Sectional Formation

Soprano I & II (Sectional) – 24 singers		1	2	3	4	5	
I felt more:	Tension	2	5	7	9	1	Freedom
I could hear myself:	Not Very Well	1	2	8	6	7	Very Well
I could hear my section (voice part):	Not Very Well	0	0	2	10	12	Very Well
I could hear other sections (voice parts):	Not Very Well	1	6	10	6	1	Very Well

Table 5. Soprano (SI and SII Combined) Likert Scale Responses Regarding Mixed Formation

Soprano I & II (Mixed) – 24 singers		1	2	3	4	5	
I felt more:	Tension	0	2	7	7	8	Freedom
I could hear myself:	Not Very Well	0	0	1	6	17	Very Well
I could hear my section (voice part):	Not Very Well	0	3	16	5	0	Very Well
I could hear other sections (voice parts):	Not Very Well	0	0	1	10	13	Very Well

Table 6. Soprano (SI and SII Combined) Reflective Responses

Soprano I & II – 24 singers	Yes	No	Mixed	Sec.	Either
In this experiment, did you perceive that formation affected the choral sound?	23	1	----	----	----
If so, which formation was better?	----	----	21	2	0
In this experiment, did you notice a difference in choral blend?	24	0	----	----	----
If so, which formation was better?	----	----	23	1	0
In this experiment, did you notice a difference in choral tuning?	20	4	----	----	----
If so, which formation was better?	----	----	16	5	0
In this experiment, which formation did you prefer?	----	----	13	3	8
In general, which formation do you prefer for performance?	----	----	19	2	3
In general, which formation do you prefer for rehearsal?	----	----	3	16	5
In general, do you perceive that formation affects the choral sound?	24	0	----	----	----
In general, which formation do you prefer?	----	----	14	3	7

Table 7. Alto (AI and AII Combined) Likert Scale Responses Regarding Sectional Formation

Alto I & II (Sectional) – 22 singers		1	2	3	4	5	
I felt more:	Tension	0	3	12	4	3	Freedom
I could hear myself:	Not Very Well	1	4	8	3	6	Very Well
I could hear my section (voice part):	Not Very Well	1	2	3	5	11	Very Well
I could hear other sections (voice parts):	Not Very Well	1	2	4	12	3	Very Well

Table 8. Alto (AI and AII Combined) Likert Scale Responses Regarding Mixed Formation

Alto I & II (Mixed) – 22 singers		1	2	3	4	5	
I felt more:	Tension	1	3	5	8	5	Freedom
I could hear myself:	Not Very Well	0	3	2	5	12	Very Well
I could hear my section (voice part):	Not Very Well	3	9	5	5	0	Very Well
I could hear other sections (voice parts):	Not Very Well	0	1	2	9	10	Very Well

Table 9. Alto (AI and AII Combined) Reflective Responses

Alto I & II – 22 singers	Yes	No	Mixed	Sec.	Either
In this experiment, did you perceive that formation affected the choral sound?	20	2	----	----	----
If so, which formation was better?	----	----	14	7	0
In this experiment, did you notice a difference in choral blend?	20	2	----	----	----
If so, which formation was better?	----	----	18	2	0
In this experiment, did you notice a difference in choral tuning?	20	2	----	----	----
If so, which formation was better?	----	----	8	12	0
In this experiment, which formation did you prefer?	----	----	16	5	1
In general, which formation do you prefer for performance?	----	----	14	5	3
In general, which formation do you prefer for rehearsal?	----	----	4	11	7
In general, do you perceive that formation affects the choral sound?	22	0	----	----	----
In general, which formation do you prefer?	----	----	14	4	4

Table 10. Soprano I Likert Scale Responses Regarding Sectional Formation

Soprano I (Sectional) – 10 singers		1	2	3	4	5	
I felt more:	Tension	1	2	2	5	0	Freedom
I could hear myself:	Not Very Well	1	0	4	2	3	Very Well
I could hear my section (voice part):	Not Very Well	0	0	0	3	7	Very Well
I could hear other sections (voice parts):	Not Very Well	1	3	4	2	0	Very Well

Table 11. Soprano I Likert Scale Responses Regarding Mixed Formation

Soprano I (Mixed) – 10 singers		1	2	3	4	5	
I felt more:	Tension	0	1	4	2	3	Freedom
I could hear myself:	Not Very Well	0	0	0	1	9	Very Well
I could hear my section (voice part):	Not Very Well	0	1	7	2	0	Very Well
I could hear other sections (voice parts):	Not Very Well	0	0	0	4	6	Very Well

Table 12. Soprano I Reflective Responses

Soprano I – 10 singers	Yes	No	Mixed	Sec.	Either
In this experiment, did you perceive that formation affected the choral sound?	10	0	----	----	----
If so, which formation was better?	----	----	9	1	0
In this experiment, did you notice a difference in choral blend?	10	0	----	----	----
If so, which formation was better?	----	----	9	1	0
In this experiment, did you notice a difference in choral tuning?	8	2	----	----	----
If so, which formation was better?	----	----	6	3	0
In this experiment, which formation did you prefer?	----	----	5	1	4
In general, which formation do you prefer for performance?	----	----	7	1	2
In general, which formation do you prefer for rehearsal?	----	----	2	5	3
In general, do you perceive that formation affects the choral sound?	10	0	----	----	----
In general, which formation do you prefer?	----	----	6	2	2

Table 13. Soprano II Likert Scale Responses Regarding Sectional Formation

Soprano II (Sectional) – 14 singers		1	2	3	4	5	
I felt more:	Tension	1	3	5	4	1	Freedom
I could hear myself:	Not Very Well	0	2	4	4	4	Very Well
I could hear my section (voice part):	Not Very Well	0	0	2	7	5	Very Well
I could hear other sections (voice parts):	Not Very Well	0	3	6	4	1	Very Well

Table 14. Soprano II Likert Scale Responses Regarding Mixed Formation

Soprano II (Mixed) – 14 singers		1	2	3	4	5	
I felt more:	Tension	0	1	3	5	5	Freedom
I could hear myself:	Not Very Well	0	0	1	5	8	Very Well
I could hear my section (voice part):	Not Very Well	0	2	9	3	0	Very Well
I could hear other sections (voice parts):	Not Very Well	0	0	1	6	7	Very Well

Table 15. Soprano II Reflective Responses

Soprano II – 14 singers	Yes	No	Mixed	Sec.	Either
In this experiment, did you perceive that formation affected the choral sound?	13	1	----	----	----
If so, which formation was better?	----	----	12	1	0
In this experiment, did you notice a difference in choral blend?	14	0	----	----	----
If so, which formation was better?	----	----	14	0	0
In this experiment, did you notice a difference in choral tuning?	12	2	----	----	----
If so, which formation was better?	----	----	10	2	0
In this experiment, which formation did you prefer?	----	----	8	2	4
In general, which formation do you prefer for performance?	----	----	12	1	1
In general, which formation do you prefer for rehearsal?	----	----	1	11	2
In general, do you perceive that formation affects the choral sound?	14	0	----	----	----
In general, which formation do you prefer?	----	----	8	1	5

Table 16. Alto I Likert Scale Responses Regarding Sectional Formation

Alto I (Sectional) – 12 singers		1	2	3	4	5	
I felt more:	Tension	0	2	6	1	3	Freedom
I could hear myself:	Not Very Well	1	4	5	1	1	Very Well
I could hear my section (voice part):	Not Very Well	1	1	3	3	4	Very Well
I could hear other sections (voice parts):	Not Very Well	1	1	2	6	2	Very Well

Table 17. Alto I Likert Scale Responses Regarding Mixed Formation

Alto I (Mixed) – 12 singers		1	2	3	4	5	
I felt more:	Tension	1	1	3	6	1	Freedom
I could hear myself:	Not Very Well	0	2	0	4	6	Very Well
I could hear my section (voice part):	Not Very Well	1	8	1	2	0	Very Well
I could hear other sections (voice parts):	Not Very Well	0	1	0	6	5	Very Well

Table 18. Alto I Reflective Responses

Alto I – 12 singers	Yes	No	Mixed	Sec.	Either
In this experiment, did you perceive that formation affected the choral sound?	10	2	----	----	----
If so, which formation was better?	----	----	6	5	0
In this experiment, did you notice a difference in choral blend?	11	1	----	----	----
If so, which formation was better?	----	----	10	1	0
In this experiment, did you notice a difference in choral tuning?	11	1	----	----	----
If so, which formation was better?	----	----	4	7	0
In this experiment, which formation did you prefer?	----	----	8	3	1
In general, which formation do you prefer for performance?	----	----	9	3	0
In general, which formation do you prefer for rehearsal?	----	----	1	7	4
In general, do you perceive that formation affects the choral sound?	12	0	----	----	----
In general, which formation do you prefer?	----	----	7	3	2

Table 19. Alto II Likert Scale Responses Regarding Sectional Formation

Alto II (Sectional) – 10 singers		1	2	3	4	5	
I felt more:	Tension	0	1	6	3	0	Freedom
I could hear myself:	Not Very Well	0	0	3	2	5	Very Well
I could hear my section (voice part):	Not Very Well	0	1	0	2	7	Very Well
I could hear other sections (voice parts):	Not Very Well	0	1	2	6	1	Very Well

Table 20. Alto II Likert Scale Responses Regarding Mixed Formation

Alto II (Mixed) – 10 singers		1	2	3	4	5	
I felt more:	Tension	0	2	2	2	4	Freedom
I could hear myself:	Not Very Well	0	1	2	1	6	Very Well
I could hear my section (voice part):	Not Very Well	2	1	4	3	0	Very Well
I could hear other sections (voice parts):	Not Very Well	0	0	2	3	5	Very Well

Table 21. Alto II Reflective Responses

Alto II – 10 singers	Yes	No	Mixed	Sec.	Either
In this experiment, did you perceive that formation affected the choral sound?	10	0	----	----	----
If so, which formation was better?	----	----	8	2	0
In this experiment, did you notice a difference in choral blend?	9	1	----	----	----
If so, which formation was better?	----	----	8	1	0
In this experiment, did you notice a difference in choral tuning?	9	1	----	----	----
If so, which formation was better?	----	----	4	5	0
In this experiment, which formation did you prefer?	----	----	8	2	0
In general, which formation do you prefer for performance?	----	----	5	2	3
In general, which formation do you prefer for rehearsal?	----	----	3	4	3
In general, do you perceive that formation affects the choral sound?	10	0	----	----	----
In general, which formation do you prefer?	----	----	7	1	2

Appendix: B

APPENDIX B

Chorister Comments

Sectional Formation Comments

Soprano I

In sectionals I think we tend to feel less accountable for our own voice parts. It creates a lot of pitch problems because, I feel like, most people don't feel enough responsibility to personally maintain pitches and dynamic levels.

This exercise was very awkward – since the conductor was recorded, she couldn't move with us when we got behind. At the end, the choir finished several beats after the conductor – simply by listening to each other. If it had been a song we don't know as well, it would have been a train wreck.

Strength in numbers. I feel more secure in my part with the same vocals around me.

In sectionals, I'm more confident in my part.

I liked the spacing.

I always feel like I oversing when placed in sections, it is so much harder to phrase and shape lines with so many of the same part around me.

When listening to others in my section I tend to either sing too loud (to bring the pitch up) or drop out because I'm trying to hear the sound around me to make sure I'm not going flat. It strains my voice either way.

Soprano II

Heard very little alto – other than solo part

A2 & S1 are the most present. I didn't hear hardly any A1.

By standing in a section, I was better able to blend my vowels to the singer beside me for a more unified sound within the section.

It's good to sing in sectionals while learning the parts but now that we know what notes to sing, it sounds better mixed.

It's difficult to gauge how much actual tension is felt from being in sections, because a great deal of tension is from trying to follow a recorded conductor.

I do not like being conducted by a video tape. I heard Altos but not Soprano I. I felt like I had to stay in one spot and not move – not comfortable.

Alto I

I am not a fan of sectionals because I feel like I am having to sing over other people.

Harder to hear other parts

I was standing on the edge of my section, basically in another section

I can barely hear Altos I and II, no Soprano II, a lot of Soprano I

I can only hear my section in most of the song and it's hard to hear my own voice because of the section blend.

I wasn't tense because I knew I'd be able to hear my section well.

I was the divider between A1 and A2, and I could hear more A2 than my own part. Usually, I'd be able to hear my own part better than a 3 [*refers to numerical choice*].

Alto II

I can only hear the first sopranos and second altos – not any other part

This formation is good for difficult music, but for easy music, the balance required isn't up to par, because each person has difficulty hearing the other voice parts at all times.

I feel in mixed formation it improves independence and gives a better opportunity to understand the music by relying on the other parts.

Mixed Formation Comments

Soprano I

I like mixed way better.

The pitch was much better mixed. Since we could all hear other voice parts, we were forced to be secure in our own parts. It's much more conducive to growing stronger as individuals and the group.

Makes you learn your part better.

I like mixed arrangement...we sound better as a choir.

I felt there was too great a distance between Soprano 1A & Soprano 1B because as a B, it depend somewhat on the A's for cues, especially with the director recording.

The balance is better, the blend is better, and we stay so much more in tune when we're mixed.

I felt more freedom to sing out. The choir grew much more attuned to each other and as a result there was better blend, pitch, and dynamics

Soprano II

I felt I could do more with the dynamics in mixed positioning – sometimes when in sections I tend to lack on musicality.

While mixed I am thinking more of the sounds and progressions of chords as well as the blend and tone quality of the whole group and not just within my section. Mixing the group allows the group to excel in their performing ability. In my opinion, a group should only stand in sections when they are not strong and confident with notes and rhythms in the piece they are singing.

I think we were better about not losing pitch in this formation.

While in mixed formation, I was able to hear how my part blended and fit within the choir. However, I was also not as confident as a singer, partially because at times my part was so exposed. Because I mainly heard myself singing, I was able to critique myself and decide upon which areas of the music I needed to work on.

It sounds better like this if all sections are able to sing on their own.

Have to pay more attention and cannot rely on others, but is more enjoyable to sing in. More in tune and free. Can hear full expanse of the song and what the composer wanted it to sound like all together instead of just hearing your section and maybe one other.

I'm not really sure what freedom and tension means.

The Alto II part was much easier to hear, even though I wasn't close to an Alto II. I felt the blend was much better than the sectional formation.

We weren't as together mixed.

Being mixed made me pay more attention to my part and helped me mix with the other sections.

Alto I

You are definitely more challenged to sing out in mixed sections because it's easy to sing the wrong part.

The blend feels much better. Can hear all of the parts.

Felt as if the mixed formation led to some inaccurate tones and off-notes

I like this formation better. It was more interesting to sing in this formation.

Hear some Soprano II, a lot of Soprano I, no Alto at all

I could hear myself and I blended more with other parts.

I don't like being conducted by a TV.

I felt a bit more tension because I wanted to stay on tune. I could hear myself very well.

Alto II

When I am mixed, I am forced to know my part whereas when I am in sectionals, I become, dare I say it, lazy and rely on others.

This section is good for balance, but inexperienced singers have troubles keeping pitch.

I loved mixed formation because it forces the group to concentrate and work harder instead of just relying on your section to pull you along.

Briefly comment about any differences you noticed during the experiment (mixed vs. sectional).

Soprano I

Sopranos mix better in the section. When mixed, solo voices stick out like a very sore thumb.

Mixed forces you to absolutely know your part.

The tone quality of the choir as a whole was much better in mixed arrangement.

Smoother in mixed formation. More security note wise in sectional.

Sectionals were better when wanting to hear and become confident in your part. However, in mixed formation, the tone is better.

I felt more nervous in mixed – more confident in sectionals.

I love being able to hear all parts because due to my height I am always in the front so when in sectionals I am bombarded with Soprano I sound so I depend on them too much whereas in mixed it is up to me to know my own part well enough to stand on my own.

Tuning, blend, and dynamics = better with mixed

Soprano II

Overall mixed formation allows more musicality

In mixed, the choir was working more as a group to produce a whole sound instead of four individual sounds.

We did not go flat when singing in mixed formation. I think we did when arranged sectionally.

When singing in sectionals, the choir as a whole was more confident. We entered at the same time and cut off at the same time. Oddly, this was not so in mixed formation, but the blend sounded better.

Mixed sounded more blended and better toned

Mixed sounded more complete as a piece of music. More in tune and free. Allows singer to get the entire sound and emotion that the composer intended. The singer also had to be more self-reliant in mixed. Sectionals more appropriate for rehearsal, mixed for performance.

When mixed we listen to different parts and I know I try to match the person next to me and blend with them even they are a different voice part.

Parts could be heard better while mixed

I could hear more of all parts in mixed over sectional. This is a good thing in my opinion because sometimes I am a third above an alto part, but I can't hear that as well in sectional.

Mixed formation was a little off tune compared to sectional

Mixed choir makes a singer pay more close attention to the sound and blending of the choir instead of "riding" on someone else in your voice part (being dependent on others).

Mixed to me always sounds more blended because we are all mixed together. It is nice to use on a song like this that we are all comfortable with.

Alto I

Tuning was better in sectional but overall the choir was better in mixed

It was a lot harder to hear my section in mixed

Mixed tunes better

Mixed had a better blend, and it was easier for all parts to be heard

Mixed – better overall blend and part equality, good balance

Sectional – better note and pitch accuracy

I enjoyed singing mixed because I'm able to hear how my part fits with the other parts of the song.

Mixed formation had a much better blend with all sections rather than only within each section. We weren't so note dependant on each other.

Mixed – makes you pay attention and sing louder

Sectional makes you feel supported

Mixed – I heard myself more clearly than in sectional. I feel like it makes you learn your part / makes you want to learn your part more, so you don't sound foolish.

Sectional – You can relax because you can hear your part clearly.

Mixed – really struggled to know pitches but the blend and sound was better than that of sectionals

Sectional – seemed more in tune in each of the sections

Alto II

I don't rely on others in my part for my notes in mixed formation. It's better.

I noticed that blend and sound was better in the mixed formation, but the younger singers tended to go flat or sharp throughout the song. I personally prefer mixed, but whichever one is best should depend on the choir.

Sectional is more free and comfortable. I prefer to sectional.

I like how mixed lets us hear the other parts. As a singer, I think the mix helps with blend.

Sectional is good for tuning and learning the part, but mixed is better for performing.

The sound was better in mixed formation because people as a whole were more concentrated on their part because they weren't standing beside someone singing their same part.

In sections, we were tuned better but I think if we were to mix more often it would increase our talent immensely because we're relying on everyone instead of our section only.

I felt like the mixed formation had a better blend of tone and sections.

For this particular piece, "O Magnum Mysterium," our sectional placement enhanced the quality. From where I was standing, we blended better in the sectional formation.

Choral tuning improves when mixed formation is used.

In mixed formation, one person's voice is not heard as easily as in sectionals, so during mixed, girls tend to sing with a fuller tone so they can be heard.

Additional Comments

Soprano I

A women's choir at collegiate level should be singing mostly in mixed formation for performances. For music learning, a sectional setting is preferred.

Soprano II

I prefer using the formation in which we rehearsed. If we rehearse in sections, we shouldn't change formations for the performance.

Alto II

I love choir.

Appendix: C

Questions to Answer AFTER the Experiment: (Circle One)

What part do you currently sing in this choir?

Soprano I Soprano II Alto I Alto II

In this choir, do you sing in the same formation most of the time? Yes No
If so, which formation? Mixed Sectional

In this experiment, did you perceive that formation affected the choral sound? Yes No
If so, which formation was better? Mixed Sectional

In this experiment, did you notice a difference in choral blend? Yes No
If so, which formation was better? Mixed Sectional

In this experiment, did you notice a difference in choral tuning? Yes No
If so, which formation was better? Mixed Sectional

In this experiment, which formation did you prefer? Mixed Sectional Either

In general, which formation do you prefer for performance? Mixed Sectional Either

In general, which formation do you prefer for rehearsal? Mixed Sectional Either

In general, do you perceive that formation affects the choral sound? Yes No

In general, which formation do you prefer? Mixed Sectional Either

Briefly comment about any differences you noticed during the experiment (mixed vs. sectional):

Additional Comments: _____

VITA

Janna Montgomery was born in Lawton, OK and completed her Bachelor of Arts degree in 2002 at Oklahoma Christian University where she studied music and theater. She also studied music while working full-time as the choral secretary at the University of Mississippi. An active choral singer and conductor, Janna is a member of Pi Kappa Lambda and the American Choral Directors Association.