

# Imagined Singing

Sensing Musical Imagery Use in Vocalists

Stage 0 Presentation - 21 May 2019

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# Presentation Structure

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- Introduction
- Background and Related Work
- Research Questions
- Proposed Studies
- PhD Timeline

# Introduction

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Musical imagery = anticipation of action

Abstract intention → Concrete execution

What are the channels that link thought to action?

Can we measure, via the body, what occurs within the mind?

Focus on the **voice** as an instrument that exists solely within the body - requires extensive use of metaphor

# Musical Imagery

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Anticipating the outcome through sensory visualisation<sup>[3,10]</sup>

Imagining an action and actually doing it →

These share the **same neural pathways**<sup>[7]</sup>

Focus on how something **feels, looks, and sounds** in performance in order to recreate it

“**Imagery toolboxes**” are built<sup>[15]</sup> during practice and rehearsal, and called up during performance<sup>[14]</sup>

**Metaphors** as abstract representations of techniques

# Audiation

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Subvocalisation = the voice in your head

“Talking to yourself”

Audiation = when vocalists sing to themselves

- Reading through a new piece of music
- Mental rehearsal
- Keeping a tonal center or tempo

# Gesture in Performance

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Leman & Godøy<sup>[4]</sup> – The musical experience as “inseparable from the sensations of movement”

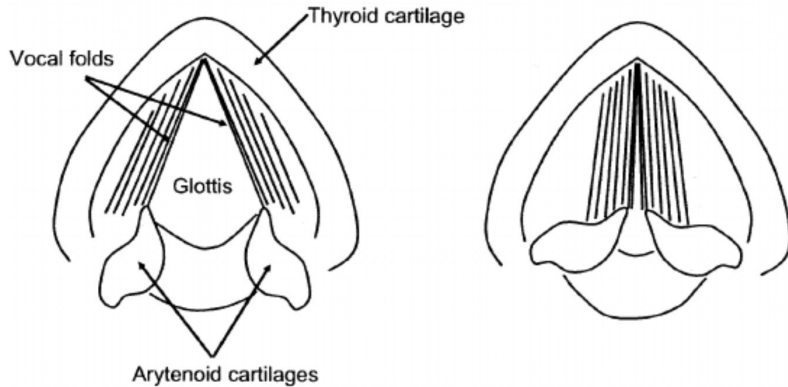
<b>effective gestures:</b>	generate sound
<b>accompanist gestures:</b>	facilitate sound production
<b>figurative gestures:</b>	interpretation and expression

Gestures work with imagery to help with anticipation  
Feel the timing in the body<sup>[11]</sup>, prepare for the sound production, express emotional content

# Voice Physiology

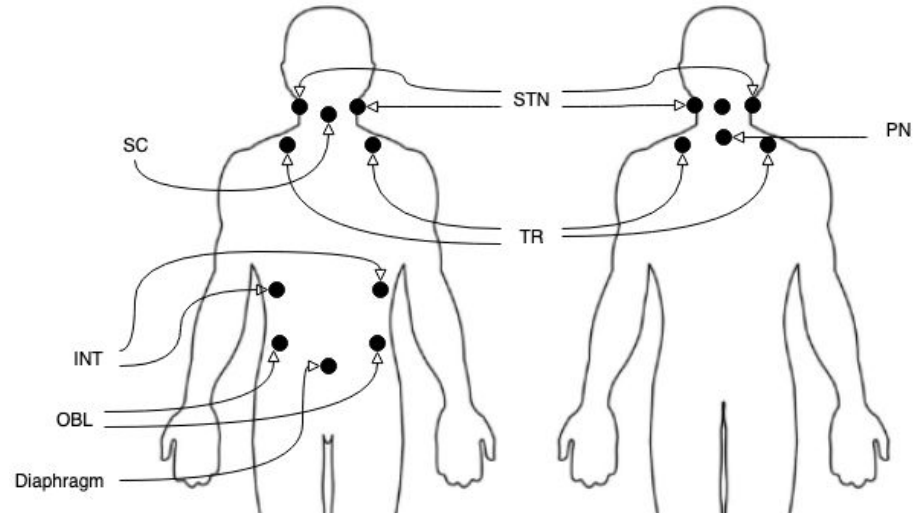
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## Vocal Tract [8]



Laryngeal movements maintain  $P_s$   
Cricothyroid tension

## Respiratory Muscles [2,5]



Abdominal and neck/shoulder regions  
Diaphragm and intercostals

Maintain “supported breathing”

# Measuring Subvocalisation

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Media Lab (MIT) Kapur *et al.*

AlterEgo<sup>[9]</sup>

“inner voice” during subvocalisation

Readings of nerve impulses across facial and laryngeal muscle articulators

Trained a model to group movements for word patterns and hear “inner voice”





# Research Questions

1

How do vocalists use imagery (including metaphor) and gesture?

2

How can we accurately measure muscular activity during audiation, as done with speech?

3

How does physiology change with different intention?

4

How can we detect expressive intent in muscular activations?

# Hypotheses

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Vocalists actively use audiation to adapt to non-ideal performance situations and depend on imagined sound to include expression in their performances.

There is a connection between visualised sound during audiation and physical execution, which is observable at the muscular level. These muscular activations reflect the performance intentions and use of imagery.

# Proposed Studies

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## **Study 1**

Vocalists perform against altered auditory feedback, using audiation to maintain accuracy and achieve expressive goals.

## **Study 2**

A network of sensors is developed and tested for the accurate detection of low-level muscular movement during audiation.

## **Study 3**

Muscular activations during audiation are used to train a model which can identify a vocalist's intended sound and its quality.

# Methodology and Analysis

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Mixed methods for data analysis:

**Quantitative** – Performance analyses<sup>[6,12-13]</sup>  
Tracked muscular activation  
and nerve impulses<sup>[9]</sup>

**Qualitative** – Thematic Analysis<sup>[1]</sup> of imagery  
Perceptual Testing<sup>[14]</sup>

# Initial Study

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Audiation in vocal performance

Observe the use of musical imagery when vocalists perform under non-ideal conditions

## **Subvocalisation tasks:**

- “sing to yourself” for specified time
- undefined silence or cued entrances

## **Altered auditory feedback tasks:**

- sing with delay or reverb
- sing with pitch shifting

## **Reflection tasks:**

- rank difficulty of conditions

## **Instruction tasks:**

- gather insight about imagery language

# PhD Timeline

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Year	2019												2020												2021												2022				
	Month	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
<b>Tasks</b>																																									
<b>Stage 0</b>																																									
Literature Review																																									
Proposal Writing																																									
Progress Review																																									
<b>Stage 1</b>																																									
First Study																																									
Prepare Study																																									
Conduct Study																																									
Data Analysis																																									
Progress Review																																									
<b>Stage 2</b>																																									
Second Study ( <i>Part 1</i> )																																									
Build Sensor Network																																									
Test Sensor Interface																																									
Second Study ( <i>Part 2</i> )																																									
Prepare Study																																									
Conduct Study																																									
Data Analysis																																									
Third Study																																									
<b>Stage 3</b>																																									
Writing Up																																									
Transfer to Writing Up																																									
Final VIVA																																									

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