

Pilot Study: Voice Effects Associated with Polycystic Ovarian Syndrome in Amateur and Semi-Professional Singers

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Project Proposal Form

Pilot Study: Voice Effects Associated with Polycystic Ovarian Syndrome in Amateur and Semi-Professional Singers

The context

PCOS and the voice is an emerging field of research and has minimal information available (Hannoun, 2011). In Module 1, I discovered that only three studies investigated the impact of PCOS on voice symptoms and the speaking voice (Aydin, 2016). Through a better understanding of this subject, I hope to share my knowledge with other singers interested in how hormones and PCOS affect the voice. I will be conducting this pilot study with participants recruited from my student roster at my private vocal studio- Dani Garcia Vocal Studios that has been operative for eight years. I have also found participants through referrals from fellow voice instructors who are semi-professionals with PCOS.

The justification

My diagnosis of Polycystic Ovarian Syndrome inspired the idea for this project. After beginning my journey into the literature about PCOS, I found out that 1 in 5 women are affected by this disorder (Aydin, 2016, pg.1). As I learned more about what the disorder entailed and affected, mainly the endocrine and reproductive system, I wanted to understand how hormones influenced the singing voice regarding the irregular menstrual cycle (Barbieri, 2021; Adam, 2014).

The intended impact

I want to research:

- Methodologies and results found in the three studies conducted on PCOS and the voice
- Any changes in regards to singing voice in relation to PCOS.
- If there are similarities or differences between women with and without PCOS (through the use of a control group)
- What other factors can affect these results (i.e. vocal hygiene, menstrual phase)
- Resources and methods that can help elevate my teaching practice by providing new tools to help assess students (ex. VoceVista)

Ramifications of the study:

The results of this study can be used to create a toolbox for voice teachers to use in their classrooms. The toolbox will help both teachers and their students understand the link between PCOS and hormones and the voice. Also, give them tools to overcome vocal obstacles that singers encounter caused by PCOS and hormones.

I want to create this resource and test it out for the final modules of the MA program.

The outlined intention

For this research study, I will use quantitative methods used in previous studies by Hannoun, Gugatschka and Aydin to have some form of comparable data (Aydin, 2016).

I intend to have 6-10 participants in this research study- made equally up of singers with PCOS and without. The research study will include:

- A literature review to understand methods and results that have already been found to cross-examine findings after completion of my pilot study
- A self-assessed structured survey based on voice quality inspired by the Voice Handicap Index as a tool for self-reflection that will be collected twice (Gugatschka, 2012).
- Two recordings of participants singing the chorus of Somewhere over the Rainbow in the key of D (so they maneuver over the B4/C5 break) (Kempfer, 2014, pg. 66).
- The recordings and surveys spaced 17-25 days apart to include different phases of a menses cycle (Bull, Rowland, Scherwitzl, 2019).
- VoceVista and teacher analysis of acoustic parameters, such as pitch quality, vibrato, breathiness, hoarseness and resonance, in submitted recordings.

Project Timeline:

ACTIVITY	18-Oct	25-Oct	26-Oct	31-Oct	01-Nov	08-Nov	16-Nov	17-Nov	21-Nov	22-Nov	30-Nov	01-Dec	08-Dec	09-Dec	16-Dec	26-Dec	02-Jan	08-Jan	09-Jan	19-Jan
Consent form																				
Survey and 1st recording																				
Analysis & Literature review																				
Survey and 2nd recording																				
Analysis of results																				
Report draft and submission																				
Final Report and submission																				
Project Presentation																				

The ethics and insider research

As an insider researcher, I must be aware that I may be too close to this project because (1) my students will participate and (2) I also have PCOS. I will have to be transparent and objective of any biases. Being objective will also help me reflect on my teaching practices (Hellawell, 2006).

Because this topic is related to medical concerns, it is essential only to use questions that relate to the voice because I am a voice teacher and not a medical doctor. All participants will sign consent forms, and all personal data will be protected and encrypted (University Wales, Trinity St. David, 2022).

Personal learning outcomes

- To understand voice changes associated with irregular menstrual cycles and what outside factors can affect them.
- To find differences or similarities in voice quality between amateur and semi-professional singers with PCOS and without.
- To learn how to analyze data on VoceVista.
- To better understand the vocabulary used in voice science and continue to train my ear to pick up nuances in the voice through analysis of recordings.
- To take the first step into creating a toolbox for vocal teachers to use with their students to overcome any obstacles caused by PCOS and hormones (regular and irregular).

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Project Report

Pilot Study: Voice Effects Associated with Polycystic Ovarian Syndrome in Amateur and Semi-Professional Singers

Introduction:

Extensive literature has been published about the influence of hormonal fluctuations and their effect on the voice within the context of the regulated menstrual cycle (Gunjawate, Dhanshree R et al., 2017). However, little is known about how irregular cycles affect the voice of singers and professional voice users (Aydin, 2016, pg. 2067).

The most common reproductive and endocrine disorder associated with irregular menstrual patterns is Polycystic Ovarian Syndrome (PCOS) (Aydin, 2016, pg.1). It affects 1 in 5 women of reproductive age (Gugatschka, 2012, pg.98; Garcia, 2021).

As a professional voice user and teacher diagnosed with Polycystic Ovarian Syndrome (PCOS), I need to understand the relationship between hormones and the voice through irregular and regular menstrual cycles to better evaluate and help my female voice students.

Participants in this exploratory study were recruited from my own private voice studio and referred to me by colleagues from other voice studios. All participants selected are amateur and semi-professional singers.

The study will examine whether Polycystic Ovarian Syndrome impacts the singing voice through comparison of (1) a literature review, (2) a self-reflective survey, (3) an analysis of recordings conducted by the researcher from the perspective of a voice teacher using a rating system and (4) spectrogram analysis of the same recordings on VoceVista Video Pro software. Two surveys and two recordings were collected over 17-24 days to look at snapshots of the voice at different times of the menstrual cycle.

The study aims to answer the following questions:

- Are there specific phases of the menstrual cycle that affect the voice most?
- Are there similarities or differences found through the self-reflective survey between PCOS and control groups?
- Are there similarities or differences found through the teacher assessment between PCOS and control groups?
- Are there similarities or differences found through spectrogram analysis between PCOS and control groups?
- Are there more observable changes in women with PCOS than in non-PCOS participants in general?

- What factors can contribute to these findings (i.e. vocal hygiene)?
- What were the research limitations?
- What recommendations can be made for future studies?

Learning outcomes include:

- Finding resources through a literature review that can corroborate or contradict study results.
- Understanding the impact of PCOS and hormones on voice production and vocal quality.
- Identifying common voice effects caused by regular and irregular menstrual cycles to improve teaching practice knowledge.
- Understand what tools are available for voice teachers in VoceVista to supplement voice analysis
- Learning new vocabulary to use in my own teaching practice.
- Identifying recommendations for future research.
- Reflecting on methodologies that can be used to simplify and standardize research studies so that data can be comparable.

Literature Review

Due to the aim of this pilot study, research presented in this literature review will be selective and will focus on Polycystic Ovarian Syndrome and its observed effects on the voice.

Approximately 20% of women have Polycystic Ovarian Syndrome (PCOS) (Aydin, 2016, pg.2067; Gugatschka, 2012, pg.98; Garcia, 2021). Voice complaints in women with PCOS usually occur between 19 and 40 years of age (Abitbol, 2019, pg.149). The primary hormonal imbalance in women with PCOS involves high androgen and low progesterone levels (Hannoun, Watson, 2015; Adam, 2014; Aydin, 2016, pg.6; Arentz, 2017, pg.1; Garcia, 2021). PCOS includes the presence of (1) polycystic ovaries, (2) hyperandrogenism (excess androgen) and (3) irregular menstrual cycles: including forms of anovulation (oligomenorrhea, amenorrhea) or, less commonly, prolonged menstrual cycles that are longer than 35 days (menorrhagia) (Hannoun, 2011, pg. 502; Blume-Peytavi et al. 2007, pg.1; Gugatschka, 2012, pg.98). Physical manifestations of the disorder vary on a case-by-case basis and can cause alopecia, insulin resistance, weight gain, hirsutism, acne, and psychological manifestations such as anxiety, depression, and brain fog, among other symptoms. (Blume-Peytavi, 2007, pg.1; Gugatschka, 2012, pg. 98; Garcia, 2021).

Unlike studies on the regular menstrual cycle, research on the voice and irregular cycles related to Polycystic Ovarian Syndrome is a relatively new field of study with limited information available

(Hannoun, 2011, pg. 501; Aydin 2016, pg. 2067). Only three studies have explored the relationship of PCOS and associated voice symptoms through analysis of acoustic voice parameters: (1) Hannoun (2011), (2) Gugatchska (2012) and (3) Aydin (2016) (Aydin, 2016, pg. 2067).

Hannoun et al. (2011) conducted the first study of PCOS and the voice that included 21 healthy participants in the control group and 17 participants with PCOS. The purpose of the study was to explore acoustic changes and voice symptoms associated with PCOS (Hannoun, 2011, pg. 501). Symptomatic parameters chosen to examine in his methodology were based on other related studies that explored excess androgen on the voice and low progesterone on the voice (Hannoun, 2011, pg. 501; Gugatschka, 2012, pg.98; Aydin, 2016, pg. 2067).

Through laryngeal videostroboscopy and acoustic analysis, Hannoun investigated the prevalence of throat clearing, deepening of the voice, lump in the throat, loss of voice and difficulty with voice amplification in participant groups with PCOS and without (Hannoun, 2011, pg. 501). Acoustic variables were measured by analyzing average fundamental frequency, shimmer, noise-to-harmonic ratio, voice turbulence index, maximum phonation time, and relative average perturbation (RAP). These variables were considered in the analysis of a recording of participants saying 'ah' for 2 seconds into the provided microphone (Hannoun, 2011, pg.502).

The study's final results found that participants from the PCOS group had more voice symptoms present than the control group. They reported that the most common voice problems included (in order from most to least prevalent) (1) throat clearing, (2) loss of voice, (3) lump in the throat and (4) deepened voice. However, they did not find any difference in acoustic parameters of the voice between groups (Hannoun, 2011, pg.501).

Gugatschka conducted a follow-up study to describe objective and subjective voice changes in women with PCOS in 2012. He acknowledged a gap in Hannoun's methodology that he implemented in his study- a standardized self-assessment method for participants through the use of the Voice Handicap Index (VHI-10) (Gugatschka, 2012, pg. 98). In addition to the survey, endocrinologic tests, voice analysis of a German text, and videolaryngostroboscopy were acquired from 24 participants with PCOS and 10 participants without (Gugatschka, 2012, pg. 98).

Acoustic parameters for analysis in recordings included mean vocal fundamental frequency, highest and lowest pitches, and softest and loudest phonations of a German text that was read three times at different volumes. He also analyzed every participant's sustained vowel at a

comfortable volume and pitch through the Multi-Dimensional Voice Program (Gugatschka, 2012, pg. 98).

Gugatschka concluded that no significant differences were found between the control group and PCOS group regarding vocal pitch, jitter, shimmer, noise-to-harmonics ratio, soft-phonation index, or VHI index assessment (Gugatschka, 2012, pg.99). He concludes that results may be different if professional voice users were recruited as sample participants instead of non-professional voice users used in his study (Gugatschka, 2012, pg.99).

Building on previous studies, Aydin (2016) speculates that the results of Hannoun and Gugascka may be contingent on the phase of the menstrual cycle not being considered in addition to small sample sizes (Aydin, 2016, pg. 2067).

In his study, 30 patients with PCOS and 22 in the control group are analyzed at the follicular phase (days 2-5) of their menstrual cycle (Aydin, 2016, pg. 2067). Aydin included demographic data, Voice Handicap Index assessment, Glottal Function Index (GFI), Reflux Symptom Index (RSI), laryngoscopy and stroboscopy in conjunction with acoustic analysis on Version 4 of Dr. Speech software (Aydin, 2016, pg. 2068; Bach et al., 2005; Belfasky, Postma, Koufman, 2011; Rosen, Lee, Osborne, 2004). Laryngoscopy and stroboscopy were used to evaluate glottal closure, muscle tension patterns and vibratory characteristics while participants phonated an /i/ vowel at low, local and high frequencies (Aydin, 2016, 2070). Acoustic analysis was based on three phonations that lasted longer than 3 seconds on an /a/ vowel (Aydin, 2016, 2071).

Once all these parameters were examined, similar to Hannoun and Gugatschka, Aydin found no differences in acoustic parameters between both groups (Aydin, 2016, 2071). All three studies discuss that participants in PCOS groups may not have high enough androgen levels to cause any discernible voice changes like those observed with hyperandrogenism (Hannoun, 2011, pg. 501; Gugatschka, 2012, pg.98; Aydin, 2016, pg. 2067). However, laryngoscopic and stroboscopic analysis found more supraglottic hyperfunction, impaired vocal fold vibration, and incomplete glottal closure present in the PCOS sample group (Aydin, 2016, 2071). Furthermore, there were higher impaired vocal fold vibration levels and abnormal muscle tension patterns. Aydin attributes this to the possible presence of Muscle Tension Dysphonia (MTD) caused by natural vocal fold pathology, glottal incompetence or psychological stressors associated with PCOS (Aydin, 2016, 2071; Belfasky, Potma, Reulbach, 2002; Van Houtte, Van Lierde, 2011). *Muscle Tension Dysphonia* is a diagnostic term that refers to increased tension of the laryngeal muscles that

diminishes voice quality (Aydin, 2016, 2071; Hillman, Holmberg et al., 1989; Morrison, MD., Rammage, 1993). However, because no differences in acoustic parameters were found, he did not confirm that abnormal tension patterns found were, in fact, MTD (Aydin, 2016, 2071). Additionally, self-assessment surveys (VHI, RSI and GHI) also showed higher voice complaints in the PCOS group than in the non-PCOS group (Aydin, 2016, 2071).

Based on his findings and previous studies, Aydin(2016) concluded that further research still needs to be conducted as findings cannot be compared due to differences in study designs.

Each study contributed new information and insight into other areas to explore regarding PCOS and the voice in future research. However, one of the overlooked areas in the previous studies is the singing voice. Although some studies include longer phonated vowels on a comfortable pitch, acoustic speech analysis was primarily conducted.

My exploratory pilot study will focus explicitly on PCOS and singing voice. I will use methodology from the previous three studies to shape my methodology with limitations to analytical tools available to the ordinary voice teacher.

Methodology

My ontological framework is based in Pragmatism and aims to use methodologies from quantitative and qualitative methods (Mackenzie & Knipe, 2006; Garcia, 2021). The methodology implemented in my pilot study is heavily influenced by studies conducted by Hannoun (2011), Gugatsckha (2012), and Aydin (2016), who rely on quantitative methods based on Positivist ideas to ensure consistency. (Easterby-Smith et al., 2012; Cohen et al., 2011; Aydin, 2016). Lomax (2004) discusses that quantitative data collection and methodology are necessary to investigate a new field of research where identifying a specific variable is most important. Once the variables have been identified, a combination of quantitative and qualitative data should be used (Lomax, 2004, pg. 108, Soiferman, 2004).

In general, the Pragmatist framework influences my teaching practice and ontological perspectives. This pilot study provides an opportunity to learn more about quantitative methods and aims to provide data comparable to methods and results used in similar studies.

This pilot study will also explore if testing the female voice over a more extended period shows differences in voice quality for women with irregular cycles as it does in women in regular cycles (Hannoun, 2011).

Repertoire selection and analysis methods:

The audio collected is a recording of the chorus of “Somewhere Over the Rainbow” sung by each participant in the key of D. The piano track was provided for students to sing to with headphones to keep timing similar across all recordings. Lyrics and sheet music were also provided. Due to the nature of the pandemic, I asked students to record themselves on their phones using the voice memo app of their choice.

This song was chosen because it is a popular contemporary ballad (Soto-Morettini, 2014, pg. 234). Although ‘Somewhere Over the Rainbow’ is typically sung in Ab major, I wanted to examine if shifting the key to D would showcase how the participants managed the B4/C5 bridge area (Kempfer, 2014, pg. 66).

This exploratory pilot study aims to identify observable voice changes and symptoms in adult amateur and semi-professional singers with PCOS.

Data was collected from:

1. a self-assessed structured survey of the voice
2. a teacher assessment rating of recorded audio of participant singing
3. spectrogram analysis of the same recordings from each participant.

Self Assessment and Surveys:

Recordings and surveys were collected twice during different phases of the participant’s menstrual cycle 17 to 25 days apart. The time frame was selected based on the knowledge that the follicular phase is the most prolonged in the menstrual cycle and lasts an average of 16 days (Bull, Rowland, Scherwitzl, 2019). The rationale behind this was to capture any differences in the voice at different times of the menstrual cycle for both PCOS and non-PCOS groups, which was not done in previous studies (Hannoun, 2011; Gugatschka, 2012; Aydin, 2016).

Borrowing from the self-assessment tools implemented by Aydin (2016) and Gugatschka (2016), this pilot study used a structured survey as a tool for the evaluation of data similar to the Voice Handicap Index (Gugatschka, 2012; Aydin, 2016). Inspiration was also taken from a questionnaire given out by Hensen, Zhang, Loven et al. (2018), combining the Visual Analogue Scale (VAS) and Likert- scales to measure voice quality such as voice failure and hoarseness.

A sample of the survey form used in this study is shown in appendix G. The surveys collected demographic, lifestyle and voice quality data. Ratings 1 (low) to 10 (high) were used for voice quality questions and never-to-often for the lifestyle questions. More detail on the survey and the results is given in the findings section.

Teacher Assessment:

In order to grasp a bigger picture of the overall recording and performance, I conducted a teacher assessment rating of the overall performance with a similar scale of 1 (low) to 10 (high) through the use of the exact parameters of pitch, breathiness, hoarseness and resonance for every participant and recording submitted. These acoustic parameters were selected because they are the most observed in voice quality analysis (Maryn, 2010). More detail on the teacher assessment and the results can be found in the findings section.

Spectrogram analysis:

With voice spectrographic analysis, vocal components can be visualized more objectively (Yasaui, 2004). When these patterns are formalized, they can be used for a variety of clinical situations (Yasui, 2004, pg. 35). Vowels and sounding consonants are displayed as colours representing the amount of harmonic energy (dB) produced (Puurtinen, Aijia, Eerola, Ritva, 2017, pg. 17). In voice quality analysis, the most observed parameters are hoarseness and breathiness, as they indicate insufficient vocal fold abduction and vocal irregularity (Maryn, 2010). Breathiness, hoarseness, pitch and resonance were also selected to be observed in VoceVista Video Pro.

Unlike previous studies, this study focuses on singing instead of short sustained pitches and speech through spectrogram analysis. Because of the amount of information each recording contained, specific sections were selected to measure acoustic parameters.

Demographic Selection:

The justification for using amateur and semi-professional singers is that professionals are more likely to have less perceived modifications in acoustic parameters between recordings due to proper use of technique. I must also acknowledge that because the purpose of a voice studio is to help the general population, random selection used in quantitative research cannot be of concern (Lomax, 2004). Quasi-experimental studies cannot be randomized either because it is logically impossible or because an assignment was implemented by someone other than the researcher (Lomax, 2004, p. 108).

This study demographic uses a more realistic sample of the demographic I have in my studio. It can provide helpful insight into my teaching practice by reflecting on how I assess as a practitioner. It can also provide a better evaluation methodology to identify and help voice problems related to hormonal changes.

I acknowledge that I am an insider researcher due to my students' involvement in the study and my position as a voice professional with PCOS (Hellawell, 2006). By examining the individual study methods, I need to be objective and not impose prior knowledge regarding my students or the topic of PCOS and the voice especially (Greene, 2014).

Recruited participants are between the ages of 20-40 and come from my private voice studio or were referred to me by other voice teaching colleagues from Canada and Peru. Written informed consent was obtained from the researcher's voice studio and all participants before the commencement of the study, see appendix E. As PCOS can pose ethical concerns as it is a medical disorder, steps to create a safe environment included providing a resource list of websites to alleviate any stress and the option to opt-out of any questions or the entire study without explanation required. Questions were selected to observe factors that directly affect the voice meaning no further medical questions were asked. They were also informed that their identities are strictly confidential and that their information would be safe behind double password-protected storage methods.

All study procedures and methodologies were reviewed and approved by the ethics committee at University of Wales Trinity St. David. All participants participated voluntarily.

Results and Analysis

This exploratory pilot study observed a small group of singers with and without PCOS as a demographic. All participants in the study submitted a completed survey and recording within the time limits. No other exclusionary measures were used. All data was analyzed through descriptive and inferential statistical analysis. Descriptive analysis is used to identify primary tendencies in the data and observe any variances that can be analyzed alone or compared to one another (Creswell, 2014; Soiferman, 2010). Inferential statistics allow the comparison of independent variables and allow the researcher to make conclusions about a population and test out previous hypotheses or results (Creswell, 2014).

The results from the participant's surveys, the teacher and vocevista assessments are shown in the tables of appendix B. The analysis of the results included the following steps:

Surveys:

- 1) Demographic: Information analyzed and compared between control and PCOS group
- 2) Lifestyle information (2 surveys)
 - a) Information on first survey was analyzed and compared between control and PCOS group
 - b) Information on second survey was analyzed and compared between control and PCOS group
 - c) Information on the first survey was compared to information on the second survey.
- 3) Voice quality information (2 surveys)
 - a) Information on first survey was analyzed and compared between control and PCOS group
 - b) Information on second survey was analyzed and compared between control and PCOS group
 - c) Information on the first survey was compared to information on the second survey.

Teacher Assessment:

- 1) The assessment of each recording was done 3 times.
- 2) The assessment results of first recording were analyzed and compared between control and PCOS group

- 3) The assessment results of second recording were analyzed and compared between control and PCOS group
- 4) The assessment results of the first recording were compared to the results of the second recording

Spectrograms (Vocevista):

- 1) The VoceVista information on pitch, resonance, hoarseness and breathiness was collected for each of the two recordings.
- 2) The results from the first recording were analyzed and compared between control and PCOS group
- 3) The results from the second recording were analyzed and compared between control and PCOS group
- 4) The results of the first recording were compared to the results of the second recording

Finally, the results from the self-assessment were compared to the teacher assessment and to VoceVista results to check for consistency.

Self-Assessed Surveys

The self-assessed surveys were used to understand how students felt about their voices in general and for some questions, in that particular moment in their menstrual phase. The options available in the survey were based on VHI, VAS and Likert- scales. A rating scale from 1 (low) to 10 (high) was used by participants to rate the degree of intensity of voice symptoms they were currently experiencing. The survey included a section for assessing vocal function in varied social settings such as at home, at work, at leisure and in a noisy environment. Additionally, participants were asked about their vocal hygiene concerning smoking habits, reflux symptoms, asthma, and medications (Hensen, Zhang, Loven et al., 2018).

Out of 7 participants, 4 had PCOS and 3 were part of the control group (non-PCOS). The survey demonstrated that all participants in the control and PCOS groups were consistent with the literature on PCOS- those in the control group had regular cycles, and PCOS participants all had irregular cycles (Aydin, 2016). Interestingly, survey results found that all participants reported having PMS at one point during the pilot study. The demographic assessment also showed that the only two semi-professional singers from this sample were in the PCOS group.

One participant in the control group reported having Endometriosis which is another endocrinological disorder (Abitbol, 2019). Another participant in the control group was an occasional smoker. There were no significant differences between groups regarding medications taken.

The lifestyle portion of the survey found that, in general, PCOS participants reported more voice problems in varied social settings (at home, at work, at leisure, and in noisy environments). Voice problems observed in the survey included fatigue, hoarseness, excess phlegm, mucus or breathiness. This is consistent with Aydin's findings that women with PCOS report more vocal problems (Aydin, 2012). 100% of PCOS participants also said they clear their throat regularly in both survey rounds. There was no significant difference in strain between groups.

Most amateur singers reported Medium resonance (3-6), whereas the semi-professional vocalists reported high resonance levels overall.

In the second survey, the control group had higher voice complaints and more trouble hearing than the first survey. This could indicate voice changes caused by a hormonal shift as both surveys' lifestyle factors were the same (Abitbol, 2019). The fluctuation of voice and hearing problems in the control group could be explained by Premenstrual syndrome. 100% of all participants say they suffer from PMS at some point in their menstrual cycle. The phase with the most reported voice problems for all women of reproductive age is the luteal phase of the menstrual cycle. Premenstrual Syndrome can accompany Premenstrual Voice Syndrome and cause voice fatigue, husky voice, and transient deafness, which were symptoms experienced by the control group (Sataloff, 2013; Abitbol, 2019; Oberlander, 2010). However, because information regarding the menstrual phase was not asked, it cannot be confirmed that the control group was in the luteal phase of their menstrual cycle.

There were no significant differences between breathiness and strain between PCOS and the control group. Overall, all voice problems were presented in both groups with 67% or more.

When comparing the self assessment of the voice quality, only 30-40% of self-assessments were consistent with the teacher and VoceVista analysis.

After completing the survey, participants were asked to submit a recording of 'Somewhere Over the Rainbow.' Each survey was submitted with a recording. The intention was to see if their self-perceptual assessment was reflected in their singing.

Teacher Assessment

Every recording submitted was listened to 3 times by the voice teacher. In the first assessment, initial observations were made in shorthand notes to reflect the researcher's perception. This would be similar to the type of notes I would make in the classroom in my voice studio. These notes were taken to identify parameters that I may be missing and help contextualize the VoceVista analysis results.

The second assessment was used to assign a rating on a scale from 1 (low) to 10 (high) for each other parameters considered: pitch, resonance, breathiness and hoarseness.

The third assessment was used to adjust perceptual measurement parameters after listening to all participants. This means that the rating given is relative to the level of participants' singing in the study. The four acoustic parameters observed were chosen because they were significant to previous observations in studies by Hannoun (2011), Gugatschka(2012) and Aydin (2016).

Pitch, Breathiness, Hoarseness and Resonance were evaluated. For consistency, the terms were defined as such:

- *"Resonance"* was interpreted as vibrato and bell-like quality in this context, based on the interpretation of Howell (2017). It was interpreted as vibrato in VoceVista and analyzed visually by how colourful, and clear harmonics were displayed on the spectrogram.
- *"Hoarseness"* was interpreted as an "involuntary scratchy voice." VoceVista interpretation refers to messy and unclear harmonic lines (Chiaramonte, Bonfiglio, 2020)
- *"Breathiness"* is defined as an "involuntary whisper sound" present in the voice (Chiaramonte, Bonfiglio, 2020). It was interpreted as excessive gaps in the harmonic spectrum.

Fig. A22 in Appendix A provides an example of breathy tone and resonant, balanced voice examples. The glottal voice example was not one of the four parameters and, therefore, will not be included in the analysis.

Findings for the first recording in the teacher assessment show that the PCOS group had slightly lower scores regarding pitch. However, this resulted from one out of 4 participants who struggled with pitch consistently in the PCOS group. The reasoning behind this could be related to PCOS or caused by inexperience in singing, as the participant only had 1.5 years of singing experience.

Breathiness and hoarseness were also observed. Breathiness was consistent for the PCOS group through both recordings; however, the difference was minimal compared to the control group.

The teacher assessment concluded that no other significant differences were found between groups that could be perceived.

When comparing the teacher assessment to the VoceVista assessment approximately 60% of agreement was found.

VoceVista Analysis

VoceVista Video Pro was used to assess the same parameters as the Teacher Assessment: Pitch, Breathiness, Hoarseness and Resonance as defined above. A rating from 1(low) to 10 (high) was also given and modified to an equivalent measurement of 'low, medium, and high' for every parameter. It should be noted that the amount of data produced from two recordings for every participant proved too much to analyze, so strategic locations in the spectrogram were selected to measure pitch and vibrato.

A previous study conducted by Aydin (2016) also observed pitched stationary vowels; however, a song was selected to understand how singers approach notes in action while singing, which is part of the study's goal. Please see Appendix D for the lyrics of the song.

Three locations were selected to be analyzed in VoceVista.

- The first location selected the word 'some' at the start of the recording. This note was used to observe the initial pitch sung. Please see Figures A1-7 in Appendix A for the VoceVista spectrograms from all participants.
- The following note observed was 'high' at the end of the second phrase of the chorus. This note was observed for pitch. Please see Figures A15-21 in Appendix A for the close up of this section on the spectrograms.
- The third note observed was 'true' for vibrato and pitch. It is located at the end of the recording. It was most likely to have vibrato because it is at the end of a phrase (Miezel, Cherer, 2009, pg. 73). Please see Figures A8-A14 for a close up of this location. The written pitch of this note is D4 (293.66 Hz).

Pitch in Hz, amplitude in cents, and vibrato rate in Hz are the only true objective and quantifiable parameters that can be measured in VoceVista (Yuin, 2004).

Mean pitch was analyzed for every participant in both recordings. In this context of mean pitch, the rating 1-3 was used to refer to off-pitch singing, 3-6 as adequate pitch and 7-10 as accurate pitch. Pitch in both groups was consistent in both recordings. The PCOS group was found to have less pitch accuracy by 25%. Findings were consistent with teacher assessment.

Breathiness on VoceVista is shown as black and empty space in the upper harmonics and represents a weaker diaphragmatic, laryngeal connection (Puurtilinen, Aijia, Eerola, Ritva, 2017, pg. 18). It is a graphic interpretation of the acoustic parameter and is not quantifiable. It is estimated through researcher interpretation. The control group showed slightly higher breathiness in both recordings.

Hoarseness can be seen as thick and uneven harmonic lines on the spectrogram and are indicative of too much subglottal pressure (Yasaui, 2004). Hoarseness was consistent in both recordings in both groups between first and second recordings. However, the control group showed higher hoarseness through spectrogram analysis.

Both of these results can relate to the participants' singing experience. Two semi-professional singers in the PCOS group have been singing for 15 to 20 years. Both participants showed higher voice quality and consistency compared to other participants.

Another factor contributing to the control group showing higher hoarseness and breathiness is that two participants in the control group have muscle tension dysphonia and the third participant occasionally smokes.

Vibrato analysis was also done on the word 'true' for all participants in both recordings. Mean pitch (Hz), mean rate (Hz) and mean extent (ct) were used to infer how much vibrato is present for every singer. See figures A8 to A14 for vibrato analysis of the two recordings for each participant. The mean rate was categorized as 0-5 (low), 5-6 (medium) and 6+ (high). Typical values for frequency vibrato rate are 4.5 to 6.5 Hertz (Nix, 2015)

Mean extent was categorized as 0-25 (low), 25-75 (medium) and 75+ (high) in cents. It refers to how far above and below the oscillation is concerning the mean frequency. One hundred cents is the average distance between semitones (Nix, 2015). A typical value for vibrato extent is 50 cents (Nix, 2015).

There was no significant difference found between groups. Most participants showed some signs of vibrato. However, the two participants that stand out with the strongest vibrato are the semi-professional singers previously mentioned.

The reasoning behind this can be that the two semi-professional singers may have the ability to compensate with technique (Rodney, Sataloff, 2019; Oberlander, 2010).

No significant differences were found in acoustic parameters between PCOS and control groups. This is consistent with findings from Hannoun (2011), Gugatschka (2012), and Aydin (2016).

Limitations and Justifications

Self-assessment method by participant

Only 30-40% of self-assessments were consistent with the teacher and VoceVista analysis. Singers with limited singing experience may have more trouble assessing their voice because they may not understand the acoustic parameters enough to evaluate their voice problem fairly. However, the self-assessment component is beneficial and gives the teacher insight into the student's vocal hygiene and can help identify reasons for voice problems. A student self-assessment could be beneficial to use in the voice studio as well in order to understand the

student's background and introduce concepts about vocal hygiene. It can also give the teacher insight into how students perceive their voice compared to teacher evaluation.

Perceptual assessment of teacher

Approximately 60% of accuracy was found in teacher assessment compared to VoceVista findings. In particular, there was difficulty distinguishing hoarseness in the recordings. This may be because more perceptual training needs to be done to better pick up nuances in the voice. It can also be explained by the inconsistent quality of recordings. This study used recordings submitted by students and did not have a standardized microphone set up like in the studies by Hannoun, Gugatschka and Aydin (Aydin, 2016). The lack of standardization may lead to excess white noise or background noise picked up from the phone or the location of participants and create a bias in the teacher and spectrograph assessment. It is recommended that future studies should include a standardized setup for participants to limit any other factors interfering with the voice recording.

In addition, the researcher may need more practice reading spectrograms as this is a new tool explored for this study.

Regardless, the teacher assessment brought another layer to verify other evaluation methods like the survey and VoceVista assessments.

Assessment with VoceVista

VoceVista is a great tool to perceive the voice visually. However, because multiple factors affect voice production, it can only visualize a specific moment, it cannot provide a universal truth (Puurtinen, Aijia, Eerola, Ritva, 2017, pg. 40). Therefore it must be used in conjunction with other methods like the survey and teacher assessment to understand the voice holistically and explain why specific measurements are captured.

Another limitation of VoceVista and spectrogram analysis is that specific measurements cannot be quantified and rely on the researcher's interpretation to read the visual patterns displayed when observing breathiness, hoarseness and resonance (Yuin, 2004).

Other limitations

After analyzing the results of the self-assessment survey, all participants in the control groups had conditions (MTD, Endometriosis) or voice hygiene habits (i.e. occasional smoking) that would have been excluded from the studies conducted by Hannoun, Gugatschka and Aydin (Aydin, 2016). However, this adds an exciting element to my pilot study as it brings realistic student cases into the study.

Conclusions and Recommendations

The primary findings of the study indicate that a lower mean pitch was found in the PCOS group by the teacher and VoceVista assessments. This finding is consistent with Hannoun's (2011) results, who also found lowered pitch amongst his PCOS participants. Similar to Hannoun and Aydin's results, the PCOS group reported more voice problems, particularly throat clearing. There was also more prevalence of hoarseness, voice failure and phlegm were reported in the PCOS sample group identified in the self-assessed survey than the control group. Similar to all three previous studies, no significant differences were found in acoustic parameters based on teacher assessment and VoceVista analysis (Hannoun, 2011; Gugatschka, 2012; Aydin, 2016).

The results from previous studies that used speech for analysis were consistent with this study's using singing voice. However, more research is required with a larger sample size for better comparison.

Sector Implication:

This study has shown that there may be higher levels of vocal problems felt by women with PCOS, however, it also shows that women in the control group experience the same vocal symptoms at some point in their menstrual phase. More access to resources can be provided for female singers in the future to help understand vocal hygiene, vocabulary and terms used to better communicate what they feel with their voice, and how hormones affect the voice.

Reflections on Pilot study and Teaching Practice:

Through reflection on initial learning outcomes, everything was met. Although there were only three studies on PCOS and the voice, there was enough information to help guide and create this exploratory pilot study. In addition to the literature review, extensive reading was done to

understand better factors affecting the female singing voice and justify results. This knowledge will help build a foundation for the following research modules.

An extensive amount of research also went into understanding unfamiliar concepts regarding acoustics and the medical field. A glossary in Appendix C is the first step to creating a glossary of terms related to hormones, voice and acoustic vocabulary that can be shared with students and teachers.

I also have a new understanding of quantitative tools that will help elevate my teaching practice through VoceVista and visual analysis.

Finally, this process also confirmed my ontological framework as a Pragmatist. Voice is a multifactorial field, and in regards to singing cannot be held to use quantitative data. In this respect, there was a qualitative aspect in the analysis of VoceVista spectrograms and in the teacher assessment, as the interpretation is subjective to the researcher. However, the data was translated back into quantitative data to maintain comparable results to each method used and previous study methods. Trochim (2006) contends that all numerical data is inseparable from the qualitative meaning given and that all good research is done with both. As this is a relatively new field, I would recommend a longer mixed-method study using a larger sample size be conducted with a focus on singing voice and PCOS to verify findings.

Singing is multifactorial and requires elements of both quantitative and qualitative methods for analysis to get a comprehensive view of a participant's voice or a group.

This exploratory pilot has helped me understand more about how hormones affect the voice in irregular and regular menstrual cycles, advanced my voice and medical terminology knowledge, and helped me understand the basics of acoustics and VoceVista analysis. It has given me inspiration about tools that can be used in my voice studio.

My goal is to publish and lecture about hormones and the voice in the future.

For the following modules, I would like to research the area of holistic voice teaching and therapies that can help students and teachers navigate any voice problems that may arise due to hormonal imbalances. In addition to my reflections on this pilot study, these resources will continue building the foundation for a resource toolbox and methodology that can help teachers and students understand and overcome the effects of hormones on the voice to be explored in Module 6.

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Appendix A: Spectrograms from participants

Fig. A1. Spectrogram for recording 1 and 2 from participant 1
Pitch at start, word “some”

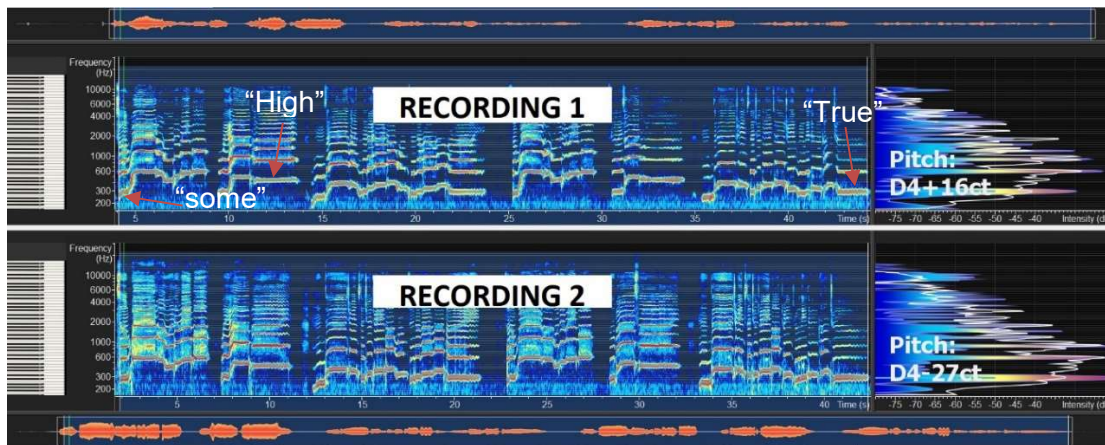


Fig. A2. Spectrogram for recording 1 and 2 from participant 2

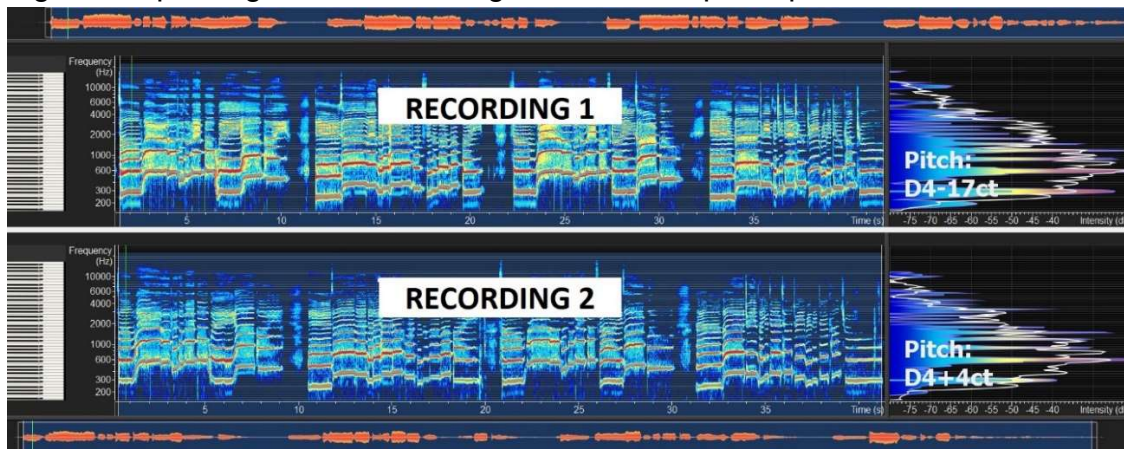


Fig. A3. Spectrogram for recording 1 and 2 from participant 3

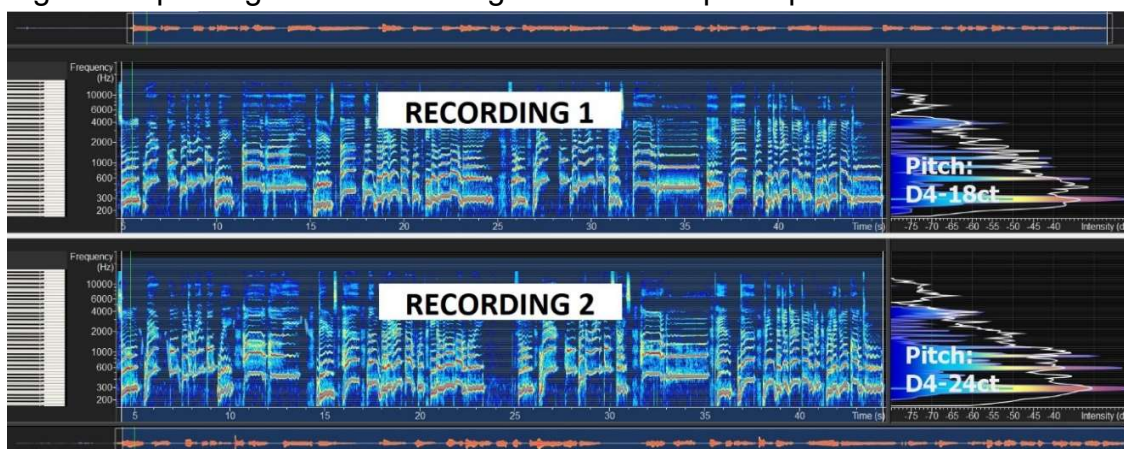


Fig. A4. Spectrogram for recording 1 and 2 from participant 4

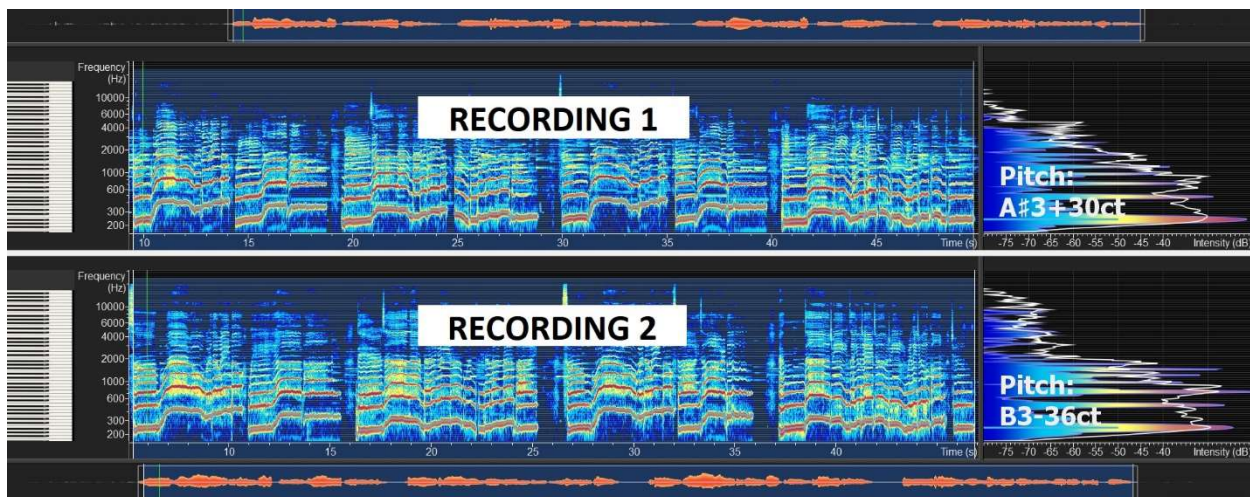


Fig. A5. Spectrogram for recording 1 and 2 from participant 5

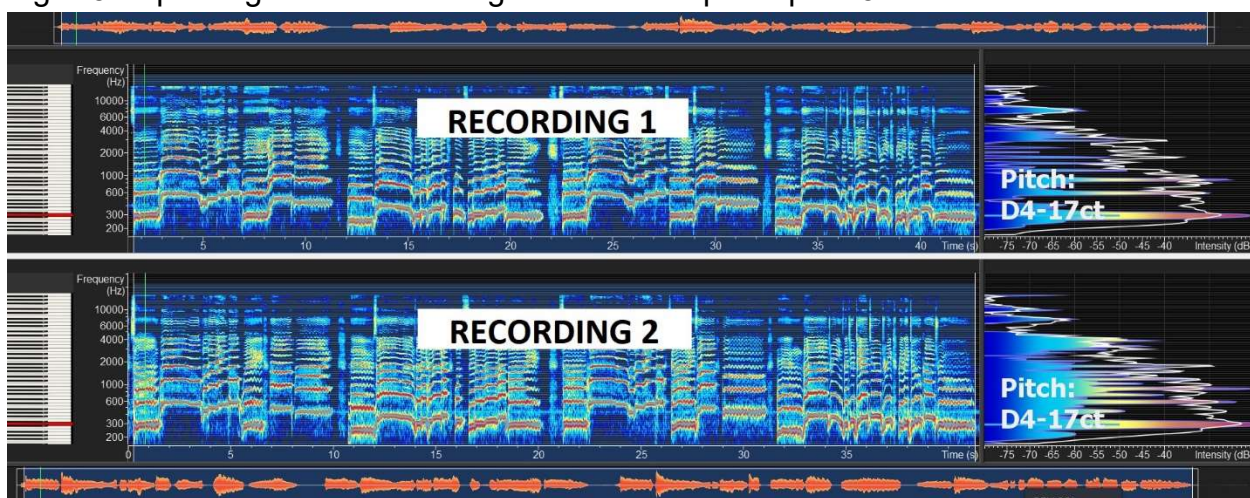


Fig. A6. Spectrogram for recording 1 and 2 from participant 6

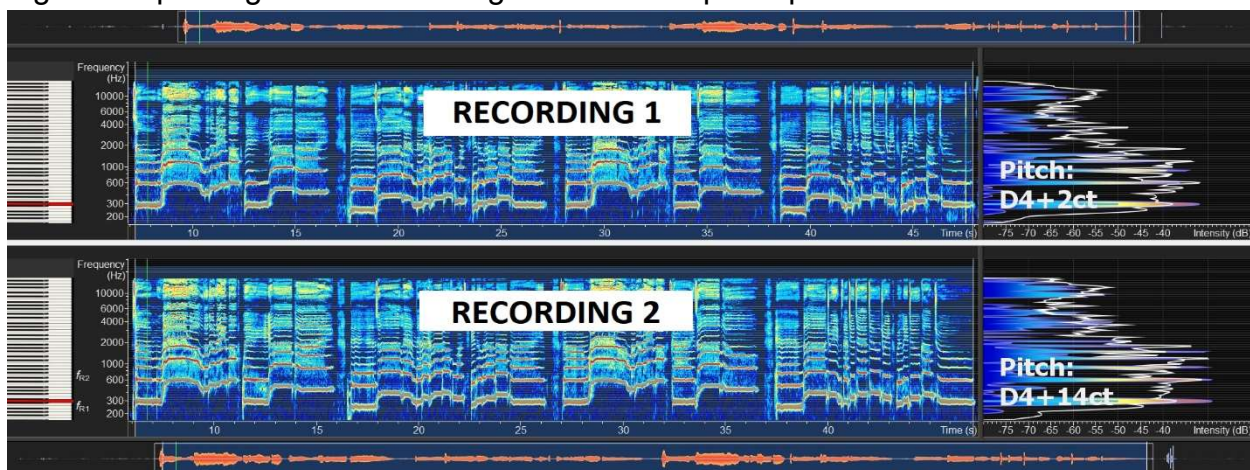


Fig. A7. Spectrogram for recording 1 and 2 from participant 7

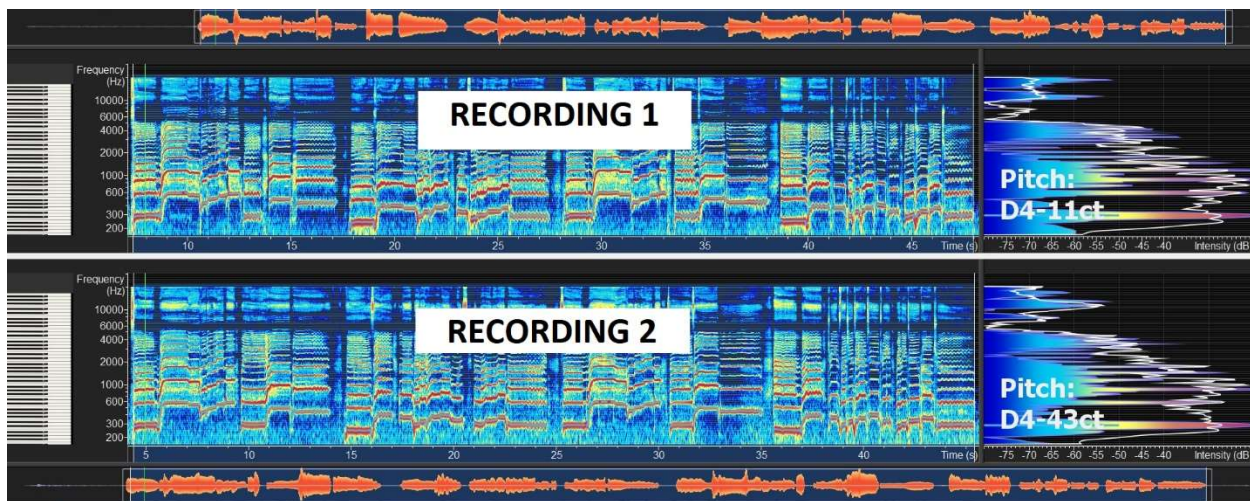


Fig A8. Vibrato analysis for end (Vowel "u") of recording 1 & 2 from participant 1

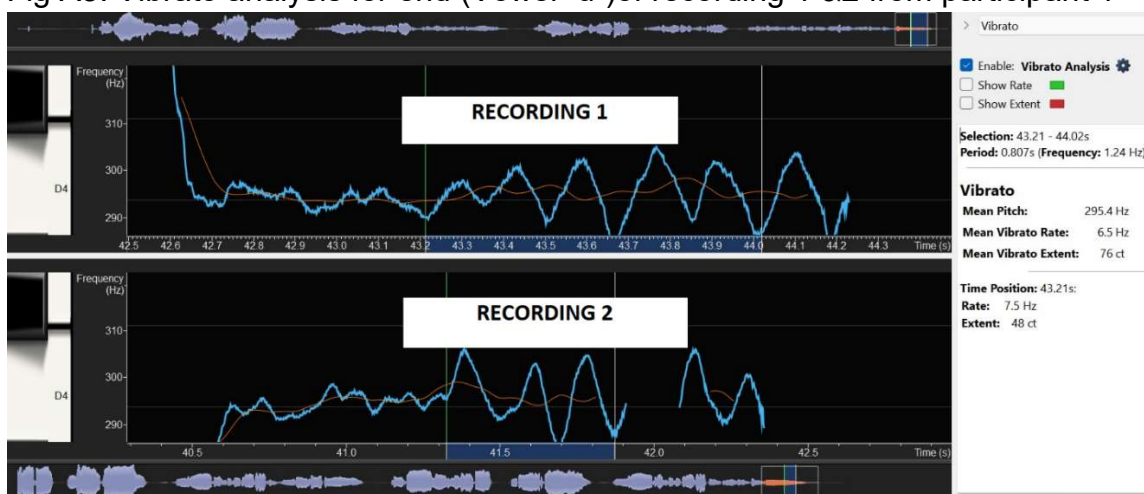


Fig A9. Vibrato analysis for end (Vowel "u") of recording 1 & 2 from participant 2

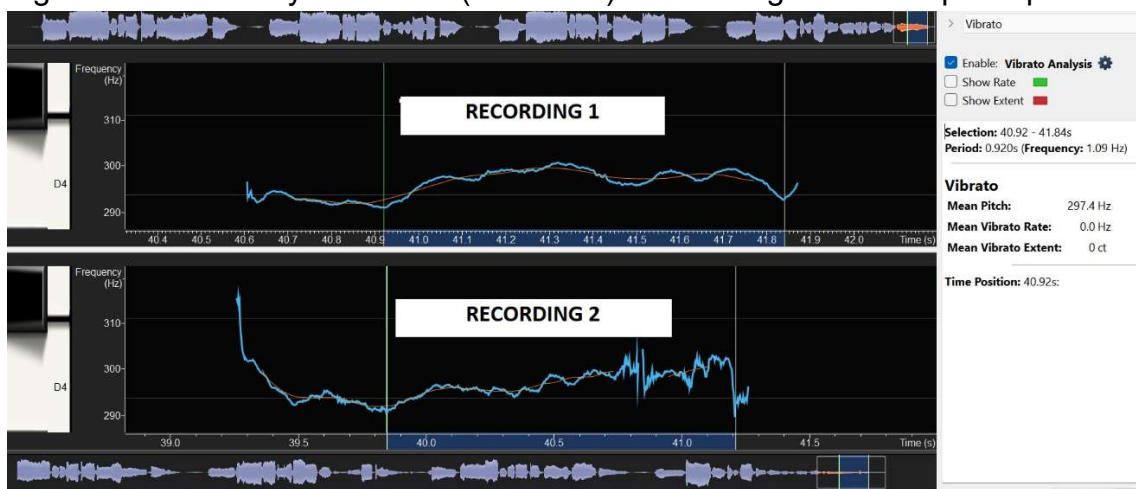


Fig A10. Vibrato analysis for end (Vowel "u") of recording 1 & 2 from participant 3

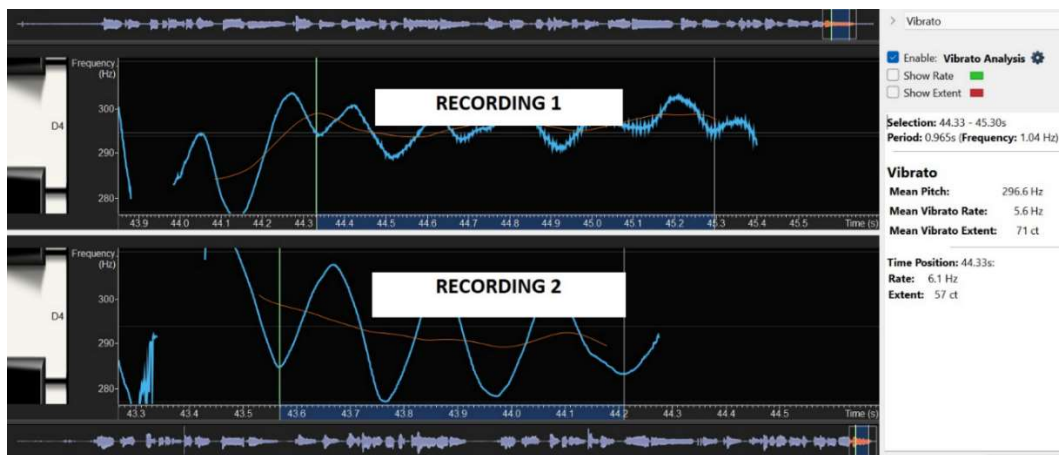


Fig A11. Vibrato analysis for end (Vowel "u") of recording 1 & 2 from participant 4



Fig A12. Vibrato analysis for end (Vowel "u") of recording 1 & 2 from participant 5

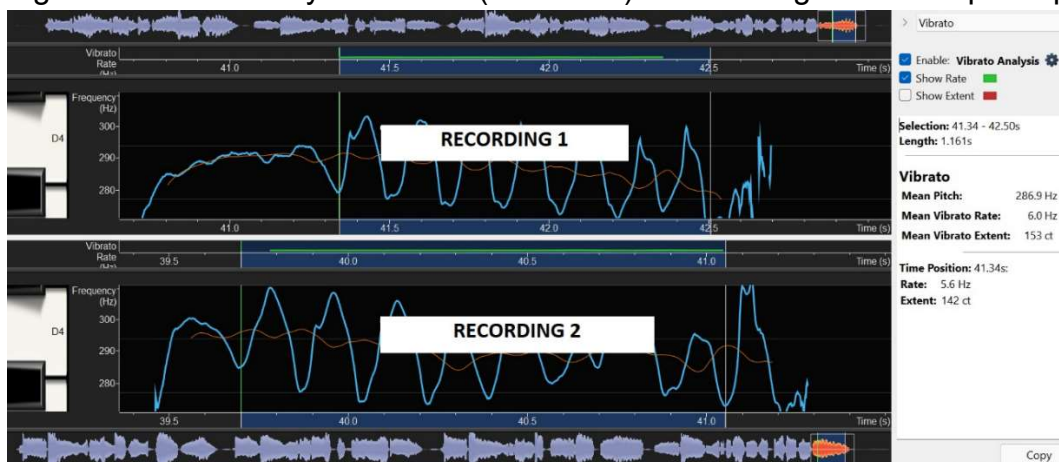


Fig A13. Vibrato analysis for end (Vowel "u") of recording 1 & 2 from participant 6

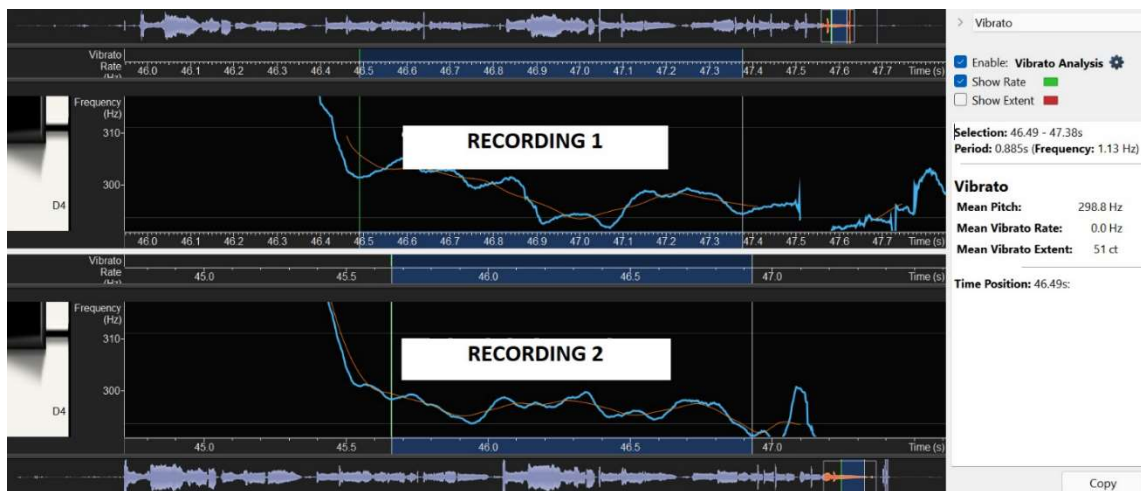


Fig A14. Vibrato analysis for end (Vowel “u”) of recording 1 &2 from participant 7

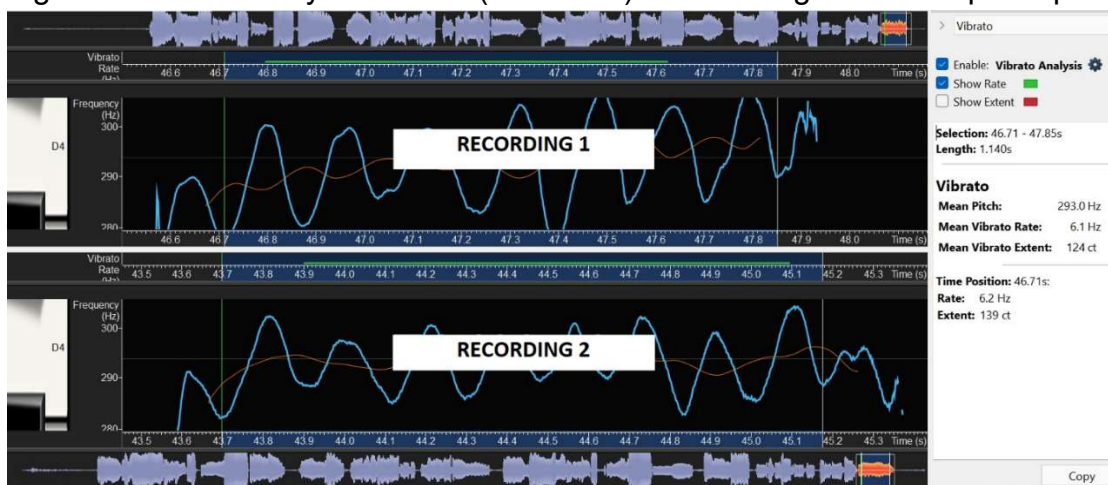
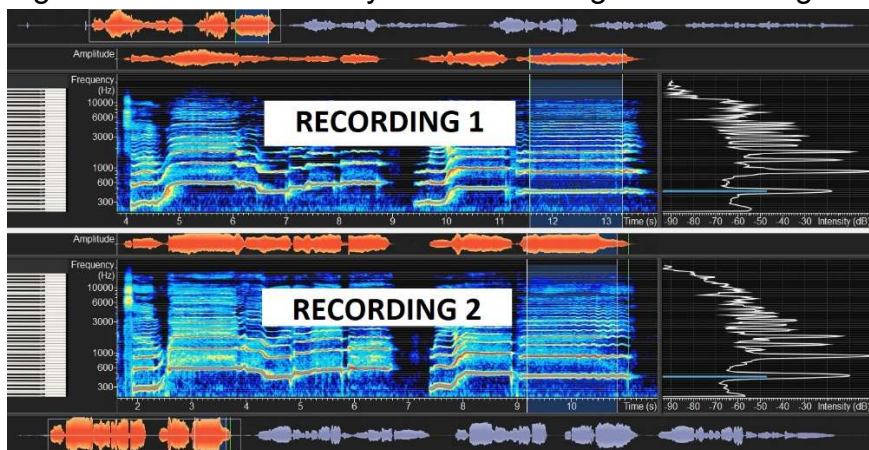


Fig A15. Resonance analysis for word “high” of recording 1 &2 from participant 1



A16. Resonance analysis for word “high” of recording 1 &2 from participant 2

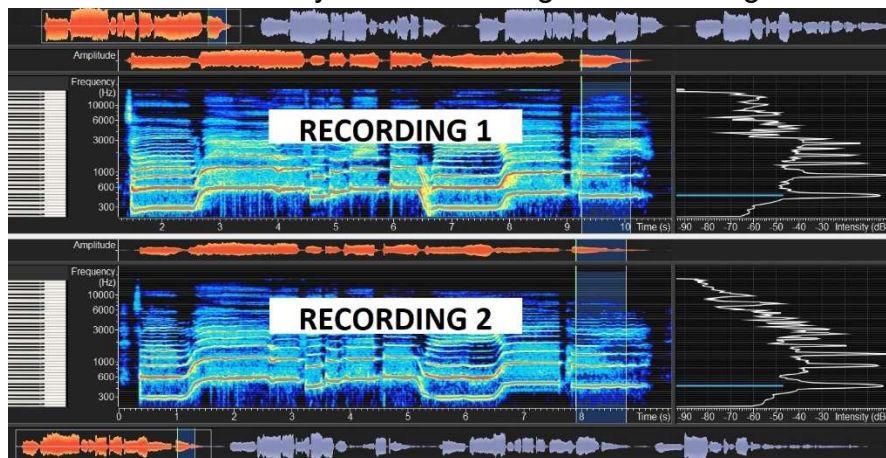


Fig A17. Resonance analysis for word “high” of recording 1 &2 from participant 3



Fig A18. Resonance analysis for word “high” of recording 1 &2 from participant 4

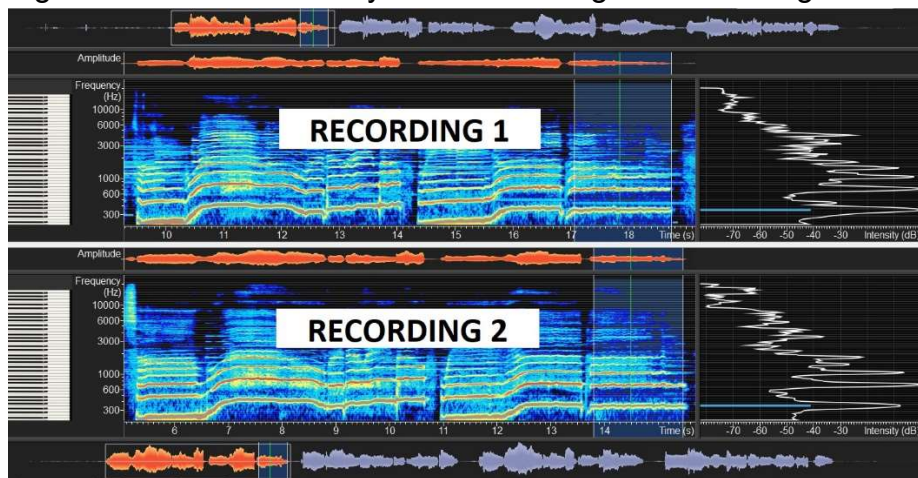


Fig A19. Resonance analysis for word “high” of recording 1 &2 from participant 5

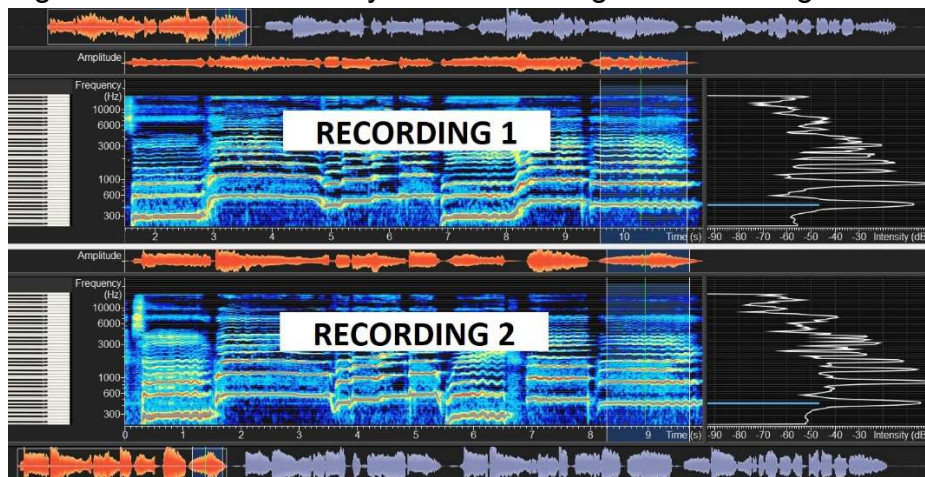


Fig A20. Resonance analysis for word “high” of recording 1 &2 from participant 6

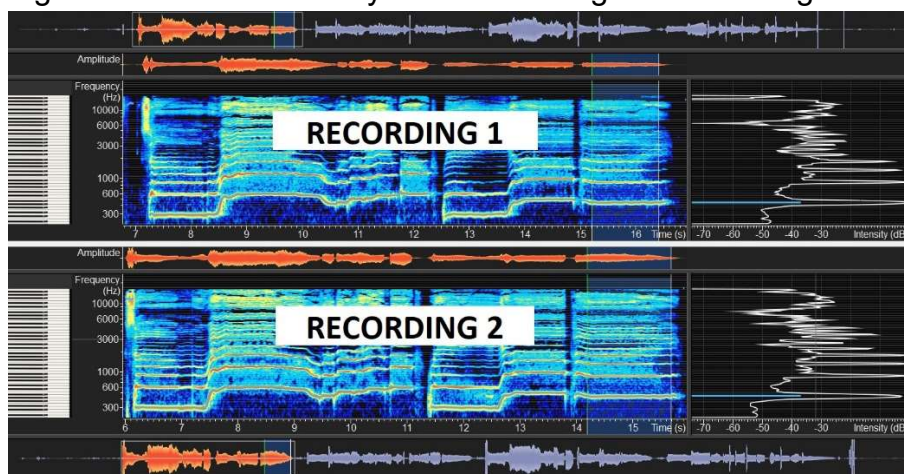


Fig A21. Resonance analysis for word “high” of recording 1 &2 from participant 7

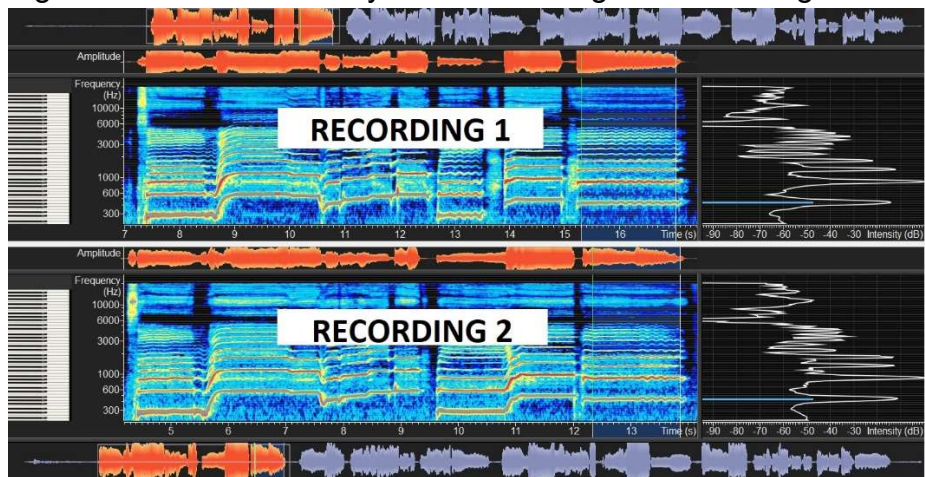
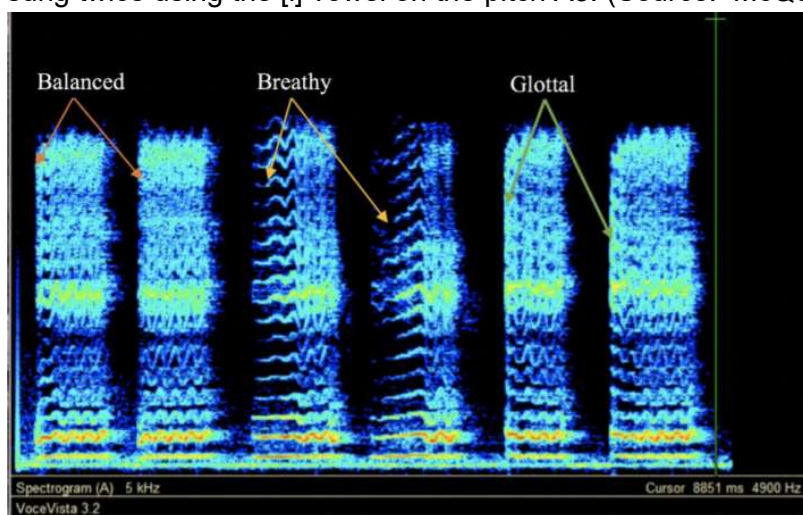


Fig. A22. Example of Balanced, Breathy and Glottal onsets in the spectrogram. Each onset is sung twice using the [i] vowel on the pitch A3. (Source: McQuade, Mark, 2020).



Appendix B: Tables

Table B1. Demographic information of participants in the study

Demographic Info													
Participant	Age	Native English	PCOS	Medication for PCOS	Endometriosis	Regular Menstrual cycle	Contraception	PMS	Aspirin/Ibuprofen	Years Singing	Type of singer	Muscle Tension Disphonia (MTD)	Speech Therapy
1	30-40	No	No	No	Yes	Yes	Yes	Yes	Yes	2.5	Amateur	Yes	Yes
2	20-30	Yes	No	No	No	Yes	No	Yes	Yes	1.5	Amateur	No	No
3	20-30	No	No	No	No	Yes	No	Sometimes	No	5	Amateur	Yes	No
4	20-30	No	Yes	No	No	No	No	Yes	No	1	Amateur	No	No
5	30-40	Yes	Yes	Yes	No	No	No	Sometimes	Yes	20	Semiprofessionist	No	No
6	20-30	No	Yes	No	No	No	No	Yes	Yes	1.5	Amateur	No	No
7	20-30	Yes	Yes	Yes	No	No	Yes	Sometimes	No	15	Semiprofessionist	No	No
Participants with no PCOS		33%	43%	0%	33%	100%	33%	100%	67%	1.5 to 5	100%	67%	33%
Participants with PCOS		50%	57%	50%	0%	0%	25%	100%	50%	1 to 20	50%	0%	0%

Notes Percentages are calculated for each group, except the PCOS column which is calculated based on the total number of participants

Table B2. Responses to life style survey 1 from participants in the study

Survey 1																	
Participant	Voice Problems Home	Voice Problems work	Voice Problems Leisure	Voice Problems Noisy	Throat clearing	Smoking	No of Caffeinated Drinks	No of Caffeinated Drinks	Hours of sleep	Hours of sleep	Glasses of water	Glasses of water	Problems hearing	Heartburn	Heartburn medication	Asthma	Inhalers
							Generally	Current	Generally	Current	Generally	Current					
	1 Often	Sometimes	Sometimes	Often	Often	Never	1	1	7	6	8	5	Sometimes	Sometimes	No	No	No
	2 Sometimes	Never	Sometimes	Sometimes	sometimes	Sometimes	2	2	7	7	7	8	Never	Never	No	No	No
	3 Never	Sometimes	Never	Sometimes	Never	Never	1	1	8	8	7	8	Sometimes	Sometimes	No	No	No
	4 sometimes	Sometimes	Sometimes	Sometimes	Often	Never	1	1	7	6	4	4	Never	Sometimes	No	No	No
	5 sometimes	Often	Sometimes	Never	Sometimes	Never	1	1	7	5	8	8	Never	Sometimes	Yes	No	No
	6 Always	Often	Sometimes	Often	Often	Never	1	1	8	9	5	3	Sometimes	Sometimes	No	No	No
	7 Often	Often	Sometimes	Sometimes	Often	Never	3	3	4	5	2	1	Never	Sometimes	No	Sometimes	No
	sometimes or often	sometimes or often	sometimes or often	sometimes or often	sometimes or often	sometimes or often							sometimes or often	sometimes or often	Yes	Sometimes	Yes
Participants with no PCOS	67%	67%	67%	100%	67%	33%							67%	67%	0%	0%	0%
Participants with PCOS	100%	100%	100%	75%	100%	0%							25%	100%	25%	25%	0%

Table B3. Responses to life style survey 2 from participants in the study

Survey 2																	
Participant	Voice Problems Home	Voice Problems work	Voice Problems Leisure	Voice Problems Noisy environment	Throat clearing	Smoking	No of Caffeinated Drinks	No of Caffeinated Drinks	Hours of sleep	Hours of sleep	Glasses of water	Glasses of water	Problems hearing	Heartburn	Heartburn medication	Asthma	Inhalers
							Generally	Current	Generally	Current	Generally	Current					
1	Often	Often	Sometimes	Always	Often	Never	1	1	7	7	8	6	Sometimes	Sometimes	Sometimes	No	Sometimes
2	Sometimes	Sometimes	Never	Sometimes	sometimes	Sometimes	2	2	8	8	7	7	Sometimes	Never	No	No	No
3	Sometimes	Sometimes	Sometimes	Sometimes	Never	Never	1	1	8	8	7	6	Sometimes	Sometimes	No	No	No
4	Often	Often	Often	Sometimes	Often	Never	1	1	7	7	3	1	Never	Never	No	No	No
5	Sometimes	Sometimes	Sometimes	Sometimes	Sometimes	Never	1	1	7	6	8	8	Sometimes	Sometimes	No	No	No
6	Often	Sometimes	Often	Sometimes	Often	Never	1	3	8	8	4	3	Sometimes	Often	Sometimes	No	No
7	Sometimes	Often	Sometimes	Sometimes	Sometimes	Never	3	1	4	6	2	2	Never	Sometimes	No	Sometimes	No
	sometimes or often	sometimes or often	sometimes or often	sometimes or often	sometimes or often	sometimes or often							sometimes or often	sometimes or often	Sometimes	Sometimes	Sometimes
Participants with no PCOS	100%	100%	67%	100%	67%	33%							100%	67%	0%	0%	0%
Participants with PCOS	100%	100%	100%	100%	100%	0%							50%	75%	25%	25%	0%

Notes
Voice problems include fatigue, hoarseness, excess phlegm or mucus, breathiness etc
Current means the day of the recording/survey

Table B4. Responses to voice quality surveys 1 from participants in the study

Survey 1											
Participant	Hoarseness	Current	Voice Failure	Current	Breathiness	Current	Strain	Current	Mucus/Phlegm	Current	Current Resonance
	Generally	Scale/10	Generally	Scale/10	Generally	Scale/10	Generally	Scale/10	Generally	Scale/10	Scale/10
1	Often	6	Never	5	Often	6	Always	8	Sometimes	2	6
2	Sometimes	2	Never	1	Never	1	Sometimes	3	Sometimes	2	5
3	Never	1	Sometimes	3	Often	5	Sometimes	6	Never	1	3
4	Sometimes	3	Sometimes	3	Never	1	Sometimes	2	Often	8	5
5	Never	1	Sometimes	1	Never	1	Often	8	Sometimes	3	8
6	Sometimes	5	Often	7	Often	8	Sometimes	6	Always	9	6
7	Often	3	Sometimes	2	Often	3	Sometimes	6	Often	7	7
Control Group	Sometimes or often		Sometimes or often		Sometimes or often		Sometimes or often		Sometimes or often		
	67%		33%		67%		100%		67%		Medium
PCOS Group	100%		100%		50%		100%		100%		Medium to High

Table B5. Responses to voice quality surveys 2 from participants in the study

Survey 2											
Participant	Hoarseness	Current	Voice Failure	Current	Breathiness	Current	Strain	Current	Mucus/Phlegm	Current	Current Resonance
	Generally	Scale/10	Generally	Scale/10	Generally	Scale/10	Generally	Scale/10	Generally	Scale/10	Scale/10
1	Sometimes	8	Sometimes	4	Sometimes	6	Often	9	Sometimes	10	6
2	Sometimes	1	Never	1	Never	1	Sometimes	3	Sometimes	1	5
3	Never	2	Sometimes	3	Often	6	Sometimes	4	Never	1	4
4	Sometimes	1	Often	6	Sometimes	2	Never	1	Always	10	5
5	Sometimes	2	Sometimes	3	Sometimes	3	Sometimes	1	Never	1	9
6	Often	7	Sometimes	5	Often	8	Sometimes	6	Always	8	6
7	Sometimes	7	Sometimes	5	Often	7	Sometimes	5	Often	9	6
Control	Sometimes or often		Sometimes or often		Sometimes or often		Sometimes or often		Sometimes or often		
	67%		67%		67%		100%		67%		Medium
PCOS Group	100%		100%		100%		75%		75%		Medium to High
Notes											
Scale: 1 is low and 10 is High											
Current means day of recording/survey											

Table B6. Assessment by vocal coach (Researcher) of recording 1

Recording 1								
Participant	Pitch Observations	Rating /10 Off Pitch = 1-3 Adequate = 4-6 Accurate = 7-10	Resonance Observations	Rating /10 Low = 1-3 Medium = 4-6 High = 7-10	Breathiness Observations	Rating /10 Low = 1-3 Medium = 4-6 High = 7-10	Hoarseness Observations	Rating /10 Low = 1-3 Medium = 4-6 High = 7-10
1	• Adequate pitch • Pitchiness at beginning and top notes	5	• Vibrato present at sustained vowels • Second time on top notes was tighter/closed off • Little shaky • r wants to come in early	6	• Extra breath being used to reach the top note	6	• Some hoarseness observed	8
2	• Pitch is adequate • Some pitchiness at the end of phrases and throughout but minimal	6	• Resonance could be developed more	6	• Excess breath to get to top notes • Excess breath more present in second verse	7	• Hoarse quality on her top notes	7
3	• Pitch needs work in particular on top notes • Top notes seem to high for her because she is not placing her voice properly	5	• Strained/tight • Short phrases without vibrato	3	• Excess breath on "o" sounds more	5	• Some hoarseness observed	7
4	• Pitch is inadequate • She can not detect the pitch center	1	• Some wavering and shakiness on the same note • There is phlegm present at the beginning	3	• She is using excess breath to hit the top note	7	• Some hoarseness observed	7
5	• Good pitch, adequate • Could be tuned a little on certain words	8	• Good use of vibrato • Some shakiness on top but minimal	7	• Use of breath to get to top notes • A little breathy throughout • Big gaps for air	8	• Some hoarseness observed	6
6	• Adequate pitch overall	8	• A bit of strain on top notes • Minimal vibrato	6	• Breathly tone, specially on top notes where voice gives out a little	7	• A bit hoarseness throughout	7
7	• Good pitch overall • Off pitch starting in a couple of spots but was able to adjust	8	• Good vibrato at the end of phrases	8	• Some breath issues because she needs to breath in the middle of phrases	5	• A little hoarse at the top	6
		Adequate to accurate	Low		High		High	
Control Group		100%	33%		33%		100%	
PCOS Group		75%	25%		75%		50%	

Table B7. Assessment by vocal coach (Researcher) of recording 2

Recording 2								
Participant	Pitch Observations	Rating /10 Off Pitch = 1-3 Adequate = 4-6 Accurate = 7-10	Resonance Observations	Rating /10 Low = 1-3 Medium = 4-6 High = 7-10	Breathiness Observations	Rating /10 Low = 1-3 Medium = 4-6 High = 7-10	Hoarseness Observations	Rating /10 Low = 1-3 Medium = 4-6 High = 7-10
1	• Similar to previous recording but harder for her to reach note	4	• Shakiness throughout • Does not sound as control as first recording • Voice breaking	3	• Extra breath being used to reach the top note	8	• Hoarse and tight sounding quality on top notes	9
2	• Pitchier throughout than first recording, specially on top notes • She sounds a little congested	5	• Less resonance than first time • No vibrato • Wavering in pitch • Less control and supported sound	4	• Struggling to get to top note and using excess breath to get there • Breathier throughout	8	• Some hoarseness observed	8
3	• Still trouble on top notes, not as bad th	4	• Her voice is breaking more than in the first recording • There is more vibrato present at the end	2	• Excess breath on starting vowels like in the previous recording • Excess breath throughout in the second recording	8	• She sounds a little more hoarse than first recording	8
4	• Pitch still inadequate	2	• Wavering and unsupported sound • Phlegm still present	3	• Breathly and runs out of breath at the end	8	• Hoarseness present	9
5	• Pitchier than first recording, specially on long notes	7	• A little bit of phlegm at the beginning but minimum • Tighter, slightly shakier and less vibrato present than initial recording	6	• More breath taken overall and still uses breath to get to top notes	7	• Some hoarseness observed	8
6	• Good pitch overall • A little pitchy on a couple of words	7	• Minimal vibrato • More energized than the first one • A little phlegm still present	5	• Breathly tone but less than first re	8	• Some hoarseness observed	8
7	• A little pitchier than last recording on the top notes	8	• Less vibrato than previous recording	8	• Still breathing in the middle of phrases • Struggling to catch breath	6	• Hoarseness is still present more than the first recording	7
		Adequate to accurate	Low		High		High	
Control Group		100%	67%		100%		100%	
PCOS Group		75%	25%		75%		100%	

Table B8. Selected acoustic characteristics of recording 1 using the VoceVista Video Pro

Recording 1								
Participant	Mean Pitch at word "some"	Vibrato at word "True"	Vibrato at word "True"	Vibrato at word "True"	Pitch at word "high"	Breathiness	Hoarseness	Resonance: Singers formant around 3-6 kHz
	Hz	Mean pitch (Hz)	Mean rate (Hz) Low=0-5 M= 5-6 H=6+	Mean extent (ct) Low=0-25 M= 25-75 H=75+	Mean pitch (Hz)	L/M/H 1 = none 10 = very breathy	L/M/H 1 = none 10 = very hoarse	L/M/H 1 = minimal 10 = very resonant
1	289	295.4	6.5	76	437	H/7	M/4	M/6
2	289.5	297.4	0	0	445.1	M/6	M/6	M/6
3	282.9	296.5	5.6	71	435.3	M/5	M/5	L/3
4	234.8	238.8	5	53	352	M/5	H/7	M/5
5	295.4	286.9	6	153	438.2	M/4	M/5	H/8
6	290.8	298.8	0	51	439.3	M/4	M/6	H/7
7	290.1	293	6.1	124	433.6	L/2	L/3	H/8
	Adequate to Accurate	Adequate to Accurate	M-H	M-H	Adequate to Accurate	M to H	M to H	M to H
Control Group	100%	100%	67%	67%	100%	100%	100%	67%
PCOS Group	75%	75%	75%	100%	75%	75%	75%	100%

Notes:

1. Vibrato analysis for end of recording word "True"
2. Breathiness: Low = 1-3, Medium = 4-6, High = 7-10
3. Hoarseness: Low = 1-3, Medium = 4-6, High = 7-10
4. Resonance: Low = 1-3, Medium = 4-6, High = 7-10

Table B9. Selected acoustic characteristics of recording 2 using the VoceVista Video Pro

Recording 2								
Participant	Mean Pitch at word "some"	Vibrato at word "True"	Vibrato at word "True"	Vibrato at word "True"	Pitch at word "high"	Breathiness	Hoarseness	Resonance: Singers formant around 3-6 kHz
	Hz	Mean pitch (Hz)	Mean rate (Hz) Low=0-5 M= 5-6 H=6+	Mean extent (ct) Low=0-25 M= 25-75 H=75+	Mean pitch (Hz)	L/M/H 1 = none 10 = very breathy	L/M/H 1 = none 10 = very hoarse	L/M/H 1 = minimal 10 = very resonant
1	287.3	296.3	4.6	87	444.9	M/6	M/6	M/6
2	294.8	294.6	0	25	436.3	M/7	M/5	M/5
3	290.9	291.9	4.9	163	444.4	M/6	M/6	M/4
4	240.5	243	0	51	347.6	M/6	H/8	M/6
5	298.3	290.3	6	138	434	M/5	M/6	H/7
6	298.4	296.1	0	0	437.2	L/3	M/6	H/7
7	287.4	293.2	5.5	80	440.1	L/2	L/3	H/9
	Adequate to Accurate	Adequate to Accurate	Medium to High	Medium to High	Adequate to Accurate	Medium to H	M to H	M to H
Control Group	100%	100%	67%	67%	100%	100%	100%	100%
PCOS Group	75%	75%	50%	75%	75%	50%	75%	100%

Appendix C: Glossary

Medical Terminology

Amenorrhea: This is a condition that refers to prolonged intervals of time without menstruation.

Androgen: A type of hormone that promotes the development and maintenance of male sex characteristics.

Anovulation: When an egg does not release or ovulate, from a woman's ovaries.

Endocrinology: The study of the medical aspects of hormones.

Estrogen: A sex hormone responsible for the female physical features and reproduction.

Hyperandrogenism: The excessive secretion of androgens.

Menorrhagia: An abnormally heavy menstrual bleeding.

Oligomenorrhea: Sporadic menstrual periods that occur less than six to eight periods per year.

Progesterone: A hormone that plays a role in the menstrual cycle and pregnancy

Voice science and acoustic terminology:

Frequency: It is the repetition rate of a periodic signal, expressed in Hz, or cycles per second.

Fundamental frequency: The fundamental frequency is the lowest in a harmonic series and determines what is perceived as pitch.

Glottal Function Index: A self-administered survey used to evaluate glottal insufficiency.

Likert scale: A rating system designed to measure people's attitudes, opinions, or perceptions.

Maximum phonation time (MPT): A clinical tool for assessing phonatory mechanics. It is the longest period during which a patient can sustain phonation of a vowel sound.

Mean fundamental frequency: It is an estimate of the central tendency of a periodic fundamental waveform.

Noise-to-harmonic ratio (HNR): The ratio between periodic (Harmonic) and non-periodic (Noise) components in the voice.

Phonation: The process of producing certain sounds through quasi-periodic vibration of the vocal folds.

Reflux Symptom Index: A quantitative measure used for assessing the relationship between gastroesophageal reflux and symptoms.

Relative Average Perturbation (RAP): A quantitative measure of the intrinsic stability of the voice.

Shimmer: The amplitude variation from cycle to cycle of the fundamental amplitude.

Videolaryngostroboscopy: A medical procedure used to help determine the cause of voice disorders.

Visual Analogue Scale (VAS): A tool used to help a person rate the intensity of pain or other sensations. The person defines the degree of pain on a visual scale without numeric values.

Voice Handicap Index (VHI): A tool used to measure the influence of voice problems on a patient's quality of life.

Voice Turbulence Index (VTI): VTI refers to an average ratio of the spectral inharmonic high-frequency energy (2800-5800 Hz) to the lower spectral harmonic energy (70-4500 Hz).

Appendix D: Project information and consent form for participants

Pilot Study: Voice Effects Associated with Polycystic Ovarian Syndrome in Amateur and Semi-Professional Singers

The purpose of this study is to better understand the effects of hormones in the voice of women with and without PCOS.

This research study will include:

- A quick semi-structured survey as self reflection about their voice and voice quality that will be collected twice 17 days apart
- Two recordings of the chorus of Somewhere over the Rainbow in the key of D that participants will submit (phone recordings are fine). Lyrics and piano melody participants can use to record with headphones will be provided.
- The recordings and surveys will be spaced 17 days apart and collected twice
- All submitted recordings will be analyzed through Vocevista for quality of pitch, vibrato and resonance
- Students will be able to opt out of any part of the study if they want to.
- The research facilitator will be available to answer any questions if there are any.
- Please fill out the consent form below if you wish to participate as part of the research study.

Pilot Study: Voice Effects Associated with Polycystic Ovarian Syndrome in Amateur and Semi-Professional Singers

Consent to take part in research

I(please fill in your first and last name)..... voluntarily agree to participate in this research study.

Please read and mark the following boxes:

- I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.
- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
- I understand that I can withdraw permission to use data from my survey and recording within two weeks after my submission date, in which case the material will be deleted.
- I agree to my interview being audio-recorded.
- I understand that participation involves submitting 2 surveys on vocal hygiene and 2 recordings that will be analyzed in voceVista spaced 17 days apart.
- I understand that I will not benefit directly from participating in this research.
- I understand that all information I provide for this study will be treated confidentially.
- I understand that in any report on the results of this research my identity will remain anonymous. This will be done by changing my name and disguising any details which may reveal my identity or the identity of people I speak about.
- I understand that disguised extracts from my survey and recording analysis may be quoted in conference presentations, published material and educational resources.
- I understand that signed consent forms and original audio recordings will be retained in the researcher's password encrypted hard drive and computer until the beginning of February 2022.
- I understand that under freedom of information legalisation I am entitled to access the information I have provided at any time while it is in storage as specified above.
- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

Contact information: Daniela Garcia (researcher), Email: danigarciamusica@gmail.com, Phone: (416) 476- 5019

I consent to being part of this research study:

Signature of research participant, DATE

Signature of researcher, DATE

Daniela Garcia, Oct. 25, 2021

Lyrics: Somewhere over the rainbow

Somewhere over the rainbow

Way up high

There's a land that I heard of

Once in a lullaby

Somewhere over the rainbow

Skies are blue

And the dreams that you dare to dream

really do come true

Appendix E: Application for ethical approval

In order for research to result in benefit and minimise risk of harm, it must be conducted ethically. A researcher may not be covered by the University's insurance if ethical approval has not been obtained prior to commencement.

The University follows the OECD Frascati manual definition of **research activity**: “creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications”. As such this covers activities undertaken by members of staff, postgraduate research students, and both taught postgraduate and undergraduate students working on dissertations/projects.

The individual undertaking the research activity is known as the “principal researcher”.

Ethical approval is not required for routine audits, performance reviews, quality assurance studies, testing within normal educational requirements, and literary or artistic criticism.

Please read the notes for guidance before completing ALL sections of the form.

This form must be completed and approved prior to undertaking any research activity. Please see Checklist for details of process for different categories of application.

Delete the Guidance Notes at the end of the form BEFORE submitting your application

SECTION A: About You (Principal Researcher)

1	Full Name:	Daniela Noemi Garcia			
2	Tick all boxes which apply:	Member of staff:	☐	Honorary research fellow:	☐
3	Undergraduate Student	☒	Taught Postgraduate Student	☒	Postgraduate Research Student

4	Institute/Academic Discipline/Centre:	WAPPAR
5	Campus:	Carmarthen
6	E-mail address:	Your email danigarciamusica@gmail.com

7	Contact Telephone Number:	(416)476-5019
<i>For students:</i>		
8	Student Number:	2016792
9	Programme of Study:	MA Professional Practice (Voice Pedagogy)
10	Director of Studies/Supervisor:	Nick Samuel

SECTION B: Approval for Research Activity

1	Has the research activity received approval in principle? (please check the Guidance Notes as to the appropriate approval process for different levels of research by different categories of individual)	YES	☒	NO	☐
					Date
2	If Yes, please indicate source of approval (and date where known): <i>Approval in principle must be obtained from the relevant source prior to seeking ethical approval</i>	Research Degrees Committee	☐		
3		Institute Research Committee	☐		
4		Other (write in) WAPPAR Ethics Board Representative	☒		

SECTION C: Internal and External Ethical Guidance Materials

	Please list the core ethical guidance documents that have been referred to during the completion of this form (including any discipline-specific codes of research ethics, and also any specific ethical guidance relating to the proposed methodology). Please tick to confirm that your research proposal adheres to these codes and guidelines.	
1	UWTSD Research Ethics & Integrity Code of Practice	☒
2	UWTSD Research Data Management Policy	☒
3	Tri-Agency Framework: Responsible Conduct of Research (Canada) https://rcr.ethics.gc.ca/eng/framework-cadre.html	☒

SECTION D: External Collaborative Research Activity

1	Does the research activity involve collaborators outside of the University?	YES	☐	NO	☒
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2	If Yes, please provide the name of the external organisation and name and contact details for the main contact person and confirmation this person has consented to their personal data being shared.as part of this collaboration.					
3	Institution					
4	Contact person name					
5	Contact person e-mail address					
6	Has this individual consented to sharing their details on this form?	YES	☐	NO	☐	
7	Are you in receipt of a KESS scholarship?	YES	☐	NO	☐	
8	Is your research externally funded	YES	☐	NO	☐	
9	Are you specifically employed to undertake this research in either a paid or voluntary capacity?	Voluntary	YES	☐	NO	☐
10		Employed	YES	☐	NO	☐
11	Is the research being undertaken within an existing UWTSD Athrofa Professional Learning Partnership (APLP)	If YES then the permission question below does not need to be answered.	YES	☐	NO	☐
12	Permission to undertake the research has been provided by the partner organisation	(If YES attach copy) If NO the application cannot continue	YES	☐	NO	☐

Where research activity is carried out in collaboration with an external organisation

13	Does this organisation have its own ethics approval system?	YES	☐	NO	☒
14	If Yes, please attach a copy of any final approval (or interim approval) from the organisation				

SECTION E: Details of Research Activity

1	Indicative title:	Pilot Study: Voice Effects Associated with Polycystic Ovarian Syndrome in Amateur and Semi-Professional Singers		
2	Proposed start date:	September 10, 2021	Proposed end date:	January 28, 2022
3	Introduction to the Research (maximum 300 words) Ensure that you write for a <u>Non-Specialist Audience</u> when outlining your response to the three points below: • <i>Purpose of Research Activity</i> • <i>Proposed Research Question</i> • <i>Aims of Research Activity</i> • <i>Objectives of Research Activity</i> Demonstrate, briefly, how <u>Existing Research</u> has informed the proposed activity and explain • <i>What the research activity will add to the body of knowledge</i> • <i>How it addresses an area of importance.</i>			
4	Purpose of Research Activity The purpose of this research study is to better understand if there is any evidence that suggests that Polycystic Ovarian Syndrome has an effect on amateur and semi-professional voice users.			
5	Research Question Does Polycystic Ovarian Syndrome have an effect on the voice of amateur and semi-professional singers?			
6	Aims of Research Activity The Goal of this research study is to uncover data associated with voice changes in women with PCOS. As 1 in 15 women have Polycystic Ovarian Syndrome, there may be merit in studying the effects of PCOS on the voice. The area is relatively new to study and previous literature review shows that voice quality may be affected in women with PCOS. I will collect information from PCOS and non-PCOS participants that reflect the state of their voice (i.e. voice production clarity, whether there is any hoarseness) and compare audio recordings analyzed by VoceVista. I am approaching this study with an open mind without having a very specific hypothesis to test. My findings may or may not corroborate scientific findings of previous studies conducted on PCOS and the voice.			

7	Objectives of Research Activity My objectives for this study are: * To examine the relationship of lifestyle of women with PCOS in relation to voice changes * To evaluate the acoustic quality of amateur and semi-professional singers with PCOS through VoceVista software * To find any correlations to previous studies in order to form a more specific hypothesis.
8	Proposed methods (maximum 600 words) Provide a brief summary of all the methods that may be used in the research activity, making it clear what specific techniques may be used. If methods other than those listed in this section are deemed appropriate later, additional ethical approval for those methods will be needed.

I plan on conducting a study of approximately 10 participants. All of the participants will be adult females (18 years and above) who are amateur and semi-professional singers that are currently taking vocal lessons. I would like to include 5 women who have been diagnosed with Polycystic Ovarian Syndrome and 5 without (as a control group). The comparison of the control group with the participant group with PCOS will help investigate if PCOS has an effect on the voice. I have chosen to use non-professional voice users because they are still developing proper singing technique. I cannot include professional singers because previous research has found that professional voice users can use technique to mask any voice obstacles they may feel.

Method 1) Semi-structured survey:

A semi-structured survey will be given out to participants that will detail their voice hygiene habits- i.e. Hours of sleep, hydration, smoking, if their profession demands a lot from their voice...etc. I will also ask participants to reflect on the quality of their voice through a rating system (0-10). All 10 participants will be given the survey.

Method 2) Recording Analysis:

I will conduct a recording analysis. I will ask all participants to record themselves singing 'Somewhere Over the Rainbow' in the same key in order to have consistency amongst recordings. This song has been chosen because melodically it has wide interval jumps that will pass over their bridge. I will then conduct 2 types of analyses on the recordings:

Researcher Observation: I will be able to take notes on tone quality, and agility from the recordings from my perspective as a voice instructor and coach.

Software analysis: I will use VoceVista in order to further analyze the acoustic resonance of their voice from the recordings and compare them to my observation notes.

Method 3) Literature Review:

I have previously conducted a literature review on PCOS and the voice and would like to compare my data findings with previous studies that have been conducted specifically about PCOS and the voice. This comparison will allow me to triangulate my findings and see if there is any correlation between research methods and data collected.

Through these methods, I hope to create a more specific understanding of PCOS and the voice. If there is any substantive evidence that there is a negative effect on the voice, I would like to research methods to help voice teachers build a toolbox for their students to overcome their vocal challenges.

10	Location of research activity Identify all locations where research activity will take place.
11	All of the research conducted and data collected will be done online with participants from Toronto, Canada (Greater Toronto Area).
12	Research activity outside of the UK **** If research activity will take place overseas, you are responsible for ensuring that local ethical considerations are complied with and that the relevant permissions are sought. Specify any local guidelines (e.g. from local professional associations/learned societies/universities) that exist and whether these involve any ethical stipulations beyond those usual in the UK (provide details of any licenses or permissions required). Also specify whether there are any specific ethical issues raised by the local context in which the research activity is taking place, for example, particular cultural and/or legal sensitivities or vulnerabilities of participants.
13	I will not need any additional licenses or permissions and will be following the ethical guidelines of the Tri-Agency Framework: Responsible Code of Conduct of Canada. Toronto is a very diverse city and therefore participants from several cultural backgrounds may take part of the study. As Polycystic Ovarian Syndrome is a reproductive disorder, it may be a sensitive subject for women from diverse cultural backgrounds. I will ensure that the survey questions will only refer to voice or vocal hygiene information.

14	Use of documentation not in the public domain: Are any documents <u>NOT</u> publicly available?	NO	☒
		YES	☐
15	If Yes, please provide details here of how you will gain access to specific documentation that is not in the public domain and that this is in accordance with prevailing data protection law of the country in question and England and Wales.		

SECTION F: Scope of Research Activity

1	Will the research activity include:	YES	NO
2	Use of a questionnaire or similar research instrument?	☒	☐
3	Use of interviews?	☐	☒
4	Use of diaries?	☐	☒
5	Participant observation with their knowledge?	☒	☐
6	Participant observation without their knowledge?	☐	☒
7	Use of video or audio recording?	☒	☐
8	Access to personal or confidential information without the participants' specific consent?	☐	☒
9	Administration of any questions, test stimuli, presentation that may be experienced as physically, mentally or emotionally harmful / offensive?	☐	☒
10	Performance of any acts which may cause embarrassment or affect self-esteem?	☐	☒
11	Investigation of participants involved in illegal activities?	☐	☒
12	Use of procedures that involve deception?	☐	☒
13	Administration of any substance, agent or placebo?	☐	☒
14	Working with live vertebrate animals?	☐	☒
15	Other primary data collection methods, please explain in this box For example, 'focus groups'. Please indicate the type of data collection method(s) in this box and tick the accompany box.	☐	☒
16	Details of any other primary data collection method: Literature Review: I will review and reference other studies conducted and associated with PCOS and the voice at the end of my data collection in order to form a better informed understanding of PCOS and the voice.		

If NO to every question, then the research activity is (ethically) low risk and **may** be exempt from **some** of the following sections (please refer to Guidance Notes).

If YES to any question, then no research activity should be undertaken until full ethical approval has been obtained.

SECTION G: Intended Participants

1	Who are the intended participants:	YES	NO
2	Students or staff at the University?	☐	☒
3	Adults (over the age of 18 and competent to give consent)?	☒	☐
4	Vulnerable adults?	☐	☒
5	Children and Young People under the age of 18? (Consent from Parent, Carer or Guardian will be required)	☐	☒
6	Prisoners?	☐	☒
7	Young offenders?	☐	☒
8	Those who could be considered to have a particularly dependent relationship with the investigator or a gatekeeper?	☐	☒
9	People engaged in illegal activities?	☐	☒
10	Others (please identify specifically any group who may be unable to give consent) please indicate here and tick the appropriate box.	☐	☒
11	Other – please indicate here:		

12	Participant numbers and source Provide an estimate of the expected number of participants. How will you identify participants and how will they be recruited?	
13	How many participants are expected?	I am expecting to have approximately 10 participants in my research study.
14	Who will the participants be?	From the 10 participants selected, 5 will be adult females with Polycystic Ovarian Syndrome, and 5 adult females without PCOS over the age of 18. All 10 participants will be amateur/ semi-professional singers that are currently taking lessons.

15	How will you identify the participants?	I will identify the participants from my own private students. I currently have a roster of approximately 80 students. Half are adult females over 18 years. I will send out a notification in order to see if they would be interested in being part of this research study focusing on Polycystic Ovarian Syndrome and the voice. I will also have some participant referrals from other voice teachers in my network that have PCOS and are singers.
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16	Information for participants:	YES	NO	N/A
17	Will you describe the main research procedures to participants in advance, so that they are informed about what to expect?	☒	☐	☐
18	Will you tell participants that their participation is voluntary?	☒	☐	☐
19	Will you obtain written consent for participation?	☒	☐	☐
20	Will you explain to participants that refusal to participate in the research will not affect their treatment or education (if relevant)?	☒	☐	☐
21	If the research is observational, will you ask participants for their consent to being observed?	☒	☐	☐
22	Will you tell participants that they may withdraw from the research at any time and for any reason?	☒	☐	☐
23	With questionnaires, will you give participants the option of omitting questions they do not want to answer?	☒	☐	☐
24	Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	☒	☐	☐
25	Will you debrief participants at the end of their participation, in a way appropriate to the type of research undertaken?	☒	☐	☐
26	If NO to any of above questions, please give an explanation			
27				

28	Information for participants:	YES	NO	N/A
29	Will participants be paid?	☐	☒	☐
30	Is specialist electrical or other equipment to be used with participants?	☒	☐	☐
31	Are there any financial or other interests to the investigator or University arising from this study?	☐	☒	☐
32	Will the research activity involve deliberately misleading participants in any way, or the partial or full concealment of the specific study aims?	☐	☒	☐
33	If YES to any question, please provide full details			

34	VoceVista and Spectrographic analysis will be used in order to analyze recordings of participants. <i>(this box should expand as you type)</i>
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SECTION H: Anticipated Risks

1	Outline any anticipated risks that may adversely affect any of the participants, the researchers and/or the University, and the steps that will be taken to address them. If you have completed a full risk assessment (for example as required by a laboratory, or external research collaborator) you may append that to this form.		
2	Full risk assessment completed and appended?	Yes	☒
		No	☐
3	Risks to participants For example: emotional distress, financial disclosure, physical harm, transfer of personal data, sensitive organisational information		
4	Risk to Participant:	1) Polycystic Ovarian Syndrome may be a sensitive topic to speak about for participants. 2) Participants may be cautious with their personal data. 3) Participants may be cautious to take part of a study during a pandemic.	
5	If research activity may include sensitive, embarrassing or upsetting topics (e.g. sexual activity, drug use) or issues likely to disclose information requiring further action (e.g. criminal activity), give details of the procedures to deal with these issues, including any support/advice (e.g. helpline numbers) to be offered to participants. Note that where applicable, consent procedures should make it clear that if something potentially or actually illegal is discovered in the course of a project, it may need to be disclosed to the proper authorities		

	1) As stated previously, I will ensure that any symptoms that do not pertain to the voice will not be included or discussed in the study therefore minimizing any emotional stress related to PCOS and the study. There will also be an option to opt out of any question or of the study at any point. 2) I will also ensure that the data published will not refer to any participant's personal data. 3) The study will all be completed online so there is not interaction between participants and therefore no risk regarding their health during the pandemic.	
6	Risks to investigator For example: personal safety, physical harm, emotional distress, risk of accusation of harm/impropriety, conflict of interest	
	Risk to Investigator:	I also have Polycystic Ovarian Syndrome and it is a topic of interest for me. I understand that I may be biased as an insider researcher because not only am I a voice user with PCOS, I am also the instructor of the participants that will be used in this study. I understand that there is a risk of emotional distress that can be present when working with data pertaining to students I have built a close professional relationship with.
7	University/institutional risks For example: adverse publicity, financial loss, data protection	
	Risk to University:	Because there are persons involved, there is always a risk regarding ethical issues. I will use the University's code of ethics as well as the Tri-Agency Framework: Responsible Code of Conduct of Canada to ensure that I uphold ethical research in this study. I will also keep all of the personal information of participants confidential.

8	Disclosure and Barring Service			
9	If the research activity involves children or vulnerable adults, a Disclosure and Barring Service (DBS) certificate must be obtained before any contact with such participants.	YES	NO	N/A
10	Does your research require you to hold a current DBS Certificate?	☐	☒	☐

SECTION I: Feedback, Consent and Confidentiality

1	Feedback What de-briefing and feedback will be provided to participants, how will this be done and when?
	All participants in this study will have access to my email address. I will also share any results I find with them once the study has been completed and analyzed.
2	Informed consent Describe the arrangements to inform potential participants, before providing consent, of what is involved in participating. Describe the arrangements for participants to provide full consent before data collection begins. If gaining consent in this way is inappropriate, explain how consent will be obtained and recorded in accordance with prevailing data protection legislation.
	I will inform participants of what this study entails including the research methods that will be utilized before presenting them with the appropriate consent form to take part of the study. <i>(this box should expand as you type)</i>
3	Confidentiality / Anonymity Set out how anonymity of participants and confidentiality will be ensured in any outputs. If anonymity is not being offered, explain why this is the case.
	Names of participants will not be included in the data. The only data collected will be grouped as participants with PCOS in comparison to participants without. As previously stated, participants will be able to opt out of questions or the study if they need to. <i>(this box should expand as you type)</i>

SECTION J: Data Protection and Storage

In completing this section refer to the University's Research Data Management Policy and the extensive resources on the University's Research Data Management web pages (<http://uwtsd.ac.uk/library/research-data-management/>).

1	Does the research activity involve personal data (as defined by the General Data Protection Regulation 2016 "GDPR" and the Data Protection Act 2018 "DPA")?	YES	NO
	<i>"Personal data" means any information relating to an identified or identifiable natural person ('data subject'). An identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person.</i>	☒	☐
2	If YES, provide a description of the data and explain why this data needs to be collected:		
	I will be collecting consent forms from participants that will include their email addresses, names and age- although individual information will not be published or shared. Participants will be given a letter or number as an identifier so that personal information is not used. I will also be collecting recordings of participants singing 'Somewhere Over the Rainbow' and analyzing them through VoceVista to examine voice quality . <i>(this box should expand as you type)</i>		
3	Does it involve special category data (as defined by the GDPR)?	YES	NO
	<i>"Special category data" means sensitive personal data consisting of information as to the data subjects' –</i> <i>(a) racial or ethnic origin,</i> <i>(b) political opinions,</i> <i>(c) religious beliefs or other beliefs of a similar nature,</i> <i>(d) membership of a trade union (within the meaning of the Trade Union and Labour Relations (Consolidation) Act 1992),</i> <i>(e) physical or mental health or condition,</i> <i>(f) sexual life,</i> <i>(g) genetics,</i>	☐	☒

	(h) biometric data (as used for ID purposes),		
4	If YES, provide a description of the special category data and explain why this data needs to be collected:		

5	Will the research activity involve storing personal data and/or special category data on one of the following:	YES	NO
6	Manual files (i.e. in paper form)?	☐	☒
7	University computers?	☐	☒
8	Private company computers?	☐	☒
9	Home or other personal computers?	☒	☐
10	Laptop computers/ CDs/ Portable disk-drives/ memory sticks?	☒	☐
11	“Cloud” storage or websites?	☐	☒
12	Other – specify:	☐	☒
13	For all stored data, explain the measures in place to ensure the security of the data collected, data confidentiality, including details of password protection, encryption, anonymisation and pseudonymisation:		
	Data collected will be kept on my personal computer that is password encrypted in a folder that is also encrypted. I will have second and third copies on a hard drive and usb that is also password encrypted as a back up. Participants will also be given number or letter identifiers to help keep track of data while maintaining participant anonymity. (this box should expand as you type)		
14	All Data Storage		

15	Will the research activity involve any of the following activities:	YES	NO
16	Electronic transfer of data in any form?	☒	☐
17	Sharing of data with others at the University?	☒	☐
18	Sharing of data with other organisations?	☒	☐
19	Export of data outside the European Union or importing of data from outside the UK?	☒	☐
20	Use of personal addresses, postcodes, faxes, emails or telephone numbers?	☒	☐
21	Publication of data that might allow identification of individuals?	☐	☒
22	Use of data management system?	☒	☐
23	Data archiving?	☐	☒
24	If YES to any question, please provide full details, explaining how this will be conducted in accordance with the GDPR and DPA (and/or any international equivalent):		
	Any data that is provided by participants will be kept in encrypted and password protected hard drive on my personal computer that is also password protected. Any data transfer online will also be password protected and encrypted. As I am a Canadian resident, the data collected will be outside of the UK/ European Union but will also be stored here in Canada. All participant data will be stored until the end of the study then deleted. Names or personal information will not be used or published in this study- it will only be used to contact participants with results as requested. Participants will be have the right to see the data collected pertaining to them and have the right to request any section of their data not to be used in the study. In accordance to DPA2018, the information will be deleted immediately.		
25	List all who will have access to the data generated by the research activity:		
	I, the principal researcher will have access to the data generated.		
26	List who will have control of, and act as custodian(s) for, data generated by the research activity:		
	I, the principal researcher will have control and be custodian of the data generated by the research study.		

27	Give details of data storage arrangements, including security measures in place to protect the data, where data will be stored, how long for, and in what form. Will data be archived – if so how and if not why not.		
	The data collected from this research study will be kept in encrypted and password protected folders on my personal computer/ hard drive. I will also use a password encrypted usb to create a third copy of the data so that I have a backup. Once the study is complete and analyzed, I will delete the data in order to protect the personal information of participants.		
28	Please indicate if your data will be stored in the UWTSD Research Data Repository (see https://researchdata.uwtsd.ac.uk/). If so please explain. (<i>Most relevant to academic staff</i>)		
	My data will not be using the UWTSD Research Data Repository, I will be using my own personal hard drive as this is a small study.		
29	Confirm that you have read the UWTSD guidance on data management (see https://www.uwtsd.ac.uk/library/research-data-management/)	YES	☒
		NO	☐
30	Confirm that you are aware that you need to keep all data until after your research has completed or the end of your funding	YES	☒
		NO	☐

SECTION K: Declaration

31	The information which I have provided is correct and complete to the best of my knowledge. I have attempted to identify any risks and issues related to the research activity and acknowledge my obligations and the rights of the participants. In submitting this application I hereby confirm that I undertake to ensure that the above named research activity will meet the University's Research Ethics and Integrity Code of Practice which is published on the website: https://www.uwtsd.ac.uk/research/research-ethics/		
	Signature of applicant:	Daniela Noemi Garcia	Date: August 5, 2021

For STUDENT Submissions:

32	Director of Studies/Supervisor:	Annette fillery-travis	Date:4/9/21
33	Signature:	<i>Annette.fillery-travis</i>	

For STAFF Submissions:

34	Academic Director/ Assistant Dean:		Date:
35	Signature:		

Checklist: Please complete the checklist below to ensure that you have completed the form according to the guidelines and attached any required documentation:

☒	I have read the guidance notes supplied before completing the form.
☒	I have completed ALL RELEVANT sections of the form in full.
☒	I confirm that the research activity has received approval in principle
☒	I have attached a copy of final/interim approval from external organisation (where appropriate)
☒	I have attached a full risk assessment (and have NOT completed Section H of this form) (where appropriate) ONLY TICK IF YOU HAVE ATTACHED A FULL RISK ASSESSMENT

☒	I understand that it is my responsibility to ensure that the above named research activity will meet the University's Research Ethics and Integrity Code of Practice.
☒	I understand that before commencing data collection all documents aimed at respondents (including information sheets, consent forms, questionnaires, interview schedules etc.) must be confirmed by the DoS/Supervisor, module tutor or Academic Director.
☒	I have deleted the guidance notes before submitting the PG2 for consideration

RESEARCH STUDENTS AND STAFF ONLY

All communications relating to this application during its processing must be in writing and emailed to pgresearch@uwtsd.ac.uk, with the title 'Ethical Approval' followed by your name.

You will be informed of the outcome of your claim by email; therefore it is important that you check your University and personal email accounts regularly.

STUDENTS ON UNDERGRADUATE OR TAUGHT MASTERS PROGRAMMES should submit this form (and receive the outcome) via systems explained to you by the supervisor/module leader.

This form is available electronically from the Academic Office web pages:

<https://www.uwtsd.ac.uk/academic-office/appendices-and-forms/>

Application Process

All staff research projects and all research students must submit the Ethical Approval Form to the **University Research Ethics Committee** via the Academic Office (pgresearch@uwtsd.ac.uk). Staff research directly in relation to personal study for taught undergraduate or Masters programmes should be submitted via the Institute procedures explained below.

Taught masters and taught undergraduate research Ethical Approval Forms are considered **within Institutes**. Institutes will provide details of the specific processes for this. Where the Ethical issues within any single ethical application are of particular concern the Institute will refer these to the University Research Ethics Committee. Any student activity that involves the collection of primary data needs to undergo Ethical approval, this includes assignment work as well as dissertations.

Notes for guidance in completion of this form

Section A: About You

Please complete all relevant sections

Section B: Approval for research activity

Research proposals must be approved in principle before applying for Ethical Approval. The proposal approval only becomes final when the ethical approval is received.

The process for proposal approval varies according the individual and programme of study:

- Research students, by application on form PG1 to the Research Degrees Committee
- Taught students by review of research proposal within Institutes (Institutes provide specific details of these processes)
- Staff, by agreement by the Academic Director/Assistant Dean

Section C: External Ethical Guidance materials

Many discipline areas are required to operate with the discipline specific codes of research ethics (for example health, psychology, education etc.), any such codes must be listed and you must tick to confirm that you have consulted with these.

Section D: External Collaborative Research Activity

Provide details of the external collaborative partners, where appropriate you might want to submit a copy of the external collaboration agreement with the Ethical Approval Form. If the partner requires the research to be subject to its own internal Ethical approval process then please provide details of that process and a copy of any final (or interim) approvals received from the organization.

Section E: Details of Research Activity

Remember that the individuals reviewing this Ethical Approval Form may not have seen your research proposal, and also may not be experts in the specific area of your research. The information provided should therefore be jargon free and clearly stated.

Indicative Title: please use the same title as used on the research proposal.

Purpose: the Ethical approval process will want to ensure that the methods you propose are adequate and appropriate to address the research aims and objectives. Excessive additional data collection can be seen as unethical.

Proposed Methods: the Ethical approval process seeks to ensure that you understand the methods that are intended, and that the implementation of those methods will be appropriate and without unnecessary impact on respondents. This section must explain how the methods described will lead to the collection of necessary and sufficient data, but not excessive data. Please be specific.

Location: this needs to mention geographical location and also local situation (for example, within Local Authority Offices in Cardiff, using a private room but close to other individuals). If you are collecting data within an organisational setting then you need to explain the permissions that you have obtained to do this.

Research Activity outside of the UK: please complete this section in detail, and note any guidance you have received. Also describe your own familiarity (or not) with the location that you will be utilising.

Section F: Scope of Research Activity

Please tick ALL of the research activities that might be undertaken. If any additional types of activity are intended then please add an extra box and describe these.

If you have answered no to all questions in F then sections G and I do not need to be completed. . Signatures are still required in section K.

Section G: Intended Participants

Please tick all categories that might apply.

Numbers & Source: if you are using a series of different methods or research activities please list numbers for each stage/phase. Be clear about how you will find respondents. Will you use intermediaries, and if so how? How will you ensure compliance with your sampling strategy?

Information for participants: all participants should be appropriately informed about the research, what is expected of them and what will happen to the information that they provide. The Ethical review process does not ask to see this documentation, but requires this to be reviewed and approved by the Director of Studies in the case of research students, the supervisor/module tutor in relation to students on taught programmes and the Academic Director/Assistant Dean in relation to staff research.

Section H: Anticipate Risks

All research carries some level of risk. The answers you provide to questions in this section will be reviewed to ensure that you have an appropriate understanding of the type of risks involved and how you can mitigate against these risks. If you have completed a full risk assessment, as required for example for laboratory work, field work, clinical tests, diving operations, or by a collaborative partner, you may append that to this form. In that case, please tick the box indicating this has been provided. You will not then be required to complete Section H.

Risk to participants Think very carefully about how your actions/questions/discussions might affect the people you are involving as participants. You might identify the risk as small but it would still be a risk. Many types of question have the potential to make respondents less content with their life / job; you need to recognise and try to ameliorate any such effects

If these are business owners, time with you may reduce profit.

In some locations physical risk is very real to both participants and yourself, please consider this.

Risk to you, the researcher Think about where you will meet people, if there are any dangers involved in the location. If you are meeting people as individuals think about using a public place. In general do not visit people in their own homes or remote locations. If you are talking to individuals about certain issues think about how their responses might affect you emotionally. What about the risk of collecting insufficient data?

Risk to the University When undertaking your research, you are acting as a member of the University (student or staff). Professionalism is important, so it is important to be well organised and well prepared. Punctuality, clarity etc. are all part of this. What will you do to ensure this? You must ensure you do not harm the good name of the University in any way and do nothing to undermine the reputation of the research it conducts and sponsors. Upholding high standards of conduct and integrity are vital in this regard. You must also conduct the research in such a way to minimise the potential for claims of negligence made against the University, its researchers and any collaborating individual or organisation. In this respect you should always comply with ethical, legal and professional frameworks, obligations and standards as required by statutory and regulatory authorities, as well as the university's Research Integrity and Ethics Code of Practice. Research misconduct in this respect can take many forms, including:

- fabrication: making up results or other outputs (eg, artefacts) and presenting them as if they were real
- falsification: manipulating research processes or changing or omitting data without good cause
- plagiarism: using other people's material without giving proper credit
- failure to meet ethical, legal and professional obligations: for example failure to declare competing interests; misrepresentation of involvement or authorship; misrepresentation of interests; breach of confidentiality; lack of informed consent; misuse of personal data; and abuse of research subjects or material

- improper dealing with allegations of misconduct: failing to address possible infringements such as attempts to cover up misconduct and reprisals against whistle-blowers

Adverse Outcomes. Think carefully about the possibilities, and cover here

Section I: Feedback, Consent and Confidentiality

Feedback to participants: outline your approach. Will interview transcripts be shared with respondents to check accuracy? Will summaries of questionnaire analysis be made available to respondents in some way? Will an overview report be provided? How and when?

Informed consent: Draft letter / e-mail / or heading (or footer) section of questionnaire must be approved by DoS/supervisor (if research student), supervisor/module tutor if taught student, or Academic Director / Assistant Dean if a member of staff.

Confidentiality/Anonymity. Explain clearly how you will ensure confidentiality and anonymity.

Section J: Data Protection and Storage

Before completing this section it is necessary to read the University's Research Data Management information. The questions that follow are designed to ensure compliance with the Data Protection Act as well as established research protocols.

Many research activities will involve electronic transfer of data and use of data management systems in the summarisation and analysis of data. You will need to explain these in relation to compliance with the Data Protection Act.

Think carefully about who will have access to your data, this will include supervisors and examiners. Also that a thesis will be made available via the University library and the British Library system. If you are seeking an access bar for a period of time after completion then mention it here. If you will provide a copy of your findings, or intend to give a presentation, to a facilitating/ supporting/accessing organisation then explain that in this section. But also think about the general principle of data sharing, as explained in the Research Data Management information.

In terms of storage of data please ensure security, and also mitigate against loss of data.

Section K: Declaration

Ensure the appropriate countersignatures have been provided

Look carefully at the checklist and ensure that you comply with and tick all that are relevant to your research.

Appendix F: Survey Form

Pilot Study: Voice Effects Associated with Polycystic Ovarian Syndrome in Amateur and Semi-Professional Singers Survey

Note: You are welcome to opt out of any question. Select 'prefer not to answer' if the question is starred, or leave a non starred question blank.

* Required

1. Name or Initials *

2. Date *

Example: January 7, 2019

3. What is your age? *

Mark only one oval.

- ☐ Less than 19
- ☐ 20-30
- ☐ 30-40
- ☐ 40 +
- ☐ Prefer not to answer

4. Are you a native English speaker? *

1 point

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ Prefer not to answer

5. What is your profession?

Reminder: You can leave this blank if you prefer not to answer.

6. Have you been diagnosed with PCOS? *

1 point

(Polycystic Ovarian Syndrome)

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ Prefer not to answer

7. If yes, do you take medication for PCOS? *

(i.e. Metformin)

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ N/A (not applicable)
- ☐ Prefer not to answer

8. Have you been diagnosed with Endometriosis? *

1 point

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ Prefer not to answer

9. Do you have a regular menstrual cycle? *

1 point

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ Prefer not to answer

10. Do you take any form of contraception? *

1 point

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ Prefer not to answer

11. Do you suffer from PMS? (Premenstrual Syndrome) *

1 point

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ Sometimes
- ☐ Prefer not to answer

12. Do you take aspirin or ibuprofen to alleviate discomfort during PMS? *

1 point

Mark only one oval.

- ☐ Yes
- ☐ No
- ☐ Sometimes
- ☐ Prefer not to answer

Vocal
Hygiene

Please mark your opinion of your vocal hygiene and quality in the appropriate box as well as the scale degree. You are welcome to opt out of any question and leave it unmarked.

13. How long have you been singing? (months or years)

14. In regards to singing, would you consider yourself: *

Mark only one oval.

- ☐ Amateur
- ☐ Semi-Professional
- ☐ Professional
- ☐ Prefer not to answer

15. In general, do you experience hoarseness? *

(breathy, creaky or raspy voice)

Mark only one oval.

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Prefer not to answer

16. On a scale of 1-10, please mark your current degree of hoarseness:

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Low	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	High

17. In general, do you experience voice failure? *

(the voice gives out in the middle of speaking)

Mark only one oval.

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Prefer not to answer

18. On a scale of 1-10, please mark your current degree of voice failure:

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Low	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	High

19. In general, do you experience breathiness? *

(excess breath in your voice)

Mark only one oval.

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Prefer not to answer

20. On a scale of 1-10, please mark your current degree of breathiness:

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Low	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	High

21. In general, do you experience strain or tightness in the throat? *

Mark only one oval.

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Prefer not to answer

22. On a scale of 1-10, please mark your current degree of strain or tightness:

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Low	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	High

23. In general, do you experience excess mucus or phlegm? *

(excess breath in your voice)

Mark only one oval.

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Prefer not to answer

24. On a scale of 1-10, please mark your current degree of excess mucus or phlegm:

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Low	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	High

25. Please rate your current vocal resonance:

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Low	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	High

26. Do you have problems/discomfort with your voice at home? *

(i.e. hoarseness, voice fatigue, excess phlegm or mucus, breathiness...etc.)

Mark only one oval.

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Prefer not to answer

27. Do you have any problems with your voice at work? *
- (i.e. hoarseness, voice fatigue, excess phlegm or mucus, breathiness...etc.)

Mark only one oval.

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Prefer not to answer

28. Do you have any problems with your voice at leisure? *
- (i.e. hoarseness, voice fatigue, excess phlegm or mucus, breathiness...etc.)

Mark only one oval.

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Prefer not to answer

29. Do you have any problems with your voice in a noisy environment? (social gatherings, restaurants, sports events, concerts, etc.) *
- (i.e. hoarseness, voice fatigue, excess phlegm or mucus, breathiness...etc.)

Mark only one oval.

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Prefer not to answer

30. Do you clear your throat? *

Mark only one oval.

- ☐ Never
☐ Sometimes
☐ Often
☐ Always
☐ Prefer not to answer

31. Do you smoke? *

Mark only one oval.

- ☐ Never
☐ Sometimes
☐ Often
☐ Always
☐ Prefer not to answer

32. Generally, how many cups of coffee/ caffeinated drinks do you have daily? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

33. How many cups of coffee/ caffeinated drinks have you have today? *

You may also answer with the estimate you plan on having today.

Mark only one oval.

1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

34. Generally, how many hours a night do you sleep? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

35. How many hours a night did you sleep last night? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

36. How many glasses of water do you drink daily? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

37. How many glasses of water did you drink today? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

38. Do you have problems with hearing? *

Mark only one oval.

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Prefer not to answer

39. Do you have heartburn? *

(Acid reflux)

Mark only one oval.

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Always
- ☐ Prefer not to answer

40. If you have heartburn, do you use medication for it? *

Mark only one oval.

- ☐ No
- ☐ Yes
- ☐ Sometimes
- ☐ N/A (not applicable)
- ☐ Prefer not to answer

41. Do you have asthma? *

Mark only one oval.

- ☐ No
- ☐ Yes
- ☐ Sometimes
- ☐ Prefer not to answer

42. If yes, do you use inhalers? *

Mark only one oval.

- ☐ No
- ☐ Yes
- ☐ Sometimes
- ☐ N/A (not applicable)
- ☐ Prefer not to answer

43. Have you ever been diagnosed with Muscle Tension Dysphonia by a professional? *

Mark only one oval.

- ☐ No
- ☐ Yes
- ☐ Sometimes
- ☐ N/A (not applicable)
- ☐ Prefer not to answer

44. Have you ever had speech therapy? *

Mark only one oval.

- ☐ No
- ☐ Yes
- ☐ Prefer not to answer

Thank you for participating in the survey! Please contact me at:
danigarciamusica@gmail.com if you have any questions.

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