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To what extent can a critical exploration of the literature relating to aging and choral singing inform pedagogical practice?

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PORTFOLIO

Introduction:

As a choral director and private voice teacher of over thirty years, I have encountered the singing voice in states of growth, change, resilience, recovery, and decline. I strive as a voice professional to provide the best support I can for singers experiencing challenges to their enjoyment of choral singing (and any singing they undertake). One set of challenges I have come to work with is that of the aging voice. Half of my private voice studio practice, which specializes in the habilitation of choral singers, comprises adults experiencing the effects of aging on the singing voice. Additionally, my choral conducting engagements frequently put me in contact with singers who experience difficulty enjoying their participation in choral music due to the effects of aging on the voice. The age-related negative experiences observed in both my studio practice and choral conducting work include presbyphonia (aging larynx), functional problems such as difficulty with registers, loss of range, hearing loss, the effects of medication, and coping with the symptoms of Essential Tremor, Parkinson's Disease, and other non-voice specific diagnoses.

The benefits of singing in choirs are well documented (McCoy, 2011; Grunewald Associates LLC and Chorus America, 2019), and the benefits to older adults singing in choirs are particularly generative and meaningful (Smith and Sataloff, 2012; Mitton, 2021). In her chapter on reflective practices for singing teachers, Marilyn McCartney (Chapman and Morris, 2023) speaks to the importance of improving capabilities and building capacity to strengthen our ability to support our students.

The goal of the literature review that follows this portfolio is to help inform a pedagogical framework for collaborating with aging choral singers in both the voice studio and the choral rehearsal. In pursuing my voice pedagogy studies and how they apply to choral singing, I established a three-domain lattice (meta-framework) for framing my research and application, including the habilitative, tonal, and health outcomes of the singer (Kovacs, 2022). Through the exploration of the literature in answering the question, "To

what extent can a critical exploration of the literature relating to aging and choral singing inform pedagogical practice?" I hope to improve my skills as a teacher and choral conductor and establish future areas of study to pursue as a singing voice researcher.

Voice pedagogists Brenda Smith and Robert Sataloff (2012) consider the aging voice a phenomenon that can start as early as fifty-five, especially in women experiencing perimenopause and menopause (Bos, Bozeman, and Frazier-Neely, 2020; Price, 2022). In the group comprising my studio practice of that age and older, common experiences can be grouped by gender (or hormonal influences at puberty) and voice type. Among the women (singers with an estrogen-influenced puberty) in this age group, the most common complaint is difficulty with registration changes, which in turn complicates the singer's ability to make timbral choices that support good intonation and blend in the choral setting. A second example of informal observation in my studio is among the basses, some of whom are also experiencing Essential Tremor, having difficulty with the experience of a "foggy" or "breathy" tone in the middle voice (from about C3 to A4). Working with both groups to produce balanced, easy registration changes with timbral choices that promote choral blend, intonation, and balance is a vital part of our partnership in the studio.

Often, my voice students are concurrently or previously in the care of a laryngologist or speech language pathologist. In many cases, their treatment resulted from my referral after a singing voice evaluation or are referred to me by a clinician after treatment as they return to singing. Currently, more than half of my studio is experiencing the effects of aging voice and related dysphonias. My interest in this research is very relevant to my professional practice and will advance my skill in addressing the topic with my students and choral singers as they pursue singing and choral singing, in particular, as a lifelong activity.

Program of Study:

Aims and Objectives:

The guiding aims of this project are in support of several goals for this research student which include deepening research and analysis skills, enriching my understanding of the subject, and informing a pedagogical framework for professional practice as a voice teacher and choral conductor. Specific aims include:

- Expanding and refining my skills with literature search, review, and analysis.
- Refining my skills at critically evaluating sources, authors, and their writing.
- Expanding and refining my reflective practice as a workplace researcher.
- Developing an understanding of the scope and quality of literature in response to the research question.
- Adding current pedagogical knowledge and understanding to professional practice.

The objectives of this project are intended to demonstrate how the literature review in the next section of this paper, the review method chosen, and my critical analysis of the literature intersect with the aims above. My intended outcomes are:

- Demonstrate critical engagement with the relevant literature, including selection, contextualization, and assessment.
- Critically evaluate the scope, quality, and quantity of the available literature relevant to the research question.
- Critically analyze the literature for themes, bias, and gaps (or areas for future research).
- Reflect critically on the review process.
- Advance my professional knowledge and apply what I've learned to my professional profile, expanding my capacity and capability as a voice professional.

Timeline:

I have structured this project into four principal sections with specific tasks underneath each for completion of the project. Please note that the Critical Reflection and Analysis in the Portfolio section of the project begins after the completion of the literature review, helping to ensure reflexivity that applies to the entire project. A comprehensive Gantt Chart of the project is included in Appendix 1, page 28.

Table 1: Project Timetable

	Start	End	Jan.	Feb.	Mar.	Apr.	May
Methods Research & Project Design							
Module Meeting	1/15/24	1/19/24					
Topic Approval	1/22/24	1/31/24					
Literature Review Methods	1/31/24	2/15/24					
Project Design & Outline	2/15/24	3/10/24					
Project Approval	3/8/24	3/15/24					
Literature Selection & Analysis							
Develop Selection Criteria	3/9/24	3/19/24					
Collect Literature	3/11/24	3/16/24					
Literature: Abstract/Criteria Pass	3/16/24	3/19/24					
Literature: Read & Code	3/16/24	4/15/24					
Portfolio							
Introduction	3/18/24	3/31/24					
Program of Study	3/18/24	4/7/24					
Critical Reflection	5/10/24	5/15/24					
Literature Review							
Introduction	4/7/24	4/9/24					
Theories, Methods, and Practices	4/10/24	4/15/24					
Analysis and Differences	4/15/24	4/25/24					
Impacts, application, and learning	4/26/24	4/30/24					
Conclusion, References, Appendices	4/30/24	5/5/24					

Methods & Resources:

Establishing a methodology for this project has presented some opportunities and challenges. From the author's perspective, these include multiple methodologies for the literature review which are suitable for this project, especially considering the quantity and quality of the literature available (peer-reviewed vs. grey, likely to be a low quantity), suitability for the time available (approximately three months), and which would support my ongoing pursuit of a voice pedagogy framework for choral conductors and teachers of choral singers. An additional set of criteria for selecting the methodology and method I considered was which would be best situated in a reflective or reflexive process and whether any of the methods surveyed could be modified to suit the needs of this project better.

The types of literature review considered or implemented for this project include:

- Systematic Literature Review
- Qualitative Evidence Synthesis
- Narrative Literature Review, including "commentary" style review

In exploring these types of literature reviews, several methods and techniques rose to the top of my preferences for this project, and several were self-selected almost immediately. My first task was considering Qualitative Evidence Review (QES) and Systematic Review types. QES, which Winter (2023) includes with her discussion of Quantitative Systematic Review (Systematic Review or S.R., emphasizes a rigorous methodology for combining large amounts of data (such as from studies). Both QES and S.R. can accurately and efficiently synthesize data for analysis and discussion (Noyes et al., 2021), which can be especially useful in medical research (Thomas and Harden, 2008). Facey et al. (2017) make a useful comparison of key elements of Qualitative Evidence Synthesis and Systematic Review:

Table 2: Comparison of the Phases of QES and Systematic Review (Noyes et al., 2021, p. 4)

	Qualitative Evidence Synthesis	Systematic Review
1.	Development of a clearly formulated review question	Formulate the problem
2.	Scoping the literature	
3.	Formal identification of the relevant literature	Literature Search
4.	Initial assessment of study reports	
		Data Extraction
		Critical appraisal of studies
5.	Analysis and synthesis	
6.	Preliminary synthesis	
7.	Full Synthesis	Data Synthesis
8.	Dissemination	Presenting results
9.	Throughout the process (reflexivity)	

From this table, key elements stood out as having application to this project:

- "Development of a clearly formulated review question," #1, was evident because I had already determined the research question in communication with my academic advisor.
- "Scoping the literature," #2, is described in the work of Arksey & O'Malley as an "aim to map rapidly the key concepts underpinning a research area and the main sources and types of evidence available" (Arksey and O'Malley, 2005, p. 5). As a relatively new and growing area of interest and research in voice pedagogy (Mitton, 2021), I was concerned I would need to examine not only the literature related to the research question but adjacent disciplines, particularly those cited in the literature directly answering the research question.
- As described further below, both aspects of #3 (QES and SR) were enrolled through a dual process that involved both a literature search with consistent search terms across multiple data sources and refining the literature selected for review (both peer-reviewed and grey) through an inclusion criteria matrix where all the literature sourced (from both scoping the literature and the literature discovered through search criteria). Additionally, I will use search criteria for a literature search borrowing from the Systematic Review methodology. The search terms will include senescent voice, aging voice, aging choral singer, senescent choral singer, adult choirs, aging singer, choral, choir, and habilitation. The literature search will include data from Elsevier, The Journal of Voice, The Journal of Singing, The Choral Journal, and the International Journal of Choral Research.
- The synthesis sections of the above matrix (#s 5, 6, and 7) represent a crucial outcome for my pedagogical research: identifying a framework for choral directors and voice teachers of choral singers. I will describe below how I intend to use my pre-existing thematic domains to structure my relevant literature analysis.
- Finally, the expression "throughout the process" (#9) references the reflexivity necessary to continually identify bias, ensure continuity, triangulation of findings, and engage the work of hermeneutic reflection (Boell and Cecez-Kecmanovic, 2010); this certainly fits with the structure of this project, as the

second section of this portfolio is a reflective report on the entire project. I outline a formal process for hermeneutic reflection below in Table 4.

Also in consideration for this project was a Narrative Review. In Winter's discussion of this type of literature review, she acknowledges that while there is some "recognition of rigor and process, a complete methodology may be absent," that it has the "capacity to inform and narrow a topic, provide a new lens, explore methodology, and make internal and external connections with the subject of choice" (Winter, 2023, p.8). In addressing the concerns about rigor, process, and methodology, I intend to introduce the practice of key elements of QES described above, including inclusion and exclusion criteria. I predict this is possible in the project's time frame because I suspect that in the *scoping* process, the quantity of relevant literature will be low, which I informally observed during prior research.

Table 3: Inclusion/Exclusion Criteria with Externally Derived Themes

Information	Title	Text	Title of paper
	Author	Name	Author (s) of paper
	Year	Date	Year Written
	Abstract	Y/N	Has the abstract been read?
	Selected?	Y/N	Has this literature been selected for use?
	Scanned?	Y/N	Has this document been scanned into Mendeley?
	Coded?	Y/N	Has this document been coded?
Literature Type	Type	P/G	Peer or Grey literature type?
	Tier	1,2,3	Literature tier: 1 = most rigor/impact 3 = least
Relevance	Research Question?	Y/N	Does this literature answer the research question?
	Tonal Domain	Y/N	Is the tonal domain addressed in this literature?
	Habilitative Domain	Y/N	Is the habilitative domain addressed in this literature?
	Health Domain	Y/N	Is the health domain addressed in this literature?

I will include externally derived themes in my analysis of the literature. This method, described as an "external conceptual framework" or "meta-framework" by Noyes *et al.* (2021, p.6), lends itself to efficiently extracting data from the literature for synthesis. Thematic Analysis is supported throughout the literature on research methodology as supportive of the reflective process and the hermeneutic circle (Thomas and Harden, 2008; Boell and Cecez-Kecmanovic, 2010; Denzin *et al.*, 2024). These predetermined themes can also be used as a framework for the inclusion and exclusion criteria, as shown in Table 3 above. Three primary fields organize the table in the first column: document information, type and quality, and relevance to the topic.

When identifying the search criteria for this review, it was important to consider the context in which they were created, the quality of those sources, and how the inclusion/exclusion criteria would be applied. I began by identifying four professional journals to be included in the search: Choral Journal, Journal of Singing, Journal of Voice, and International Journal of Research in Choral Music. These were chosen without regard to impact score, article acceptance policy, or citation frequency as a prevalent source of information in the choral and voice pedagogy professional milieu. Elsevier Health and Google Scholar were included in subsequent searches to ensure "saturation" of the search criteria across sources, as evidenced by repeated results after multiple searches across databases. They were conducted in addition to forensic reference and citation searches (Arksey and O'Malley, 2005). In my inclusion/exclusion criteria, I qualified each peer-reviewed article with a score of one as the highest quality and three as the lowest:

- 1) Peer-reviewed scientific publications that include methods and reference sections
- 2) Peer-reviewed professional association publications that include references
- 3) Peer-reviewed interest publications or publications lacking references, citations, or attributions

Unfortunately, much of the first-tier peer-reviewed literature does not directly address the research question, though two exceptions are noted below. As discussed above, literature adjacent to the research question in the first tier has been included and largely comprises quantitative studies in physiology and vocal acoustics of the aging voice. Most of the peer-reviewed literature falls into the second tier, and some third-tier literature was considered because it informs the larger discussion of the historical

development of the subject relative to the rigor with which it was researched, analyzed, and discussed.

Critical Reflection on the Learning Experience:

Before:

There were several hoped-for outcomes in pursuing this project. First, to deepen my understanding of the state of our professional literature as it informs our practice supporting the needs of aging avocational choral singers, a vocal category I engage with professionally nearly every day of my career as a voice professional. The second was to more intentionally engage research methods that promote rigor in both my analytical and critical thinking skills. This was assisted by research into literature review methods as discussed above, as well as a previously tested reflective journal format that combines the Experience, Reflections, and Action reflective model with that of Jaspers, shown in Table 4 below (Kovacs, 2023).

Table 4: Reflective Journal Format

	Date	Experience	Reflection	Action
Before				
During				
After				

Additionally, in support of the hermeneutic process, I included in my research practice a critical reflection log specific to the literature, informed by the work of Cotrell (2023), Bolton, and Delderfield (2014), as advocated for by Winter (2023):

Table 5: Literature Critical Reflection Log

<u>Title</u>	<u>Author</u>	<u>Context</u>	<u>Initial Reaction to Content</u>	<u>Reflection and Analysis: perspectives, intersections, and biases</u>	<u>Ton</u>	<u>Hab</u>	<u>Heal</u>	<u>Other</u>

The context/reaction/reflection fields have a hermeneutic relationship to the Jaspers method, which can be outlined in three questions as "before/during/after:"

- Context (Before): What is the context of the article? Are there any evident biases? What do I expect to read?
- Reaction (During): A brief description of the content with first reactions.
- Reflection (After): Have my expectations been met? Have they changed? Where have I encountered my biases?

I later added fields for the three externally derived themes and an optional field for "other," allowing me to code the selected literature (Guba and Lincoln, 1994; Creswell, 2014). An extract from the literature critical reflection is available in Appendix 2, page 29.

Finally, I had hoped to further test my previously developed pedagogical meta-framework, called "externally derived themes," throughout this paper. Using this framework, first proposed in my paper *Voice Pedagogy and the Choral Singer* (Kovacs, 2022), fits well with elements elucidated by Noyes *et al.* (2021) in their discussion of Qualitative Evidence Synthesis, as described above. So, with the "context" or "before" part of this reflection established, I would like to move on to the "initial" or "during" part of this reflection.

During:

As I began engaging in the work of this literature review, I became aware that minor adjustments to my methodology would be needed to meet the changing needs of the data. As the project progressed, the search, selection, and inclusion/exclusion of the literature each presented challenges that needed to be addressed to ensure consistency. These adjustments are methodologically sound as they represent the reflexive quality "throughout the process," as indicated by Noyes *et al.* (2021) in their model for comparing QES and Systematic Review (see Table 2, p. 6 above). Regarding the search criteria, I began a parallel gathering of peer-reviewed and grey literature. I quickly realized that the amount of literature directly addressing the research question was small, a quantity of three. So, after discussion and advice with academic advisors, I increased the search parameters to literature adjacent to the topic, which increased the volume of peer-reviewed literature but not the grey literature. With much smaller amounts of data, I was becoming concerned that the hybrid synthesis method I hoped to achieve would not work. As I proceeded to the analysis portion of the literature review, I

realized this challenge to my methodology would be half true. With sufficient data for the peer review literature to be easily synthesized into the externally derived themes, I could use the planned methodology with one adaptation: adding a section for themes other than those prescribed, which meant alterations to the inclusion criteria and critical reflection logs. Regarding the grey literature, with a final inclusion quantity of six, the synthesis method barely worked when considered separately. Therefore, the grey literature is included in the synthesis and analysis alongside the peer-reviewed literature. In her discussion of Lineage of Practice literature reviews, Winter (2023, p.6) discusses the validity of this practice, though she acknowledges that this creates a "tension between rigor and relevance." My attempt to minimize that tension with respect to the grey literature is by ensuring that the artifacts are well-referenced with current research, cited elsewhere in the literature, and have relevance to practice.

I feel that the first personal learning outcome that I would like to reflect on here is that methodological and organizational rigor improve understanding of the data, make relationships both to external experience and within the data more apparent, and improve my ability to look critically at not only the data but my experience of the data and the effect the context of the literature has on my qualitative analysis of that literature. This improvement is the quality of expertise Bolton and Delderfield (2014) describe as necessary for increasing our professional practice and profile.

The other important "during" experience happened while writing the narrative portion of this paper. As a researcher and author who begins every writing project with an outline, I try to support that outline with materials that help me quickly find data, citations, and resources. In the case of this paper, an Excel Workbook containing the project Gantt Chart, task timetable, all the literature for the project in an inclusion/exclusion criteria spreadsheet, the literature critical reflection log, and this author's reflective journal in one workbook. In this way, as I was writing, I could easily triangulate my findings, including fitness of criteria, context, analysis (Walliman, 2001; Costley, Elliott, and Gibbs, 2014; Creswell, 2014). The other, more subtle effect was that organizing my relationship with the reflective, hermeneutic, and qualitative literature review methods in a visual matrix allowed me to analyze problems with my method and adjust for those challenges (Boell and Cecez-Kecmanovic, 2010; Le Cunff, 2022; Scott, 2022). My recollection is of high school algebra and having to "show your work," which I realize in this case is "know your work."

Lastly, with respect to the hermeneutic process "during," I want to highlight one experience in particular as an example of the value of reflection (Bolton and Delderfield, 2014). In reviewing the literature about the singer's experience with the aging voice, I encountered first-person-perspective articles written by professional singers (Sjoerdsma, 2009; Edwin, 2012). As recorded in my critical reflection diary for these examples, my initial reaction was sour. I saw these as entitled complainers warning us of our fate and advising us to accept our lot in life. As those articles lived longer in the context of the research I was reading, I realized more and more that I was searching for the experience of the singers represented in the research (Costley, Elliott, and Gibbs, 2014). "What are the perceptions of these participants?" is a question I value. As I looked back, via the critical reflection diary, I re-contextualized those authors as having a necessary voice because they add to the quality of our understanding and perspective as researchers. Yes, the "woe is me, I must accept my fate" aging singer story is valid data. As this was a "during" observation, I included it in my narrative.

After:

With the narrative literature review complete, I can now consider a more extended look back at the project. If I ask myself, "Have my expectations been met or have they changed?" the answer is "yes" to both. As I mentioned above, my hoped-for outcomes included deepening my understanding of the literature as it applied to practice, then deepening my experience with the methods and practices necessary for rigorous qualitative research, and finally testing my meta framework for legibility and ease of use across pedagogical subject matter as a tool for analysis and systematic application.

With respect to deepening my understanding of the literature, the first point of reflection is that the scope of the literature, the parameters of the search process, and the method of the analysis are all key elements in the outcome of a researcher's relationship to the literature (Scott, 2022; Winter, 2023). I am grateful that under these circumstances, I was able to monitor these variables and adjust for their inputs while maintaining academic rigor through the analytical methods applied, including the externally derived themes, which remained constant throughout. While the number of appropriately researched and reviewed materials that answer the research question is few, our understanding of the tonal, health, and habilitative information supporting those examples is a growing body of research (Smith and Sataloff, 2012; Brunssen, 2018; Mitton, 2021). How the information learned about supporting aging avocational choral singers through this

literature applies to my practice includes confirming current habilitative methods and techniques, cues for further inquiry, and consideration for inclusion in later research projects and an eventual pedagogical framework for choral musicians.

Qualitative research contains many pitfalls, not the least of which is methodological and philosophical rigor (Winter, 2023). By enriching my knowledge of qualitative research methods before starting this literature review, I could consider how my expectations and biases needed to be addressed, what the subject required methodologically, and how my previous research might inform my analysis of the literature related to the research question. Having enough understanding of the models I borrowed from to create this project's framework allowed me to quickly identify those problems before they became pitfalls in the analysis (Meyer and Goss, 2024). One point of long-view reflection is that I was initially interested in a much larger scale project that looked much more like a Qualitative Evidence Review. I am now grateful I could identify the elements of QES and Systematic Review I was attracted to for their rigor and adapt them to my narrative literature review, including the use of externally derived themes. With the relatively small amount of literature available on the subject, having those elements in the more liberal milieu of the narrative literature review provided the structure, rigor, and consistency of the analytical process I had hoped for.

The Tonal, Health, and Habilitative Domains of Choral Singing are the connecting thread of all my research and writing in this program of study. They were developed in 2022 in consultation with Kerrie Obert and have continued to inform my inquiry, analysis, and discussion of voice pedagogy as it applies to choral musicians. Testing their viability as a meta-framework requires repeating their instance throughout my encounters with research, literature, program lectures, and application in the studio and rehearsal (Thomas and Harden, 2008). Looking back, I was delighted when I understood I could use them as inclusion criteria for this project. As I continued to design this project, it became clear that it would be necessary to use them as the fundamental elements of the analysis, too. Not only did it provide structural conformity and triangulation in the project, but it also confirmed the meta framework's portability across subjects. This outcome greatly pleases me and encourages me to continue applying it to my program of study.

Concluding thoughts:

At this point, I wonder if the reflexive gaze should look forward, perhaps with an appropriate posture for the conclusion of a reflective model (Bolton and Delderfield,

2014). I think there are two things to consider for the future: the metaphysics of workplace research design and the application of research in professional practice. In the first case, the "shoes have to fit." Having fundamental philosophy and research skills is certainly a starting point; however, understanding how those interact with a workplace researcher, who often works independently and without the benefit of a multi-disciplinary research team, is vital (Mackenzie and Knipe, 2006). Also crucial to that dynamic are the principles that keep the researcher facing their bias, intersections of power, and assumptions or predeterminations about the research (Homan, 1991). This includes the hermeneutic principles of reflexivity, academic, ethical, and methodological rigor, and the accountability of having one's peers review your work (Scott, 2022; Winter, 2023). In this way, the independent workplace researcher can have meaningful encounters with the data they gather so it can be applied to or presented for use in practice (Helyer *et al.*, 2010).

I believe that expressing our research in a way that is relevant to our practice and to that of our peers in the profession is a desired outcome for all who engage in research. I hope that by continually refining my research practice and testing the pedagogical domains I have proposed, I can create a framework of choral pedagogy legible for choral musicians in professional practice as voice teachers, conductors, and singing voice specialists. Improving the experience and enjoyment of choral singing is the final and best hoped-for outcome.

WRITTEN ASSIGNMENT

To what extent can a critical exploration of the literature relating to aging and choral singing inform pedagogical practice?

Introduction:

The purpose of this literature review is to examine the current theories, methods, and practices described in the literature relevant to the research question such that they can be used to create and inform a pedagogical framework for use in the choral rehearsal and studio teaching while working with singers for whom choral music is their primary singing activity.

While this literature review is narrative in type, it is methodologically supported by elements of Systematic Literature Review and Qualitative Evidence Synthesis to help ensure rigor in both the selection of the literature reviewed and the subsequent analysis (Facey, Hansen, and Single, 2017; Winter, 2023). With a more detailed elucidation of the methodological considerations discussed above in the Portfolio section of this paper, I will review them here in summary:

- A scoping process that included not only forensic reference chaining but also search criteria for use across multiple databases in completing the literature search (Arksey and O'Malley, 2005)
- Detailed inclusion/exclusion criteria for the final selection of literature (Winter, 2023)
- Use of a critical reflection journal applied to each selected article or book to help extract themes and to examine the context, intersections, and biases of the literature (Bolton and Delderfield, 2014)
- Use of externally derived themes to aid in synthesizing the theories, methods, and practices described in the literature, including tonal, health, and habilitative domains (Noyes *et al.*, 2021; Kovacs, 2022)

Further supporting this review is using a reflective journal based on a combination of the ERA and Jaspers reflective models (see Table 4, p.8 above). Scott (2022) and Bolton

and Delderfield (2014) advise that the contemporary and continuous use of reflective journals supports not only the work of examining bias in the case of workplace research but also enriches the researcher's relationship to hermeneutic principles. This reflective process proved to be very important to the literature selection and inclusion criteria when, as described in the reflective portion of the portfolio, it was determined that the search and inclusion criteria for the peer-reviewed literature were too narrow and would need to be expanded to include adjacent fields of study in support of answering the research question, even if indirectly (Boell and Cecez-Kecmanovic, 2010).

Theories, Methods, and Practices in the Literature:

Below is a synthesis and analysis of the theories, methods, and practices included in the literature as applied to the tonal, health, and habilitative domains, with a critical discussion of the positionality and perspectives observed in analyzing the literature. The three domains comprise the meta-framework on which I have placed my research throughout my program of study as I apply my learning to practice. Also included is a discussion of the themes observed which do not fit precisely into the externally derived themes. In this review, white and grey literature are included together in the analysis, supported by the concepts of Lineage of Practice in literature review (Winter, 2023), the quality of which was assessed through author citations, references cited, and publication details.

Tonal Domain:

In my 2023 paper, I describe the Tonal Domain as "the timbral (quality of sound) qualities arising from choral musicians' acoustic choices, including vowel placement, resonance, brightness or darkness, and warmth of tone" (Kovacs, 2023, p.8). In applying the Tonal Domain to analyzing the selected literature, two subordinate themes emerge: acoustic perception and acoustic production. The former is derived primarily through qualitative and the latter through quantitative methods. In one or two examples selected for inclusion, both were used.

Nearly a third of the literature selected for this paper addressed the tonal domain either exclusively or in combination with other areas of pedagogical concern. In analyzing the reason for the propensity of this particular discussion in the literature, I arrived at several

possible conclusions. The first is that the acoustic qualities of the aging voice are among the first we observe (Kirsh *et al.*, 2013). As an example, Linville's (1996) *Journal of Voice* article entitled *The Sound of Senescence* finds that listeners are able to accurately perceive the age of a voice based on its acoustic qualities, which result from changes to the glottal gap (McGarey *et al.*, 2021), changes to the fundamental speaking frequency and stability, and rate of speech as we age. A handful of studies joins Linville's observations, many of which focus on the fundamental speaking frequency and accompanying formants of the aging voice (Ferrand, 2002; Prakup, 2012; Eichhorn *et al.*, 2018; Schultz *et al.*, 2023) while others examine the underlying causes for the acoustic changes, including physiological changes to the systems and subsystems of phonation, such as the respiratory system and cartilages (Bloch and Behrman, 2001; Pontes, Brasolotto, and Behlau, 2005; Çiyiltepe and Şenkal, 2017; McGarey *et al.*, 2021; Desjardins *et al.*, 2022a, 2022b). Some key takeaways from this body of research into aging voice acoustics include:

- There is a consistent decrease in the vocal fundamental (f_0) for women, likely related to menopause and accompanying edematous changes to the larynx.
- There is a consistent increase in the vocal fundamental for men
- Male voices show a higher prevalence of atrophy and hypofunctional dysphonia.
- As we age, the harmonics-to-noise ratio significantly lowers in the voice (the fundamental becomes less distinct with increased instability).
- There is an increased likelihood of tremor or undesirable oscillation in the voice.

While the authors above used quantitative measurement of acoustic and physiological properties in analyzing the aging voice's tonal (acoustic) qualities, others incorporated perceptive self-reporting into their analysis of singers' experience with their timbral or tonal production. This group of papers often included other factors, such as quality of life, cognition, and hearing in their evaluations (Price, 2022; Schultz *et al.*, 2023; Tremblay and Perron, 2023). Tremblay and Perron (2023) point to the benefits of singing in reducing cognitive decline as part of the *mental exercise hypothesis* (p.1). Schultz *et al.* (2023) included the phrase "healthy aging" in the title of their paper, addressing physiologic rather than pathologic changes to the voice. Sataloff's *The Aging Adult Voice* (Sataloff *et al.*, 1997) makes clear that voice care providers should be familiar with and understand the differences between normal aging (physiologic) and treatable medical conditions (pathologic) in support of a singer's goals. One example in the group stood

out as having taken great care to consider the perspective and to apply very specific psychometrics in extracting data from the perceptive questionnaire. *Factors Associated with Singer's Perceptions of Choral Singing and Well Being* (Kirsh *et al.*, 2013) was written by a consortium of multi-disciplinary authors that brought a range of expertise to the research design and analysis. The authors address differences in solo and choral singing techniques, a concept supported by Smith and Sataloff (2013), explain the limitations of the psychometrics used, and discuss the heterogeneity challenges of the sample. This paper added to my understanding of the research and research methodology by highlighting the benefits of a multi-disciplinary team conducting complex research (having a psychologist, otolaryngologists, singing teachers, and communications researchers working together in this case) and supports the idea of having a cross-disciplinary team supporting studio and conducting practice.

Finally, in the tonal domain, some papers incorporated both acoustical measurements and data with singer perceptual data in the same discussion. For example, Mathmann *et al.*'s (2024) study on how age, gender, and health behaviors affect singers presents statistical information across several areas of impact on singer's vocal health through both measured observation and self-reported data about those impacts, it does not suggest any interventions for those impacts, something that frequently occurred during this literature review with respect to the first tiered peer-reviewed literature; i.e., phenomena are observed, but no solution, direction, or interventions are suggested. My reflection on this limitation is that the scope of these articles is discretely confined to the research topic or question, and any problem-solving that falls outside the scope of the stated research is speculative and does not fall within the jurisdiction of the paper or author's intent. I would also observe that this is less true in the second and third-tier literature surveyed, if not selected, for this project.

While much of the literature in this group does not specifically address singing, the acoustic characteristics of the singing voice are addressed in other publications, including Unteregger *et al.* (2019) and Baken (2005), and addressed directly in pedagogical books such as *Singing Through Change* (Bos, Bozeman, and Frazier-Neely, 2020), where acoustic changes such as fundamental pitch and timbral quality are discussed the context of perimenopause and menopause. Smith, Sataloff, and Brunsenn also place their treatment of acoustics and the aging voice squarely in the choral context with varying perspectives (voice teacher, laryngologist, conductor) with great attention to theory in practice (Smith and Sataloff, 2012; Brunsenn, 2018).

In terms of application to practice for the tonal domain, I hope to promote knowledge and understanding about the acoustic effects of aging on the voice (Smith and Sataloff, 2003) and then effectively communicate those effects to the singer or singers in a way that supports their well-being, confidence, and enjoyment of singing (Mitton, 2021). This includes actively listening for and integrating the singer's perspectives and experiences in evaluating and discerning intervention approaches (Kirsh *et al.*, 2013). When developing or assigning interventions for singers, it is important to consider whether the voice or voices they are being applied to exhibit acoustic changes from healthy aging or pathological processes inhibiting a satisfying tonal outcome (Sataloff *et al.*, 1997). For example, knowing the application of Vocal Function Exercises (VFEs) for singers is an effective strategy for improving tonal outcomes in the studio for students coping with vocal fold bowing and the choral rehearsal with senescent singers (Tay, Phyland and Oates, 2012; Kaneko *et al.*, 2015).

Health Domain:

I define the health domain as pedagogical choices that result in choral musicians' long-term vocal health, including vocal hygiene, rehearsal, and performance technique that supports resiliency of the voice, and supported by medical intervention from outside professionals, including otolaryngologists, speech language pathologists, and singing voice specialists (Rosa and Behlau, 2017; Kovacs, 2023). Mathmann *et al.* (2024) note that aging has health-related impacts on singers, including neurological, cognitive, hearing, endocrine, hormonal, and muscular changes (Sataloff *et al.*, 1997). Of the twenty-three peer-reviewed articles selected for this review, almost half (48%) directly addressed singer health as the intended subject or included singer health in the discussion, often in conjunction with analysis or discussion of tonal or habilitative outcomes for singers. As with the tonal domain above, much of the peer-reviewed literature at the first tier is adjacent to the research question rather than directly responding. The subject of singer health and aging appeared in the singing voice professional literature as early as 1987 with an entry by Dr. Robert Sataloff in the NATS Bulletin, which brought attention to the science and practice of laryngology for singing voice professionals (Sataloff, 1987). Sataloff's work, along with several interdisciplinary collaborators, spans decades in the vocal pedagogical literature and includes peer-reviewed articles, book chapters, textbooks, and numerous lectures and discussion panels (Michel *et al.*, 1986; Sataloff *et al.*, 1997; Smith and Sataloff, 2003, 2012, 2013).

Where Sataloff and his collaborators emphasized the pedagogical aspects of the health of the aging singing voice, another area of the literature examines the physiological and acoustic changes without discussing interventions. This group of the peer-reviewed literature includes a discussion of the discrete changes to anatomy, acoustic production, acoustic perception, and the cognitive changes associated with aging (Kirsh *et al.*, 2013; Unteregger *et al.*, 2019; Price, 2022; Tremblay and Perron, 2023). Significant findings and discussion can be synthesized into the idea that there is non-linearity between the anatomical, acoustic, and perceptual subsystems of the voice, such as how changes to the thyroid cartilages resulting from use cause aerodynamic changes, which in turn have acoustic affects, which in turn create percepts that call for acoustic adjustments to the voice as we age (Baken, 2004). While these articles do not address potential strategies for meeting the needs of singers experiencing the changes and challenges discussed, they are important to the research question because they help inform the observation and evaluation of individual singers in the studio and singers in the choral rehearsal individually and corporately.

The book *Singing Through Change* (Bos, Bozeman, and Frazier-Neely, 2020) addresses the effects of menopausal changes directly and indirectly on the voice, including psychological and social factors. The authors, all voice professionals with credentials as authors, researchers, and teachers, collaborated on this volume to describe their experience with menopause and the singer's voice from a female pedagogical perspective. Anecdotal recollection, current research, and contemporary experience frame the discussion of this book; however, the missing element for me is an expanded discussion of the habilitative methods (some listing of vocal exercises) and other direct studio and rehearsal applications. One example of peer-reviewed research on this subject is *Still Singing After All These Years* (Price, 2022), a perceptual study of post-menopausal choral singers. Price questioned twenty-three post-menopausal singers about aspects of vocal behavior, hormone therapy use, and singing mode. Participants in her study reported a loss of range, stamina, instability in the passaggio, difficulty with pitch onset, and vocal health problems. In her conclusion, Price advocates for better understanding by voice teachers and choral conductors in assisting their singers experiencing these effects. As the cisgender male director of a treble chorus comprised almost entirely of women assigned female at birth, I am witness every week to singers experiencing exactly these circumstances and need this research and elucidation. Having resources to examine the needs of these singers, approach them with some

understanding, and make meaningful inquiries as to how to support them is an important part of the framework. The practical pedagogical support here is understanding the cause and effect of menopausal vocal changes and finding solutions that support the singer's well-being and success, such as changing voice parts or encouraging passaggio exercises that help a singer refamiliarize themselves with their voice in a changed (aging, menopausal) state (D'haeseleer *et al.*, 2009).

Finally, within the Health Domain, a group of research articles directly examines the benefits of singing and group singing concerning aging and the aging voice. Two in particular related to the research question in a way that will help inform my development of a framework for choral pedagogy that includes the aging voice. The first is *Teaching Reaches Out: Class Voice and the Aging Singer* (Rayapati, 2008). The author considers the effectiveness of a specific pedagogical approach for aging choral singers through a group class (not a choral rehearsal). She took nine singers with no history of smoking, respiratory illness, or mobility issues) ranging in age from 63 – 79 years through a ten-week voice class that engaged the singers in a series of warm-ups and exercises designed to focus on breathing, resonance, and articulation, all of which have been observed to experience diminishment in the senescent voice (Linville, 1996; Çiyiltepe and Senkal, 2017). The data from measuring respiratory and laryngeal function changes resulting from the ten-week course showed no significant results, which the study's author attributes to the small number of participants. However, anecdotal discussion of individual reports and participant questionnaire results suggest this method was successful, as participants self-reported increased confidence and enjoyment in singing activity. In *The Effects of Participation in a Structured Choral Program on the Voice of Older Adults* (Stager, Goudelias, and Johnson, 2023) the authors attempt to confirm the positive acoustic effects of choral singing on older adults via LTAS (Long-Term Average Spectrum) results alongside the psychosocial benefits confirmed using self-rating scales. In this study, choral singers participated in fifteen weeks of ninety-minute rehearsals. Again, there was an exclusion criterion for pre-existing health conditions, including neurological or movement disorders or a history of seeing a speech language pathologist or otolaryngologist. Similarly to Prakup, the acoustic measurements did not yield conclusive evidence of improvement but confirmed improvement of experience through self-reporting. As with Prakup, the authors cite a small sample size as a possible explanation for the unremarkable quantitative statistical result.

The pedagogical consideration here is that while we need more evidence about the physiological benefits of choral singing as we age, we can certainly advise our private voice students and choral singers that there is every reason to believe that their participation in choral music is a benefit to them and will help them maintain vocal resilience and skill (Lortie *et al.*, 2017; Brunssen, 2018); moreover, that those benefits will have an effect on other areas of their life including communication, cognition, mobility, and respiration, especially where the voice practitioner is intentionally incorporating support for those modes in their instruction (Moreno and Bidelman, 2014; Desjardins *et al.*, 2022b; Trost, 2022; Tremblay and Perron, 2023). Addressing the vocal health needs of aging singers experiencing presbyphonia and voice-changing health disorders such as Essential Tremor and Parkinson's Disease requires interventions or strategies for managing the impacts of those experiences from a multi-disciplinary and integrated approach that meets the unique needs of the singer, including SOVTEs, breath work, and resonance exercises (Rhonda et al., 2000; Ziegler *et al.*, 2014; Brunssen, 2018; Kosztyła-Hojna, Zdrojkowski, and Duchnowska, 2023).

Habilitative Domain:

The Habilitative Domain in my pedagogical framework includes the skills, habits, and abilities a singer acquires through instruction and practice (McCoy, 2012; McCoy and Ragan, 2018; Grady and Brunkan, 2022; Kovacs, 2023). Within the scope of the peer-reviewed literature, little exists about how to support the habilitation of aging choral singers' voices. One article attempts to fill that void: *Habilitation for the Aging Choral Singer* (Mitton, 2021). Mitton acknowledges that "there is a growing sector of aging avocational choral singers who need instruction" (p. 352) and attempts to consolidate current research with best practices in finding an approach to supporting the constituency of the phenotype while acknowledging the lack of direct research into the topic. The author suggests a functional approach to habilitation (similar to Rayapati, whom he cites) but also identifies common challenges found in the aging choral singer, including onset, power, vibrato, noise, and vowel production, and suggests strategies for each area of challenge. I have further consolidated Mitton's observations along with those of Trost (2022), Smith and Sataloff (2012), and Brunssen (2018) and created a systematic framework consisting of *body*, *breath*, *phonation*, *intonation*, and *registration*.

- *Body*: stretches, body awareness (asking ourselves, "Where am I feeling tension?"), head and neck rolls, shoulder rolls, "rag doll, and a five-point body

alignment check for the ankles, knees, hips, shoulders, and ears. These must be done with the agility and ability of the singer in mind, prefaced with an "as able" statement that allows singers to move within the soft limits of their bodies (Trost, 2022).

- *Breath*: warm-ups that promote the "free and coordinated use of the abdominal, back, and chest muscles" (Smith and Sataloff, 2012, p. 34) including puppy pants, sighs, laughing, staccato pitch patterns, and postures where the singer is touching the body in a way that encourages tactile feedback (hand on the upper abdomen or sternum) (McKinney, 1982; Trost, 2022).
- *Phonation*: strategies that encourage efficient phonatory sensations (ease) might include SOVTEs such as straw phonation, lip trills, and humming (Titze, 2006; Trost, 2022). Coordinated pitch onset can be assisted by a pitched staccato exercise such as laughing (Brunssen, 2018) while helping singers avoid excess tension in the throat (Mitton, 2021).
- *Intonation*: Helping aging voices achieve comfort with choral ensemble intonation relies on effective strategies for resonance (Smith and Sataloff, 2012). Methods here include encouraging singers to explore the sensations of resonance through vowel and timbre, including nasal vowel sounds, twang, chiaroscuro, and forward vowels such as /i/ and /e/ alternating with the back vowel /u/.
- *Registration*: Warm-ups extending the vocal range beyond the passaggio must provide support for the comfort of the singer, who may experience functional challenges at high or low tessitura. One example or approach would be an arpeggio that uses a *messa di voce*, where the singer decrescendos to the higher pitches and crescendos on the way down (Brunssen, 2018; Trost, 2022).

These "subdomains" form the pedagogical structure for the Habilitative Domain in my larger concept of vocal pedagogy for the choral singer, applied here specifically for the needs of the aging avocational choral singer.

Other Themes in the Literature:

Two additional motifs arose from my critical analysis that fell outside the externally identified themes: that of reflective narrative and intermediary authorship. In the first, authors, usually professional singers experiencing the effects of aging on their voice, consider the impact on their career, how it changes their teaching, and perhaps some sage advice on how to cope with the psychological effects of aging as a professional

singer. This reflective genre tends to offer little pedagogical advice or practical application to practice. In one case, the author recites the Serenity Prayer as a way to summarize their strategy for coping with age-related changes to the voice, quoting C.S. Lewis in the title of the work, *The Aging Voice – A Pilgrim's Regress* (Sjoerdsma, 2009). While this approach to the subject at first seemed trite to me, with further consideration, I realized that by listening to the voices of our performers and teachers through the vehicle of their written reflection, we could poetically receive what we as pedagogists tend to analyze, quantify, and develop scientifically and practically. Poetry and literature are an essential part of our art form and of the qualitative experience of all singers; this is one example of how the reflective process and the hermeneutic circle have been necessary to this project.

The other theme I identified in my analysis was intermediary authorship, where a secondary or even tertiary author made pre-existing research more legible for practitioners. Mitton's (2021) article on the habilitation of avocational choral singers is an excellent example of this act of translation, where complex research projects by scientists and interdisciplinary academic researchers are digested into consumable narratives that professional practitioners can more easily apply to their work. Critical to this process is the rigor with which these "translators" achieve their work, including triangulation and discussion of supporting research.

While the amount of peer-reviewed literature included in the analysis for this project is narrow and often only topic-adjacent, it does align with the externally derived themes, further strengthening my argument for their use in promoting a pedagogical framework. Furthermore, excellent examples of research protocols and adaptable approaches to practical application for technical intervention with singers were evident throughout the peer-reviewed literature.

Voice Pedagogy for Choral Musicians:

As I approach my ultimate goal of introducing a pedagogical framework based on the tonal, health, and habilitative domains, I look to the work of authors such as Smith and Sataloff (Smith and Sataloff, 2012, 2013) for editorial style, rigor, and compatibility of ease for integration with practice, while also considering the systematic approach of other pedagogical texts such as Kari Ragan's *A Systematic Approach to Voice* (2020), which, while proposing clear, practical frameworks for voice instruction, do not explicitly address the needs of choral singers tonal demands or the needs of aging singers. I

imagine a future publication entitled "Voice Pedagogy for Choral Musicians," wherein I use the meta-framework of the Tonal, Health, and Habilitative Domains to facilitate science and evidence-based vocal pedagogy by choral directors, singers, and voice teachers of choral singers. As the needs of aging avocational choral singers can be unique, separate sections for senescent singers (or a separate chapter) would be needed.

Further, I would like to consider how I might further research and frame these additional considerations related to the aging choral singer into the pedagogical framework:

- *Hearing aids*: Supporting choral singers who use assistive hearing technology when they sing, including gathering data about what brands, capabilities, and limitations of the technology they experience and developing practical strategies for how aging choral singers make the best use of these technologies in rehearsal and performance (Chasin, 2023).
- *Changes in cognition*: learning more about the impact of and differences in healthy and pathologic cognitive aging, including singer's perceptions of those experiences and the strategies for supporting them (Moreno and Bidelman, 2014; Bigelow and Agrawal, 2015; Tremblay and Perron, 2023)
- *Arthritis*: Helping constituents understand the effects of ossification and arthritis on the vocal mechanism and strategies for supporting singers experiencing arthritis (Sato and Hirano, 1995; Sachs, Bielamowicz, and Stager, 2017).
- *Choral posture*: Acknowledging that our bodies change as we age, and the ability to hold a folder of heavy music or stand for long periods during a concert can be a challenge, and finding strategies to assist these singers (Smith and Sataloff, 2012).
- *Vibrato and tremor*: One of the most commonly perceived challenges of the aging choral singer is an undesirable or uncontrolled vibrato (Neumann, 2017), along with other oscillatory tonal challenges such as tremor and tremolo, sometimes derisively called "church lady voice" (Sataloff, 1987; Sataloff *et al.*, 1997) While strategies for assisting these singers therapeutically are advancing, helping choral directors and teachers assist these singers in having successful and enjoyable experiences in choir is a challenging discussion I feel is worth exploring (Galante, 2011; Ravall and Simberg, 2020).

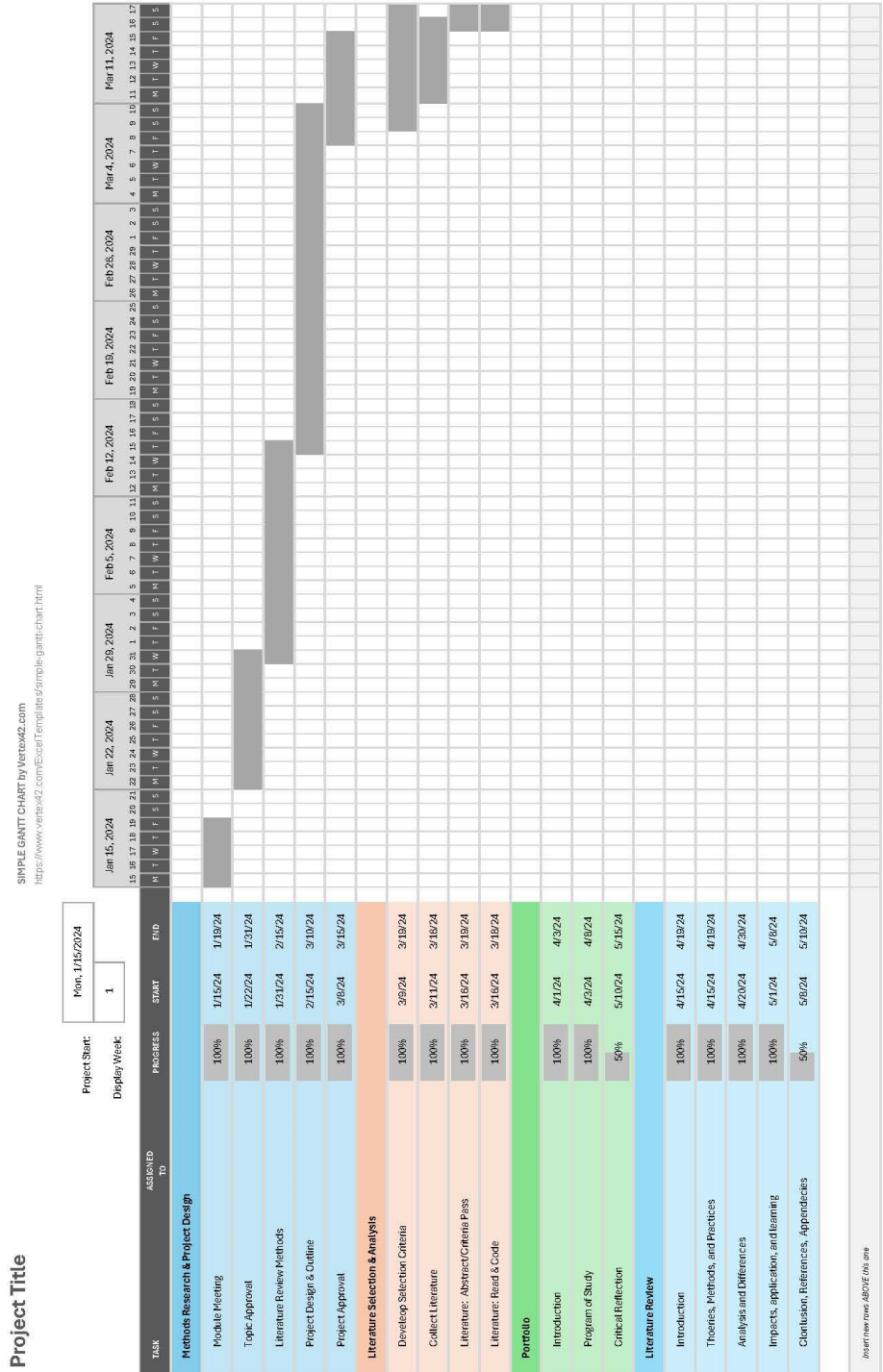
Conclusion:

There are two additional potential impacts on future research and practice for this author. The first is that throughout the analysis of the peer-reviewed literature, I noted research protocols such as Rayapati's (2008), which are possible models for future research projects in choral pedagogy and aging voices. Finding ways to corroborate quantitative data, such as acoustic measurements, with the singers' experiences through self-reporting perceptions is a methodology that interests me as a workplace researcher. I am also encouraged to consider the benefits of interdisciplinary research and am considering ways to align this methodology with my practice and study. I already have a consulting speech language pathologist in my studio practice. I am now considering how adding other disciplines to my roster of consulting professionals might benefit my singers.

Only a handful of publications directly answer the question, "To what extent can a critical exploration of the literature relating to aging and choral singing inform pedagogical practice?" With the benefits of choral singing and singing into later life (beyond age 65) at least anecdotally established (Kirsh *et al.*, 2013; Grunewald Associates LLC and Chorus America, 2019) and increasingly quantitatively determined (Trost, 2022), I encourage my colleagues to consider further research into the tonal, health, and habilitative needs of aging choral singers so that I and others can be more effective and supportive conductors of choirs and voice teachers of choral singers. Furthermore, I encourage the editors of our choral journals to continue advancing the cause of voice pedagogy in our professional publications (Schmidt, 2022) and for the editors of singing and voice journals to consider publishing more about voice science and pedagogy as it applies to choral singing and choral singers (Nix, 2014).

This literature review confirmed that the externally derived themes that remain created early in my research program apply consistently to the body of peer-reviewed and grey literature and allow for additional thematic observations to emerge as adjunct and supportive, and not contradictory of those themes. It also confirmed a great need to continue researching and discussing how we support aging avocational choral singers in the studio and ensemble rehearsal.

Appendix 1: Project Gantt Chart



Appendix 2: Literature Critical Reflection Log (Extract)

Title	Author	Context	Initial Reaction to Content	Reflection and Analysis: perspectives, intersections, and biases
Singing and Teaching Singing	Chapman	Book endorsed by Sataloff (reviewed) used as a textbook in ped programs	Has one small reference to the aging voice in a chapter about caring for the voice of a professional singer.	This book assumes one is working with young, professional, classical solo singers. The only mention of care for the aging voice is really about the teacher as they age. There is a clear bias in pedagogy textbooks in excluding choral habilitation.
Choral Pedagogy and the Older Singer	Smith	A Sataloff (book) Both are experts in the physiology & habilitation of the voice. Sataloff is a top ENT/voice researcher, and Smith a top choral pedagogist having written several textbooks on the subject	The only book of its kind.	This is a comprehensive textbook that covers a wide range of subject matter: tonal considerations, vocal health, and habilitation of the aging choral singer are all covered. Importantly, the authors emphasize the importance of choral pedagogy as a way to promote lifelong singing.
Choral Pedagogy	Smith	These are the two authors who also wrote "Choral pedagogy for the older singer."	A very well cited book, annotated, and with several kinds of references (ie, for further reading) at the end. The chapter on voice disorders is extended into their book on aging choral singers.	The precursor to the text from these authors about aging choral ped, this book covers tonal, health, and habilitation domains with good illustrations, references, and concise editorial style. Written for voice teachers, conductors, and educators.
Singing through the Change	Bos	Book written by three women voice teacher/pedagogists filling in a gap in the literature	This book was a game changer when it was published. It's well researched with references to both internet sources and a standard bibliography representing current research and science	Feminist perspective on voice pedagogy, much needed. Explains for all genders of voice professional while speaking more to women.
The Owner's Manual to the Voice	Gates	SLPs writing about the clinical aspects of voice care	Brief section on presbylarynx	This book is written for professional voice users, singers, and voice teachers, and is a literal handbook/reference on topics ranging from medications to somatics. The comprehensive glossary, references, and index are very helpful. I keep this book on my piano during lessons. The sections on presbylarynx are limited. This book has practical application for all voice users, whether choral, solo, etc..
The Confident Choir: A Handbook for Leaders of Choral Ensembles	Bonsior	Author (book) is a music psychologist and voice pedagogist writing from an academic perspective with practical application	Well cited (heavily annotated) to current research. Concise, clear editorial style.	This book addresses the psychosocial dynamics of choral leadership, and provides guidance for choral leaders in guiding their ensembles. In particular to the subject, it addresses the effects of criticism on singers (and aging singers). The author "translates" the subject matter into an editorial style for application by choral professionals. This is an example of intermediary authorship where the the expert makes the science practical for the practitioner.
Manging Voice Problems in the Private Studio	Brunk	Private voice teacher writing for the Journal of Singing with an interest in voice disorders	This author side-steps the issues of the aging voice altogether	Again, the author's perspective is one of working with young solo singers in a professional or academic environment, with no consideration of choral or aging environments. Are private voice studios only made up of solo pros?
Voice Training for Solo Work vs. Choral Work	Diercks	This article is from 1948, written for the NATS bulletin	Barely touches on the habilitative needs of older singers, really about differentiating the teaching of solo and choral technique	While this article really isn't about aging voice, it does argue for the need for a separate pedagogical approach for choral singing. This article is more of commentary than anything, and doesn't contain any citations.

Appendix 3: Inclusion Matrix and Codes

Documentation							Type		Relevance			
Title	Author	Year	Abstract	Sel.	Scanned	Coded	Type	Tier	Reas. ?	Tonal	Habit.	Health
Singing through Change	Bos	2020	NA	Y	D	-	G	1	Y	Y	Y	Y
The Evolving Singing Voice	Brunssen	2018	NA	Y	D	-	G	1	Y	Y	Y	Y
Choral Pedagogy and the Older Singer	Sataloff	2012	NA	Y	D	-	G	1	Y	Y	Y	Y
The Confident Choir: A Handbook for Leaders of Group Singing	Bonshor	2018	NA	Y	D	-	G	1	Y	Y	Y	Y
Choral Singing and Health Voice Production	Howard	2015	NA	N	D	-	G	1	Y	Y	Y	N
Choral Pedagogy	Smith	2013	NA	Y	D	-	G	1	Y	Y	Y	Y
Singing and Teaching Singing	Chapman	2023	NA	N	D	-	G	1	Y	Y	Y	Y
A Systematic Approach to Voice	Ragan	2020	NA	Y	D	-	G	1	Y	Y	Y	Y
The Structure of Singing	Miller	1996	NA	N	D	-	G	1	Y	Y	Y	Y
The Oxford Handbook of Singing	Welch	2019	NA	N	D	-	G	1	Y	Y	Y	Y
Choral Conducting: A symposium	Decker	1973	NA	N	D	-	G	1	Y	Y	Y	N
Group Vocal Technique	Haaseman	1991	NA	N	D	-	G	1	Y	Y	Y	N
The Robert Shaw Reader	Blocker	2004	NA	N	D	-	G	1	Y	Y	N	N
The Anatomy of Tone	Jordan	2017	NA	N	D	-	G	1	Y	Y	Y	N
Your Voice: An inside View	McCoy	2019	NA	N	D	-	G	1	Y	Y	Y	Y
The Art of Singing	Miller	1996	NA	Y	D	-	G	1	Y	Y	Y	Y
Bel Canto: Principles and Practices	Reid	1971	NA	N	D	-	G	1	Y	Y	Y	N
Singing: the Mechanism and the Technique	Vennard	1967	NA	Y	D	-	G	1	Y	Y	Y	N
Principles of Voice Production	Titze	2000	NA	N	D	-	G	1	Y	Y	Y	Y
Practical Vocal Acoustics	Bozeman	2023	NA	N	D	-	G	1	Y	Y	Y	N
The Science of the Singing Voice	Sundberg	1987	NA	N	D	-	G	1	Y	Y	Y	Y
The Free Voice	Reid	2018	NA	N	D	-	G	1	Y	Y	Y	Y
The Owner's Manual to the Voice	Gates	2013	NA	Y	D	-	G	1	Y	Y	Y	Y
Voice Training for Solo Work vs. Choral Work	Diercks	1948	No	SNA	Y	Y	P	3	Y	Y	Y	N
Choral Training for the Vocalist	Schofield	1952	No	SNA	Y	Y	P	3	Y	Y	N	N
Choral Pedagogy and Vocal Health	Smith	2003	No	Y	Y	Y	P	2	Y	N	Y	Y
The Aging Voice	Sataloff	1987	No	Y	Y	Y	P	2	N	N	Y	Y
Manging Voice Problems in the Private Studio	Brunk	2008	No	SNA	Y	Y	P	2	N	N	Y	Y
Aging Voice - A Pilgrim's Regress	Sjoerdsma	2009	No	Y	Y	Y	P	2	N	Y	N	N
Teaching Reaches Out: Class Voice and the Aging Singer	Rayapati	2008	No	Y	Y	Y	P	2	Y	Y	Y	Y
Voice Pedagogy for Aging Singers (Including the Author)	Edwin	2012	No	Y	Y	Y	P	2	N	Y	Y	Y
The Influence of Age, Gender...Health Complaints of Singers	Mathmann	2021	Yes	Y	Y	Y	P	1	N	Y	N	Y
Acoustic Measures of the Voices of Older Singers	Prakup	2011	Yes	Y	Y	Y	P	1	N	Y	N	N
Auditory cognitive aging in amateur singers	Trembalay	2022	Yes	Y	Y	Y	P	1	N	N	N	Y
How Age and Frequency Impact the Thyroid	Unteregger	2017	Yes	Y	Y	Y	P	1	N	N	N	Y
Habitation for the Aging Avocational Choral Singer	Milton	2022	Y	Y	Y	Y	P	2	Y	Y	Y	Y
Effects of Participation in a Structured Choral Program	Stager	2023	Y	Y	Y	Y	P	2	Y	N	N	Y
Aging Voice: Panel 2	Michael	1986	N	Y	Y	Y	G	3	N	Y	Y	Y
Aging Voice: Panel 1	Michael	1986	N	Y	Y	Y	G	3	N	Y	Y	Y
The Choir Issue, Part 1	McCoy	2011	N	Y	Y	Y	P	2	N	Y	Y	Y
The Choir Issue, Part 2	McCoy	2011	N	Y	Y	Y	P	2	N	Y	Y	N
The Sound of Senescence	Linville	1996	N	Y	Y	Y	P	2	N	Y	N	Y
Three Ages of Voice: Aging Adult Voice	Sataloff	1997	N	Y	Y	Y	P	2	N	N	Y	Y
The Aged Voice: A New Hypothesis	Baken	2004	Y	Y	Y	Y	P	1	N	Y	N	Y
Factors Associated With Singer's Perceptions of Choral Singing Well	Kirsh	2013	Y	Y	Y	Y	P	1	N	Y	Y	Y
The Moderating Effect of Frequent Singing on Voice Aging	Lortie	2016	Y	Y	Y	Y	P	1	N	Y	N	Y
On Resilience: A Conversation with Daria Blair	Senkiewicz	2021	N	N	Y	N	P	2	N	N	Y	Y
URCS: Abstracts on Singer Health	Ed.	2022	N	Y	Y	Y	P	1	N	N	N	Y
Singing Scientifically: A Content Analysis of Choral Journal and Science	Schmidt	2022	Y	Y	Y	N	P	1	N	N	N	N
The Aging Voice	Trost	2022	N	Y	Y	Y	P	2	Y	Y	Y	Y
Still singing after all these years-	Price	2022	Y	Y	Y	Y	P	1	Y	N	Y	Y
Age-Related Changes to the Macula Flava	Sato	1995	Y	Y	Y	Y	P	1	N	N	N	Y
Quantitative Analysis of Videostroboscopic Images/Presbylarynx	Bloch	2001	Y	Y	Y	Y	P	1	N	N	N	Y
Correlations of Glottic Gap and Voice Impairment in Presb.	McGarey	2021	Y	Y	Y	Y	P	1	N	N	N	Y
Glottic Characteristics and Voice Complaint in the Elderly	Pontes	2005	Y	Y	Y	Y	P	1	N	N	N	Y
Harmonics-to-Noise Ratio: An Index of Vocal Aging	Ferrand	2002	Y	Y	Y	Y	P	2	N	Y	N	Y
Effects of Aging on Vocal Fundamental Frequency and Vowel Formants	Eichhorn	2017	Y	Y	Y	Y	P	1	N	Y	N	Y
A Cross-sectional Study of Perceptual and Acoustic Voice Characteristics	Schultz	2021	Y	Y	Y	Y	P	1	N	Y	N	Y
Multidimensional Analysis of the Effect of Vocal Function Exercises	Kaneko	2015	Y	Y	Y	Y	P	1	Y	Y	Y	Y
Voice and Respiratory Characteristics of Men and Women Seeking Treatment	Desjardins	2020	Y	Y	Y	Y	P	1	N	Y	Y	Y
The Impact of Respiratory Function on Voice...Presbyphonia	Desjardins	2020	Y	Y	Y	Y	P	1	Y	Y	N	Y
Presbyphonia as an Individual Process of Voice Change	Koszta	2021	Y	Y	Y	Y	P	1	Y	Y	N	Y
Voice Characteristics in the Progression of Parkinson's	Holmes	2000	Y	Y	Y	Y	P	2	Y	Y	N	Y
The ageing voice and voice therapy in geriatrics	Cytiltepe	2014	Y	Y	Y	Y	P	1	Y	Y	Y	Y
Voice Training and Therapy With a Semi-occluded Vocal Tract	Titze	2006	Y	Y	Y	Y	P	1	Y	Y	Y	Y
Preliminary Data on Two Voice Therapy Interventions...Presbyphonia	Ziegler	2014	Y	Y	Y	Y	P	1	Y	Y	Y	Y

Appendix 3: Inclusion/Exclusion Matrix and Codes (cont.)

Inclusion/Exclusion Codes

Abstract	Y/N	Abstract read
Selected	Y/N	Selected
Scanned	Y/N	Scanned and entered into Mendely
Coded	Y/N	Content coded for analysis and synthesis
Reas. ?	Y/N	Applies to the research question
Tonal	Y/N	Applies to the Tonal Domain (Externally Derived Theme)
Habil.	Y/N	Applies to the Habilitative Domain (Externally Derived Theme)
Health	Y/N	Applies to the Health Domain (Externally Derived Theme)
Peer	Y/N	Peer reviewed article
Tier	1, 2, 3	1= Peer reviewed scienfitic publication, 2 = peer reviewed professional
Grey	Y/N	Is this grey literature
Tier	1, 2, 3	1= book, chapter, journal 2= lecture, video, presentation 3 = blog, emai

Thematic Codes

Tonal Domain
Habilitative Domain
Health Domain

Theory
Method
Practice

Search Parameters	Elsevier	JOS	JOV	CJ	IJCR
Senecent Voice	X	X	X	X	X
Aging Voice	X	X	X	X	X
Aging choral singer	X	X	X	X	X
Senecent choral singer	X	X	X	X	X
Adult choirs	X	X	X	X	X
Aging Singer	X	X	X	X	X
Choral	X	X	X	X	X
Choir	X	X	X	X	X
habilitation	X	X	X	X	X

SNA Selected not analysed

Appendix 4: Reflective Journal Extract (ERA/Jaspers)

	Date	Experience	Reflection	Action
Before	15-Mar	Organizing current reference materials	I want to start by organizing the reference materials I have (books/grey lit and articles in Mendeley) to see where I'm at. This will help me identify tiers, scopes, and types.	Sort and highlight Mendeley files for two groups: methods and research, and put books/grey into tiers (1,2,3)
During	15-Mar	Organizing current reference materials	I am already realizing that my grey literature (books) may not fit neatly into the three domains/externally identified themes. It's more likely that the grey literature will need to be criticized separately, meaning a change in the outline.	Books are all sorted and piled by anticipated tier, Mendeley is organized and key references are selected for addition to the inclusion/exclusion criteria page
After	15-Mar	Organizing current reference materials	It is very evident that I will need to address the grey literature separately and with a different approach to the peer reviewed literature (the purpose of the books is generally sufficient to indicate this)	I have updated my outline to now have two sections of analysis in the literature review section: one for the peer reviewed and one for the grey lit.
Before	15-Mar	Inclusion Criteria: Grey Lit	I have already "presorted" my grey lit, so this exercise feels like it might be about refining my sense of relevance of the lit and placement in the paper	Books are stacked by possible "groupings" for synthesis and analysis.
During	16-Mar	Inclusion Criteria: Grey Lit	My preconceived "groupings" have been rethought, and the overlap in themes from type to type have been considered. There are essentially four groups: choral ped, vocal ped, aging voice specific, and voice science non-related to aging voice at all	Stacks were reorganized and citations, quotes, and rough ideas dropped into the outline.
After	17-Mar	Inclusion Criteria: Grey Lit	My wonderment is whether or not preselecting the grey lit from my existing collection is enough here.	I will consider opening up the grey lit search after I complete the peer reviewed lit search.
Before	18-Mar	Peer review search	I'm not expecting to find a huge amount of material here, so I've made the search criteria list pretty broad	I am engaging the PR search one source at a time: Elsevier, Journal of Singing, Journal of Voice, Choral Journal, and Choral Research.
During	22-Mar	Peer review search	It's becoming clear that my PR inclusion process needs to include articles that are adjacent to the R?, because there are so very few that answer the R? directly	I am including articles that touch on the three domains, whether or not they directly answer the research question.
After	30-Mar	Peer review search (completed?)	I have finished searching the databases/services I have planned. I am disappointed by both the functionality and the amount of literature on the R? from the US choral professional journals, which are largely focused on the academic environment	I may consider opening up the PR search to Google Scholar. I also need to scan sources in the currently included literature for potential additions to the PR lit. \]
Before	4/1/2024	Portfolio Section A	I am varying from the outline quite a bit, primarily because I kept adding to my outline as I read.	Re-versioning the outline with citations. Sending section A to Debbie for remarks.
During	4/7/2024	Portfolio Section A	Remarks back, needed to tighten things up to preserve word count availability. Spending more time talking about what's included than excluded.	Adopted a new more critical research question based on Debbie's suggestions.
After	4/21/2024	Portfolio Section A	Grateful for Debbie's encouragement and remarks. This reads much more succinctly and flows better	Might be interesting to go back and do an analysis of the outline I started with and the one I finished with.
Before	4/12/2024	Critical Reflection/Literature	After chatting with Michael, I need to review the grey literature for quality and relevance. There's no point in going into books that won't contribute to the research question. Again, talking more about what IS there than ISNT there is important.	I eliminated about 2/3 of the grey lit from my inclusion list based on quality and relevance.
During	4/20/2024	Critical Reflection/Literature	Bias in much of the vocal ped and research lit to solo, classical, young singers. It's also apparent my externally imposed themes are almost irrelevant to the analysis of the available literature	I have all but abandoned my external themes and am identifying new themes as I go. The coding process I had imagined is now pointless..
After	4/27/2024	Critical Reflection/Literature	I need to rethink how to present the data for this paper. I am considering yet another outline without the external themes.	Starting a version 3 outline before writing the analysis of the lit review portion.
Before	4/27/2024	Literature Review: Analysis	I have started outline version 3 and I think I can do this while preserving the externally identified criteria	Writing, adding and adjusting the outline as I go.
During	5/2/2024	Literature Review: Analysis	Having the answers in the critical reflective journal to refer to has been powerful in assisting with writing.	Making some additions to the Critical Refl. Journal so I can more easily sort the list as I'm writing.
After	5/10/2024	Literature Review: Analysis	I ended up completely rethinking the outline of the Grey Lit because there was so little of it. Thematic synthesis seems like an overstatement when there are only one or two in a category	I ended up writing about each book separately, and just excluded the conference findings altogether.
Before	5/10/2024	Impacts and Conclusion	OOH word count is low, but I think I can be concise	Broke this section down into three paragraphs, slightly off from my outline
During	5/10/2024	Impacts and Conclusion	Noticing that I would like to have talked more about the excluded literature	Mentioned Kari's book as a way to bring in the excluded literature "don't talk about what you're not analysing"

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