CHARACTERIZATION IN MOZART'S *DON GIOVANNI*: THE INTERSECTION OF TESSITURA AND FACH IN THE ROLES OF DONNA ANNA, DONNA ELVIRA, AND ZERLINA

by

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(Under the Direction of Frederick Burchinal)

ABSTRACT

This document analyzes the three female roles in Mozart's *Don Giovanni* according to Fach and tessitura. A historical survey of the premiere casts of Prague and Vienna is included, along with a review of literature pertaining to current casting trends. Tessitura is analyzed using standard statistical methods and methods borrowed from mechanics that have a publication history in musicological studies. The correlation of these two categorization systems is discussed, using median quartiles of tessitura as a means of mapping onto suggested Fach ranges.

INDEX WORDS: *Don Giovanni*, Fach, Tessitura, Characterization, Opera, Pitch Center of Gravity, Median Analysis

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CHAPTER 1

INTRODUCTION

Proposal

There are two difficulties in objectively observing the intersection of tessitura, the most comfortable range of the voice, and Fach, a categorization system for operatic roles and the voices that sing them. The first of these is the subjective nature of vocal tessitura, and the second is the subjective nature of the Fach system. Each must be discussed in turn before an objective analysis of either is possible. From the limited published scholarship in this area, it seems that the relationship between tessitura and Fach, or even voice type, to speak more broadly, has been largely uncharted. Sandra Cotton, one of two authors who has investigated along this line of inquiry, states that "although there exist numerous pedagogic studies concerning classification criteria and the anatomy and physiology of singing, dealings with the Fach system have primarily remained in the realm of defining terminology and role types, rather than in the analysis and implications of such a system." [1] The objective of this document is to provide a sample of what the application of quantitative methods to tessitura can offer the operatic world within a limited scope, with the hope that through this limitation, specific relationships may come to light in an objective way that can stand in stark contrast to the subjective manner in which the suitability of particular roles is often considered. Therefore, I have chosen to analyze and discuss the differences in tessitura between the three female roles of W. A. Mozart's *Don Giovanni*, which could be considered a prime example of casting subjectivity owing to the range and breadth of voices that have sung these roles through the 20th and 21st centuries.

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[1] Sandra Cotton, "Fach Vs. Voice Type: A Call for Critical Discussion," *Journal of Singing* 69.2 (2012). 154.

Analytical Background: Fach

The word Fach (plural Fächer) in German can be applied to everything from a post box to an academic specialization. In the operatic sense, it refers to a system of delineation between types of roles (and thus types of voices that sing those roles). The Fach system was first created in the 20th century as a means of protecting unionized singers from being asked to perform a role too far out of their vocal comfort zone, and thus also protecting houses by ensuring they have singers of the correct Fach to perform the operas they produce.[2] It should be stated that voice type and Fach are not necessarily synonymous; in fact, physicality, age, experience, acting skill, and suitability to comic or serious roles might be considered just as important as vocal characteristics like range, size, timbre, and tessitura in determining whether a particular Fach is appropriate.

The gold standard reference guide for the appropriate Fächer for roles in the current repertory is Rudolf Kloiber's *Handbuch der Oper*.[3] This reference, currently in its 14th edition, has been edited many times to reflect the changing tastes of opera producers and audiences, and designates 24 distinct Fächer to categorize the standard operatic repertoire. However, numerous other resources exist that attempt to authoritatively and exhaustively categorize the repertory. The most important American addition to this list is the *Guide to Operatic Roles & Arias* by Richard Boldrey.[4] Boldrey expands on the Kloiber, covering far more operas and using over 30 different categories to distinguish between roles. The author admits to the arbitrary nature of such a classification system and suggests that his aim of specificity and thoroughness is meant solely to aid singers.

Though the Fach system was developed in the 20th century in German opera houses, today it is widely used throughout the world. My aim in this largely quantitative endeavor is to determine whether there is any objective, measurable difference between roles that have long been subjectively

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[2] Ibid. 155.
[3] Wulf Konold Rudolf Kloiber, and Robert Maschka, *Handbuch Der Oper* (Kassel: Bärenreiter, 1985, 2016).
[4] Richard Boldrey, *Guide to Operatic Roles & Arias* (Redmond, WA: PST… Inc., 1994).

distinguished. While many factors enter into determining the suitability of a role, one of the most easily measurable is tessitura, though it must be considered along with other physical and vocal characteristics like age, build, and the ever-elusive timbre.

Tessitura

Tessitura is a subcategory of range, and when used to describe a voice is typically defined as "that part of the voice that can be consistently sung with the most ease and beauty,"[5] "[a zone] of ease of production,"[6] or, perhaps most plainly, "the small portion of the voice, anywhere from a fourth to an octave, where the singer is most comfortable singing."[7] Therefore, tessitura involves a limitation of the entire range of a role or aria (or the entire compass of the voice) to a smaller area where the voice sits comfortably. This limitation can describe the tessitura of a work as well as the comfortable and beautiful range of a voice. Usually, an approximation of tessitura is made by intuition, generally selecting a smaller range of between a fifth and an octave where the voice sits.[8] In her discussion of voice type and Fach as they pertain to the mezzo-soprano voice, Cotton exposes an alarming disparity of tessitura even within two or three closely related Fächer, approximating tessitura in the manner described above. She states that this kind of analysis can be problematic, especially with certain composers who wrote virtuosic, rangy roles, like Rossini and Strauss: "there are often arias or sections of arias that employ a different tessitura over a significant length of time for dramatic purposes. Likewise, many of the Mozart roles have different zones of tessitura for the

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[5] Pearl Yandon McGinnis, *The Opera Singer's Career Guide: Understanding the European Fach System*, ed. Marith McGinnis Willis (Lanham, MD: Scarecrow Press, 2010). 5.
[6] Cotton. 154.
[7] Boldrey. 8.
[8] Vocologist Ingo Titze has suggested two methods for the quantification of tessitura: either from the written score, if there are no interpolations or fermatas, or by using a vocal dosimeter to track the frequency and duration of pitches in performance. He suggests that in determining the tessitura of an individual voice, "one could easily argue that the ideal tessitura[…] would be centered around the pitch where the greatest dynamic range is available." Ingo Titze, "Quantifying Tessitura in a Song," *Journal of Singing* 65.1 (2008). 60.

recitatives than the arias."[9] Boldrey similarly mentions that shifts in tessitura throughout a role should be considered in determining which Fach is most appropriate to a particular role.[10]

In a previous statistical analysis, I attempted, along with my coauthors, to explore the intersection of tessitura and Fach through a pilot study of 20 arias in four Fächer (dramatic coloratura, spinto soprano, lyric mezzo-soprano, and dramatic mezzo-soprano).[11] We achieved this through a statistical analysis of pitch content within each aria and attempted to show relations of tessitura both within and across Fächer, relating them to registral areas for each voice type. Our results showed some similarity across three of our four selected Fächer, with the dramatic coloratura Fach proving to be most diverse in total range and tessitura. Some of our results could be explained with contextual information, and much of the inconsistency we found could be due to our small sample size. We hope to have an opportunity to further this research in the future.

This foray into the complex relationship between Fach and tessitura will strike a different, narrower track: to present and discuss the differences in tessitura between the three female roles of W. A. Mozart's *Don Giovanni*. As such, much of the complexity and breadth of the Fach system can be ignored, for the moment, as we focus in on the vocal demands of the three roles in question. An evaluation of current casting trends and some historical information can provide necessary context.[12]

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[9] Cotton. 161.

[10] "For example, Violetta[…] and Gilda[…] both sing their highest at the beginning of the opera, and lower later;[…] Despina[…] sings a higher tessitura in her arias than in the ensembles, where she sings the lowest of the three ladies." Boldrey. 9.

[11] Many thanks to Kaitlyn Powers and Rebecca Sacks for their work in this study and spurring me on to my own research.

[12] Because of the narrow focus of this study, many of the issues that surround casting trends would prove to be irrelevant to the presentation and discussion of the data; namely, acting concerns, body type, and other issues of physicality, while hugely important in casting decisions, are better left to more subjective analysis. The focus of this work is to present analytical data that may be of pedagogical or practical worth when considering the appropriateness of a particular voice to a role. For an excellent introduction to the complexities these visual demands add, see Sandra Cotton's previously referenced article. Boldrey's introduction to his guide also goes into great detail concerning the multifarious issues that surround Fach.

CHAPTER 2

FACH AND DON GIOVANNI

Current Trends: Casting

The concept of Fach as it pertains to opera is muddled in its history, use, and intent, which is made all the more confusing by its constant evolution and geographic peculiarities. As Cotton explains, even in the past 100 years, there have been drastically different approaches to categorizing roles; often due to dramatic and physical concerns (typified by the advent of HD broadcasts), specific roles may be cast with less regard to musical demands, like tessitura, range, and orchestration.[13] To represent the breadth of opinion concerning the casting of the female roles of *Don Giovanni*, suggested Fächer have been listed below from reputable sources throughout the 20th and 21st centuries.

[13] An excellent example would be the tendency for all trouser roles to be generally lumped into the lyric mezzo category regardless of the scope of the role, which is discussed in greater detail in Cotton's article.

Table 1. Roles and Fach categorizations according to Kloiber, Boldrey, and Miller

Role	**Kloiber (1973)**	**Kloiber (2016)**	**Boldrey[14] (1994)**	**Miller (2000)**
Donna Anna	dramatic coloratura soprano	dramatic coloratura soprano	full dramatic coloratura soprano (light dramatic coloratura soprano, spinto soprano)	spinto soprano
Donna Elvira	youthful dramatic soprano, also dramatic coloratura soprano	lyric soprano	light dramatic coloratura soprano	spinto soprano (lyric soprano)[15]
Zerlina	coloratura soubrette (lyric coloratura soprano)	coloratura soubrette, also mezzo-soprano (unspecified)	soubrette (light lyric coloratura soprano, light lyric mezzo-soprano)	soubrette

Even these disparate categories do not account for all current casting trends; recently, it has become common for lyric or coloratura mezzo-sopranos to take on the role of Donna Elvira. That marks two of the three roles (Zerlina and Donna Elvira) that are alternately cast with sopranos or mezzo-sopranos, and a rather wide range of casting for each, even accounting for different national schools of terminology.

Premiere Casts

Though the Fach system was not used during Mozart's lifetime, contemporary operatic composers employed a praxis similarly designed to maximize efficiency in the theaters, using the individual voices available. Mozart is famously quoted for his tailoring of arias to singers ("I like an aria to fit the singer like a well-made garment"),[16] and this practice often entailed changes in a score from cast to cast, city to city, production to production, or even night to night. This is particularly

[14] Boldrey lists a preferred Fach and sometimes alternate Fächer, shown in parentheses throughout this paper.
[15] Miller cites a "current tendency to cast [Elvira] as a flaming sex-mad lyric," but clearly doesn't believe the casting is correct. Richard Miller, *Training Soprano Voices* (Oxford: Oxford UP, 2000). 10.
[16] Quoted in: Patricia Lewy Gidwitz, "'Ich Bin Die Erste Sängerin': Vocal Profiles of Two Mozart Sopranos," *Early Music* 19.4 (1991), accessed October 14, 2015, http://www.jstor.org/stable/3127918. 566.

true of *Don Giovanni*, which received two premieres overseen by the composer: at the National Theater in Prague on October 29th, 1787,[17] and at the Royal-Imperial National Court Theater of Vienna on May 7th, 1788.[18] The premiere casts for the three female roles are detailed in Table 2.

Table 2. Prague and Vienna premiere casts

Role	**Prague, 1787**	**Vienna 1788**
Donna Anna	Teresa Saporiti	Aloysia Weber-Lange
Donna Elvira	Caterina Micelli	Caterina Cavalieri
Zerlina	Caterina (Teresa) Bondini[19]	Luisa Mombelli/Therese Teyber

Prague Cast

Of the two casts, significantly more can be stated about all four Viennese singers; in fact, even whether Caterina Micelli and Caterina Bondini sang Elvira and Zerlina respectively or whether they switched roles has been questioned by Ian Woodfield and others.[20] Here the first problem of determining which roles are suitable to which singers arises: given that the cast members are set, are the roles distributed according to acting ability, voice type, or billing? And who decides how they are assigned? These are problems that still face modern theaters, but the manner in which they are settled has changed in small but not insignificant ways.

After the unparalleled success in Prague of *Le nozze di Figaro* in 1786, Pasquale Bondini's troupe commissioned Mozart for what would become *Don Giovanni*. In 1787, Bondini, in poor

[17] Julian Rushton, "Don Giovanni," in *Mozart and His Operas*, ed. Stanley Sadie (New York: St. Martin's Press, Inc., 2000).
[18] Wolfgang Amadé Mozart, *Don Giovanni*, Vocal Score ed. (Kassel: Bärenreiter, 2005).
[19] Most likely sung by Caterina Bondini, the wife of impresario Pasquale Bondini who commissioned the opera, but possibly Teresa Bondini, a singer that began appearing in shows the following season per the 1788 Prague *Indice de' teatrali spettacoli*. See: Ian Woodfield, *Performing Operas for Mozart: Impresarios, Singers and Troupes* (Cambridge: Cambridge University Press, 2012).
[20] Ibid. 101.

health, named Domenico Guardasoni as his co-director and later successor. In the Prague troupe, the impresario himself (whether Bondini or Guardasoni) seemed to have final authority over casting, which is not inconsistent with Mozart's known compositional history of the work.[21] Because the casting decisions were beyond the control of the musical director or the composer, the fact that these roles may have been tailored to the singers' vocal capabilities is worth investigating. Other than Caterina Bondini, who premiered Susanna in Prague in 1786, the other female singers in the Prague premiere are chiefly remembered for their roles in *Don Giovanni.*[22] Table 3 lists other known highlights and Fächer according to Kloiber (2016).

Table 3. Repertoire highlights of the Prague *Don Giovanni* premiere female cast

Singer	**Role(s)**	**Fach**
Teresa Saporiti	(Countess? 1786, October 1787?) Dorina, *Fra i due litiganti* (May 1786) Rosina, Paisiello's *Il barbiere di Siviglia*[23]	youthful dramatic soprano, lyric soprano soubrette[24] lyric soprano, also lyric mezzo-soprano
Caterina Micelli	Cherubino (October 1787, 1792)[25]	lyric mezzo-soprano, also lyric soprano
Caterina Bondini	Susanna* (1786, October 1787?)[26] Countess, *Fra i due litiganti* (May 1786)	lyric soprano, lyric coloratura soprano light lyric coloratura soprano[27]

Owing to several delays, the original premiere date of October 14th for *Don Giovanni* was instead given over to a performance of *Le nozze di Figaro*. Whether or not both Teresa Saporiti and

[21] Ibid. 85, 104, 105.
[22] Woodfield asserts that Saporiti likely was the Prague Countess Almaviva, but states that only the casting of Figaro (and Susanna, per Raeburn) was certain.
[23] Saporiti was later prima buffa assoluta with a company in St. Petersburg in 1796, where she also sang Cimarosa's *L'italiana in Londra.* Christopher Raeburn, "Teresa Saporiti," in *Mozart and His Operas*, ed. Stanley Sadie (New York: St. Martin's Press, Inc., 2000). 183.
[24] Boldrey. 504. *Fra i due litigani* does not appear in Kloiber.
[25] Woodfield. 86.
[26] All premieres (or first productions in Prague/Vienna under the direction of the composer) have been starred.
[27] Boldrey. 504. *Fra i due litigani* does not appear in Kloiber.

Caterina Bondini sang in the Prague premiere of *Figaro*, they certainly would have rehearsed for the October 14th performance, along with Micelli. This casting can shed some additional light on the vocal characteristics of the three singers. It is recorded that Micelli sang the role of Cherubino, and Bondini, Susanna. This would leave Saporiti the most likely to sing the Countess Almaviva.[28] Just from comparing the Kloiber Fach suggestions for the respective roles above, not too much can be surmised about the difference between the vocal profiles of the singers, indeed, each singer's repertoire shares at least one role with the lyric soprano designation. However, the Prague *Figaro* score differed from the Viennese version in several important ways that provide more context.

The first and least significant change for the matter of vocal characterization is the omission of Cherubino's first act aria, "Non so piu."[29] Though shortening the role and thereby lessening its importance, the aria itself is representative of the rest of Cherubino's music, and its omission should not significantly change the vocal character of the role.[30] Particularly of note is the ensemble listing, which always places Cherubino below Susanna and the Countess. More important are changes to the ranges of the other roles, particularly in ensembles. Alan Tyson uncovered various sources that show the Countess was given the top line in many ensembles, switching the Vienna vocal line material with Susanna. Further changes to Susanna's vocal lines were made to avoid pitches above the staff, whether by substituting lower harmonies or switching lines with other characters (including Basilio in Act I; as the Countess does not enter until Act II, this switch is noteworthy). Tyson then attempts to explain these shifts, suggesting that although

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[28] One of the reasons for the delay of the *Giovanni* premiere was the illness of one of the female singers, but there is no documentation as to which member of the troupe it was.

[29] Musicologist Alan Tyson has done a significant amount of research into the reconstruction of the Prague *Figaro*, and found this aria to be missing from a copyist's score at Donaueschingen. Alan Tyson, "The 1786 Prague Version of Mozart's 'Le Nozze Di Figaro'," *Music & Letters* 69.3 (1988), http://www.jstor.org.proxy-remote.galib.uga.edu/stable/854740. 322, 323.

[30] This supposition could be supported by the type of analysis this document provides, but currently falls outside of the aim of the study.

the switching of the Countess and Susanna in Act II and afterward might have suited Mozart's original conception of the opera, because many of the shifts weaken motives in Act I, Mozart was likely making a concession to Caterina Bondini's range, and not correcting the score to match his ideal version.[31] This version of *Figaro*, with the Countess singing the top in ensembles, followed by Susanna and then Cherubino, fits with the assignation of parts in *Don Giovanni*, as will be outlined below.

Vienna Cast

Of the Viennese cast, the least can be said of the vocal qualities of Therese Teyber, who likely stepped into the role of Zerlina after the confinement of Luisa Laschi Mombelli.[32] Teyber most notably created the role of Blonde in Mozart's 1782 singspiel *Die Entführung aus dem Serail*, KV 384, appearing as the seconda donna with Caterina Cavalieri, her *Don Giovanni* castmate.[33] Blonde, variously categorized as a lyric coloratura or soubrette by Kloiber and Boldrey, belongs in the same buffa category as Zerlina, and though her first aria exhibits a run up to E6, [34] the rest of the role does not call for extended singing above the staff. The first Viennese Zerlina, Laschi Mombelli, had an extensive career in Vienna singing mainly lyric repertoire, notably including the premiere of the Countess in *Le nozze di Figaro*. Other important roles appear below.

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[31] Tyson explains that early drafts of *Figaro* place the Countess as the top line in the score above Susanna but change in most ensembles before the Viennese premiere. He suggests that this may have been due to Luisa Laschi Mombelli's range, who premiered as the Countess in Vienna. Woodfield offers an alternate explanation: that the incredible popularity of the Viennese Susanna, Nancy Storace, afforded her the clout to demand not only top billing, but also the top vocal line. Tyson. 329. Woodfield. 78.

[32] Christopher Raeburn, *Laschi [Mombelli], Luisa* (Oxford University Press, 2001).

[33] Peter Branscombe, "Therese Teyber," in *Mozart and His Operas*, ed. Stanley Sadie (New York: St. Martin's Press, Inc., 2000).

[34] This paper uses Scientific Pitch Notation for the designation of pitches, but with octaves beginning on A (so that C4 is Middle C, with the A above it being A5).

Table 4. A selection of Mombelli's documented roles, listed chronologically, with suggested Fächer

Roles	**Kloiber**	**Boldrey**
Rosina, Paisiello's *Il barbiere di Siviglia* (1785)	lyric soprano, also lyric mezzo-soprano	light lyric coloratura soprano
La Contessa di Almaviva, *Le nozze di Figaro* (1786)*	youthful dramatic soprano, lyric soprano	full lyric soprano (light dramatic soprano)
Queen Isabella, *Una cosa rara* (1786)*	—	light lyric soprano (full lyric soprano)
Amore, *L'arbore di Diana* (1787)*	—	light lyric soprano
Aspasia, *Axur, re d'Ormus* (1788)*	—	light lyric coloratura soprano (full lyric coloratura soprano)

There has been a substantial amount of scholarship trying to reconstruct the vocal profiles of Aloysia Weber Lange and Caterina Cavalieri, as both have been documented in works written expressly for them. Chief in this field of inquiry is Patricia Lewy Gidwitz, whose dissertation dealt with the vocal profiles of Lange, Cavalieri, and two of their Viennese contemporaries, and who has published a significant amount of scholarship on the two sopranos.

Gidwitz asserts that Aloysia Weber Lange had a high, light soprano capable of intense dramatic expression, flexibility and "a predilection toward portamento singing."[35] She cites numerous reasons for this particular reconstruction, including observations of the vocal figurations, tessitura, and instrumentation of works known to have been written expressly for Lange and comparing them to works written for other singers. Leopold Mozart, in a letter to his daughter in 1785, describes Weber Lange's voice tellingly:

> *It can scarcely be denied that she sings with the greatest expression: only now I understand why some persons I frequently asked would say that she has a very weak voice, while others said she has a very loud voice. Both are true. The held notes and all expressive notes are astonishingly loud; the tender moments, the*

[35] Gidwitz. 566.

> *passage-work and embellishments, and high notes are very delicate, so that for my taste the one contrasts too strongly with the other. In an ordinary room the loud notes assault the ear, while in the theatre the delicate passages demand a great attentiveness and stillness on the part of the audience.*[36]

Catarina Cavalieri, on the other hand, tended toward "athletic" singing that was overall less diverse in its variation and coloratura, with potentially more heft and ease in the chest voice. These disparate singing styles are evidenced in the writing of their respective roles in *Der Schauspieldirektor*, KV 486, most apparently when in the trio "Ich bin die erste Sängerin," Mozart offsets Lange's cantabile "Adagio," rising to a sustained E♭6, with Cavalieri's bravura athleticism in "Allegro" triplets touching C6. Some of their other roles are outlined in Tables 5 and 6.

Table 5. A selection of Lange's documented roles, listed chronologically, with suggested Fächer

Roles	**Kloiber**	**Boldrey**
Parthenia, *Alceste* (1778)	—	light lyric soprano
Clorinda, *Il curioso indiscreto* (1783)[37]	—	light lyric coloratura soprano
Konstanze, *Die Entführung aus dem Serail* (1785-88)	dramatic coloratura soprano	light dramatic coloratura soprano (spinto soprano, full dramatic coloratura soprano)
Rezia, *La rencontre imprévue* (1785)	lyric coloratura soprano	full lyric soprano
Madame Herz, *Der Schauspieldirektor* (1786)*	lyric coloratura soprano	light dramatic coloratura soprano (full dramatic coloratura soprano)
Sesto, *La clemenza di Tito* (1791 and later)	lyric mezzo-soprano, originally castrato (dramatic soprano)[38]	full lyric mezzo soprano (full lyric coloratura soprano, light lyric mezzo-soprano)

[36] Ibid. 569.
[37] This role was the source of two celebrated insertion arias written for Lange by Mozart, "Vorrei spiegarvi, o Dio," KV 418, and "No, no, che non sei capace," KV 419. Mozart wrote five other concert arias for Lange.
[38] Kloiber 1973 edition.

Table 6. A selection of Cavalieri's documented roles, listed chronologically, with suggested Fächer[39]

Roles	**Kloiber**	**Boldrey**
Nannette, *Der Rauchfangkehrer* (1781)	—	light lyric coloratura soprano
Konstanze, *Die Entführung aus dem Serail* (1782)*	dramatic coloratura soprano	light dramatic coloratura soprano (spinto soprano, full dramatic coloratura soprano)
Madame Silberklang, *Der Schauspieldirektor* (1786)*	lyric coloratura soprano	light lyric coloratura soprano (full lyric coloratura soprano, light dramatic coloratura soprano)
La Contessa di Almaviva, *Le nozze di Figaro* (1789)[40]	youthful dramatic soprano, lyric soprano	full lyric soprano (light dramatic soprano)

Here again as with the Prague cast, the suggested Fächer for Lange and Cavalieri do little to distinguish much about their voices beyond what an analysis of vocal figurations can show; in fact, their repertoire overlapped in the role of Konstanze in *Die Entführung aus dem Serail*, a role which Caterina Cavalieri premiered, (as she was considerably better established in Vienna at the time, and was undoubtedly one of the reasons for the great success of the original production), but which Lange performed so often throughout her career that her contemporary Michael Kelly associated her with the composition of the role,[41] and scholars question whether the role was at some point intended for her.[42] Though the tessitura and vocal predilections of Cavalieri and Lange were different and would drift apart throughout their careers, in the role of Konstanze, the requirements for both appear to have been met.

[39] Cavalieri is also known to have premiered in Mozart's cantata *Davide penitente*, KV. 469, based on the Great Mass in C minor, KV. 427. Mozart composed new music for the work, including an aria for Cavalieri, "Fra l'oscure ombre funeste."
[40] For the 1789 revival, Mozart rewrote the rondo "Dove sono i bei momenti," adding coloratura in the faster section. See Appendix.
[41] Gidwitz. "'Ich bin die erste Sängerin,'" no. 8.
[42] Jane Glover, *Mozart's Women* (New York: HarperCollins, 2005). 222.

Numerous factors must be accounted for in determining the suitability of a role to a voice, including orchestration and range, as well as tessitura, dramatic characterization, and the demand for agility and sostenuto, not to mention the age of the singer and the size of the house. Though the current approach through the Fach system differs from a Classical period sensibility toward the operatic repertoire, the key principals remain.

CHAPTER 3

TESSITURA AND DON GIOVANNI

Primary Considerations

Perhaps the most important consideration in determining the correct repertoire for the maximum of beauty and power in a voice should be the tessitura of the role. It is in the tessitura that one can really see the different character of voice between otherwise similarly ranged instruments like Cavalieri's and Lange's. In her article dealing primarily with *Der Schauspieldirektor*, Gidwitz sets Lange's tessitura at that time in the top of the treble staff (between B5 and F♯5), while pinpointing Cavalieri's as around a third lower.[43] Gidwitz, however, offers no methodology for determining this quantification. In modern Fach terminology, this difference would approximate the distinction between a coloratura soprano Fach and a coloratura mezzo-soprano Fach. This is somewhat unsurprising, since the concept of the mezzo-soprano was not distinguished from a soprano or contralto until the 19th century.[44]

To return to the question of suitability of role to singer and how it is determined, it seems that range, and therefore tessitura, may have been the chiefest of Mozart's concerns in the writing of *Giovanni*. It has been asserted that Mozart must surely have had a Viennese production of *Don Giovanni* in mind as he left with a half-completed score for Prague; this influenced his vocal writing for the voices he had come to know in Vienna and those he knew less of in Prague.[45] Even granted that Mozart diligently tailored his roles to his singers, this idea of preparing a score for several casts

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[43] Gidwitz. 566.
[44] Cotton. 155.
[45] Julian Rushton, "Buffo Roles in Mozart's Vienna: Tessitura and Tonality as Signs of Characterization," in *Opera Buffa in Mozart's Vienna*, ed. Mary Kathleen Hunter and James Webster (New York: Cambridge UP, 1997). 407.

necessitates a broadening of scope for practicality's sake; one could even assert that Mozart wrote the roles in *Don Giovanni* to fit certain voice types, and not specific voices.

Considering ensemble order, with Donna Anna taking the top line, then Zerlina, and finally Donna Elvira, it could be surmised that this indicates the tessitura order for each role as well. However, this is only the usual ordering throughout the score; in the Act I finale during the unmasking, and in the Act II finale, Elvira and Zerlina switch.[46] An alternate reasoning behind voicing in ensembles when choosing between otherwise similar voices could be billing, with the top line given as a concession to the prima donna, and other harmonies filled out respective to rank within the company.[47] Or perhaps with Donna Anna as the obvious seria character, Zerlina fulfilling the buffa role, and Elvira as di mezzo carattere, the vocal ordering of both finales could be explained as a concession to dramatic type. Woodford speaks to this final proposal in his discussion of the Prague cast:

> *If [Teresa Saporiti and Caterina Bondini] did indeed play the Countess and Susanna in the Prague Figaro, then the previous year they took the opposite sides of this standard operatic partnership[…] in* Fra i due litiganti. *For all that Mozart 'tailored' roles for his singers, the practicalities of theatrical life meant that typecasting in the modern sense was impossible; flexibility was a great asset[….] What was important, though, was to ensure that the vocal scoring worked well. Saporiti thus played the higher soprano part and Bondini the lower.*[48]

Here, the concept of typecasting dramatically must be rejected in favor of typecasting vocally, even though the delineation between seria and buffa seems to have been much stronger than the delineation between different types of soprano, or even soprano and mezzo soprano.

Another possibility that cannot be ignored is that, with the "general widening of ranges characteristic of eighteenth-century virtuoso singing," composers might choose to highlight specific

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[46] Mozart. Act I, no. 13, mm.461-532 (Zerlina and Elvira switch at the Allegro), and Act II, both at the beginning (mm. 603-617) and the Presto (mm.756-871).
[47] As previously referenced, Woodfield makes this assertion regarding Lusia Laschi Mombelli and Nancy Storace in the premiere of *Le nozze di Figaro*.
[48] Woodfield. 77.

qualities of those ranges for dramatic effect.[49] This gets at the core of musical characterization, and is a central focus of Julian Rushton's exploration of tessitura in buffo roles: "Mozart's choices of range and tessitura within a vocal line function rhetorically like other more familiar variables such as topics and instrumentation[….] Exactly how these signs function may depend upon the individual performance, but should not vary widely if the appropriate voice type is selected for the role."[50] A detailed examination of the score and how it differed between the Prague and Vienna versions will clarify how tessitura and characterization are related within the work.

The Score: Prague

The original Prague score makes it clear that the role of Donna Anna is for the prima donna of the company, as she is given two arias, with the second, no. 23, "Non mi dir, bell'idol mio," appearing just before the finale, in a traditionally honored place. She also has several masterful accompanied recitatives, befitting the seria nature of her character, and appears in multiple ensembles, including a dramatic duet with Don Ottavio, the Act I quartet, the Act II sextet, and both finales. Donna Elvira is presented as di mezzo carattere, halfway between a serious and comic character, and also has two arias, both in the first act. In addition to the quartet, sextet, and both finales, she sings in a beautiful, would-be love duet in Act II, which is set as a trio, and an extended scene in the Act II finale with Don Giovanni and Leporello. Finally, Zerlina is also given two arias, both pastoral in topic, firmly placing her as a buffa character. She also sings the lyrical duettino no. 7, "La ci darem la mano," both finales, and the sextet.

Vienna Additions

There is much speculation as to what exactly was performed in the Vienna premiere production of *Don Giovanni*; the *NMA* itself suggests that there may have been changes from night

[49] Rushton, "Buffo Roles in Mozart's Vienna: Tessitura and Tonality as Signs of Characterization," in *Opera Buffa in Mozart's Vienna*. 414.
[50] Ibid. 410, 411.

to night. It is unclear whether the final sextet in the Act II finale was performed, as da Ponte left it out of his libretto for the production. It appears to have been performed at least once, for there is a cut of music between Anna and Ottavio, which may have been made to ease the tenor role for Francesco Morella.[51] There was a good deal of new material written to better fit Mozart's cast of Viennese singers, including a buffo duet between Zerlina and Leporello, and new arias for Ottavio (to replace the fiendishly difficult coloratura aria "Il mio tesoro intanto") and Elvira, sung by Caterina Cavalieri. Elvira's aria, "Mi tradì quel'alma ingrata," raises the seconda donna role to the same level as prima donna Anna and features the scalar and arpeggio work for which Cavalieri was famous, all within the context of a heart-wrenchingly expressive recitative and aria. At some point in the rehearsal process, Mozart transposed the finished aria down a whole step, whether due to illness or some other malady.

Current Trends: Performance Practice

Usually, an amalgam of these versions ends up being performed in contemporary productions. For the purposes of analyzing the female roles, only the Viennese additions of no. 21a, "Per queste tue manine," and no. 21b, "In quali eccessi… Mi tradì quell' alma ingrata," are of note. The cuts made to the Act II Finale, no. 24, are rarely performed in professional productions, as is no. 21a. "Mi tradì" is performed in either E♭ major or D major, depending on the voice type of the Elvira in question. Usually, the rest of the Prague version is maintained, though sometimes one or another of Don Ottavio's arias is cut. All numbers featuring female characters in modern productions have been listed below.

[51] Jessica Waldoff, "Don Giovanni: Recognition Denied," in *Opera Buffa in Mozart's Vienna*, ed. Mary Hunter and James Webster (New York: Caimbridge UP, 1997). 289, no. 9.

Table 7. All commonly performed musical numbers featuring female characters, Act I

Musical Number	**Character(s)**
No. 1 Introduction, "Notte e giorno faticar"	Anna
No. 2 Duet, "Fuggi, crudele, fuggi"	Anna
No. 3 Aria, "Ah, chi mi dice mai"	Elvira
No. 5 Chorus, "Giovinette che fate all'amore"	Zerlina
No. 7 Duettino, "La ci darem la mano"	Zerlina
No. 8 Aria, "Ah, fuggi il traditor"	Elvira
No. 9 Quartet, "Non ti fidar"	Anna, Elvira
No. 10 Aria, "Or sai chi l'onore	Anna
No. 12 Aria, "Batti, batti, o bel Masetto"	Zerlina
No. 13 Finale, "Presto, presto pria ch'ei venga"	Anna, Elvira, Zerlina

Table 8. All commonly performed musical numbers featuring female characters, Act II

Musical Number	**Character(s)**
No. 15 Trio, "Ah, taci, ingiusto core"	Elvira
No. 18 Aria, "Vedrai, carino"	Zerlina
No. 19 Sextet, "Sola, sola in buio loco"	Anna, Elvira, Zerlina
No. 21b Rondo, "Mi tradì quell' alma ingrata"	Elvira
No. 23 Rondo, "Non mi dir, bell'idol mio"	Anna
No. 24 Finale, "Gia la mensa è preparata"	Anna, Elvira, Zerlina

No matter which version is chosen, whether Prague, Vienna, or today's mixed version, the total range of the roles remained unchanged and is reproduced below.

Table 9. Total range of female roles

Role	**Total Range**
Donna Anna	D4-B6
Donna Elvira	B4-B♭6
Zerlina	C4-B♭6

Given these nearly identical ranges, nothing much can be said to differentiate these roles based solely on this evidence. Finding a method for quantifying the tessitura seems to be the only solution for objectively assessing the difference.

CHAPTER 4

SAMPLE ANALYSES: PITCH CENTER OF GRAVITY

Analytical Methods

In his exploration of the relationship between tessitura and characterization in music written for lower male voices in Mozart's Vienna, Julian Rushton employed a technique that has proven useful in categorizing arias according to tessitura.[52] His work hinges upon the quantification of tessitura, a concept called the Pitch Center of Gravity that is related to the mean of any respective collection of notes through their respective durations, quantifying the amount of time a piece spends on any particular pitch. This method comes from the work of Richard Rastall and is related to the concept of center of gravity in mechanics.[53] Rushton proves that it can be readily applied not only to whole roles (as a classification system similar to Fach) but also to specific sections with regard to dramatic implications; this concept is invaluable in determining the real vocal demands of two tempo arias, as the lyrical section of these arias usually has a lower tessitura than the agile, bravura section. It also allows for the influence of tonality because of its flexibility, in that it is simple to constrain the data analysis sectionally and show how modulation affects tessitura. The greatest limitation with this kind of data presentation is its simplicity; by reducing a section of music down to one mean pitch, the representation of distribution of pitches is normalized around that mean without showing any irregularities of distribution, and erasing evidence of bi- or multimodal distribution.

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[52] Rushton, "Buffo Roles in Mozart's Vienna: Tessitura and Tonality as Signs of Characterization," in *Opera Buffa in Mozart's Vienna*.

[53] Richard Rastall, "Vocal Range and Tessitura in Music from York Play 45," *Music Analysis* 3.2 (1984), www.jstor.org/stable/854316. 190. See Appendix for formula.

For the purposes of this document, I have limited my sample size for analysis to arias and ensembles that feature all of the female characters. In analyzing arias, I attempt to answer whether each character's music behaves in the same way throughout the opera when presented alone. Another important consideration that this analysis can highlight is whether the key of Elvira's aria, "Mi tradì" has any effect on her role as a whole. These analyses have been conducted in sections based on tempo changes, and they omit all secco and accompanied recitatives.[54] The analyzed numbers are listed below.

Table 10. Analyzed musical numbers

Musical Number	**Character(s)**
No. 3 Aria, "Ah, chi mi dice mai"	Elvira
No. 8 Aria, "Ah, fuggi il traditor"	Elvira
No. 10 Aria, "Or sai chi l'onore	Anna
No. 12 Aria, "Batti, batti, o bel Masetto"	Zerlina
No. 13 Finale, "Presto, presto pria ch'ei venga"	Anna, Elvira, Zerlina
No. 18 Aria, "Vedrai, carino"	Zerlina
No. 19 Sextet, "Sola, sola in buio loco"	Anna, Elvira, Zerlina
No. 21b Rondo, "Mi tradì quell' alma ingrata"	Elvira
No. 23 Rondo, "Non mi dir, bell'idol mio"	Anna
No. 24 Finale, "Gia la mensa è preparata"	Anna, Elvira, Zerlina

[54] See Appendix, Methodology no. 2.

Pitch Center of Gravity: Arias by Role

For the PCG analysis, I have chosen to limit analysis to the seven aforementioned arias,[55] and have divided them sectionally, noting the complete range of each section and the mean PCG.[56] These are respectively summarized in tables and represented in figures, with pitch represented on the y axis and sections presented on the x axis according to total sung duration per section. The observed trends are discussed and related to key area and dramatic content.

Elvira

Elvira's first aria, no. 3, "Ah, chi mi dice mai," has been divided into seven sections. The highest and lowest pitches and PCG have been reproduced in Table 11 and Figure 1. In almost every section, the PCG follows the contour of the lowest pitch, indicating that the distribution may be skewed downward. This even holds true in mm. 92-107, which contain arpeggiated and final cadential material, and represent the widest range of the aria. Surprisingly, though this chart shows that the overall highest pitches are attained in these last two sections, the mean distribution is relatively unaffected.

[55] As there is no suggested method for this analytical method to standardize for different tempos.
[56] That is, Pitch Center of Gravity, the weighted mean of any distinct collection of notes through their respective durations. This quantification method assigns values to pitches and durations and calculates the amount of time spent on any particular pitch, then finds the mean pitch for the total sung duration.

Table 11. PCG analysis of no. 3, "Ah, chi mi dice mai"

Section (measures)	Lowest Pitch	PCG	Highest Pitch
mm. 1-23	G4	D5 (14.0625)	A♭6
mm. 24-40	D4	A5 (9.1315789)	G5
mm. 41-58	E♭4	B♭5 (10.107143)	G5
mm. 59-69	G4	D5 (14.065)	A♭6
mm. 70-91	G4	D5 (14.072165)	A♭6
mm. 92-100	D4	B5 (11.952381)	B♭6
mm. 100-107	F4	E♭5 (14.733333)	B♭6
Total	**D4**	**C5/C♯5 (12.488889)**	**B♭6**

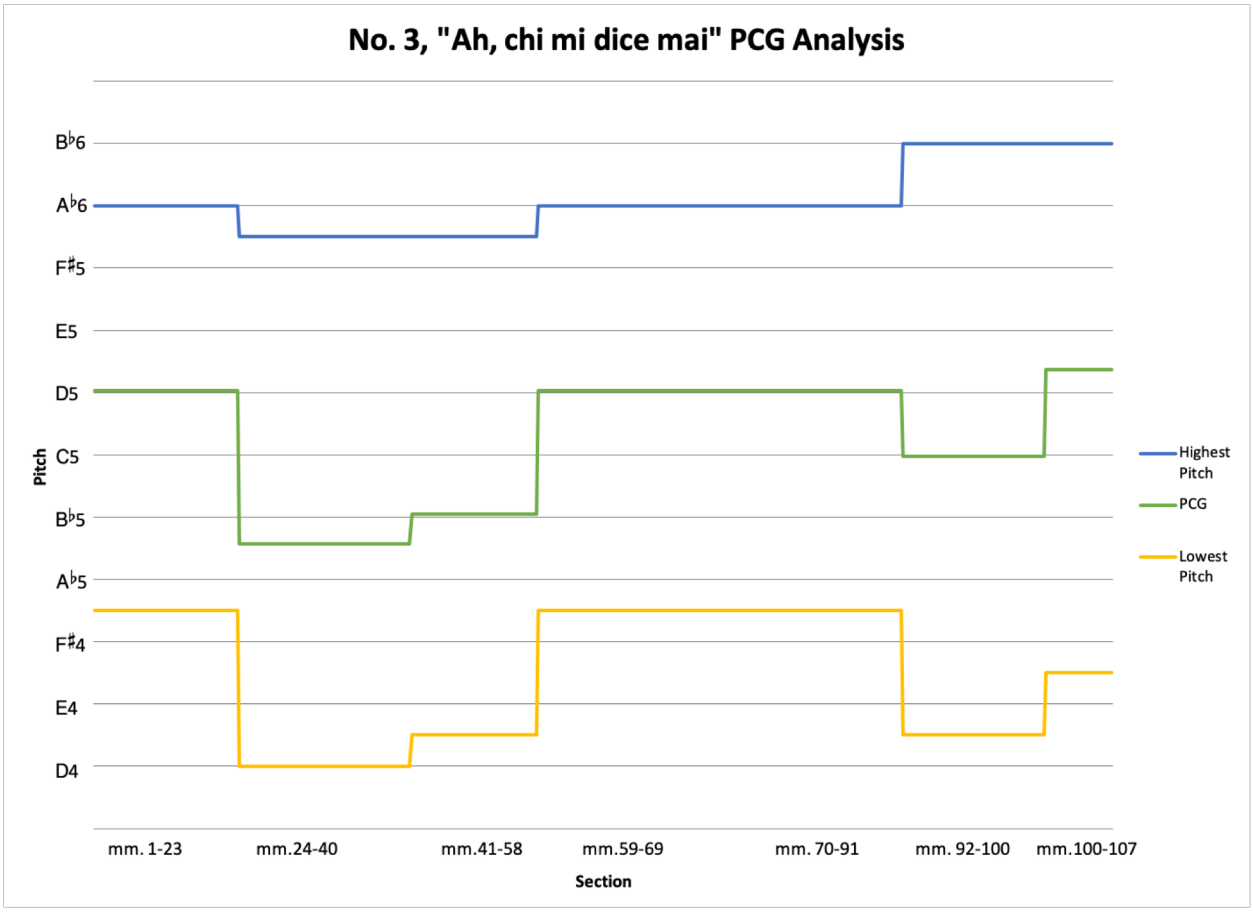

Figure 1. PCG analysis of no. 3, "Ah, chi mi dice mai"

One possible means of explaining this downward trend is the characterization of Elvira during her first aria. As an abandoned woman searching for the man she believed to be her husband, and potentially depicted as pregnant,[57] her desperation and despondency at not being able to find him could call for the warmth of her lower register.

Elvira's second aria, no. 8, "Ah, fuggi il traditor," has been divided into six sections. The highest and lowest pitches and PCG have been reproduced in Table 12 and Figure 2. Dramatically, Elvira warns Zerlina not to trust Don Giovanni before whisking her away; her righteous indignation fits with her bravura vocalization, and the multiple attempts at a final cadence to the aria could be interpreted a necessary intensification to draw Zerlina away. These dramatic concerns are exhibited in the resulting range and PCG. Unlike Elvira's first aria, though the lowest range remains fairly consistent, the PCG is far higher than the midpoint of the range, showing a skewed distribution (i.e., more time is spent on pitches in the upper range of the piece than lower pitches). Additionally, the PCG for each section tends upward throughout the aria, moving from between C5 and C♯5 in the first section gradually up almost 3 half steps to between D♯5 and E5.

What might not fit this model exactly, however, is that mm. 14-22, despite maintaining the same octave range as the preceding measures, have a significantly higher PCG of 14.11 (just above D5). This is the second couplet of text that da Ponte wrote for the aria, and it deals with Elvira's anguish and danger in addition to her warning to Zerlina. This more heartfelt text would seem more exposed and would follow a natural vocal cadence with an overall higher setting. The vocal line lingers on F♯5 and E5, respectively the dominant of B minor and the tonic of the transitional E minor of the first few bars of the section, thus achieving an overall higher tessitura.

[57] In the no. 9 quartet, Elvira references her "state," and this is interpreted by some to mean her pregnancy.

Table 12. PCG analysis of no. 8, "Ah, fuggi il traditor"

Section (measures)	Lowest Pitch	PCG	Highest Pitch
mm. 1-13	F♯4	C5/C♯5 (12.638554)	F♯5
mm. 14-22	F♯4	D5 (14.10989)	F♯5
mm. 22-28	F♯4	C♯5 (12.768116)	G5
mm. 28-32	G4	D♯5 (14.853659)	G5
mm. 32-38	F♯4	D5/D♯5 (14.575758)	G5
mm. 38-45	F♯4	D♯5/E5 (15.512195)	A6
Total	**F♯4**	**C♯5 (13.86445)**	**A6**

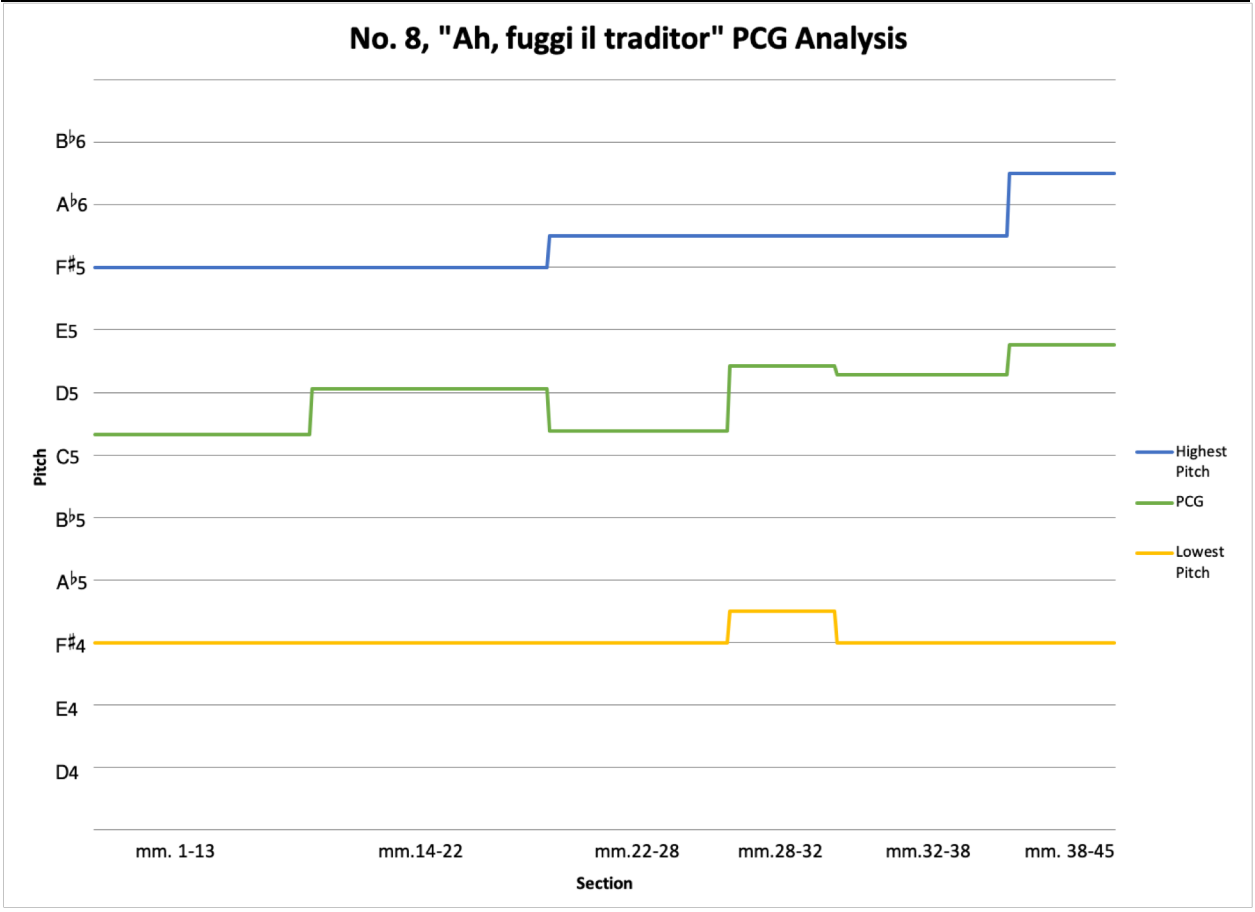

Figure 2. PCG analysis of no. 8, "Ah, fuggi il traditor"

Elvira's third aria, no. 21b, "Mi tradì quell'alma ingrata," has been divided into seven sections. The highest and lowest pitches and PCG have been reproduced in Table 13 and Figure 3. The aria has only been analyzed in E♭ major; since each aria is being analyzed separately and since the only difference between the analyzed portions is an overall key difference of one half step, the issue of key can be ignored for the time being. All results could be corrected for the D major version by lowering each by one half step.[58]

Because this aria is a rondo, the form has molded the range and mean tessitura in ways that differ from the typical aria presentation expected. The refrain, with its lyrical running eighth note pattern, is comparatively restricted in range, though the PCG is skewed higher than the midpoint. This high distribution generally exists throughout the aria.

The couplets show some surprising trends and should be discussed in turn. Despite reaching B♭6 and surpassing the previous highest note, the first couplet sits almost a whole step lower (12.55) than the refrain (14.31). This could be due to the lowest pitch dropping three half steps, or potentially due to the plurality of C5 and B♭5s, stressing the dominant key area. The second couplet sits even lower, almost at C5 (12.14). Set in the mediant key area, this couplet dramatically serves to show Elvira's sorrow and pity and move away from her anger and distress, explaining the sudden drop in range and tessitura.

The coda has been separated into coloratura (mm. 135-145) and cadential material (mm. 145-165). This separation shows that not only does the coda sit lower than the refrain, but that it does so for a majority of time at a lower range, as the duration of the last section shows. This lower tessitura could perhaps indicate the resolve that propels Elvira to offer Giovanni one final chance for redemption.

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[58] Though the accompanied recitatives differ from measure 20 on, there is no way to control for tempo in recitative, and they therefore cannot be included in this study.

Table 13. PCG analysis of no. 21b, "Mi tradì quell'alma ingrata," E♭ major

Section (measures)	Lowest Pitch	PCG	Highest Pitch
mm. 36-53	F4	D5 (14.308411)	A♭6
mm. 54-75	D4	C5/C♯5 (12.552448)	B♭6
mm. 76-90	F4	D5 (14.308411)	A♭6
mm. 91-117	D4	C5 (12.144654)	A♭6
mm. 117-134	F4	D5 (14.308411)	A♭6
mm. 135-145	A5	D5 (14.177632)	B♭6
mm. 145-165	E♭4	C♯5 (13.344828)	A♭6
Total	**D4**	**C♯5 (13.428834)**	**B♭6**

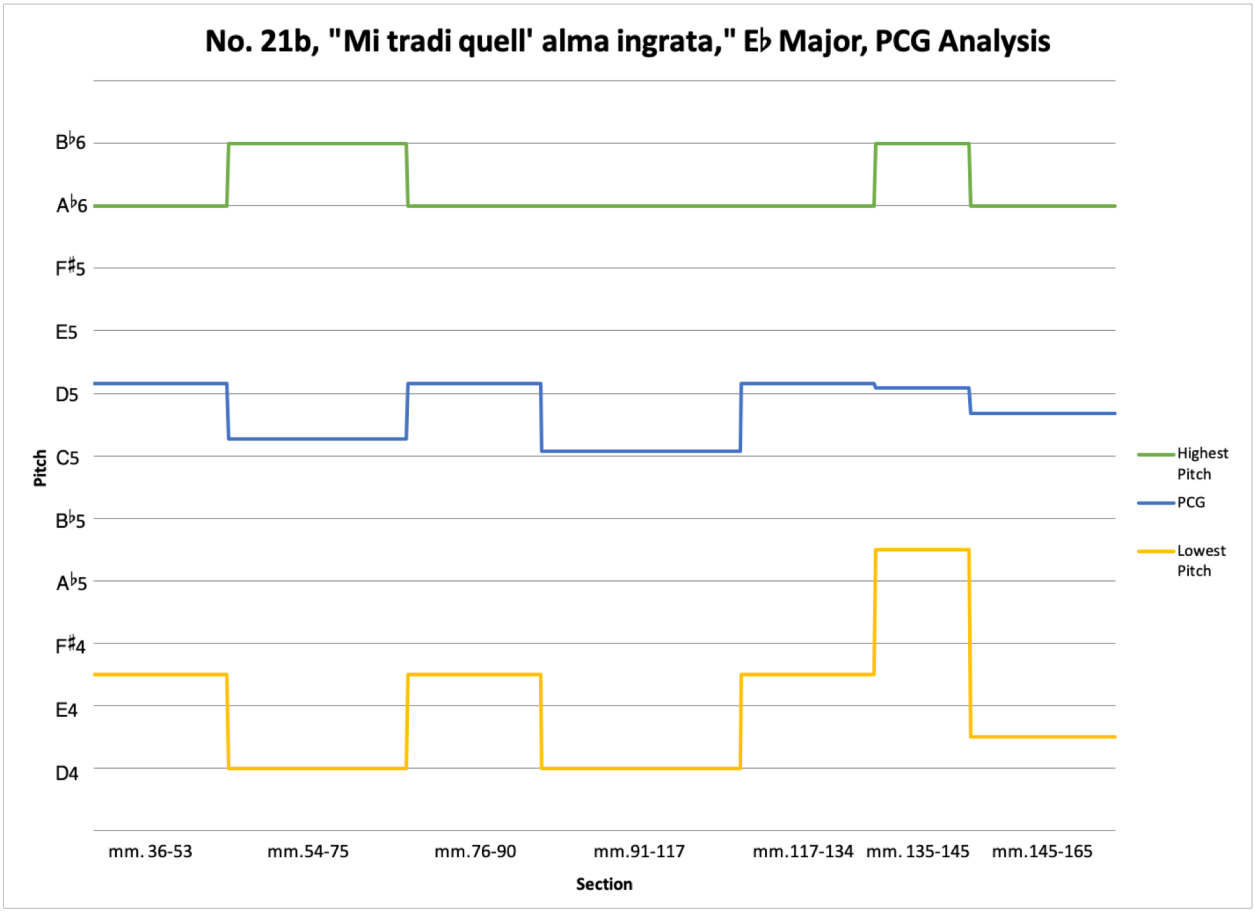

Figure 3. PCG analysis of no. 21b, "Mi tradì quell'alma ingrata," E♭ major

Anna

Anna's first aria, no. 10, "Or sai chi l'onore," has been divided into seven sections. The highest and lowest pitches and PCG have been reproduced in Table 14 and Figure 4. In each section, the highest pitch sung is A6, and the lowest pitch fluctuates between F4 and A5. In almost every section, the PCG is far higher than the midpoint of the range, showing a skewed distribution. This is probably due to the plurality of the pitch A6 overall, which remains true even when divided by section most of the time. This method shows that from measure 86 on, the PCG rises with almost every section, which may help to create an air of increased fervor and dramatic tension. The closing material is the only exception to this, and the PCG here is only slightly lower than before (near F5 at the top of the treble staff). Also notable is that the lowest PCG belongs to mm. 86-101, where the music suddenly shifts to *minore* as Anna recounts the horror of seeing her father's corpse. Such a lower tessitura would certainly lend a grave dramatic air to the text setting. The overall PCG for the aria is 15.39, close to E♭5.

Table 14. PCG analysis of no. 10, "Or sai chi l'onore

Section (measures)	**Lowest Pitch**	**PCG**	**Highest Pitch**
mm. 36-53	F♯4	E♭5 (14.888889)	A6
mm. 54-75	A5	F5 (16.822917)	A6
mm. 76-90	F4	C♯5 (13.070175)	A6
mm. 91-117	F♯4	D5/E♭5 (14.596491)	A6
mm. 117-134	F♯4	E5 (16.141667)	A6
mm. 135-145	A5	F5 (16.822917)	A6
mm. 145-165	F♯4	E5 (16.42803)	A6
Total	**F4**	**E♭5 (15.387468)**	**A6**

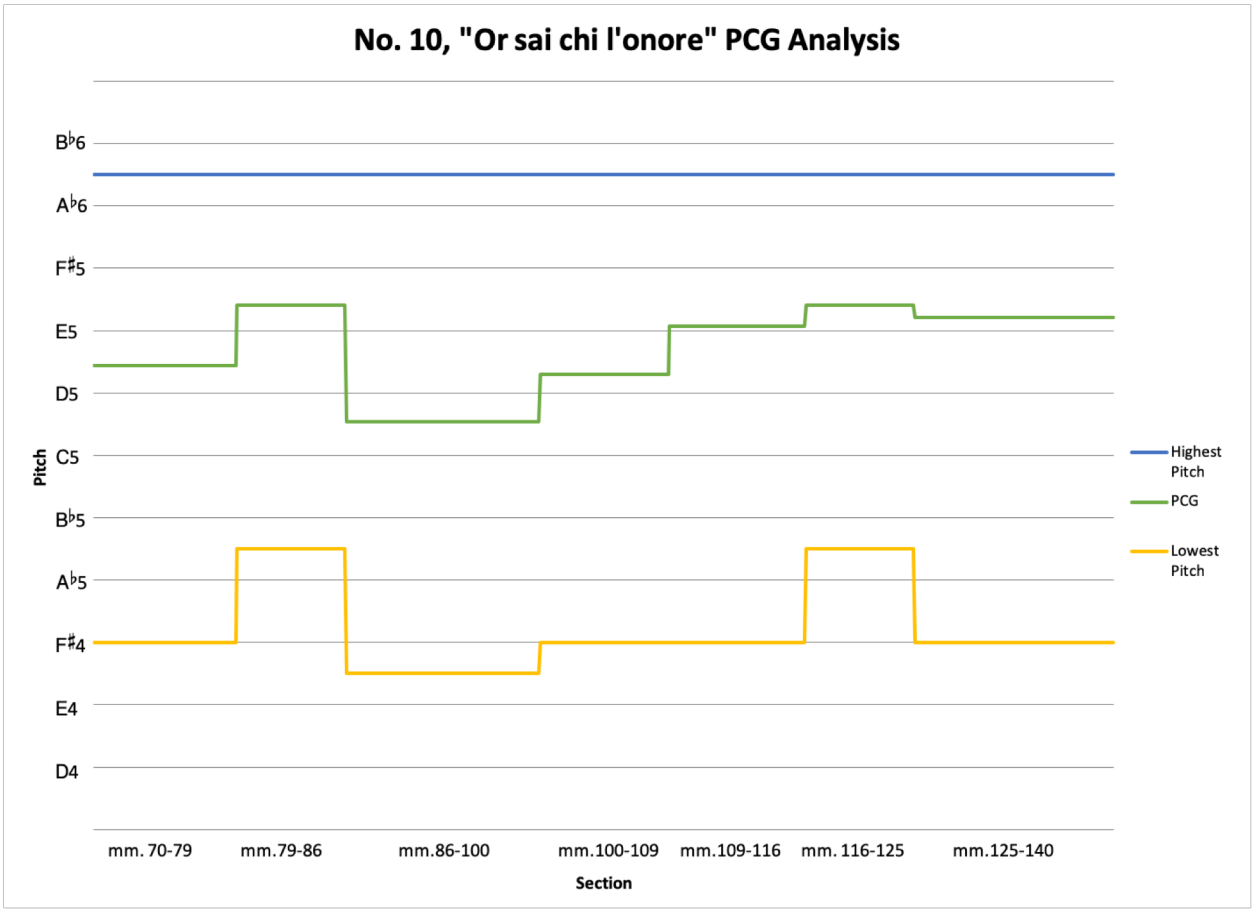

Figure 4. PCG analysis of no. 10, "Or sai chi l'onore

Anna's second aria, no. 23, "Non mi dir," has been divided into eight sections, five in the larghetto tempo, and three in the allegretto moderato tempo. The highest and lowest pitches and PCG have been reproduced in Table 15 and Figure 5. This two-tempo aria has been analyzed using a 2 : 3 ratio for the sections in order to standardize beat values throughout.

In the larghetto section, the PCG appears to be dependent upon the contour of the lowest range and is usually at or lower than the midpoint of the range overall. This fits the sedate and pained mood of the text, and though the refrains (mm. 16-27 and mm. 48-55) are not exact matches, they are significantly more stable than the intervening material, which shows a significant change in PCG from B5 (11.36) to D5 (13.9). This follows the meaning behind each section: in the first, Anna is calmly reassuring Ottavio of her dedication, and in the second, she speaks of the pain she feels at

Ottavio's insistence that they should marry immediately. Notably, after the tempo change, the PCG rises fairly consistently far above the average PCG of the first section (C5/C♯5, 12.67, versus D5/D♯5, 14.68). As Anna is looking forward to a happier future, this fits well with the dramatic implications of the text.

Table 15. PCG analysis of no. 23, "Non mi dir"

Section (measures)	**Lowest Pitch**	**PCG**	**Highest Pitch**
mm. 16-27	G4	C5 (11.803571)	G5
mm. 28-37	F4	B5 (11.36413)	A6
mm. 38-47	G4	D5 (13.9)	A6
mm. 48-55	F4	B5 (11.136842)	G5
mm. 55-63	G4	D5 (14.115385)	A♭6
mm. 64-79	A5	D5/E♭5 (14.627119)	A6
mm. 79-101	E4	D5/E♭5 (14.523585)	B♭6
mm. 101-116	F4	E♭5 (15.077465)	B♭6
Total	**E4**	**C♯5/D5 (13.479043)**	**B♭6**

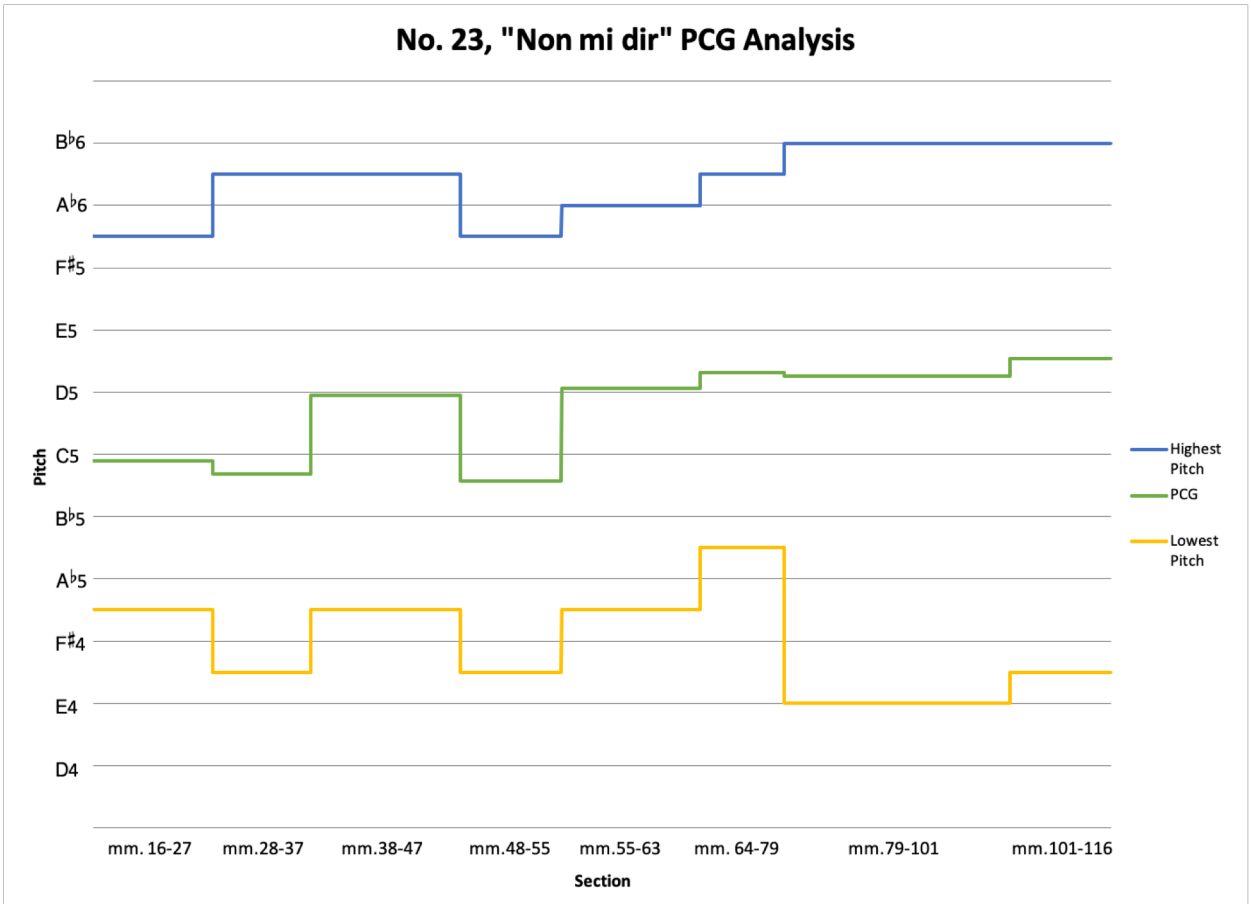

Figure 5. PCG analysis of no. 23, "Non mi dir"

Zerlina

Zerlina's first aria, no. 12, "Batti, batti," has been divided into ten sections, six in the andante grazioso tempo, and four in the allegretto tempo. The highest and lowest pitches and PCG have been reproduced in Table 16 and Figure 6. This two-tempo aria has been analyzed using a 2 : 3 ratio for the sections in order to standardize beat values throughout.

Overall, the PCG of this aria is dependent on the contour of the lowest pitches in each section. Additionally of note are two large jumps in range (and accordingly in tessitura) in mm. 19-35 and mm. 53-60. The first accompanies Zerlina's account of all the terrible things she will allow Masetto to do to her, and how lovingly she will then treat him. This text is repeated and ornamented

in such a way as to thoroughly exhaust her point. The second contains similar repetitive figurations decorating the final cadence of the first section as Zerlina points out that Masetto will not harm her.

Unlike Anna's two-tempo aria, Zerlina's second section of music features a lowering of tessitura from this cadence point of relatively high dramatic tension. As she describes the peace and happiness she foresees for each of them, Zerlina's tessitura gradually lowers from the previous high point (D5/E♭5, 14.6) to the final cadential material (B5, 11.41). Only the immediately preceding mm. 78-86 have a lower PCG in the final section (A♭5/A5, 8.48), which may have been a vocal concession to allow the singer to rest after the two runs up to B♭6; as there is no other textual or topical difference upon which to base characterization.

Table 16. PCG analysis of no. 12, "Batti, batti"

Section (measures)	**Lowest Pitch**	**PCG**	**Highest Pitch**
mm. 1-8	E4	B♭5 (10.15625)	F5
mm. 9-18	C4	B5 (10.88)	F5
mm. 19-35	B5	D5/E♭5 (14.580808)	G5
mm. 36-44	E4	B♭5 (10.048387)	F5
mm. 45-52	C4	B5/C5 (11.56)	G5
mm. 53-60	C5	D5/E♭5 (14.6)	F5
mm. 60-70	A5	D5 (13.754386)	G5
mm. 70-78	F4	C5 (12.382979)	B♭6
mm. 78-86	E4	A♭5/A5(8.4772727)	F5
mm. 86-99	F4	B5(11.40678)	F5
Total	**E4**	**C♯5/D5 (13.479043)**	**B♭6**

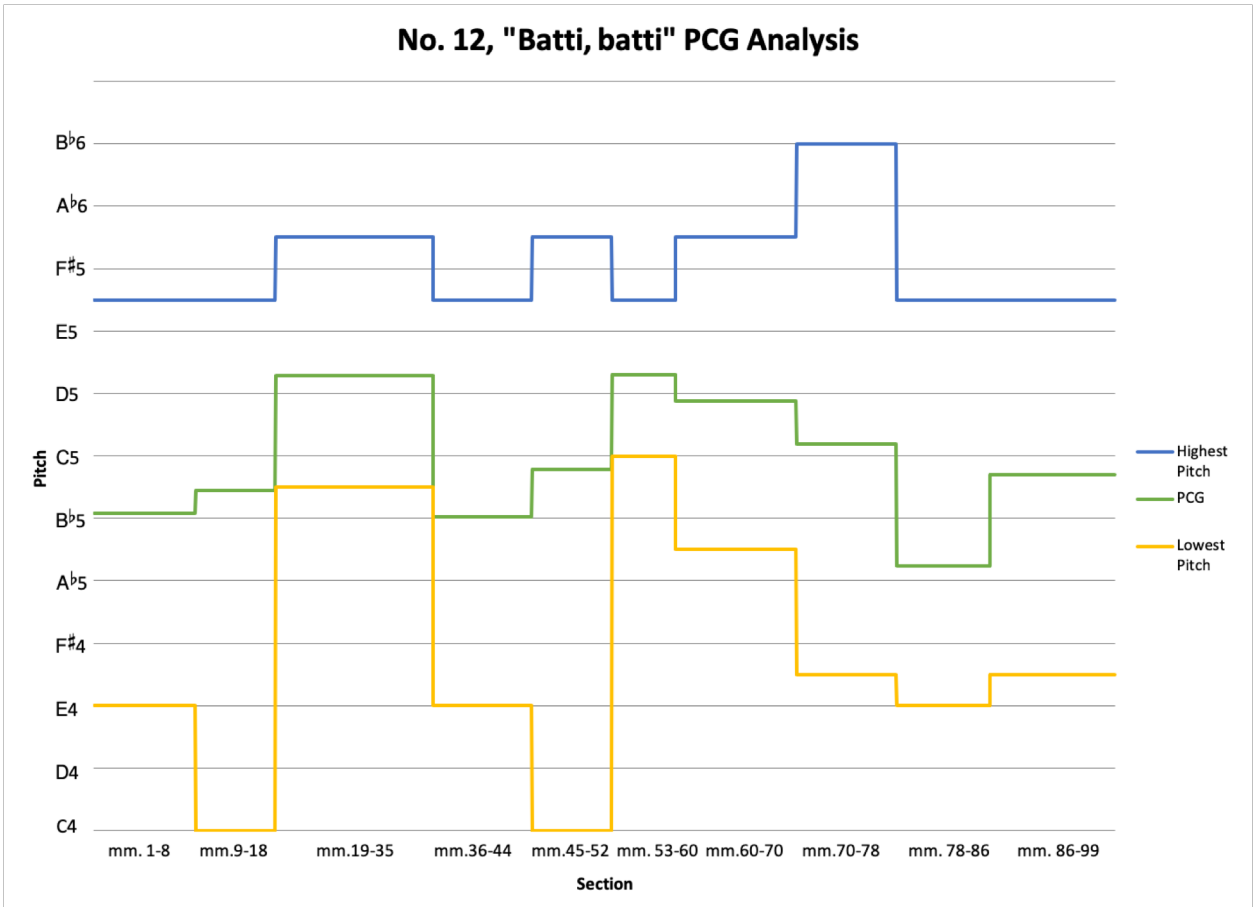

Figure 6. PCG analysis of no. 12, "Batti, batti"

Zerlina's second aria, no. 18, "Vedrai, carino," has been divided into seven sections. The highest and lowest pitches and PCG have been reproduced in Table 17 and Figure 7. Though this aria only covers the total range of an octave, it is representative of the pattern that has been evidenced in most of the other analyzed arias in this opera. The first three sections deal very placidly with Zerlina's plan to take care of her Masetto, and the resultant PCG shows the calm in this first section by barely changing. Measures 44-55 jump dramatically, with the lowest pitch almost overtaking the PCG of the first section, and the tessitura rising accordingly. This section poses a question to Masetto, similarly to Zerlina's first aria, and also has repetitive pitch material. From measure 56 on, the total range and tessitura rise section by section as she reveals the answer to her question and tenderly takes care of Masetto before leaving the stage.

Table 17. PCG analysis of no. 18, "Vedrai, carino"

Section (measures)	Lowest Pitch	PCG	Highest Pitch
mm. 1-18	G4	C5 (11.958333)	E5
mm. 19-33	G4	C5 (11.918919)	E5
mm. 34-43	G4	C5 (11.918333)	E5
mm. 44-55	C5	D5/E♭5 (14.634146)	E5
mm. 56-67	G4	B♭5/B5 (10.5625)	F5
mm. 67-75	A5	D5 (13.94898)	F5
mm. 76-104	B5	D5 (14.407407)	G5
Total	**G4**	**C♯5 (12.751412)**	**G5**

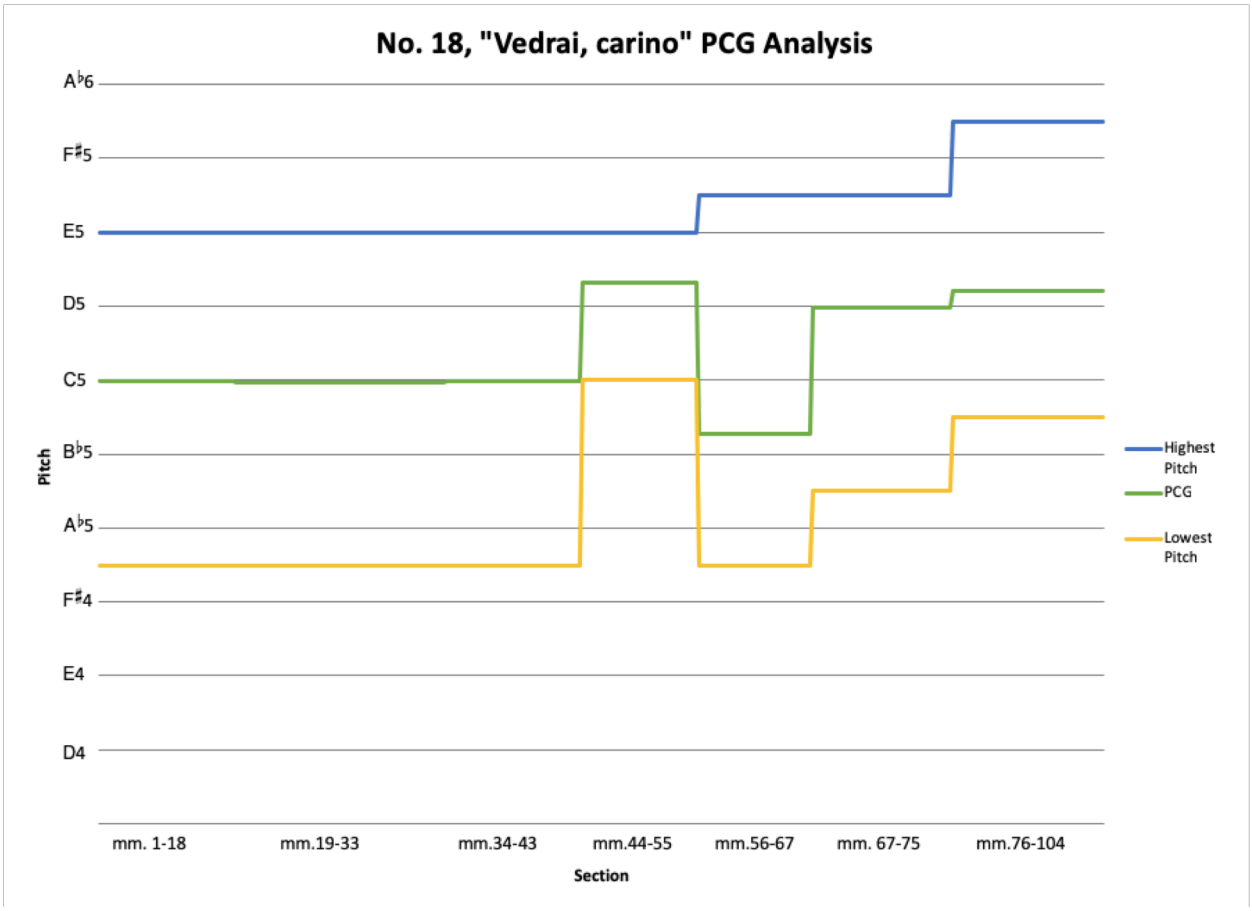

Figure 7. PCG analysis of no. 18, "Vedrai, carino"

These analyses on their own allow for some descriptive characterization, but do not allow for comparison between arias within or between roles. Because the durational values are dependent upon the localized tempos, time spent on each pitch cannot be reconciled from one number to the next. In order to compare arias and ensembles, some manner of standardizing duration must be used.

CHAPTER 5

SAMPLE ANALYSES: STATISTICAL ANALYSIS

Analytical Methods

Statistical methods offer more ways of manipulating and interpreting data and are therefore a more complete and accurate way to observe pitch distribution throughout whole pieces and compare between musical numbers and between roles within ensembles. In the pilot study of arias mentioned previously, we determined that the distribution of pitches in the selected arias was non-normal, and often multimodal. This showed that no transformation of the distribution would allow us to achieve normality, and that the most accurate measure of central tendency in these distributions would be the median, unlike the PCG.[59] However, this method also allows for measuring the quartiles around the median, giving a wider representation of the distribution in each piece. Constructing various figures of pitch content shows the nature of any modality throughout the distribution and allows for a comparison test for parity or disparity between pieces, called an Analysis of Variance or ANOVA.[60]

There are many different ways of displaying this kind of data, and the choice of figures used to best represent each musical number and comparison of medians was a complex issue. Because the pitch distribution was analyzed categorically (half step by half step) and not continuously (as a

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[59] Mean vs. median and central tendency: the mean is generally referred to as the average of a set of numbers. It is the sum of all values divided by the total number of values. The median is the point at which the higher and lower halves of values are separated. The median can be calculated by finding the mid value of any respective collection. With data that exhibits non-normalized distribution (i.e., more high or low values than mid values), the median can more easily approximate a typical value without being skewed by outliers. It therefore is a better approximation of central tendency, or the midpoint of any set of values, than the mean under such parameters.

[60] ANOVA is a series of tests developed by statistician Ronald Fisher. It is a widely accepted standard throughout scientific fields for measuring differences among three or more groups of data with comparisons of means. It is therefore not as robust as other methods for analyzing nonparametric data, but since this study limited its use to analysis of medians, the non-normal distribution was already controlled.

measure of frequency in Hz), bar charts proved to be the most accurate representation of the data. In an attempt to make the depiction of tessitura intuitive, box and whisker plots were superimposed over these charts. The boxes represent the middle quartiles of pitch distribution (i.e., where the middle 50% of each piece lies), with the midline representing the median pitch. The whiskers extend to cover the total range of each number.

The choice to omit ensembles where the characters are the only female voice present was a logical one; it could be assumed that the tessitura, range, and vocal character of these musical numbers would imitate the behavior of the arias. In analyzing ensembles with all three female characters, the interaction of melody and harmony and their influence on voicing can be observed. This can attempt to answer whether there is a difference in tessitura between arias and ensembles, and whether there is any factor that can account for ensemble ordering, or indeed if ordering affects overall tessitura.

Statistical Analysis: Arias by Role

For the statistical analyses, total time spent singing each pitch was standardized by calculating in seconds the durations for all selected musical numbers featuring the characters Anna, Elvira, and Zerlina. This was accomplished by calculating beat durations on each pitch and summed for each character during each number and controlling for tempo by multiplying the resulting values by the corresponding second value per beat (see Table 18 for each tempo marking and selected bpm[61]). Analysis was conducted on each musical number as a whole and displays the duration in seconds of pitches correlating to each pitch.

[61] In each instance, the bpm was determined by following generally accepted guidelines for ranges of bpm for these tempo markings, attempting to make tempo changes work with the smallest ratios possible, and paying attention to the tactus and smallest beat divisions in each section.

Table 18. Tempos for analyzed musical numbers by section

Musical Number and Section	**Tempo Marking**	**Selected bpm**
No. 3 Aria, "Ah, chi mi dice mai"	Allegro	♩ = 120
No. 8 Aria, "Ah, fuggi il traditor"	Allegro	♩ = 120
No. 10 Aria, "Or sai chi l'onore	Andante	♩ = 110
No. 12 Aria, "Batti, batti, o bel Masetto"	Andante grazioso	♩ = 60
No. 12 Aria, "Pace, pace, o vita mia"	Allegretto	♩. = 60
No. 13 Finale, "Gente, aiuto, aiuto gente"[62]	Allegro assai	♩ = 210
No. 13 Finale, "Ecco il birbo"	Andante maestoso	♩ = 90
No. 13 Finale, "Trema, trema, o scellerato"	Allegro	♩ = 130
No. 13 Finale, "Sul tuo capo"	Piu stretto	♩ = 260
No. 18 Aria, "Vedrai, carino"	Grazioso	♪ = 90
No. 19 Sextet, "Sola, sola in buio loco"	Andante	♩ = 100
No. 19 Sextet, "Mille torbidi pensieri"	Molto allegro	♩ = 240
No. 21b Rondo, "Mi tradì quell' alma ingrata"	Allegretto	♩ = 120
No. 23 Rondo, "Non mi dir, bell'idol mio"	Larghetto	♩ = 40
No. 23 Rondo, "Forse, forse un giorno"	Allegretto moderato	♩ = 60
No. 24 Finale, "Ah, dove è il perfido"	Allegro assai	♩ = 180
No. 24 Finale, "Or che tutti"	Larghetto	♩ = 105
No. 24 Finale, "Questo è il fin"	Presto	♩ = 290

[62] The first included measure of this section, m. 467, was accounted for in the new tempo that begins in m. 468. The value of Zerlina's 3 beats of G5 was added to her total count for the first section of the finale. It was arrived at by using tempo di menuetto (♩ = 90) to determine that the measure of pitch G5 lasts for 2 seconds (and would count as 7 beats in the new tempo; 3 : 7 being the smallest division of the ratio 90 : 210).

Anna: Arias

Total time spent singing each pitch was calculated for the five selected musical numbers featuring the character Anna. The arias sung by Anna are no. 10, "Or sai chi l'onore," (Figure 8) and no. 23, "Non mi dir" (Figure 9). For no. 10, "Or sai," the pitches sung by Anna range from F4 to A6. Fifty percent of the pitches sung by Anna in this number fall between C♯5 and G5, with the median pitch being E5. Here the second and third quartiles around the median constitute nearly a perfect fifth, and it might be appropriate to say that they correspond to the tessitura of the piece. However, the most frequently sung pitch for this number is A6. Interestingly, A6 falls outside of the upper bound of the 75th percentile, yet it is still the mode of the piece, since it exhibits a plurality compared to the other pitches. This aria does not exhibit a normalized distribution.

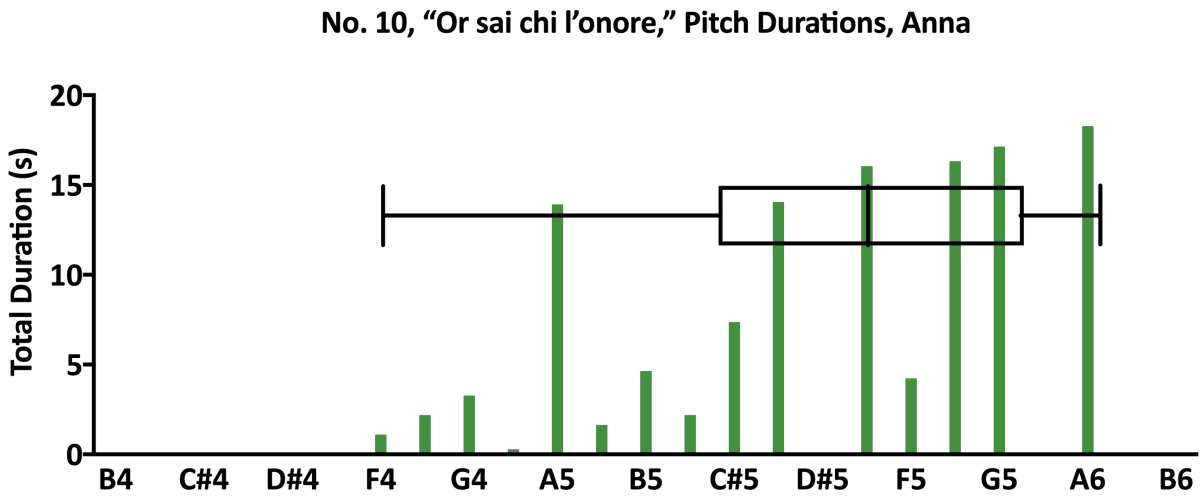

Figure 8. Bar chart with box and whisker analysis of no. 10, "Or sai chi l'onore"

For no. 23, "Non mi dir," the pitches sung by Anna range from E4 to B♭6. Fifty percent of the pitches sung by Anna during this aria fall between B♭5 and F5, with the median pitch being D5. The most frequently sung pitch for this number is C5. Here, the quartiles around the median also

seem to parallel the tessitura well, and the mode falls inside that range. This distribution is much more normalized.

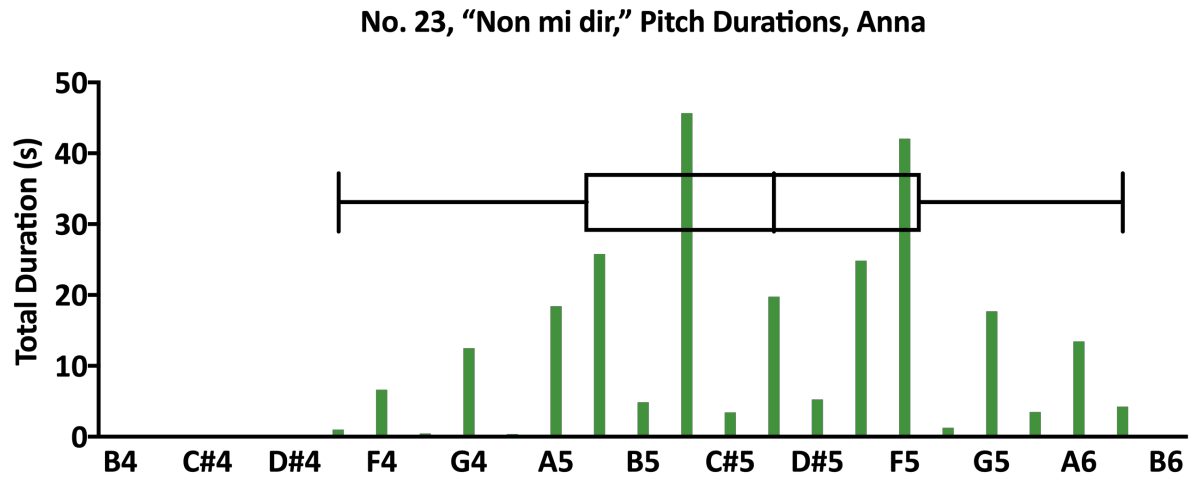

Figure 9. Bar chart with box and whisker analysis of no. 23, "Non mi dir"

Elvira: Arias

Total time spent singing each pitch was calculated for the six selected musical numbers featuring the character Elvira. The arias sung by Elvira are no. 3, "Ah, chi mi dice mai," (Figure 10), no. 8, "Ah, fuggi il traditor" (Figure 11), and no. 21b, "Mi tradì quell'alma ingrata" (Figure 12). For no. 3, "Ah, chi mi dice mai," the pitches sung by Elvira range from D4 to B♭6. Fifty percent of the pitches sung by Elvira during this aria fall between B♭5 and F5, with the median pitch being D5. The most frequently sung pitch for this number is E♭5. This distribution is fairly normalized around the median, and the quartiles around the median correspond well to tessitura.

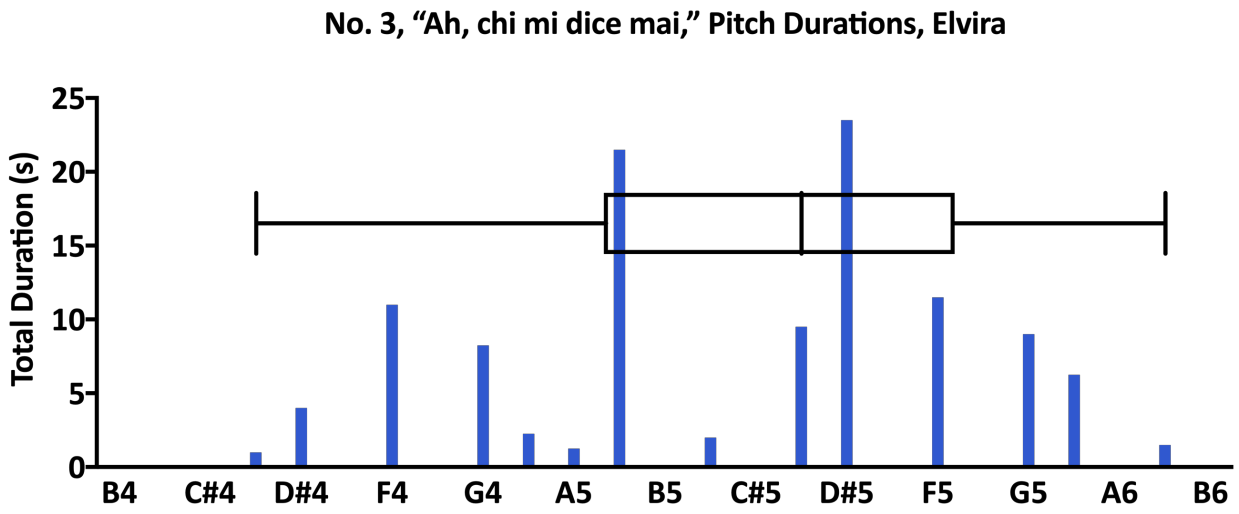

Figure 10. Bar chart with box and whisker analysis of no. 3, "Ah, chi mi dice mai"

For no. 8, "Ah, fuggi il traditor," the pitches sung by Elvira range from F♯4 to A6. Fifty percent of the pitches sung by Elvira during this aria fall between B5 and E5, with the median pitch being D5. The most frequently sung pitch for this number is D5. This distribution is fairly normalized around the median, and the quartiles around the median, though smaller than some previous examples, correspond well to tessitura, potentially due to the small sample size of the aria.

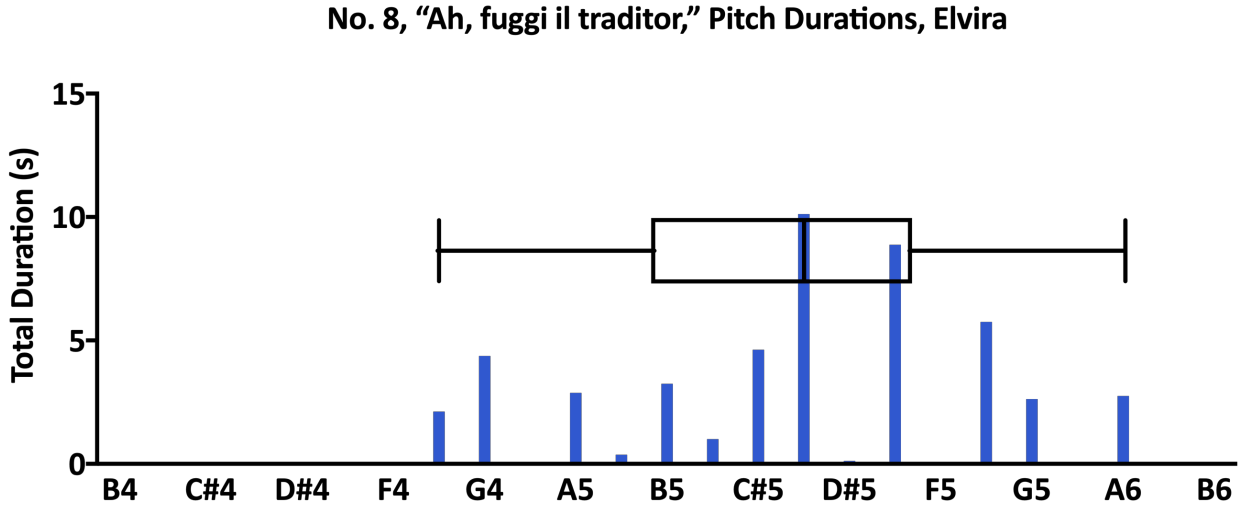

Figure 11. Bar chart with box and whisker analysis of no. 8, "Ah, fuggi il traditor"

For no. 21b, "Mi tradì quell'alma ingrata," the pitches sung by Elvira range from D4 to B♭6. Fifty percent of the pitches sung by Elvira during this aria fall between B♭5 and F5, with the median pitch being D5. The most frequently sung pitch for this number is E♭5. This distribution is somewhat skewed right beyond the median. This skewed distribution is partially due to the preponderance of pitches between the low dominant B♭5 and the high subdominant A♭6. The quartiles around the median, however, cover a perfect fifth and correspond well to tessitura. Since the D major version by itself bears the same characteristics, it will not be discussed here.

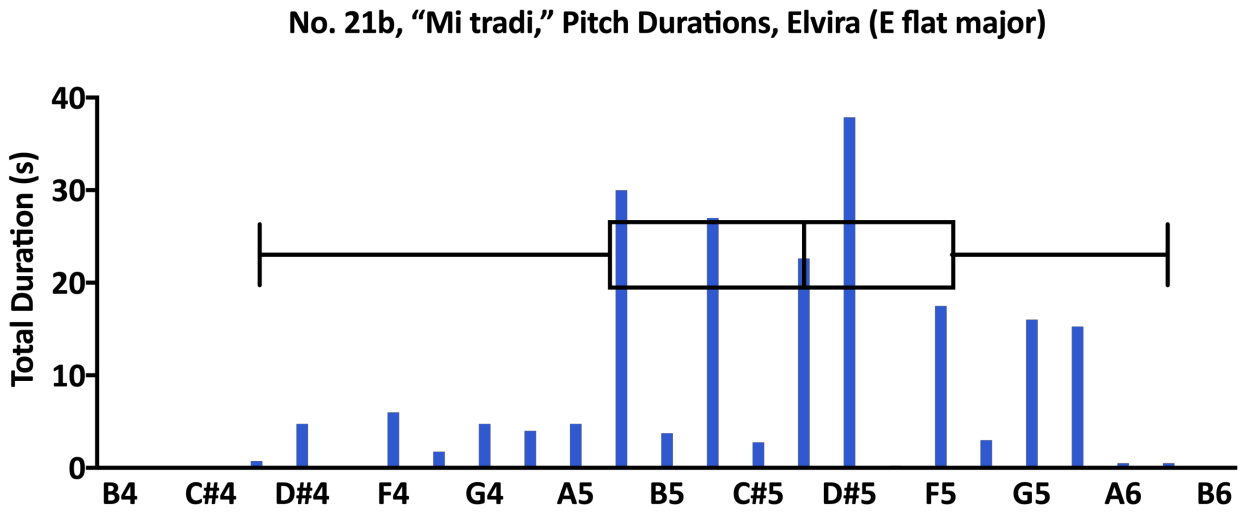

Figure 12. Bar chart with box and whisker analysis of no. 21b, "Mi tradì quell'alma ingrata"

Zerlina: Arias

Total time spent singing each pitch was calculated for the five selected musical numbers featuring the character Zerlina. The arias sung by Elvira are no. 12, "Batti, batti," (Figure 13) and no. 18, "Vedrai, carino"(Figure 14). For no. 12, "Batti, batti," the pitches sung by Zerlina range from C4 to B♭6. Fifty percent of the pitches sung by Zerlina during this aria fall between A5 and E5, with the

median pitch being C♯5. The most frequently sung pitch for this number is C5. This distribution is fairly normalized around the median, though slightly skewed left, and the quartiles around the median correspond well to tessitura, covering the range of a fifth.

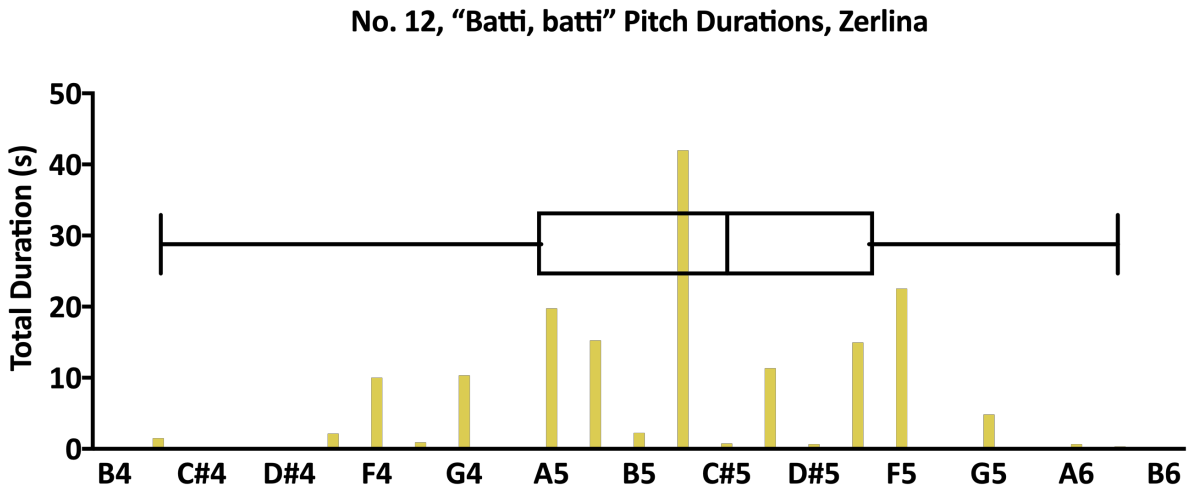

Figure 13. Bar chart with box and whisker analysis of no. 12, "Batti, batti"

For no. 18, "Vedrai, carino," the pitches sung by Zerlina range from G4 to G5. Fifty percent of the pitches sung by Zerlina during this aria fall between B5 and E5, with the median pitch being C5. The most frequently sung pitch for this number is C5. This distribution is difficult to ascertain accurately due to the small sample size, though the quartiles around the median correspond well to tessitura.

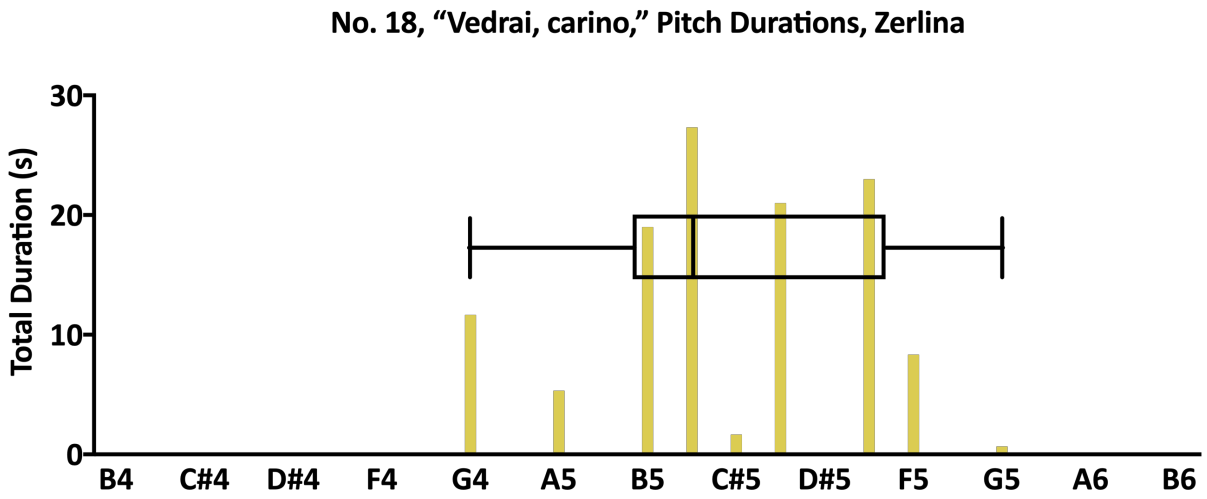

Figure 14. Bar chart with box and whisker analysis of no. 18, "Vedrai, carino"

Statistical Analysis: Ensembles

The act one finale, no. 13, the no. 19 sextet, and the act two finale, no. 24, were chosen for analysis because Anna, Zerlina, and Elvira sing in harmony in each of them. Results of median analysis are summarized and depicted below (Table 19, Figure 15, Table 20, Figure 16, Table 21 and Figure 17). In general, the middle quartiles are shortened here, in order to accommodate the tight vocal harmonies when all three voices sing together. Also of note is the finding that the exchange of lines in each ensemble is significant and is reflected in the medians summarized below.

Table 19. No. 13 Finale median analysis summary

Singer	**Total Range**	**Median**	**Mode**	**25%-75%**
Anna	F4-A6	E5	G5	C5-G5
Elvira	E4-A6	C5	C5	B5-E5
Zerlina	D4-A6	E5	G5	C5-G5

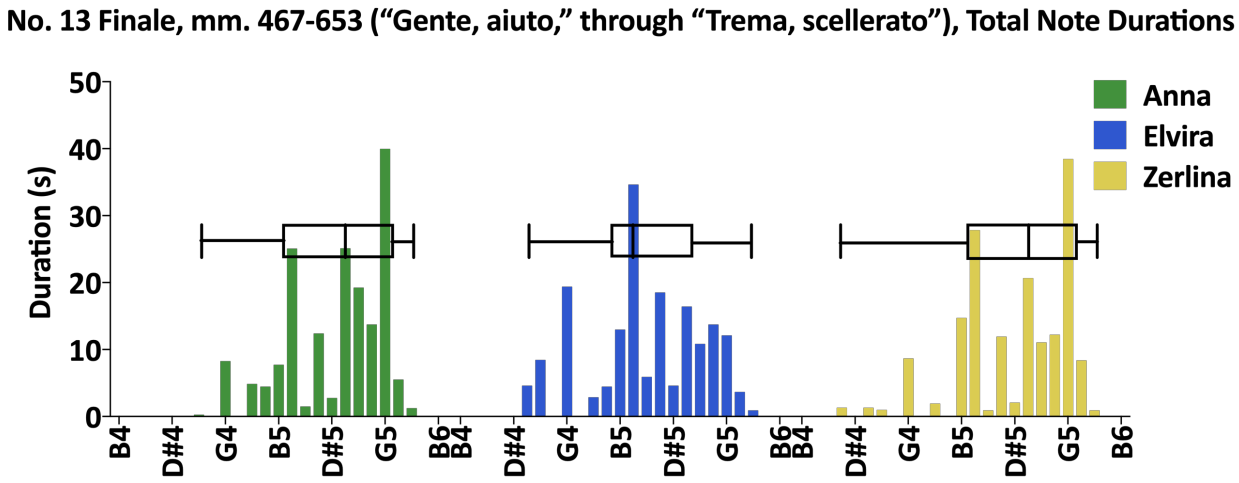

Figure 15. Bar chart with box and whisker analysis of no. 13 Finale

Table 20. No. 19 Sextet median analysis summary

Singer	Total Range	Median	Mode	25%-75%
Anna	E♭4-B♭6	E♭5	F5	D5-F5
Zerlina	D4-F5	C5	B♭5	B♭5-D5
Elvira	B4-G5	A5	G4	G4-C5

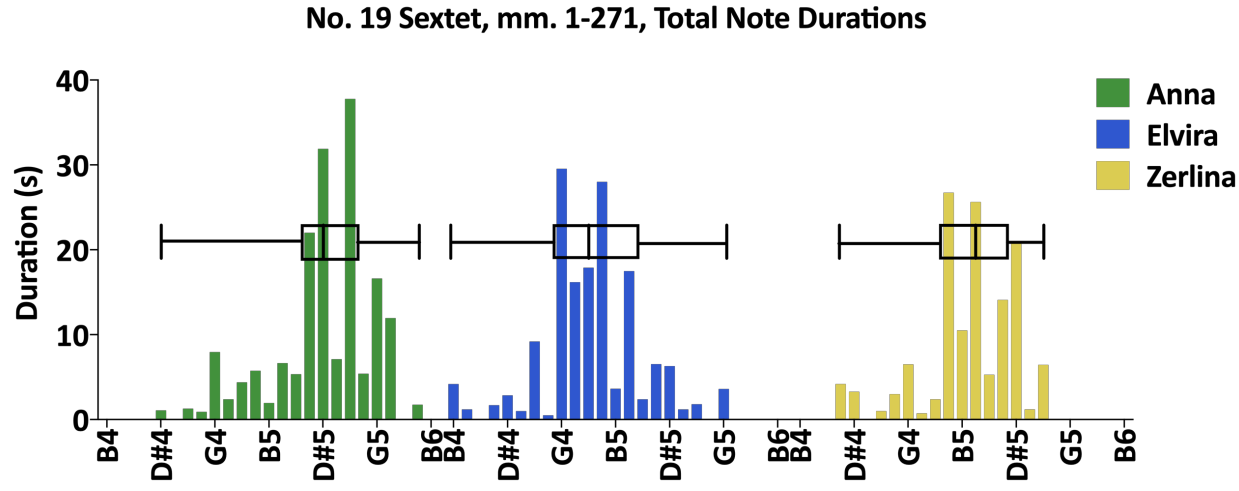

Figure 16. Bar chart with box and whisker analysis of no. 19 Sextet

Table 21. No. 24 Finale median analysis summary

Singer	Total Range	Median	Mode	25%-75%
Anna	D4-B6	E5	D5	C5-F♯5
Zerlina	C♯4-G5	A5	A5	G♯4-C♯5
Elvira	C4-A6	D5	F♯5	A5-F♯5

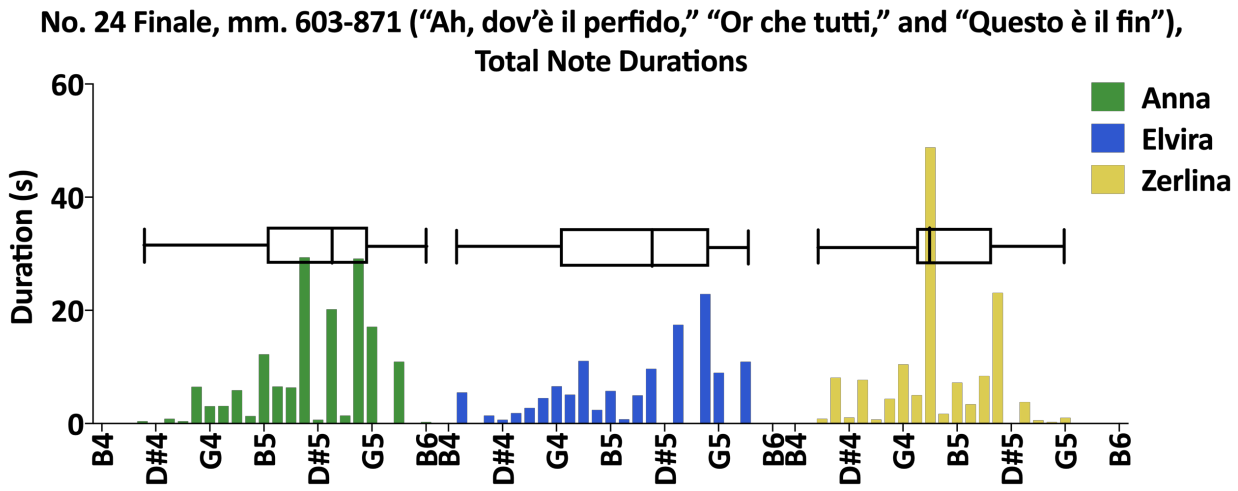

Figure 17. Bar chart with box and whisker analysis of no. 24 Finale

Statistical Analysis: Total Durations

Total time spent singing each pitch during each of the selected five musical numbers with each singer was summed to determine the total time spent singing each pitch throughout the analyzed portion of the opera (Table 22 and Figure 18).

Table 22. Total durations median analysis summary

Singer	Total Range	Median	Mode	25%-75%
Anna	D4-B6	E5	G5	C5-F♯5
Elvira	B4-B♭6	C5	B♭5	A5-E♭5
Zerlina	C4-B♭6	C5	C5	A5-E5

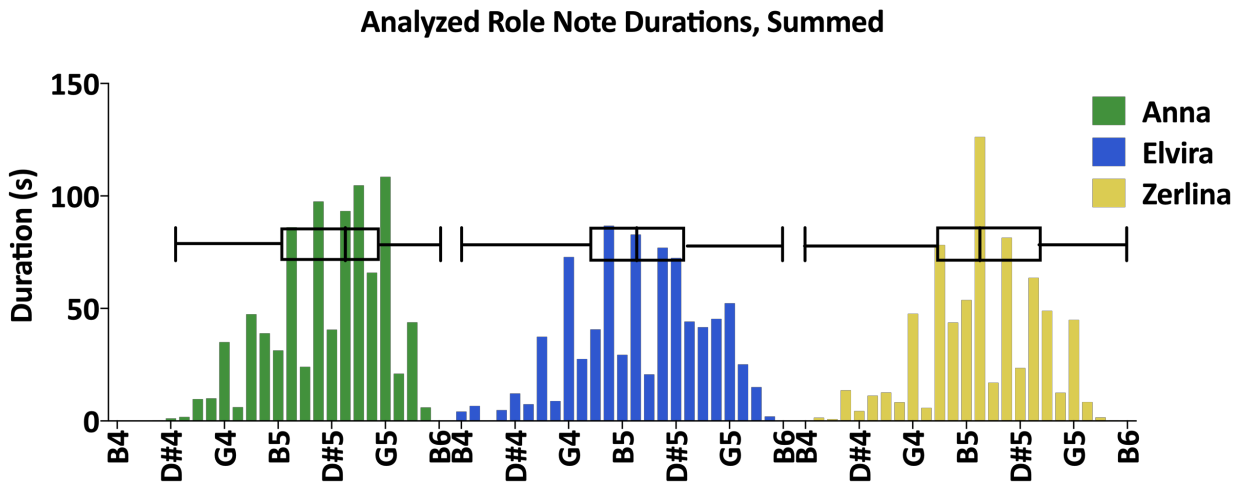

Figure 18. Bar chart with box and whisker analysis, total analyzed music

This data is significant in several ways. First, each role's music is substantially more normalized, showing that with the increase in sample size, the data normalizes around the median. However, there are some important trends to note: both Anna's and Elvira's distributions are still skewed, Anna's because of duration on high pitches, and Elvira because of number of pitches in the upper quartile. Additionally, Zerlina's mode and median of C5 far outstrips the duration of any other pitch (the next pitch, D5, lacks 44.75 seconds).

Statistical Analysis: Medians

So far, all this data has only been characterized descriptively, but not actually compared. When isolating the medians and upper and lower bounds of tessitura, comparative tests can be conducted to analyze parity or disparity. A 3 X 25 (Character X Pitch) Two-Way ANOVA was performed to determine whether there are significant differences between characters in time spent singing each pitch during the selected musical numbers of the opera.[63] There was no interaction between pitches and characters, $F(48, 350) = 1.20$, $p = 0.17$, nor was there was a main effect of character, $F(2, 350) = 1.30$, $p = 0.27$.[64] Unsurprisingly; however, there was a main effect of pitch, $F(24, 350) = 8.80$, $p < 0.0001$, confirming that there was unequal time spent singing each pitch throughout the opera.

One-way ANOVAs were performed on median pitches, the upper bound of the character tessitura, and the lower bound of the character tessitura to determine if there are differences between the tessituras of each female character in *Don Giovanni* (Figure 19). There was a significant difference between median pitch for each character (between Anna and Elvira, and Anna and Zerlina), $F(2, 13) = 3.87$, $p = 0.05$. The median pitch for Anna was E♭5 (15.4), for Elvira was C♯5 (12.83), and for Zerlina was C5(12.2). Fisher's LSD pairwise comparisons show that Anna's median was significantly higher than Zerlina's ($p = 0.02$) and Elvira's ($p = 0.05$).[65] There was no statistical difference between Elvira and Zerlina's medians ($p = 0.6$). There was also a significant difference between characters for lower bound of the tessitura, $F(2, 13) = 4.27$, $p = 0.04$. The lower bounds for

[63] Two-way ANOVAs analyze two variables, while one-way ANOVAs only deal with one.
[64] In general, the smaller the p-value, the greater the assurance that the results are valid and not due to chance. A p-value of 0.05 is considered standard in statistical analysis, but this not an absolute (it corresponds to a confidence level of 95%). This also correlates to two standard deviations from the median and covers 95% of the data on either side of that median.
[65] When the ANOVA shows a significant difference between three or more groups of data, additional tests can limit that difference to one or more pairs of the data analyzed. Fisher, the developer of ANOVA, is also the developer of this pairwise test.

Anna, Elvira, and Zerlina were C5 (12.2), A5 (9.66), and B♭5 (10), respectively. Fisher's LSD pairwise comparisons revealed that Anna's lower bound was significantly higher than Elvira's (p = 0.02) and Zerlina's (p = 0.04). There was no statistical difference between Elvira and Zerlina's lower bounds (p = 0.72). There was no difference between characters for upper bound of the tessitura, $F(2, 13) = 2.31$, $p = 0.14$, though there was a trend toward significant difference between the upper bounds of Anna and Zerlina (p = 0.07). The upper bounds for Anna, Elvira, and Zerlina were F♯5 (18), E5 (16), and E5 (15.6), respectively.

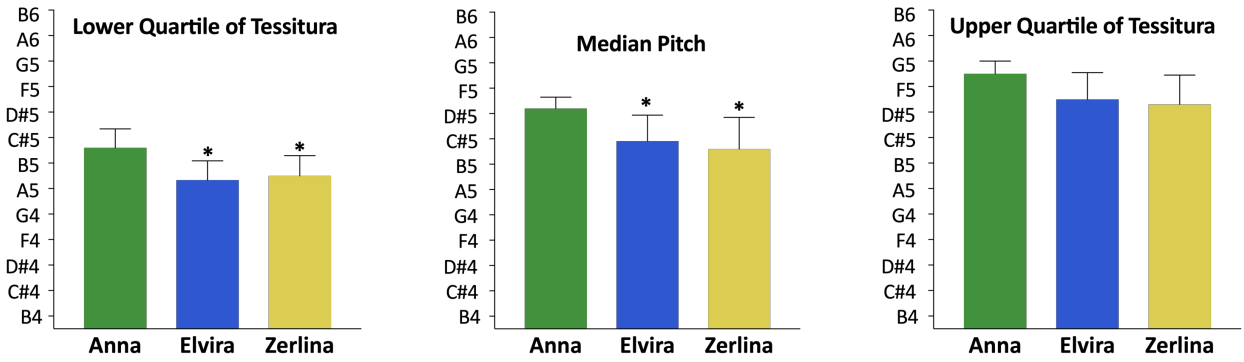

Figure 19. Comparison of tessitura, lower and upper bounds and median pitches[66]

Additional Problems

The preceding analyses treat each section of the three ensembles as equal in importance; however, in no. 19 and no. 24, there are two sections of music in which the singers don't sing together and their music behaves more like the music of the arias: in no. 19, the first section features two separate scenes with Elvira singing a duet with Leporello, and Anna singing with Ottavio; and in no. 24, the middle larghetto section features a long duet between Anna and Ottavio and a trio with

[66] *p<0.05 compared to Anna. Error bars represent ± one standard deviation.

Zerlina, Masetto, and Leporello, with Elvira only providing a short transition. This should not preclude these sections from analysis (they should not be included in total duration examples for a more complete view of how each voice behaves) but by omitting them, a shift in vocal behavior during interaction may become clear. These numbers without the soloist material for the pertinent characters were analyzed, and while the resulting difference in no. 24 was statistically unimportant and had no effect on the total medians or upper or lower bounds for the number, the ensemble music of no. 19 exhibited relevant changes (Figure 20, Table 23). Anna's tessitura remains unchanged, but Elvira's upper bound jumps down by a whole step; since she sings the bottom of the three harmonies in this ensemble, this shift may be unsurprising.

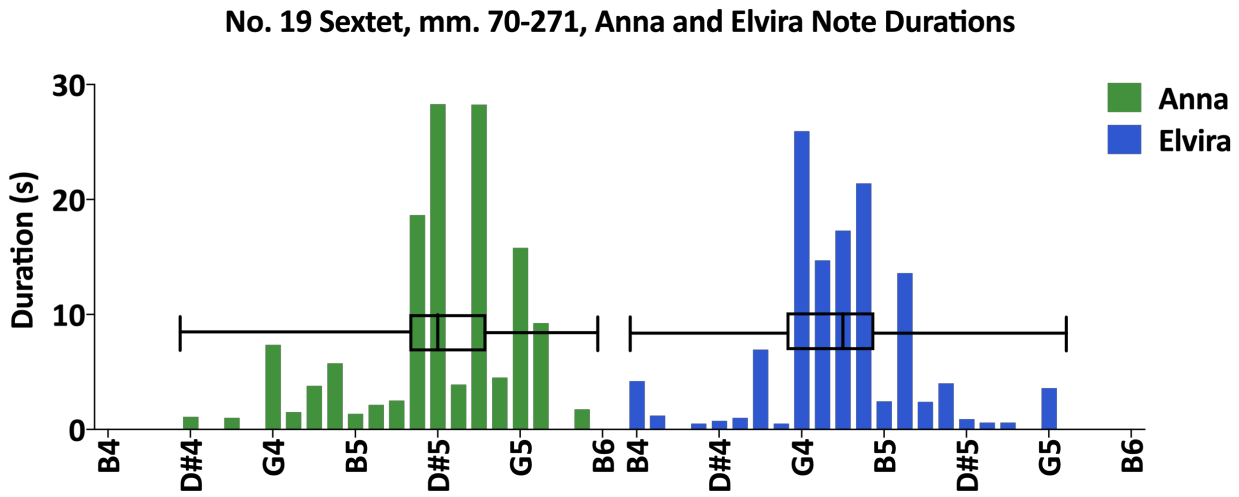

Figure 20. Bar chart with box and whisker analysis, no. 19 Sextet, "Ferma, briccone"

Table 23. no. 19 Sextet, mm. 1-271 vs. mm. 70-271, Anna and Elvira

Singer	**Median and Bounds, mm. 1-271**	**Median and Bounds, mm. 70-271**
Anna	D5-E♭5-F5	D5-E♭5-F5
Elvira	G4-A5-C5	G4-A5-B♭5

As exhibited above, when arias and ensembles are considered together, they may present an incomplete version of the overall tessitura of each role as it behaves from number to number. Therefore these numbers were separated and values were calculated for each to determine how the roles behave differently over the course of the analyzed opera (Figure 21, Figure 22).

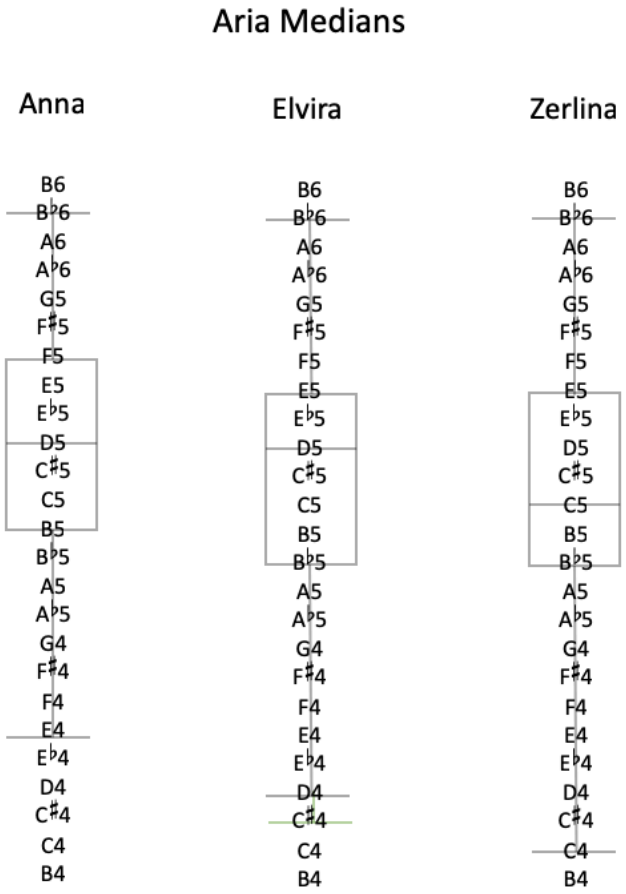

Figure 21. Box and whisker plots for medians and upper and lower tessitura and range, arias[67]

[67] The second lower whisker for Elvira's plot indicates that the pitch C♯4 is present in the D major version of no. 21b, but since the key does not affect the overall median, a separate plot is not included.

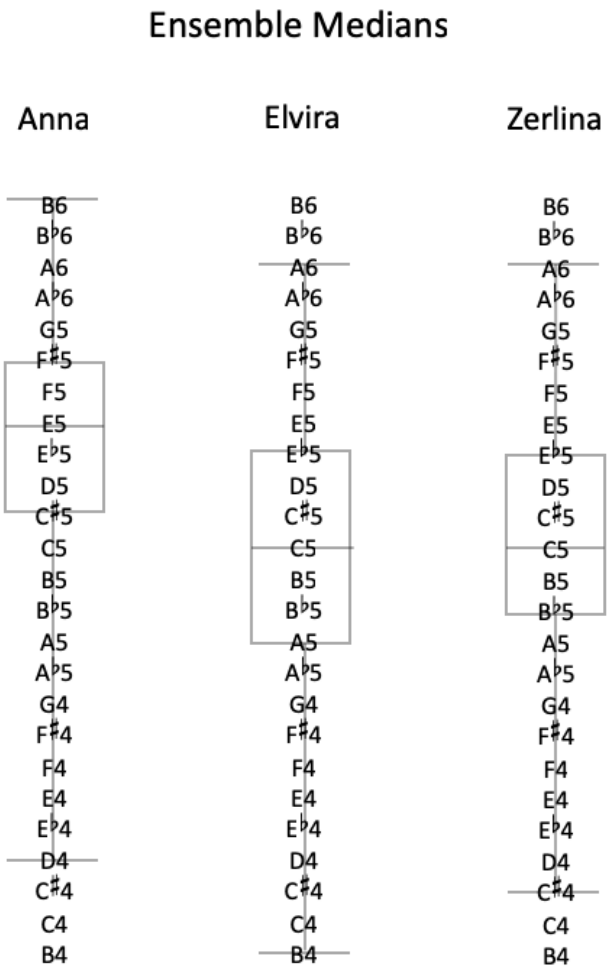

Figure 22. Box and whisker plots for medians and upper and lower tessitura and range, ensembles[68]

These comparisons show that Anna's vocal character is significantly higher in ensembles than in her arias combined, though similar to the tessitura bounds and median of no. 10. Elvira's ensemble music, on the contrary, sits a half or whole step lower than her arias, even with the inclusion of no. 24, where she predominantly sings the melody or middle harmony. Only Zerlina's median, quartiles and range are closely similar.

[68] Only true ensemble singing was included in this comparison, leaving out the first section of no. 19 and the second section of no. 24.

CHAPTER 6

CONCLUSIONS

Many of the questions this study sought to answer can be tentatively settled. It is important to keep in mind that even when considered overall, the data analyzed comprises a relatively small sample size, and in the future, more of the music might be included to more fully lay to rest some of these issues. Also, a test designed for nonparametric data may provide a less robust analysis but give a more accurate depiction with a smaller chance of error when considering the two-variable data set as a whole. Nevertheless, many of the problems that led to this study can now be at least partially answered.

Is there an overall order of tessitura for the three analyzed roles? Yes, but not a complete order. As could probably be surmised from information from the score, premiere casts, or current casting trends, Anna has the highest overall tessitura, and it is significantly different from the tessituras of Elvira and Zerlina. However, no significant difference could be found overall from the analyzed music between Elvira and Zerlina. Here the differences in aria and ensemble tessitura and characterization may prove to be the most useful differentiation.

Is there a similarity or disparity between arias within roles, or between ensembles and arias? Yes, in many cases, though perhaps not overly significant: Anna's second aria sits lower than her first aria overall, and though this difference can be easily explained by the dramatic context of each piece, when considered within the bulk of each act on the whole, the difference might prove to be negligible. Zerlina's second aria, while being contained to a much smaller range, exhibits a very similar tessitura and median. Elvira's arias also are quite similar, even with differences in character, mood, form, and vocal figuration. As for ensembles, when singing in harmony, Anna's tessitura is

most like her first aria, and Elvira's tessitura is lower than any of her arias, even the D major version of no. 21b.

As Rushton indicated, range and tessitura are a vital method for characterization, and these varying considerations for tessitura throughout the work must be considered carefully in order to achieve the best results. To return to the commonly suggested Fächer for these roles, it seems that dramatic coloratura soprano might be the best fit for Anna, with the high overall tessitura of the role. Perhaps a dramatic coloratura soprano might feel uncomfortable singing Elvira, with her overall lower tessitura, but the voice could bring a different, softer color to her midrange while still singing with clarity and ring in the upper register. Since the difference between lyric, spinto, and soubrette sopranos seems to be mainly one of color and not of range or tessitura, the roles of Elvira and Zerlina would not be unsuitable to any merely because of their tessitura. But a spinto soprano may be tested by Anna's higher tessitura, even if the voice does bring an exciting color and dramatic sound to the role that may be desirable.

Further study may be warranted into this methodology for measuring tessitura or even vocal dose, but some of the suppositions of this analysis should be taken into account. First, the data was collected from the score, and as such, applies to a theoretical performance in which tempo is strictly observed. Second, the quantity and dispersion of rests were not taken into account, and these surely have a great effect on vocal longevity and ease both on the small scale, by musical number, and large scale of the entire work. A related issue is the difference between frequency and duration of pitches (multiple touches versus sustained singing), which may affect vocal ease, and which was not distinguished in this analysis. Finally, and perhaps most importantly, a linear relationship of pitch and vocal dose was assumed. This necessitates thinking of outlying pitches as no harder to produce than midrange pitches, merely higher or lower. If the distribution is fairly normalized, this distinction may amount to little, but in a number or role with a great quantity of outliers, other means of

interpreting this relationship may provide a more accurate representation of the demands of the music.

Because the overwhelming majority of operas being produced today are not new premieres but part of the established repertory, the method by which these shows are cast is one of the chief concerns of not only the theaters producing the shows, but singers auditioning and performing in them. Though casting trends may change from season to season, the operas most firmly ensconced in the repertory make the same demands no matter what vocal color or physicality is currently on trend. The careful examination of roles like those in *Don Giovanni* therefore is in the best interest of the singer wishing to have a long and fruitful career, and ultimately in the best interest of those producing these shows as well. My hope is that this kind of analysis can provide one more tool for that examination, with the goal of finding a comfortable tessitura within a Fach and therefore helping singers attain their most beautiful singing throughout their careers.

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APPENDIX A

Supplemental Table A. Female Fächer and descriptions from Kloiber (2016)[69]

Serious Fächer	
lyric soprano	Mellow voice with beautiful fluidity; noble lines. Range: C4-C6
youthful-dramatic soprano	Lyric soprano voice with a greater volume, that can also create dramatic high points. Range: C4-C6
dramatic coloratura soprano	Flexible voice with extreme range; dramatic penetrability. Range: C4-F6
dramatic soprano	Voluminous, metallic voice; intense penetrability. Range: G3-C6
dramatic mezzo-soprano	Flexible, metallic Zwischenfach[70] voice of dark coloration, that often develops with increasing maturity into the high-dramatic Fach;[71] good top. Range: G3-B6
dramatic contralto	Flexible, metallic voice with a well-developed top and bottom; dramatic penetrability. Range: G3-B6
low contralto	Full, pastose (densely-painted) voice with extreme depth. Range: F3-A6
Comic and Character Fächer	
lyric coloratura soprano	Very flexible, mellow voice with extreme range. Range: C4-F6
soubrette (Spielsopran)	Delicate, lithe voice; dainty appearance. Range: C4-C6
lyric mezzo-soprano (Spielalt)	Pliable instrument capable of characterization. Range: G3-B6

[69] Rudolf Kloiber. 926. Translations LAC.
[70] Literally, "between-Fach," a designation for a voice between soprano and mezzo-soprano. Use of this term has a complex history but does not pertain to this paper; for more information, see Weiss, Stephanie, "Zwischenfach – a Distinct Voice Type: A Study of Fach through Specific Roles in the Works of Richard Wagner and Richard Strauss" (DMA diss., University of Nevada, Las Vegas, 2015), https://digitalscholarship.unlv.edu/thesesdissertations/2445.
[71] A holdover from a previous edition that distinguished the dramatic soprano roles of Wagner and Strauss into a separate category. This Fach has been subsumed into the dramatic soprano category as of this edition. See Kloiber, 1973.

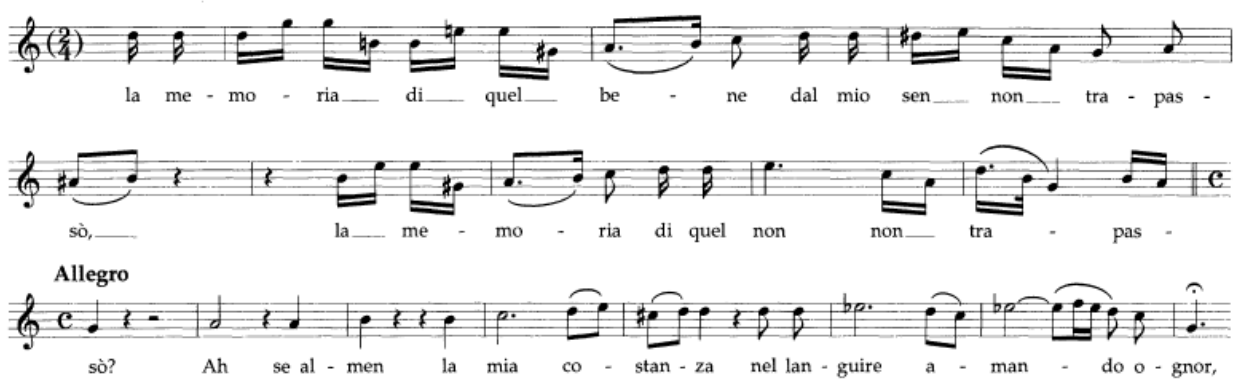
Supplemental Equation B. PCG formula

$$p = \frac{1d_1+2d_2+3d_3+ \ . \ . \ . \ +nd_n}{d_1+d_2+d_3+ \ . \ . \ . \ +d_n}$$

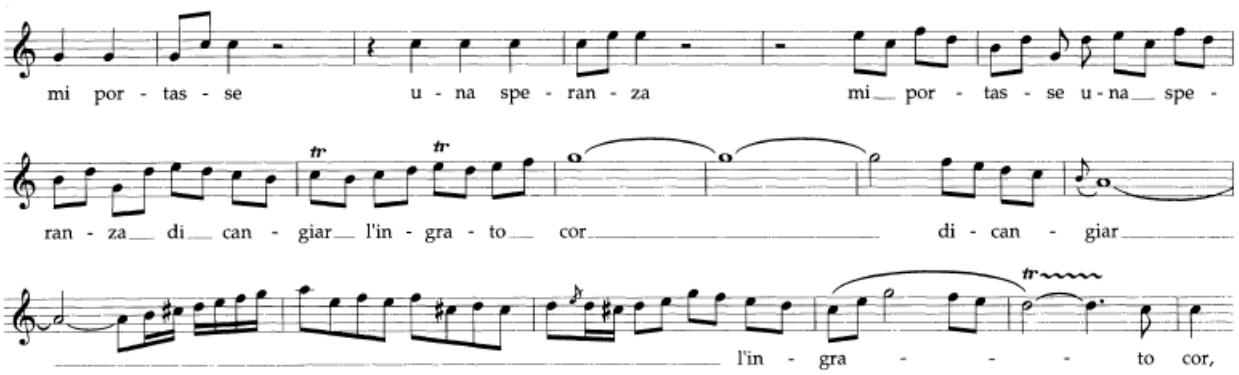
where p is the pitch to be determined and d_n is the duration of each iteration of the pitch within a selected section of music.[72]

Supplemental Figure C. Mozart, *Le nozze di Figaro,* KV 492, Act III, no. 21 (variant). "Dove sono," written for Caterina Cavalieri, 1789. [73]

a. mm. 28-43



b. mm. 68-84



[72] From Rastall. 190.

[73] Wolfgang Amadé Mozart, *Le Nozze Di Figaro: Eight Variant Versions*, ed. Alan Tyson (Oxford: Oxford University Press, 1989).

Supplemental Table D. Pitch numbering system

Note	Number
B4	-1
C4	0
C♯4	1
D4	2
D♯4	3
E4	4
F4	5
F♯4	6
G4	7
G♯5	8
A5	9
A♯5	10
B5	11
C5	12
C♯5	13
D5	14
D♯5	15
E5	16
F5	17
F♯5	18
G5	19
G♯6	20
A6	21
A♯6	22
B6	23

APPENDIX B

PCG AND STATISTICAL METHODOLOGY

1. Metric units have been entered as fractions of the basic metric unit of a measure (e.g., in a piece in four, a quarter note would have a metric value of 1, an eighth note a metric value of 0.5, etc.). These durations were entered to the thousandth decimal place. With regard to tempo, I have made every effort to accurately depict the correct ratio of note values across tempo changes.[74] In every instance possible, I used small ratios (1:2, 2:3, etc).
2. Only music with a strict tempo affords this kind of analysis. For this reason, all secco and accompagnato recitatives have been cut from inclusion.
3. In the case of long lines of music, I have never included breaths, even logical ones, in an effort to maintain true objectivity from the perspective of the written musical line.
4. Wherever indicated in the *NMA*, appoggiatura suggestions have been followed instead of the notated pitches. Similarly, all embellishments have been given their notated rhythm. Grace notes were calculated as occurring on the beat, and their duration was subtracted from the following pitch. Trills have been split evenly, except when this would not result in an integer, where preference has been given to the upper note. Fermatas have been given exactly 1.5 times the notated value, and only on those notes under the fermata, excluding any other cadential or embellishing material. No embellishing material has been added to any fermata that was not already suggested in the *NMA*, leaving room for interpolations to alter these numbers toward a slightly higher pitch.[75]
5. For pitch analysis, each half step was given its own integer with C4 (middle C) being 0 (and C5 in the treble staff being 12, C♯5 13, etc.). Any instances of pitches below C4 were

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[74] Insofar as it is possible to surmise, tempo markings may not have been strictly followed in the Classical Period as they are not today. This gets at the root of the music vs. text conundrum: when the stress of the language or the dramatic scene calls for broadening or tightening of the rhythm, it is to be expected that performers will slow and speed up, which is inherently a musical inclination.

[75] One authoritative example of ornamentation is "Non so d'onde viene," KV 294, which was the first concert aria Mozart wrote for Aloysia Weber in 1778. It is unique in that an autograph score exists with Mozart's own suggestions for embellishment of the melody. Though these embellishments do tend to raise the pitch, the resulting new PCG (14.64—D5/D♯5) is less than a quarter step higher than the original (14.29—D5). Thus I believe it is safe to surmise that even in the event of extensive ornamentation, the tessitura of any given performance would not have differed drastically from what was written in the score. This, of course, precludes stratospheric interpolations.

denoted with a negative number. Assigning one number to each pitch across arias that were written for Vienna and Prague does force one large assumption: that performances of these arias were done with the same tuning. This is still a consideration that is important today, with many performances of *Don Giovanni* being given at various concert pitches, whether standard A = 440 Hz, European A = 442 or 443 Hz, or Baroque A = 415 Hz.