

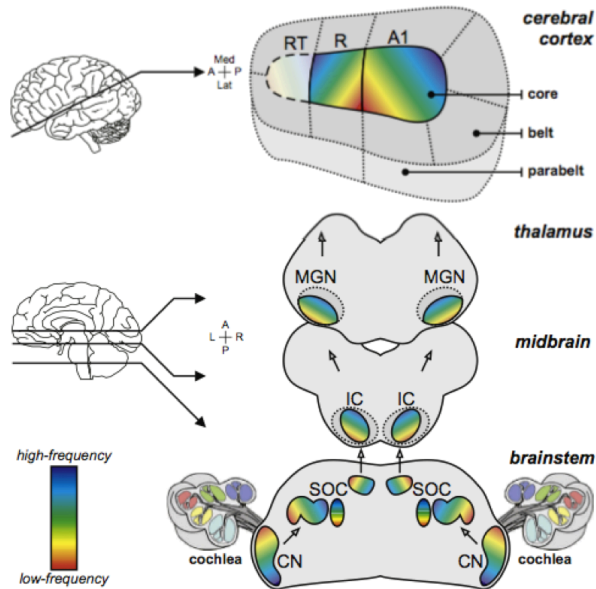
Melodic perception



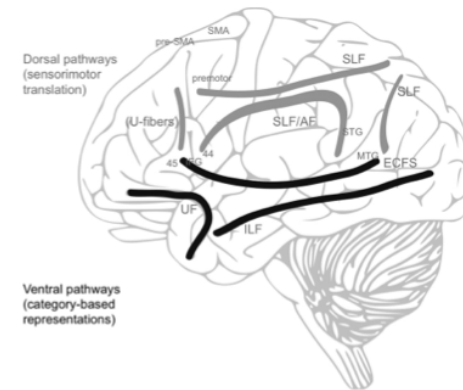
Pauline Larrouy-Maestri

Pauline.larrouy-maestri@aesthetics.mpg.de

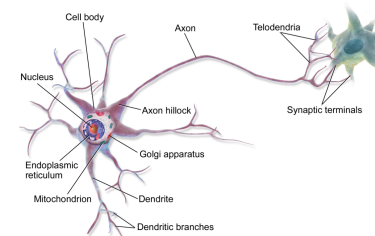
What happens?



Central auditory pathway (from Saenz & Langers, 2014)



Dorsal and ventral pathways (from Loui, 2015)



(random picture)

- Saenz & Langers (2014). Tonotopic mappig of human auditory cortex. *Hearing Research*
- Loui (2015). A dual-stream neuroanatomy of singing. *Music Perception*
- Peretz & Colheart (2003). Modularity of music processing. *Nature Neuroscience*
- Peretz, Vuvan, Lagrois, & Armony (2015). Neural overlap in processing music and speech. *Philosophical transactions*

David Marr's levels of analysis

Definition of correctness
(i.e., pitch accuracy)

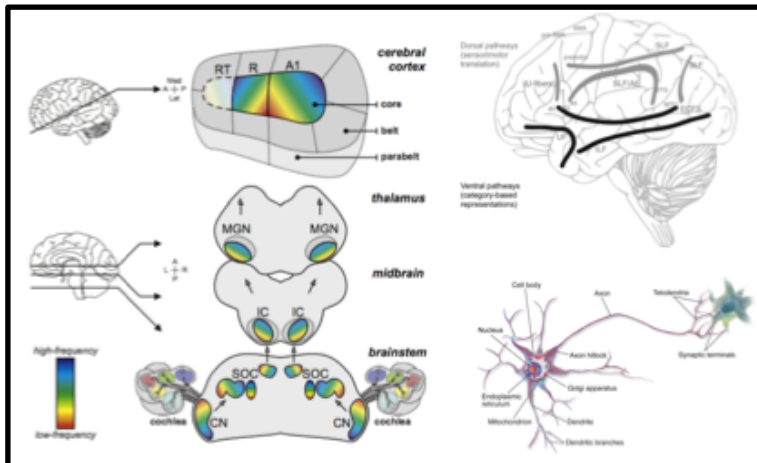
Computational level

→ What does the system do?

Mechanisms driving the
perception of correctness

Algorithmic level

→ How does it do it?



Implementational level

Physical structure / Hardware

Neurobiological mechanisms

→ How can it be realized physically?

David Marr's levels of analysis

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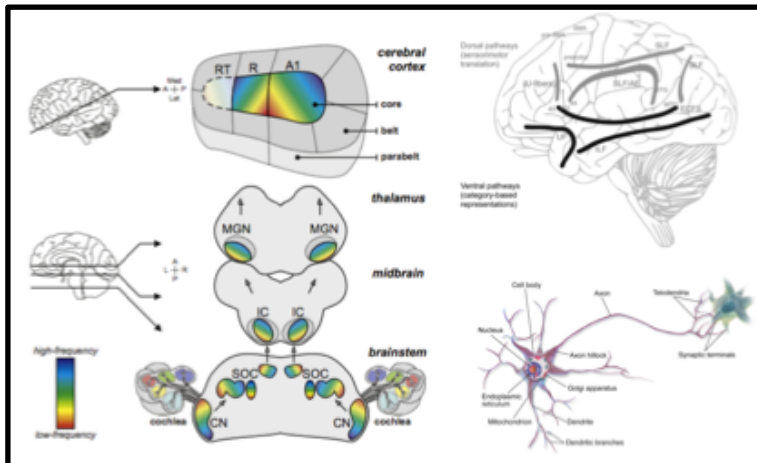
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Pitch accuracy



Contour error



Interval error



Tonality error



Pitch accuracy

166 performances



<http://sldr.org/sldr000774/en>

Computer
assisted method

3 criteria

Judges



1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9
Out of tune In tune



Pitch accuracy – Music experts



Contour error



Interval error



Tonality error



Pitch accuracy – Layman listeners



Contour error



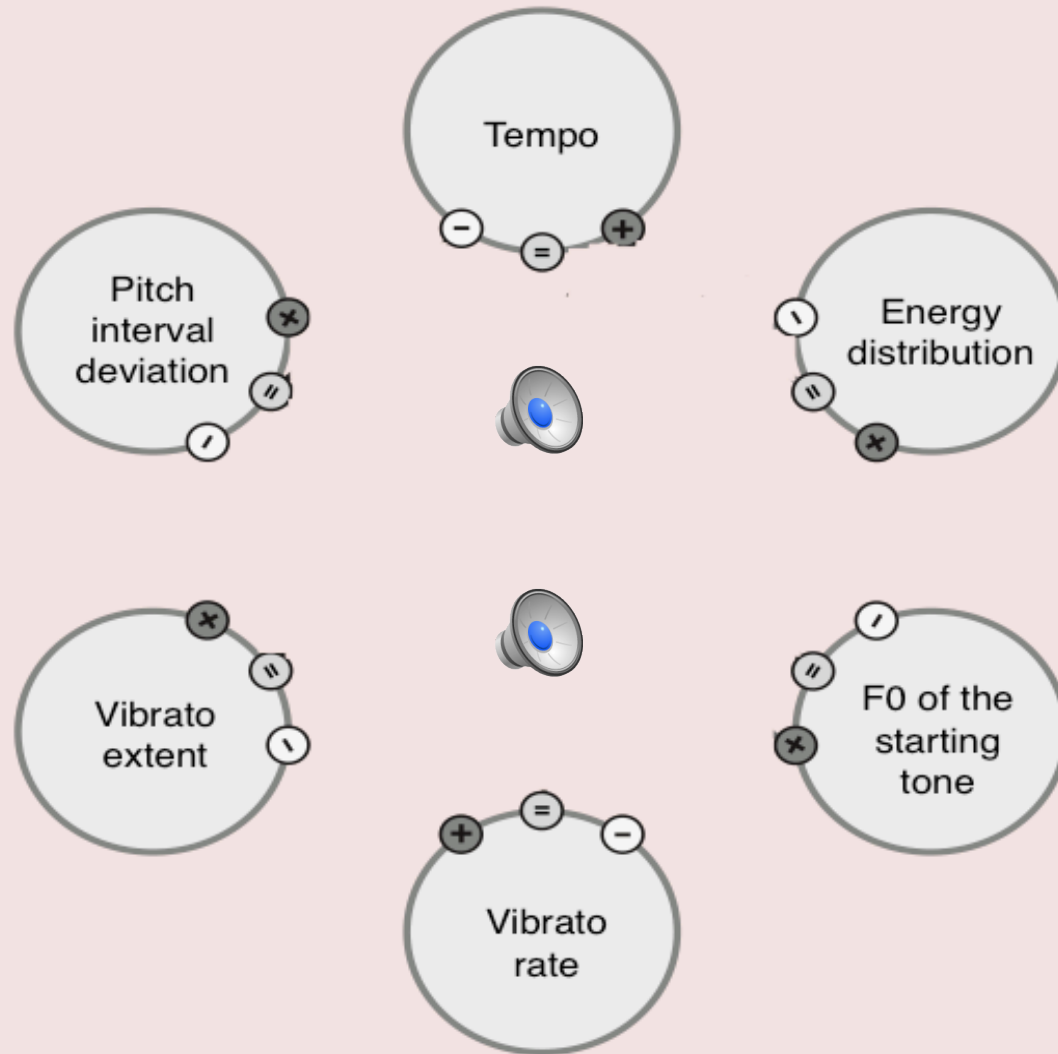
Interval error



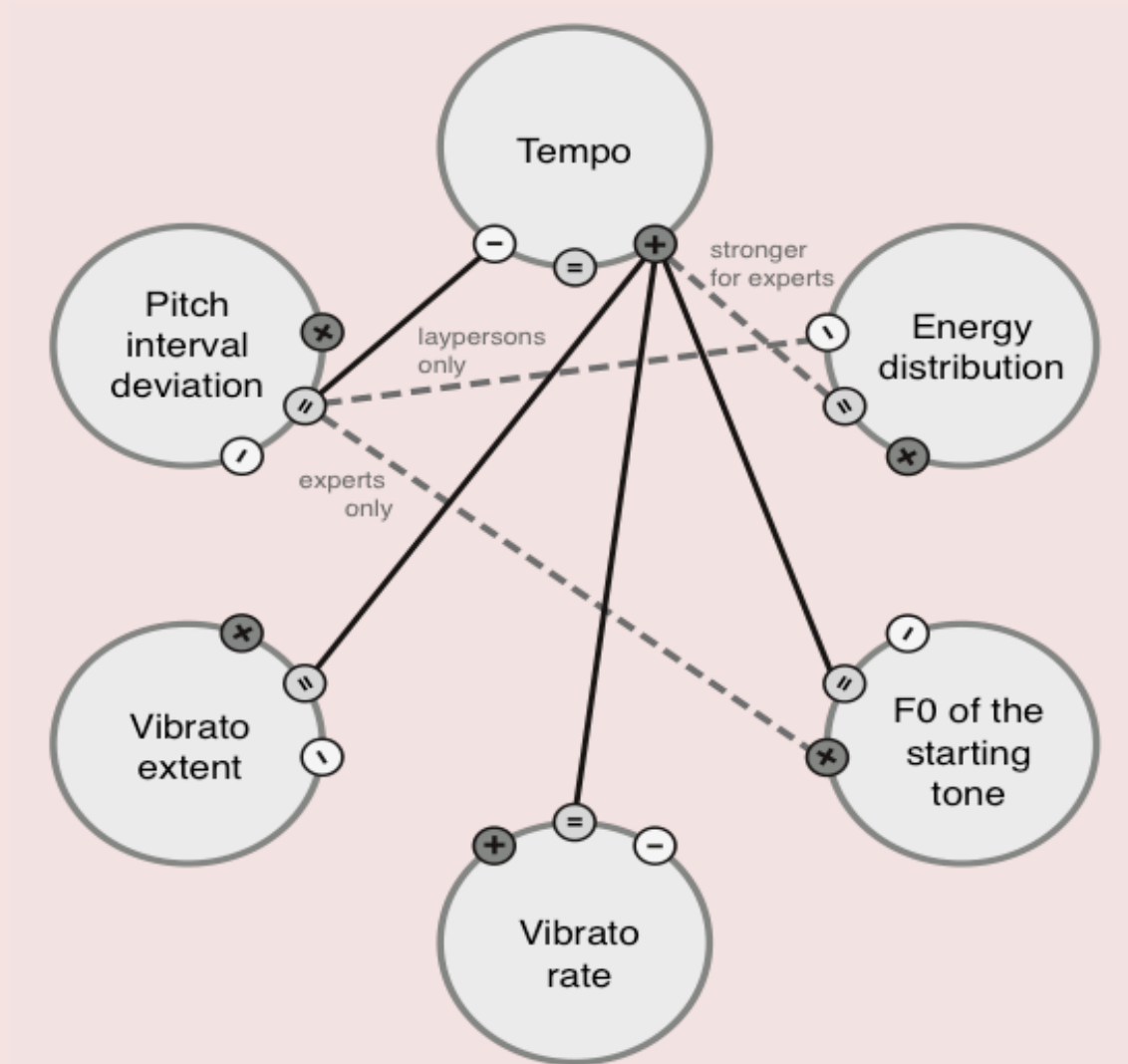
Tonality error



(The case of operatic singers – Definition)



(The case of operatic singers – Evaluation)



Pitch accuracy – Layman listeners



Contour error



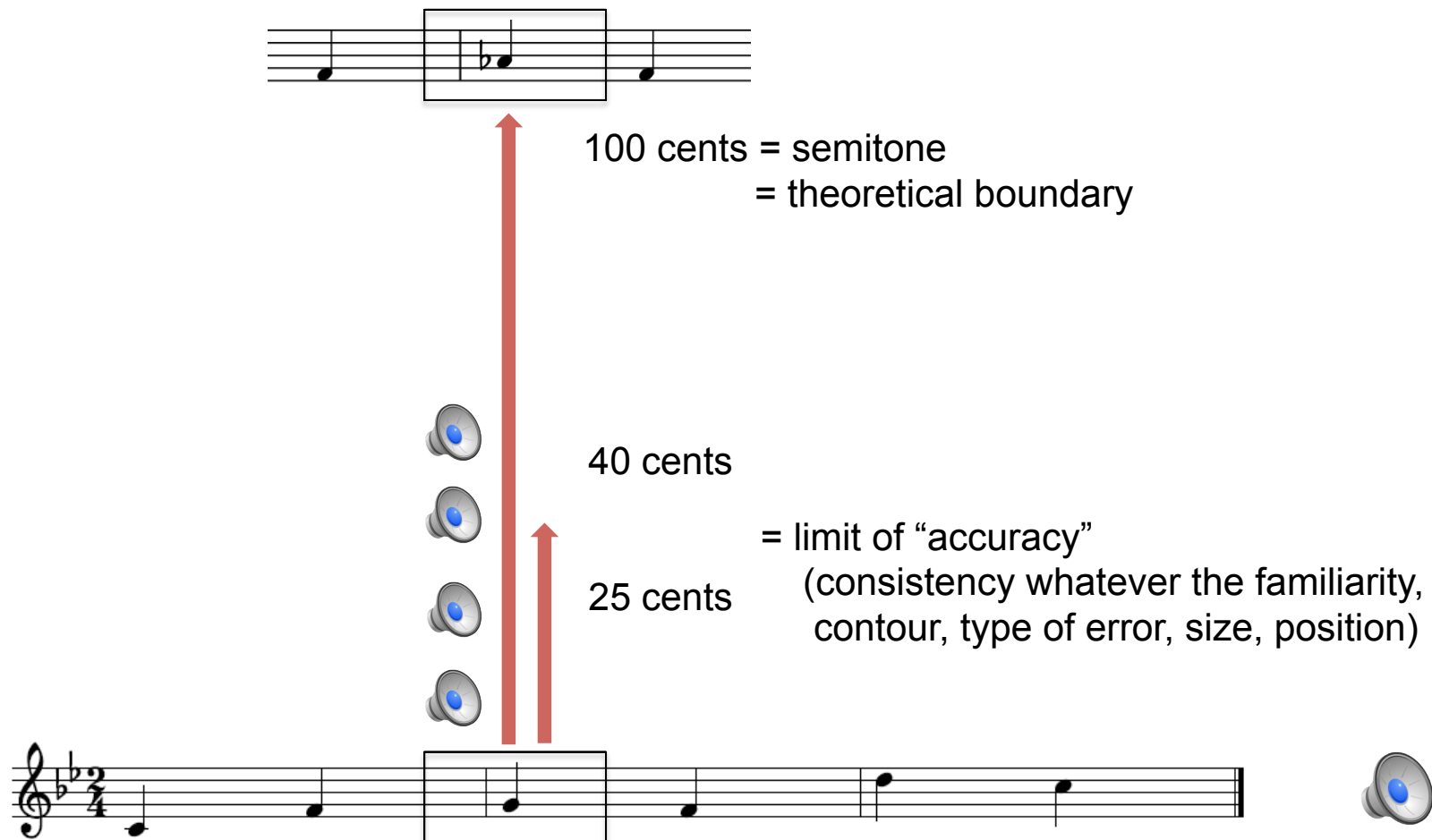
Interval error



Tonality error



Pitch accuracy – Definition



David Marr's levels of analysis

Definition of correctness
(i.e., pitch accuracy)

Computational level

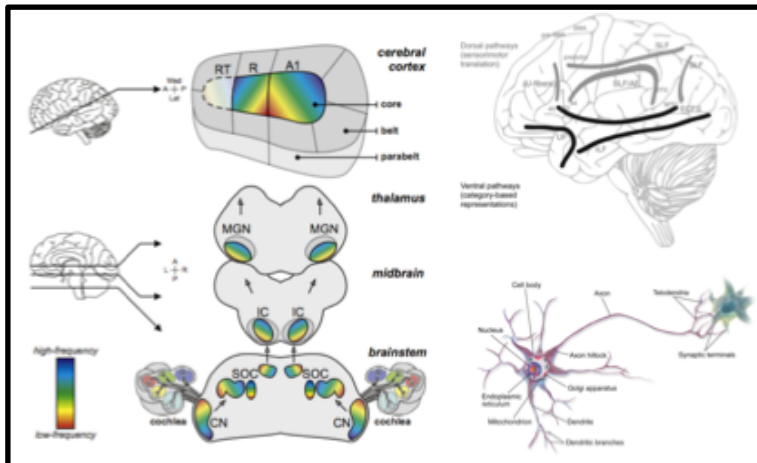
→ What does the system do?

Reacts to pitch deviations of 25 to 40 cents

Mechanisms driving the
perception of correctness

Algorithmic level

→ How does it do it?



Implementational level

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David Marr's levels of analysis

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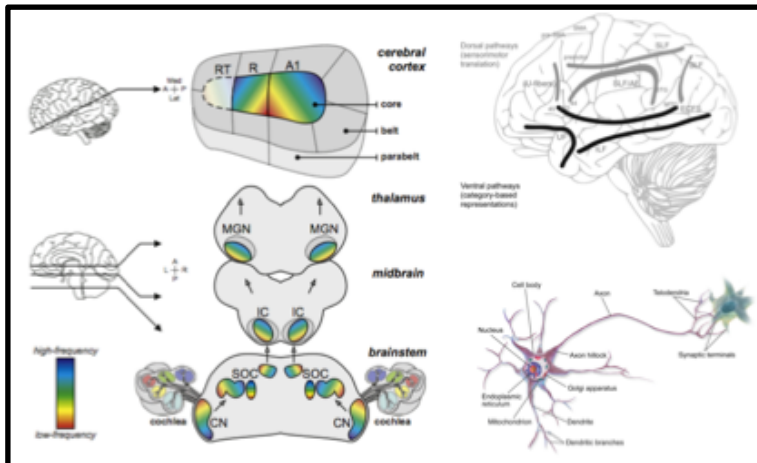
→ How does it do it?

Implementational level

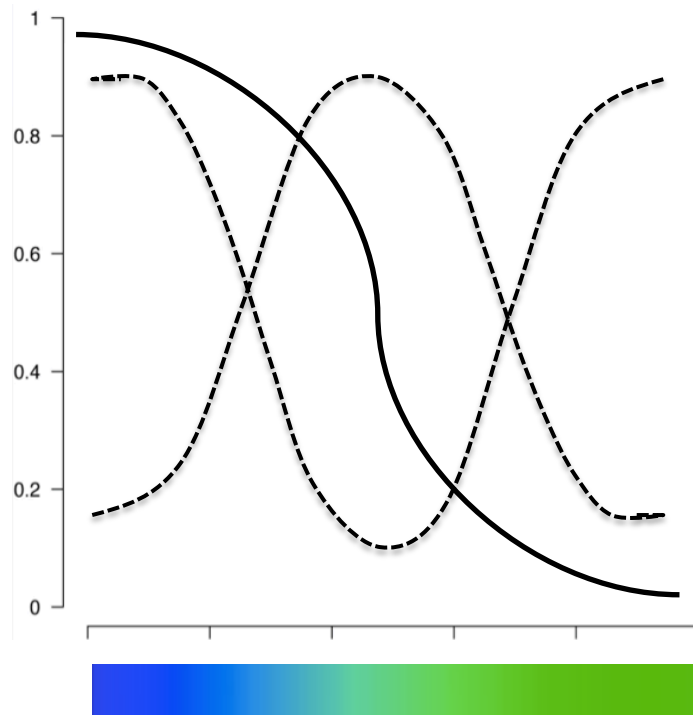
Physical structure / Hardware

Neurobiological mechanisms

→ How can it be realized physically?

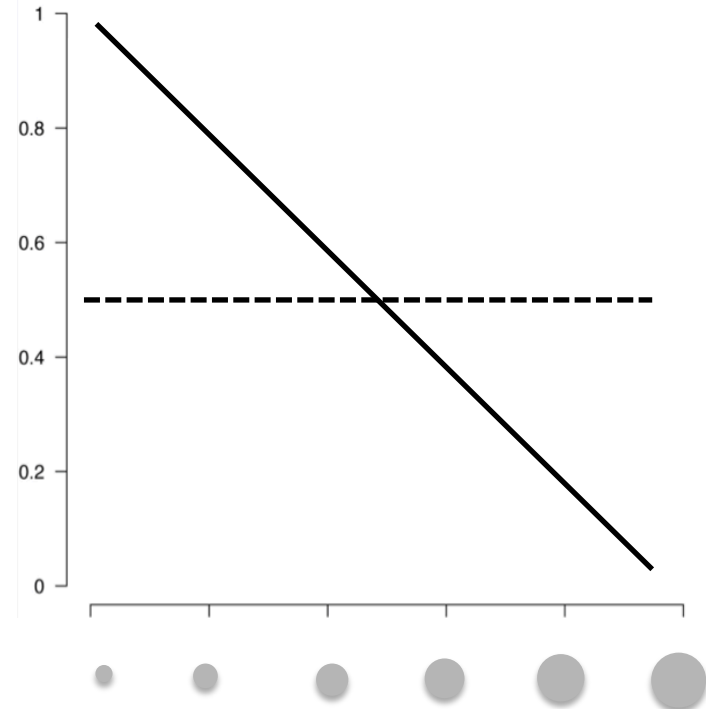


Mechanisms driving perception



Categorical

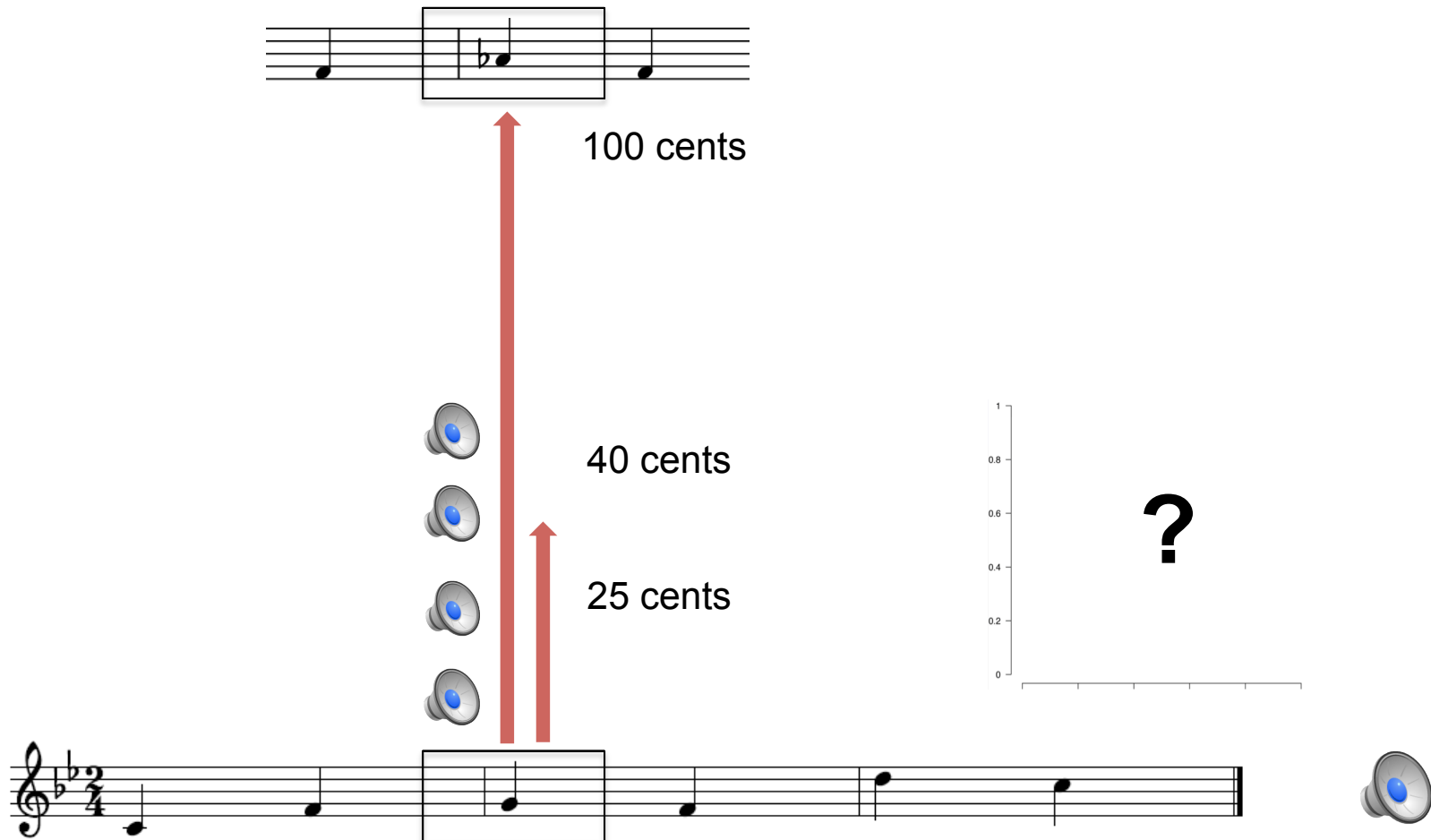
Transformation of varying sensory signals into categorical internal representations



Continuous

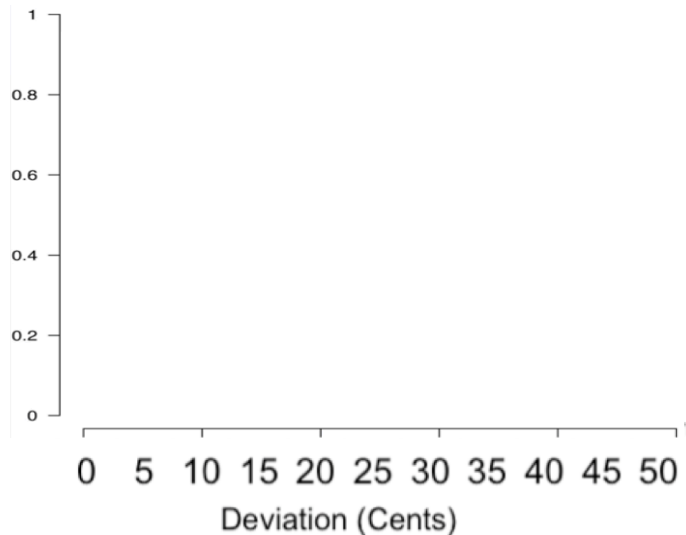
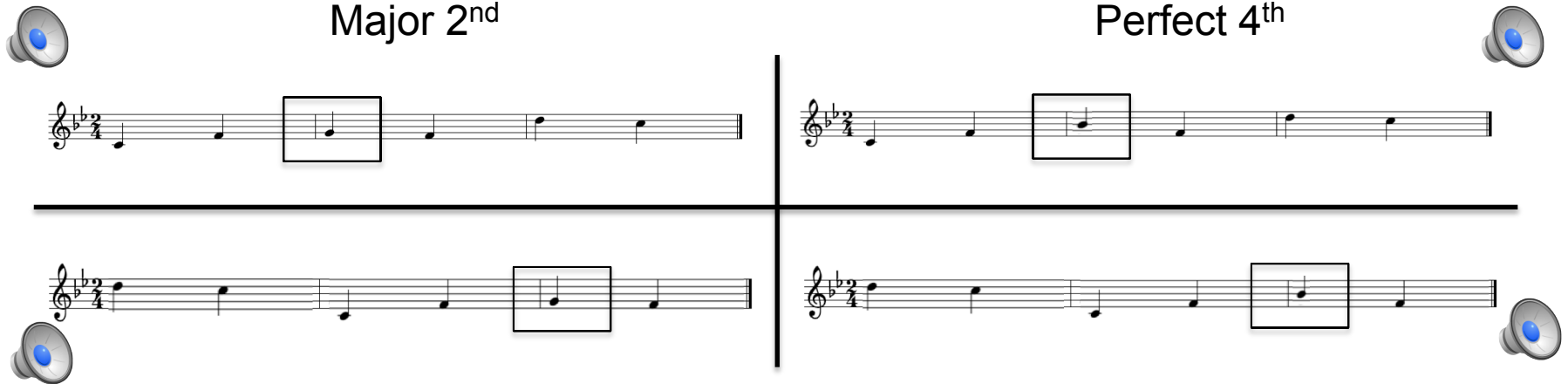
Perception (sometimes linearly) of the variation of sensory signals

Mechanisms driving perception



Perception of correctness - Material

Major 2nd **Perfect 4th**



Identification

In-tune

Out-of-tune

Confidence

0

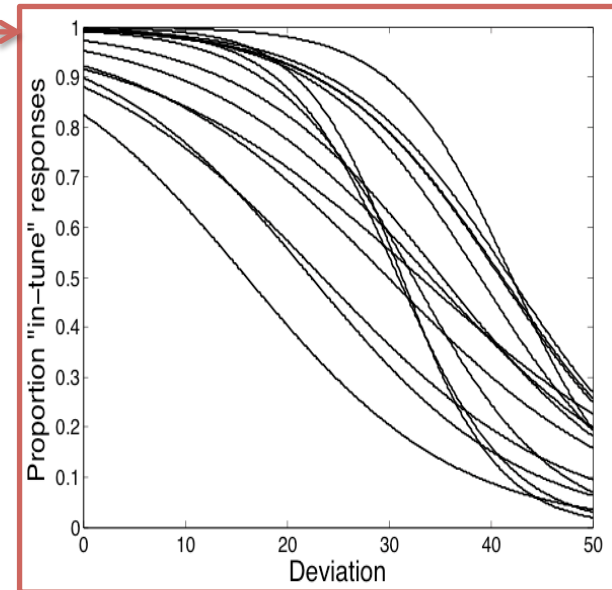
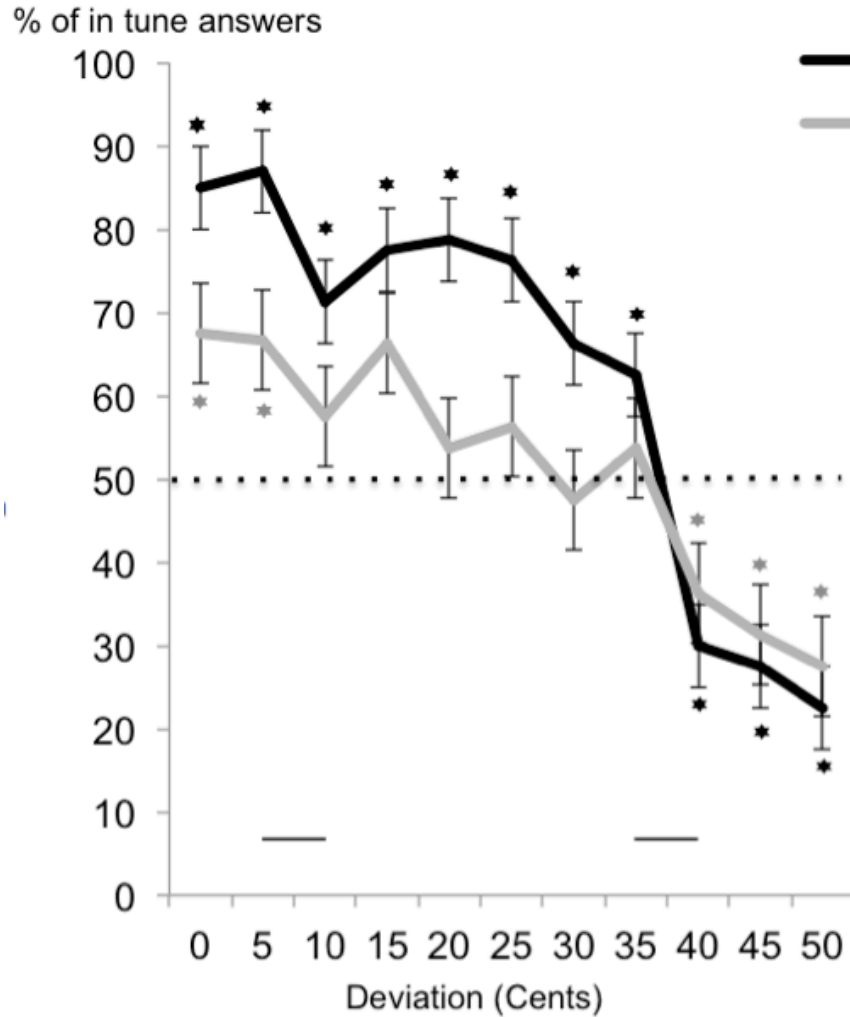
1

2

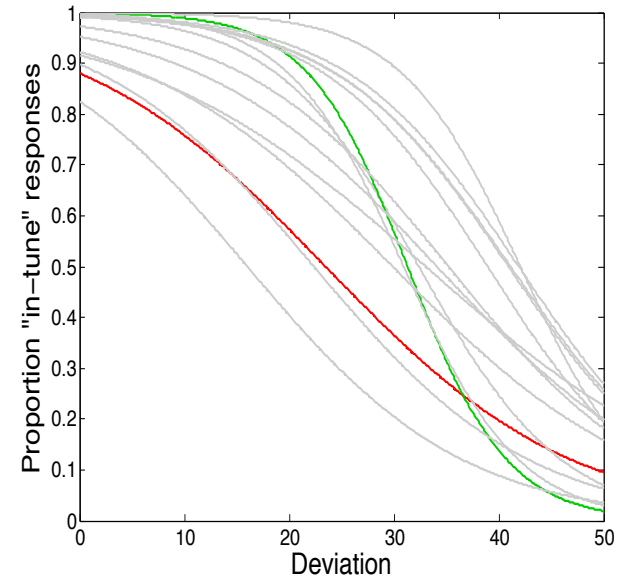
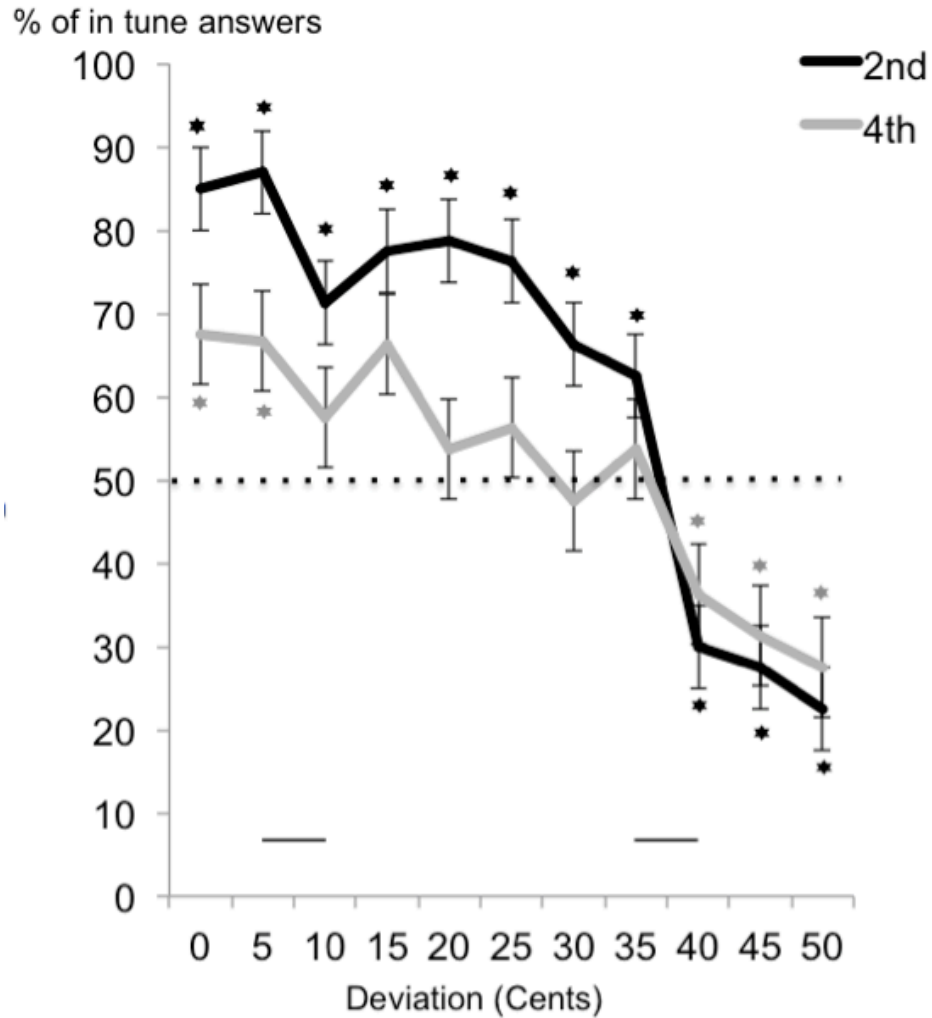
3



Identification task – first results (n = 20)



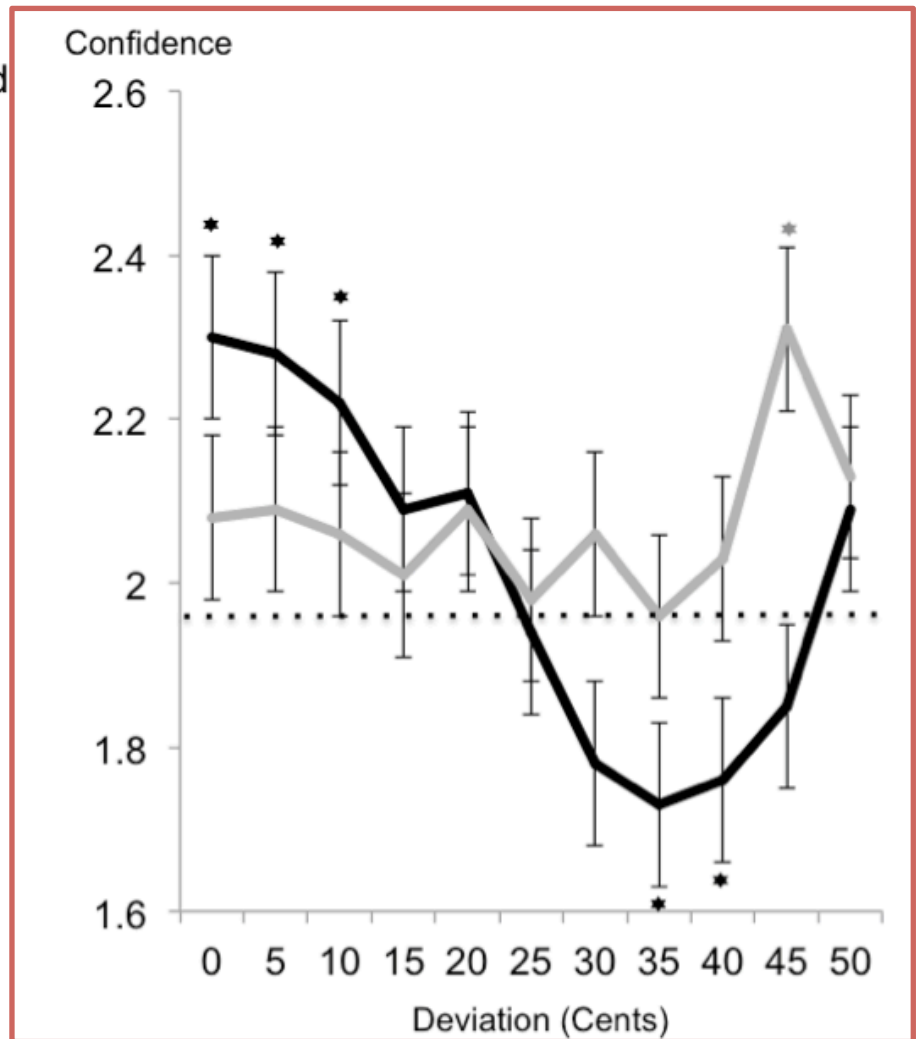
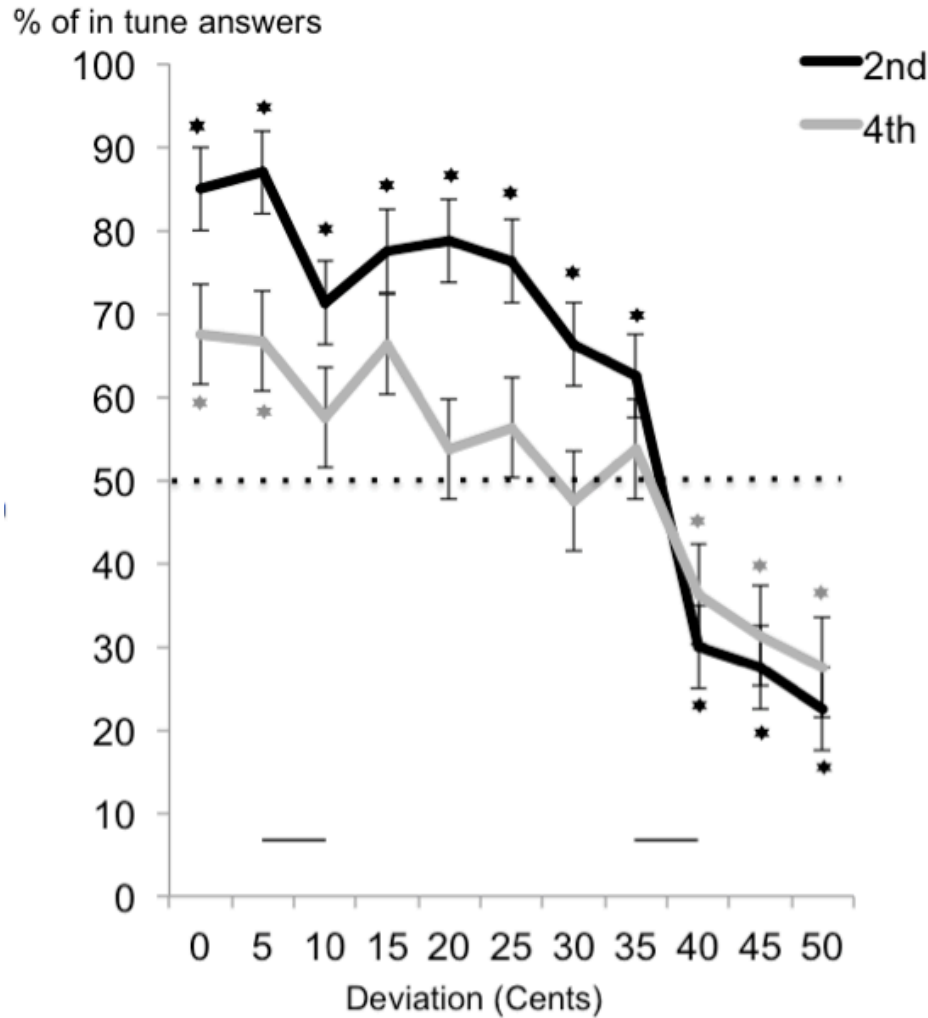
Identification task – first results (n = 20)



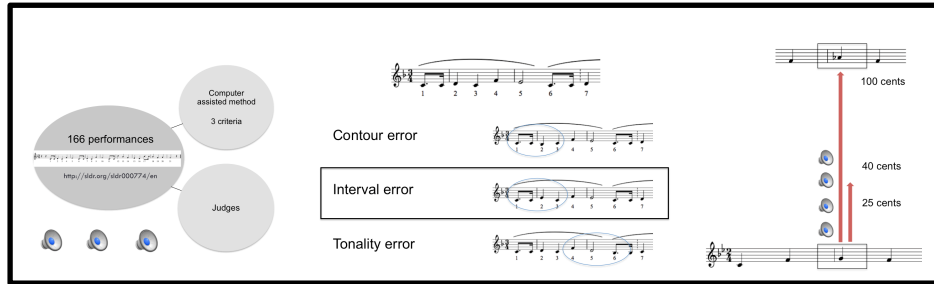
No effect of

- Formal musical training
- Informal musical training
 - Active/passive listening
 - Concerts
- Difficulty of the task
- Performance in the learning task
- Enjoyment of the voice

Confidence task – first results (n = 20)



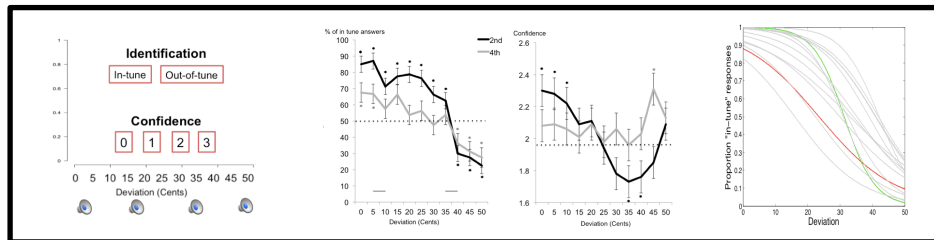
Melodic perception in music



Computational level

→ What does the system do?

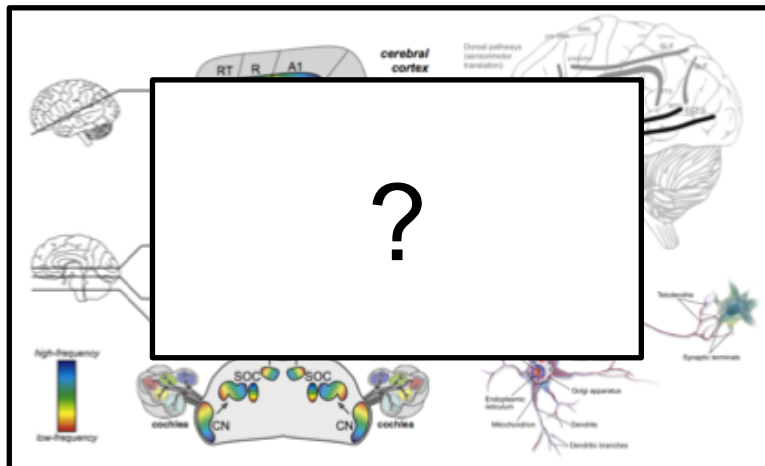
Reacts to pitch deviations of 25 to 40 cents



Algorithmic level

→ How does it do it?

Categorization (partly)



Implementational level

Physical structure / Hardware

Neurobiological mechanisms

→ How can it be realized physically?

Melodic perception in music speech



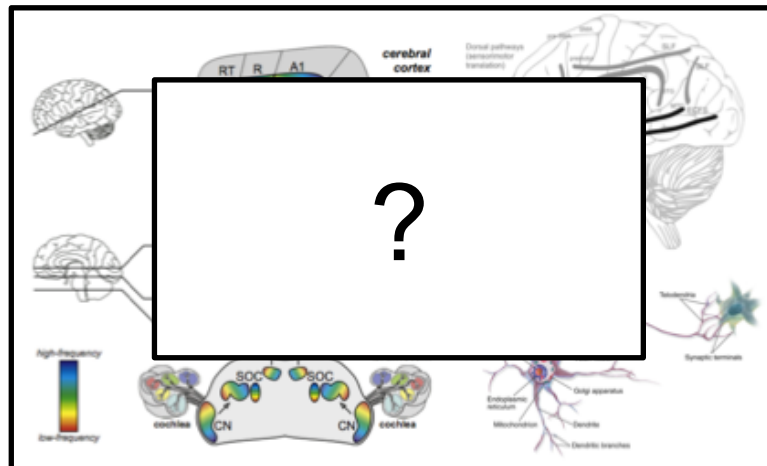
Computational level

→ What does the system do?



Algorithmic level

→ How does it do it?



Implementational level

Physical structure / Hardware

Neurobiological mechanisms

→ How can it be realized physically?



David Poeppel



Ellen Blanckaert



Yohana Lévêque



Simone Franz



Renan Vairo Nunes



Dominique Morsomme



David Magis



Daniele Schön



R. Muralikrishnan



Matthias Grabenhorst



Marie-Reine Ayoub



Claudia Lehr and Freya Materne



Laura Gosselin

Thanks for your attention!