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**An Exploration of Research Methodologies, Philosophy of Research,
Paradigms and Design**

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Introduction

It is claimed that attempts to understand how the voice works began in antiquity (Grussl, 2019). Since then, these observations of the phenomena of singing have been systematised and formalised as early as the medieval era and with the advent of electricity and continuing advances in technology in recent history, the desire to fully understand voice and singing shows no signs of slowing down (Hoch, 2018). As musical traditions evolve, and as advances in technology make observations possible that were not in the past, for example, a study in the last decade used computer tomography to measure vocal fold length (Clarós et al., 2019), now is an exciting time for voice research. Within this paper, I aim to delve into qualitative, quantitative and mixed-methodology approaches. I will also explore research paradigms and how they affect the understanding of research while discussing strengths and limitations of varying philosophies with a consideration for ethics and relevant concerns for the insider-researcher. As a working voice teacher specialising in contemporary commercial music, it is important for me to identify and position myself accordingly as a practitioner-researcher. I have an interest in connecting the subjective with the objective, particularly in the realms of perception of voice quality and the measurable recording of physical reality and how this can be used to supplement existing pedagogy.

Ethics

In all research ethics must be considered. All participants in a study must give their consent freely and willingly (Fleming, 2018). Anonymity for participants must be upheld, unless in situations where there is a fear of harm to the participant or others and participants must be informed of this. Participants should also be made aware of their right to withdraw from a study with no negative repercussions. All research must also follow the relevant protocols of data protection to ensure participant's data is held securely and risks of personal data leakage is mitigated. Special considerations must be made when involving vulnerable people as research subjects.

The development of research guidelines have been influenced by the three Belmont Principles: Beneficence, Freedom and Justice (Nagai, Nakazawa and Akabayashi, 2022). *Beneficence*, meaning ethical research must provide the “most benefit and least harm” *freedom*, meaning participants must engage free of coercion, and *justice*, referring to “equal protection and equal opportunity” (Nagai, Nakazawa and Akabayashi, 2022, pg. 163).

Potentially Vulnerable People

Children and young people, anyone under the age of 18 in accordance to the Children Act 1989 (Department for Education, 2023), those with a learning disability or cognitive impairment or individuals in a dependent or unequal relationship are defined as vulnerable people (UK Research and Innovation, 2023). It is also possible that participants taken from a voice teacher's population of clients/students could be considered vulnerable due to the power dynamic between teacher/coach and student even if they do not fall into one of the above definitions. This of course should be reviewed on a case by case basis as subjects or groups could become vulnerable during the research process even though they would not be thought of as vulnerable initially (UK Research and Innovation, 2023). For example, a study participant could be an adult with no cognitive impairments but may have limited mobility, in this case the location of the search would have an impact on their ability to get around. This could lead to them feeling they cannot withdraw as they may fear they would not be able to leave the location without assistance.

Insider Research Considerations

An Insider Researcher is defined as "research that is undertaken within an organisation, group or community where the researcher is also a member" (Fleming, 2018, pg. 1). As I am a working voice practitioner, researching voice, I am by definition an insider researcher.

Key challenges in insider research includes: minimising implicit coercion or influence over results, it is possible if study participants are known to the researcher they may behave differently if they believe there is an expectation to behave a certain way; rigour, as insider researchers can potentially allow their biases to affect objectivity; and managing existing relationship dynamics (Fleming, 2018; Courtney and Mujis, 2024). I will have existing biases which could affect research if I remain ignorant to them. Other issues such as the possibility of using people already known to me as research subjects may raise further issues and even ethical concerns. For example, it's possible a student of mine may feel there is an expectation to participate in research with me if asked. There are actions researchers can take to mitigate these potential issues. One such action could be sending out an anonymous form for participant sign-up, rather than asking a client/student individually. This could reduce the risk of people agreeing to participate due to insecurities of what is accepted as the invitation is less direct. The issue of influencing behaviour could be helped by limiting the contact with participants while data is being collected. A researcher could complete the research design and then have another

individual actually collecting the data and briefing the participants. However, this may not be possible in all circumstances due to the specialist knowledge that may be needed in some voice studies. Depending on the specific task and research question, it may be the case that only the primary researcher is suitable to brief participants. Additionally, in the case where it is appropriate to use another individual, they will likely have their own biases which may influence their instruction - therefore precise attention must be made to ensure rigour and integrity is met (Fleming, 2018).

Insider Research does also have its benefits. There is a belief among some research paradigms that methodologies such as anthropology can only be done thoroughly if the researcher is placed into the community they are researching (Kwame Harrison, 2018).

Axiology, Epistemology and Ontology

Axiology

Axiology is the study of value and what things we see as valuable. It concerns what is valuable and worthy, either intrinsically, extrinsically or systemically (Edwards, 1995; Edelheim, 2014). It concerns itself with aesthetics and ethics - in research it concerns itself with what is valuable and ethical (Killam, 2013). Investigating axiology makes us as researchers examine why we make effort into one thing but not another, and having an understanding of a researcher's axiological beliefs is important for us to be able to read their research through the correct lens (Kawulich, 2012).

Epistemology

Epistemology is the study of knowledge, asking what knowledge is and how it is acquired. The classical definition is Justified True Belief (Sol and Heng, 2022), this definition can be broken down to mean for a person to have knowledge of something the following three conditions must be met.

1. The person has a belief.
2. That belief is true.
3. That belief must be justified (they came to the belief because they had reason to)

However as Gettier (1963) famously reported, there are incidences when claims meet the criteria for Justified True Belief but intuitively would not be considered knowledge (Zhao, 2024).

Consider the following thought experiment:

A man stands in his garden and looks over his wall and sees smoke a few hundred feet away.

He develops the belief that there must be a fire burning, based on this observation. Unfortunately, the smoke was actually a cloud of flies hovering around some rotting fruit.

Let's say at the moment he looked outside, there is a fire that had just been lit and hadn't started giving off smoke yet.

Did that man *know* there was a fire?

This thought experiment originally brought forward by Dharmottara, an 8th Century Buddhist writer (Edmonds, 2024), raises similar issues to those raised by Gettier (1963). To amend the definition, Goodman (1967) proposed that the belief must be causally connected to the fact that makes it true. However, there are still problems with this more recent definition (Stalkfleet, 2011) see Appendix 1 for an example that satisfies the causal theory for knowledge but intuitively does not constitute knowledge.

Similar attempts to refine the classical definition have been that the true belief must be *appropriately justified* (Rescher, 2003; Sol and Heng, 2022), however, this brings into question how justification becomes appropriate and who gets to decide when justification is appropriate and opens up ethical questions.

This exploration may seem pedantic, however, one could question how possible it is to correctly research and prove anything if there is still no universally agreed upon definition of knowledge. I will not endeavour to answer this question in this paper, as this will be better left to philosophers, but it is an important consideration to have when researching and a strong rationale as to why understanding the epistemological position of the researcher is so important so we can position ourselves inside their epistemology to view their research.

Two contrasting philosophies of epistemology are skepticism, the belief that we cannot have absolute knowledge of anything outside of our own minds (Klein, 2010) and fallibilism, the belief that knowledge can exist even if our justification is fallible.

Ontology

Ontology defines how people construct their view of the world and reality, concerning itself with being, the real world and what is true and real. Two examples of ontological philosophies are Realism and Relativism. Realism refers to the belief that there is an objectively true, fixed reality that can be measured. Discoveries can then be used to generalise other situations (Newing, 2011). Relativism, conversely, refers to the philosophy that multiple valid versions of reality exist, because truth cannot exist without context (Newing, 2011). A researcher's ontological philosophy will shape their epistemological beliefs, which will in turn inform how they choose to conduct research. When understanding research it is paramount that the ontological and epistemological position of the researchers is understood, to ensure their research and data is correctly viewed. Ontological beliefs will be connected to axiological beliefs and thoughts on ethics. A person who believes in Moral Absolutism, the belief that an act can be defined as inherently good or bad, may more closely identify as an Ontological Realist. This may not be true however, as the Ontological Realist may create rules or laws which may follow an objective path, leading to complex reasoning to distinguish between good or bad, such as beneficial consequences compared to the negative consequences. This may mean that actions are not seen as inherently good or bad, but there is still a clear framework that objectively decides whether an action is ethically permissible or not.

Research Methodologies

Qualitative

Qualitative Methodologies explore qualities and collect subjective data usually in the form of words or images (Newing, 2011). This type of research relates to the Relativism Philosophy, due to its focus on understanding phenomena and human experiences. This is typically done through participant observation, open-ended interview, archival documents and other methods that prioritise the participants' subjective experience (Creswell, 2007; Newing, 2011).

This type of research is advantageous for research related to human experience and perceptual phenomena and can be used to understanding varying ideas and perspectives; however a disadvantage is that it can be difficult to use the data to show trends or patterns (Newing, 2011)

Quantitative

Quantitative Methodologies, look at numbers and objective data. Connected to the Realism Philosophy, researchers using Quantitative Methodologies attempt prove or disprove a claim in order to work towards an objective truth. This is often done through hypothesis testing, or, null-hypothesis testing (Newing, 2011). After data collection, the results either will or will not align with the hypothesis. The researcher can then either communicate their result, or refine their hypothesis or research design and test again.

The presentation of data is extremely important so readers can understand the data collected even if they do not have an academic background in the subject matter, you often see graphs, charts and tables in research papers dealing with quantitative statistics.

Mixed-methodology

Mixed-methodology involves both qualitative and quantitative methods. These research studies make use of both Qualitative Data and Quantitative Data; the goal may be to analyse a large sample size with quantitative methods and then focus on specific issues or individuals to gain more insight using qualitative research methods. Conversely, research could begin with qualitative data collection, which is then analysed to generate a hypothesis which is then tested in the form of Quantitative Research such as a survey using numbered scale (Newing, 2011).

While Mixed-Methods Research can be difficult to achieve due to the opposing Ontological and Epistemological Philosophies of Quantitative and Qualitative research approaches (Newing, 2011) it is possible to conduct successful, rigorous Mixed-Methods Research. I have chosen to include this type of research in this paper, as I am potentially interested in connecting qualitative observations in voice such as voice quality, with measurable data such as spectral analysis and physical observations, which would be collected through Quantitative Methods. Therefore, to study this area of interest, research will have to include both Qualitative and Quantitative Data.

Research Paradigms

A research paradigm is a framework, developed from a set of underlying epistemological, ontological and methodological foundations (Kawulich, 2012). Below I have briefly outlined three research paradigms with examples of their relevance for voice related research.

Positivism

Positivism is the belief that there exists a factual objective reality that can be broken down into discrete elements which are able to be observed objectively. Axiologically, in this paradigm, empirical knowledge is only type of knowledge that is valid, and epistemologically knowledge can only be developed by directly observing evidence. Only after multiple incidences of such objective evidence, can general laws be developed and tested to investigate possible cause and effect (Blaikie, 1993; Newing 2011). The paradigm is named positivism due to the optimism from contemporaries in the potential of *the scientific method* to create improvements in living conditions and society (Newing, 2011). The scientific method never produces absolute knowledge, as a hypothesis can never be fully proven - however a null-hypothesis, the negative of the hypothesis, can be disproven (Newing, 2011).

This paradigm within voice research, can be utilised in research that concerns making improvements to voice models or expanding our current knowledge of the physics of the voice. In relation to my own interests, I would adopt this paradigm as a frame of reference if conducting research looking at spectral analysis across different voice qualities. However, this paradigm may not be as useful if the research goal is to develop clearer communication in teaching, as this would likely involve data on the subjective experiences of singers performing different tasks, this data may not be quantifiable. A counter-argument however, could be that even subjective experiences could be quantified after being appropriately coded and if this does not lead to patterns forming it simply means there are parts missing from the current theory. We see similar discussions within the realms of cosmology and physics in the pursuit for a “theory of everything” (Atle Ottesen Søvik, 2022).

Constructivism/Interpretivism

Constructivism by contrast, is a belief that reality is constructed by individuals and/or society and are “mind dependent” (Kawulich, 2012, pg. 10). As such, this paradigm gives

legitimacy to all shaped realities of different individuals, societies and cultures, and for a researcher to truly engage with the constructivist paradigm in research they must build this axiom into their research design. Particular attention must go into the awareness and admission of biases to ensure the researcher does not allow their own perception of reality to cloud judgement in the designing of the research study or in the collection/analysis of data. Due to this, constructivist/interpretivist research usually concerns qualitative data (Sol and Heng, 2022).

This paradigm may be suited to voice-research related contexts when asking questions based on an individual's, or collective group's, own human experience. For example, a voice teacher may wish to find out what the most comfortable studio set-up and environment is for their students. They may form a group of people to interview and simply ask for their thoughts on what is the most comfortable environment for them, or they may trial a variety of different studio set-ups and then conduct interviews afterwards to collect information on how the different environments made subjects feel. It is important to bear in mind that due to the individualistic nature of this type of research, insights may not always be transferrable to other groups and populations.

Pragmatism

Pragmatism, in short, is a philosophy that there is no one way to obtain knowledge and truth; and, as such, researchers must find workable solutions based on how to best investigate or solve an issue or question. Two main epistemological axioms are that knowledge is fallible and should follow an ongoing process of self-correction as more experience is gained (Sol and Heng, 2022). This research paradigm often involves mixed-methods of both quantitative and qualitative data.

Looking at my own beliefs of reality and knowledge I would place myself within the pragmatism paradigm. Due to the multifaceted nature of voice, there are phenomena that can be measured and quantified, such as the relationship between vocal fold tension and fundamental frequency for example; however, there are phenomena that I believe cannot be measured quantifiably, such as where a person feels sensations in their own body when performing different vocal tasks.

Research Designs

Experimental Design

The experimental design, is a quantitative research design which aims to test the effect of changing a variable. This involves dividing the subjects into two groups, an experimental group and a control group. Testing is carried out in both groups before intervention to gather a baseline, and then tests are repeated with the change in the experimental group and without intervention in the control group to reduce the possibility that any difference discovered happened by chance or was the result of confounding variables (Newing, 2011).

Within voice research, this design has been used to study cause and effect relationships between precisely measured variables; Zheng et al. (2009) used an experimental design when investigating how false folds affect glottal flow and vocal fold vibration.

Grounded Theory

Data collection begins with no theory or hypothesis to test, instead, it follows a continuous loop of data collection and analysis which the theory is then developed out of (Creswell, 2007; Newing, 2011).

In voice research this could be used to understand the day-to-day lives of professional singers in a particular setting, or to look into the experiences of self-taught vocalists.

Phenomenology

Phenomenology has a focus in what different people share in their experience of similar things (Creswell, 2007). According to Creswell (2007) “the basic purpose of phenomenology is to reduce individual experiences with a phenomenon to a description of the universal essence” (pg. 58). The process starts by identifying a phenomena and then collecting data from a group of people who have experienced it in an effort to create an essential description of the experience (Creswell, 2007).

Even when using Bracketing techniques maintaining objectivity is difficult as we are relying on the researcher to interpret the data given by participants and it may not be possible to remove and disregard all personal bias and perspective.

Research Methods

Observation

Observation is a descriptive method which collects data without intervention (Newing, 2011). It is used to develop understanding or explanation of a group, event, behaviour or phenomena and can be either structured or unstructured and the role of the researcher can be either participant or non-participant (Lambert, 2019). During structured observation, researchers will have decided what specific behaviour they are observing before data collection begins and will likely collect quantitative data for statistical analysis; whereas in unstructured observation, data is collected as it is observed by the researcher in great detail (Lambert, 2019). Structured observation is advantageous as the data can often be more easily used to identify patterns and trends, however it requires attentive planning and careful design before data collection can begin (Lambert, 2019). Unstructured observation on the other hand gives more opportunity to describe events in finer detail, capturing a wider set of information; this may however, be problematic due to large amounts of data that has to then be analysed or due to the data's focus on a specific setting (Newing, 2011; Lambert, 2019). Roll (2015) used observation to explore high belt singing by visiting the studios of four teachers and spending at least two days observing their teaching; semi-structured interview was also conducted.

Acoustic Analysis

Acoustic analysis can obtain quantitative data from a voice signal and can be hugely useful in voice research and practice as it provides an objective set of data points that can be viewed and compared, as opposed to relying solely on the subjective perceptions of a listener (Cunningham and Nandamudi, 2021; Nguyen and Madill, 2023). This makes acoustic analysis a great tool for identifying trends or differences when looking to quantify qualitative data such as perceived vocal brightness or vocal intensity.

Additionally, there are a large number of programs available including relatively inexpensive and free programs, making this method often very accessible; although the price of paid systems can vary greatly (Cunningham and Nandamudi, 2021). Different systems also examine different ranges of the vocal signal (Cunningham and Nandamudi, 2021), meaning a researcher can select a system which gives the most detailed analysis of what they are specifically investigating. A limitation, however, is that due to the large number of systems available, variance in results from system to system exist, and

consequently, one should only compare data collected within the same system (Cunningham and Nandamudi, 2021). The design of these experiments must also provide consistency across all incidences of data recording; keeping “settings, readings, microphone placement, software, and environment” the same (Cunningham and Nandamudi, 2021, pg 295) controlling these variables may be overwhelming or may not be possible in all circumstances. Flynn, Trudeau and Johnson (2018) used acoustic analysis in their study of professional Broadway actresses’ lower and higher belt ranges.

Survey

Surveys are another often used method for data collection and can collect both qualitative or quantitative data but either asking closed questions with a numerical response or open ended questions giving responders space to write out answers in words (Brant et al., 2015). Data can be collected in-person either with participants recorded results themselves or by a researcher asking their questions and writing down their responses; or can be completed at a distance either via post/paper methods or electronic methods such as email or other “Internet-based program such as SurveyMonkey” (Brant et al., 2015, pg. 170). While online may reach more people, it may result in certain demographics being excluded, therefore, in order to gather data that is an accurate representation of a wider population, additional methods of delivery should be employed (Brant et al., 2015).

Surveys are advantageous when looking to gather data from either a large or a specific population, as they can be both circulated widely and include information on the target population before a potential responder begins answering questions. If this information is clear, it would result in only collecting data from the specific group you are interested in researching. Survey research has obstacles however. As we live in a multicultural society, it is likely that not all respondents receiving a widely shared survey will speak English as a first language. The survey could be translated, but it may not be possible to accurately translate the concept from one language to another due to differences in language codability (Sha and Gabel, 2020).

Survey was used by LoVetri et al (2021, pg. 1) in a study on the “Demographics, Vocal Training Background, Definitions, and Vocal Health” of professional belters. The survey was distributed online using Google and a sample was found by sharing the survey with the authors’ network of peers, students and colleagues.

Conclusion

There are a variety of accepted approaches, methods and designs of research which encompass different research paradigms and philosophies on epistemology, ontology and axiology. None of these approaches are inherently better than others but have their own strengths and limitations when conducting research. In order for research to be successful, the researcher must identify a design which best aligns with solving the research problem while being conscious of the designs limitations. As mentioned previously, data on everything cannot be collected, therefore good research must be clear and specific. Due to the multifaceted nature of voice, and the role of the practitioner-researcher, the pragmatist research paradigm may be the most suited to voice practitioner research (Winter, 2022); although other paradigms can still be used successfully in voice research depending on the research problem.

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Appendices

Appendix 1:

Thought experiment in question to Goldman (1967) Causal Theory of Knowing. Adapted by idea shown by Stalkfleet (2011).

Julia, tells her friend Sam that she is going to visit the shopping centre on Friday afternoon.

Sam then constructs the belief that Julia will be at the shopping centre on Friday afternoon, based on Julia's telling him.

Their conversation is however overheard by a group of kidnappers, who kidnap Julia on Friday morning and take her to their base, which happens to be in a storage unit in the shopping centre.

Did Sam *know* that Julia was going to be at the shopping centre on Friday afternoon?

Sam's belief is caused by information given to him by Julia, and that same information is what caused the kidnapping to take place so there are no breaks in the causal chain between belief and fact.