

*Slides from a keynote at the Managing Your Talents Conference, 29 August 2013, Amsterdam.
N.B. All text in blue are clickable links to the original sources.*

Tip of the iceberg?

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- 
- A large iceberg is visible in the background, with a significant portion of its mass submerged beneath the surface of the ocean. The water is a deep blue, and the sky above is clear and light.
- I.
We all share a predisposition for music!
 2.
What makes us musical animals?

?



Source: YouTube

Music vs musicality

- *Musicality* – a natural, spontaneously developing trait based on and constrained by our cognitive and biological system;
- *Music* – a social and cultural construct based on that very musicality;
- In short: *without musicality no music.*

Hypothesized components of musicality

1. Relative pitch (e.g., Trehub, 2003)
2. Beat induction (e.g., Patel, 2008)
3. Tonal encoding of pitch (e.g., Peretz & Coltheart, 2003)
4. Metrical encoding of rhythm (e.g., Fitch, 2013)
5. ...

Are these the same melody?

A

=

B

?

Are these the same melody?

A

=

C

?

Are these the same melody?

A

=

C

?

A

Standard melody



0

B

Out-of-key change



+1

C

Within-key change



+4

Trehub (2003) *Nature Neuroscience*

Listening test

Song I

Which one is rhythmically similar?

Song

A

or

B



?

Listening test

Song 2

Which one is rhythmically similar?

Song 2

A

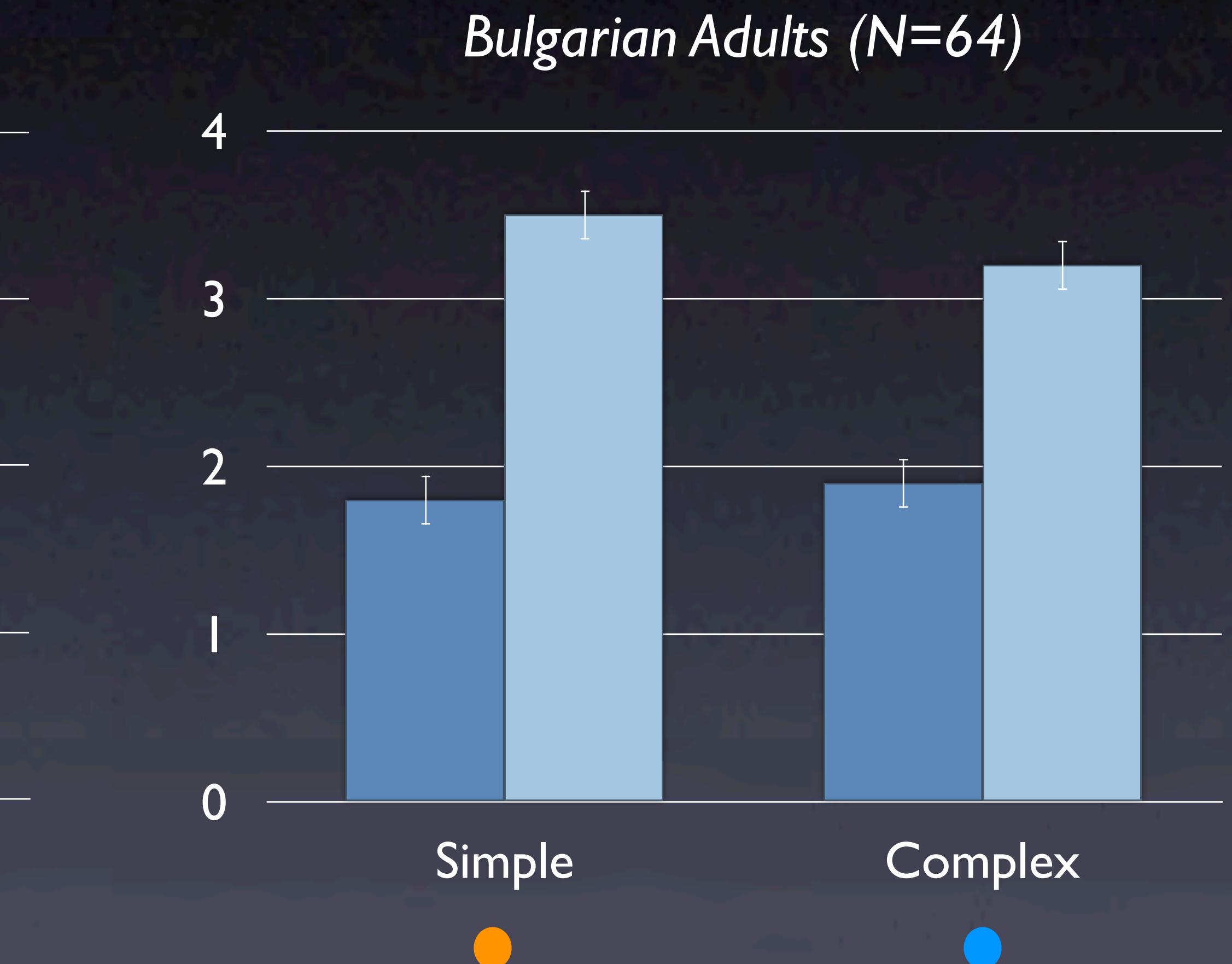
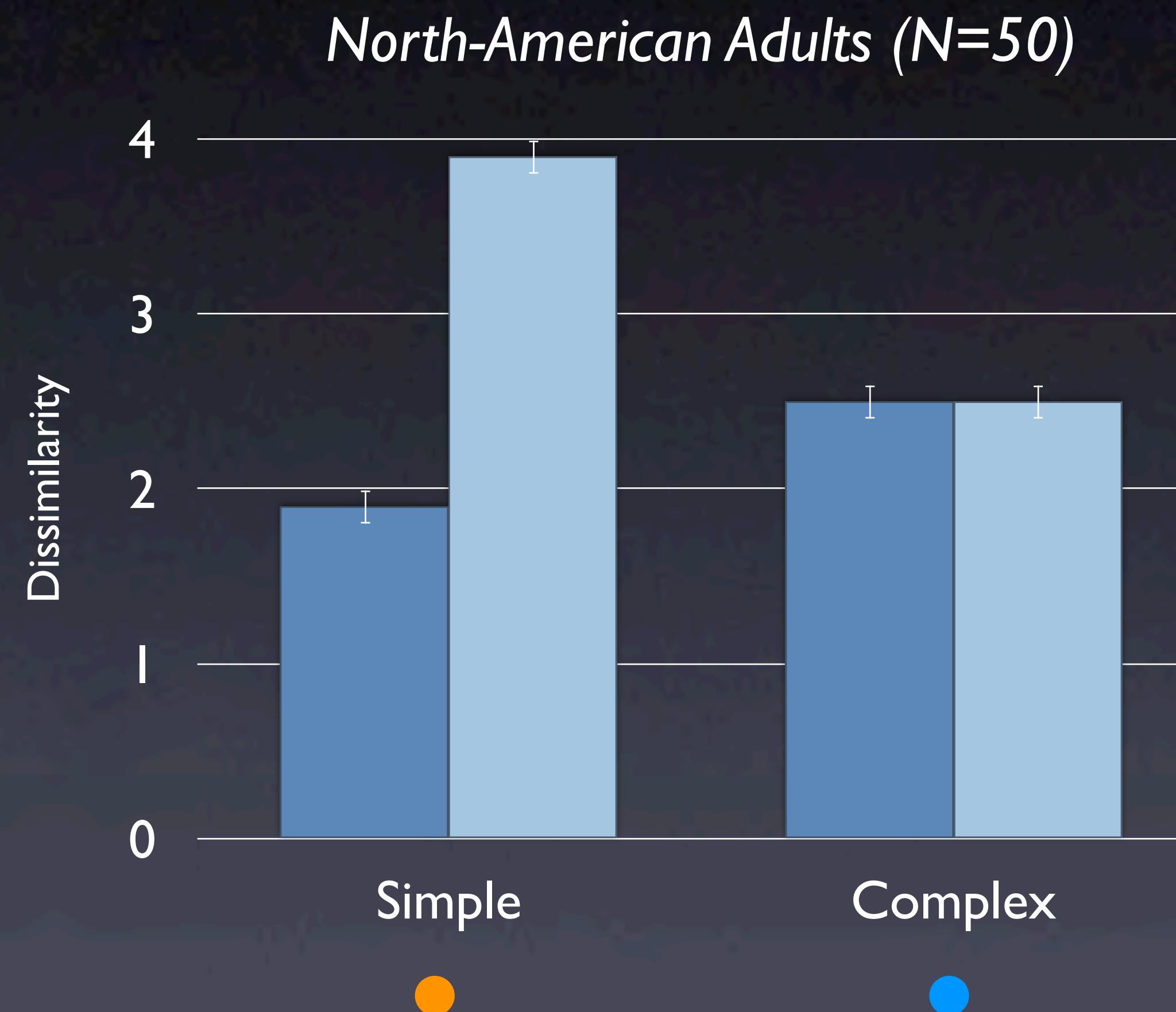
or

B



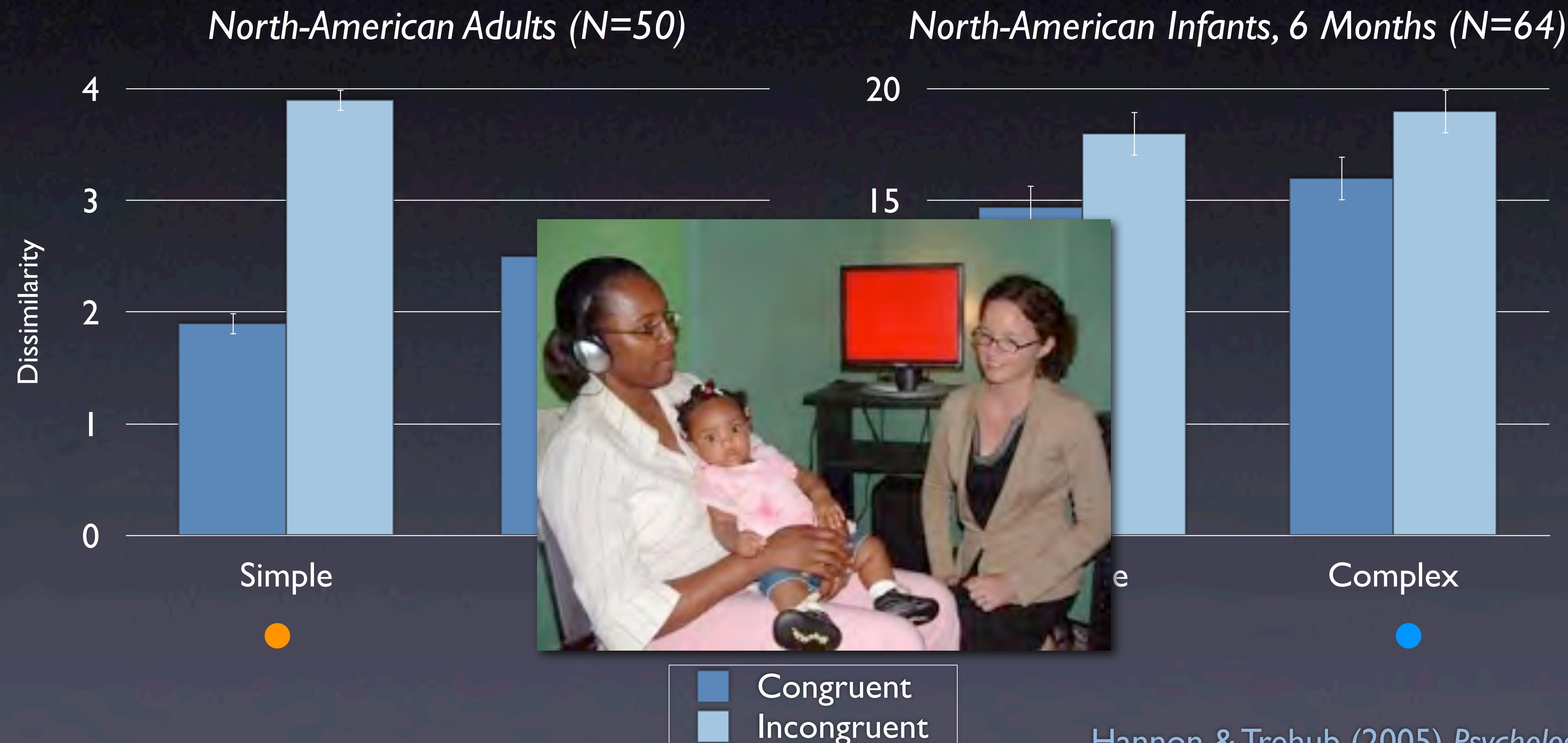
?

Sense of rhythm



Hannon & Trehub (2005) *Psychological Science*

Sense of rhythm

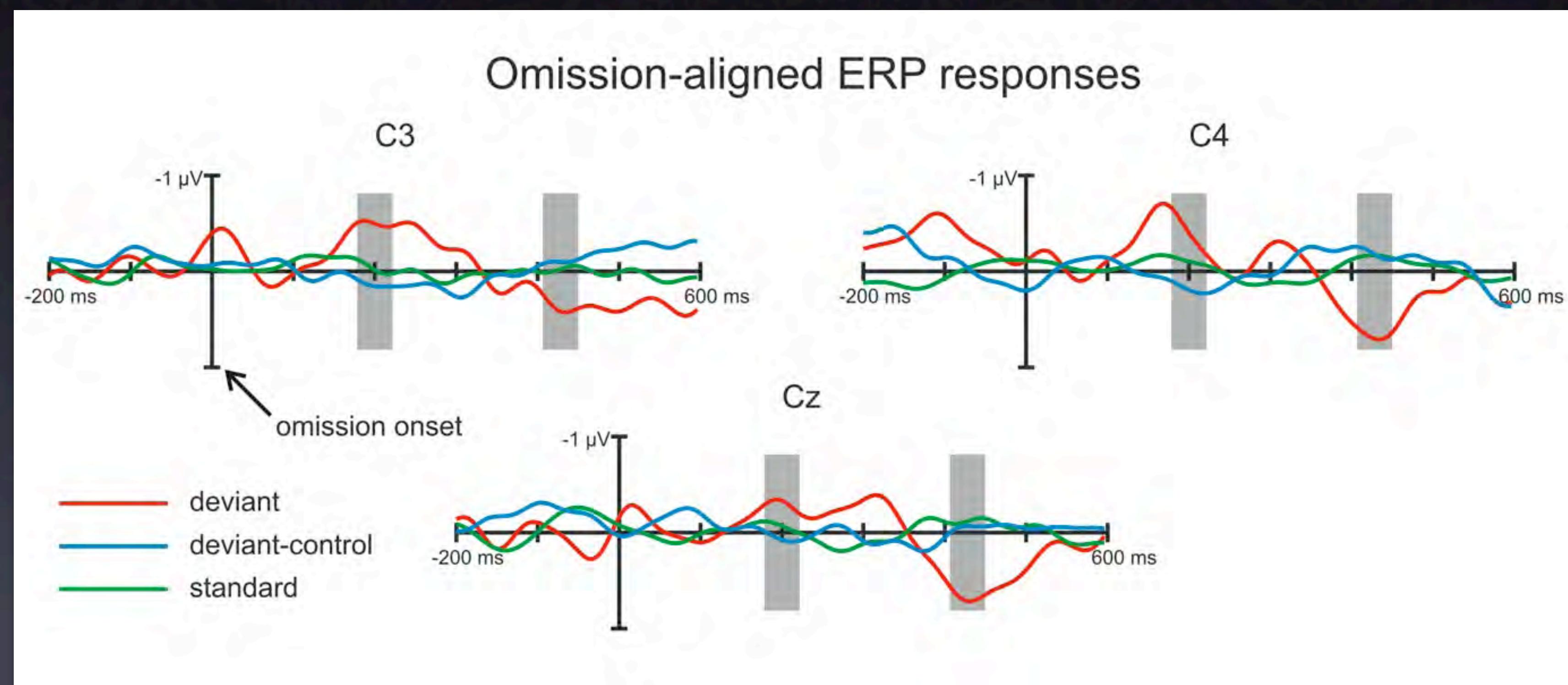


Can newborns sense the beat?



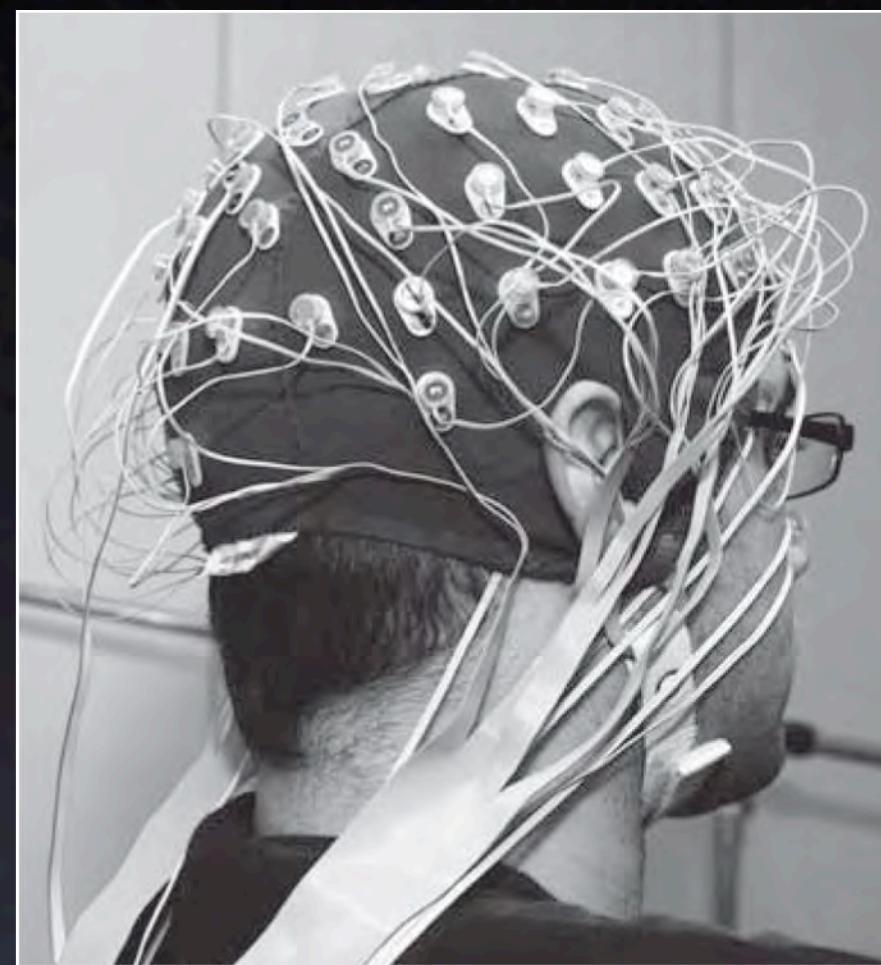
Winkler, Háden, Ladinig & Honing (2009) PNAS

Newborns do sense the beat



Is beat induction species-specific?

1



Honing et al. (2009) NYAS

2



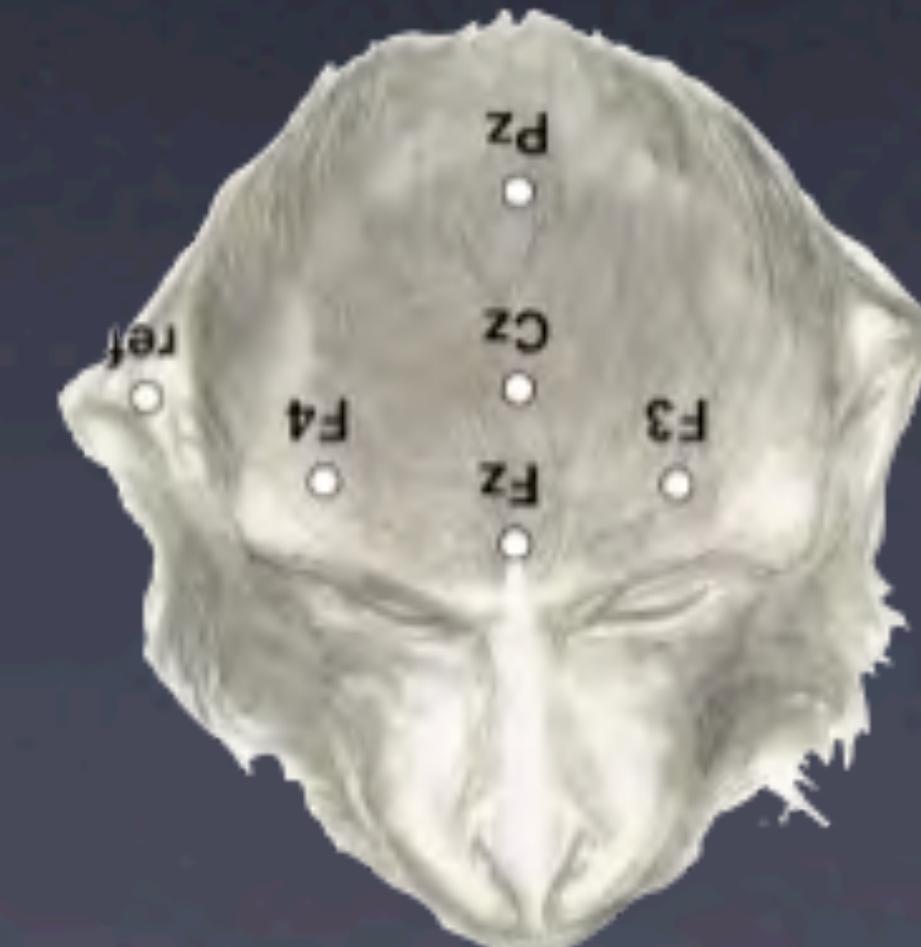
Winkler et al. (2009) PNAS

3



Lidji et al. (in prep.)

4



Honing et al. (2012) PLOS ONE

Core mechanisms of musicality

Beat induction

Relative pitch

Honing & Ploeger (2011) *Topics*



Item on Dutch TV feat. Lavinia Meijer

Listening test

Experiment (E3v4-nl)

Classical Repertoire	Welke is een echte (onveranderde) opname?	Ben je zeker?	Herken je deze compositie?	Vind je dit leuke/goede muziek?
Pair 9        	<input checked="" type="radio"/> Boven <input type="radio"/> Onder	<input checked="" type="radio"/> Ja <input type="radio"/> Nee	<input checked="" type="radio"/> Ja <input type="radio"/> Nee	<input checked="" type="radio"/> Ja <input type="radio"/> Nee
Pair 5        	<input checked="" type="radio"/> Boven <input type="radio"/> Onder	<input checked="" type="radio"/> Ja <input type="radio"/> Nee	<input checked="" type="radio"/> Ja <input type="radio"/> Nee	<input checked="" type="radio"/> Ja <input type="radio"/> Nee
Pair 1        	<input checked="" type="radio"/> Boven <input type="radio"/> Onder	<input checked="" type="radio"/> Ja <input type="radio"/> Nee	<input checked="" type="radio"/> Ja <input type="radio"/> Nee	<input checked="" type="radio"/> Ja <input type="radio"/> Nee
Pair 7        	<input checked="" type="radio"/> Boven <input type="radio"/> Onder	<input checked="" type="radio"/> Ja <input type="radio"/> Nee	<input checked="" type="radio"/> Ja <input type="radio"/> Nee	<input checked="" type="radio"/> Ja <input type="radio"/> Nee
Pair 3        	<input checked="" type="radio"/> Boven <input type="radio"/> Onder	<input checked="" type="radio"/> Ja <input type="radio"/> Nee	<input checked="" type="radio"/> Ja <input type="radio"/> Nee	<input checked="" type="radio"/> Ja <input type="radio"/> Nee

Which one is manipulated?

Glenn Gould
J.S. Bach, English Suite No. 4,
BWV 809, Allemande
Sony, SK 87766
1974/76

+15%

Sviatoslav Richter
J.S. Bach, English Suite No. 4,
BWV 809, Allemande
Delos, GH 5601
1991

Experiment (E3v4-nl)

Welke is een echte (onveranderde) opname?

Ben je zeker?

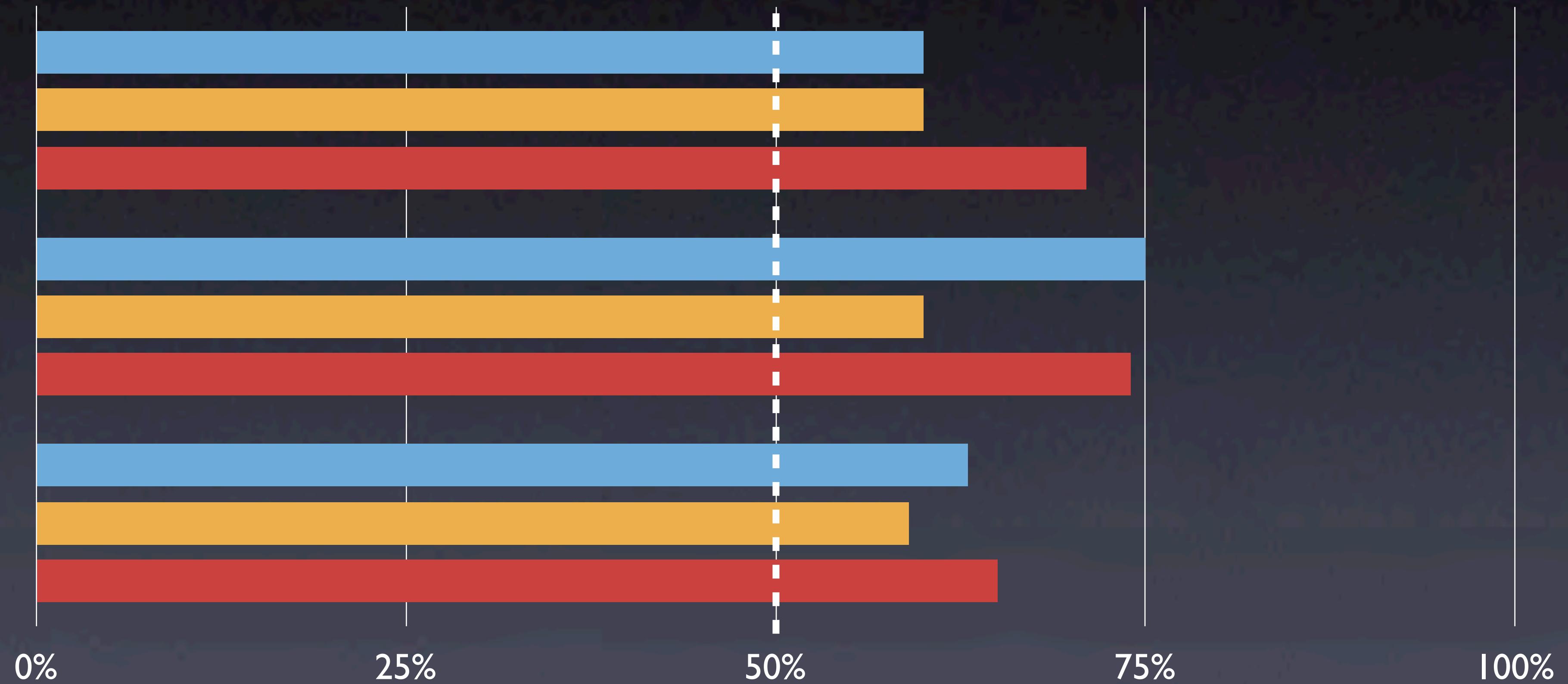
Herken je deze compositie?

Vind je dit leuke/goede muziek?

	Boven	Onder	
Pair 1	<input type="radio"/> Ja <input type="radio"/> Nee	<input type="radio"/> Ja <input type="radio"/> Nee	<input type="radio"/> Ja <input checked="" type="radio"/> Nee
	<input type="radio"/> Boven <input type="radio"/> Onder	<input type="radio"/> Ja <input type="radio"/> Nee	<input type="radio"/> Ja <input checked="" type="radio"/> Nee
	<input type="radio"/> Boven <input type="radio"/> Onder	<input type="radio"/> Ja <input type="radio"/> Nee	<input type="radio"/> Ja <input checked="" type="radio"/> Nee
	<input type="radio"/> Boven <input type="radio"/> Onder	<input type="radio"/> Ja <input type="radio"/> Nee	<input type="radio"/> Ja <input checked="" type="radio"/> Nee
	<input type="radio"/> Boven <input type="radio"/> Onder	<input type="radio"/> Ja <input type="radio"/> Nee	<input type="radio"/> Ja <input checked="" type="radio"/> Nee
	<input type="radio"/> Boven <input type="radio"/> Onder	<input type="radio"/> Ja <input type="radio"/> Nee	<input type="radio"/> Ja <input checked="" type="radio"/> Nee

Expertise

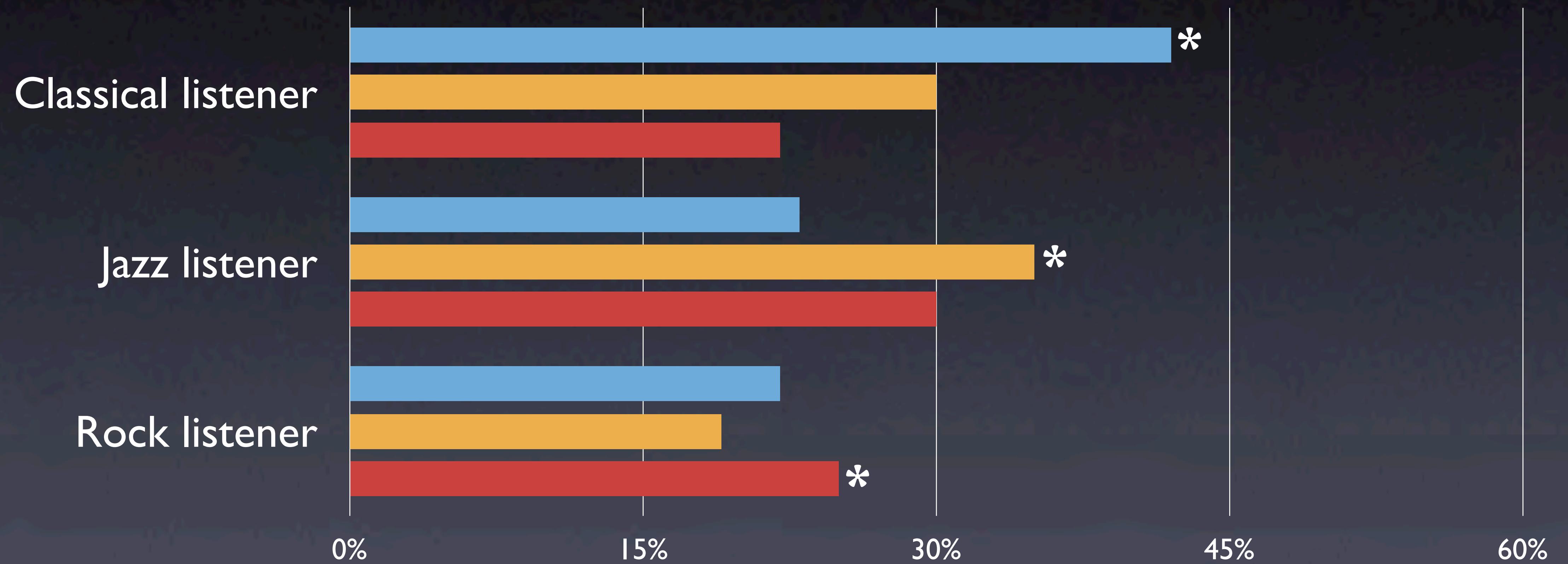
Non-musicians
Semi-musicians
Musical Experts



■ Klassiek ■ Jazz ■ Rock

Honing & Ladinig (2009) JEP:HPP

Exposure



Klassiek



Jazz



Rock

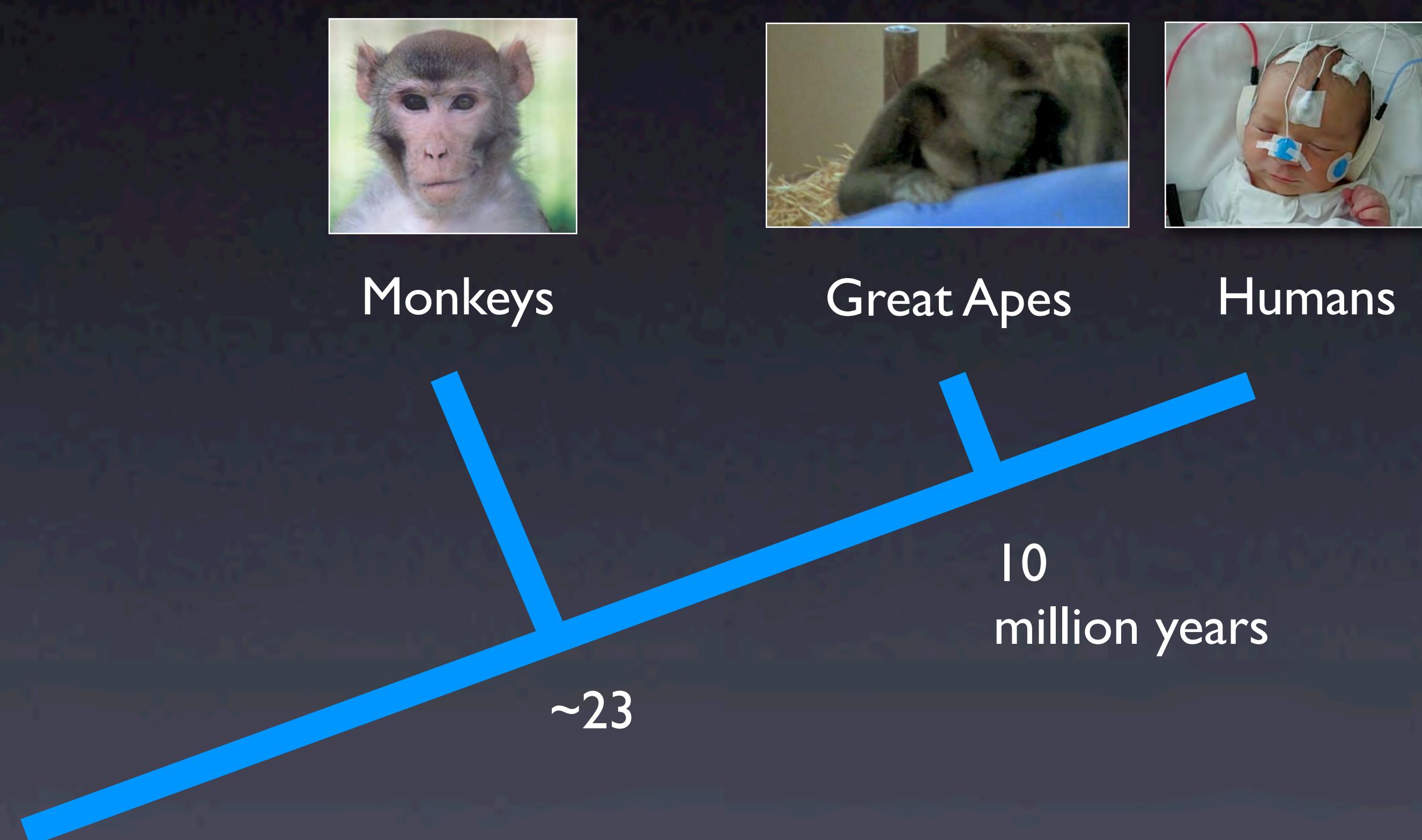
Honing & Ladinig (2009) JEP:HPP

Absolute Pitch?



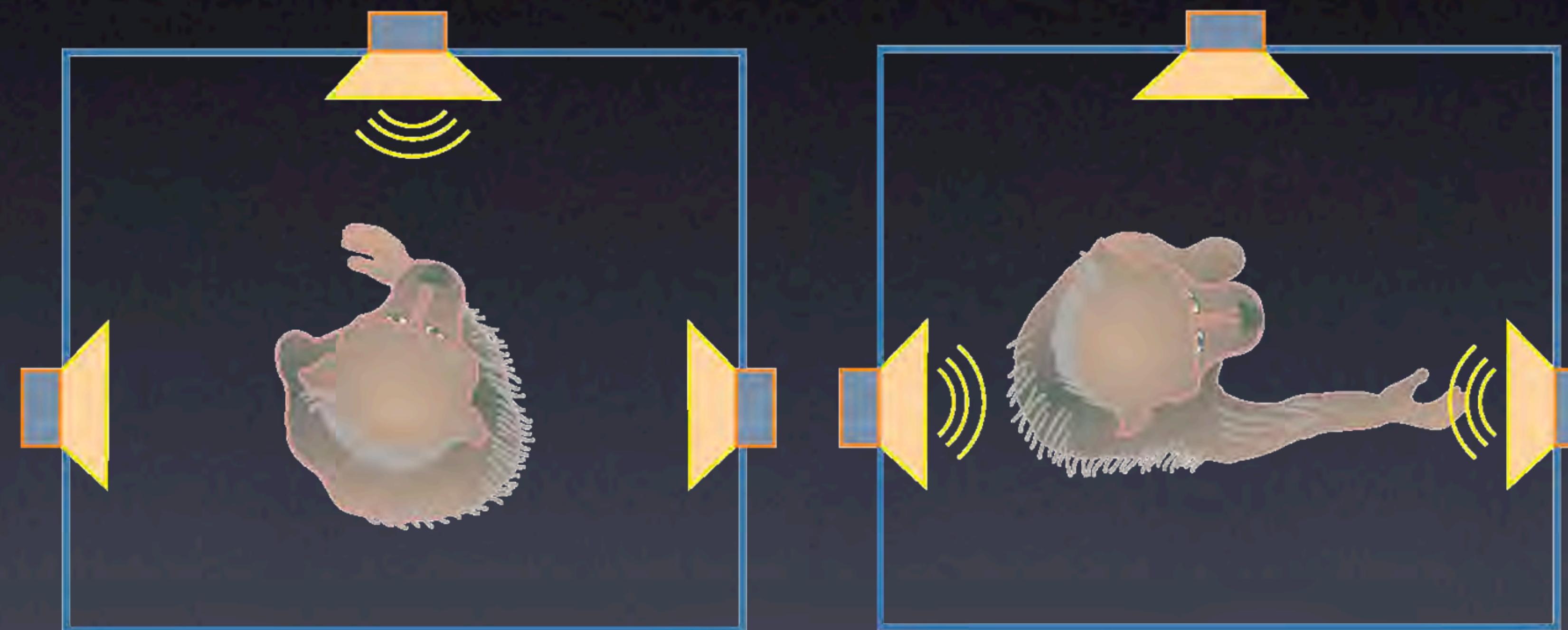
Source: YouTube

Do monkeys have *relative pitch*?



Cf. de Waal & Ferrari (2010) *TiCS*

Do monkeys have *relative pitch*?



Test

Same or different?

Wright et al. (2000) JEP: General

Do birds have *relative pitch*?



Songbirds



Monkeys



Great Apes



Humans



Do birds have relative pitch?



Weisman & Ratcliffe (2004) American Scientist

Can monkeys sense the *beat*?



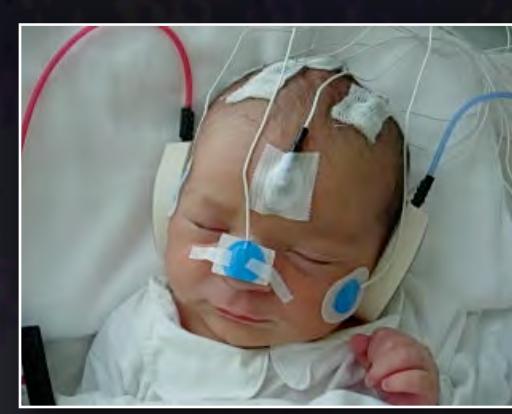
Songbirds



Monkeys



Great Apes

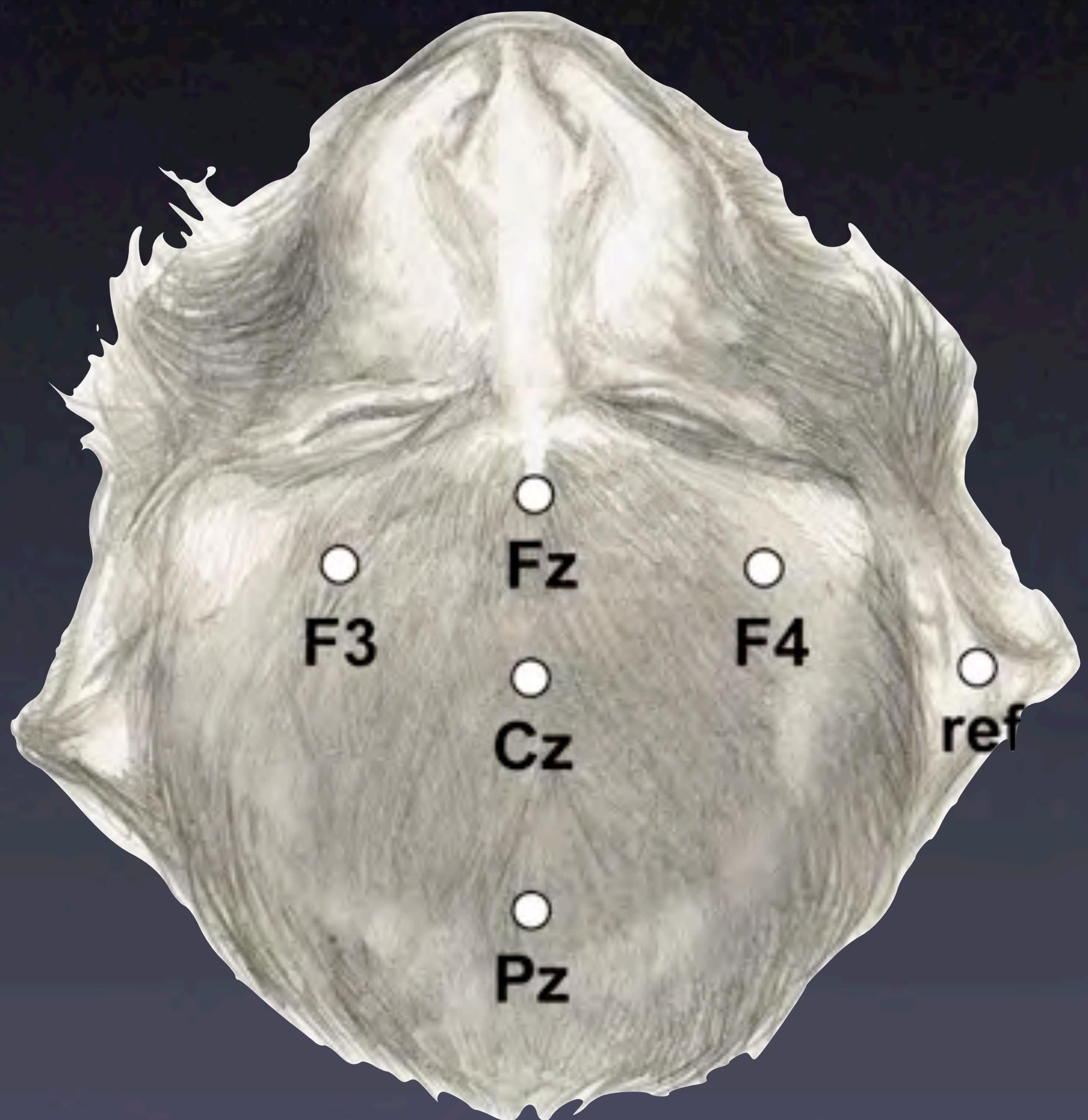


Humans



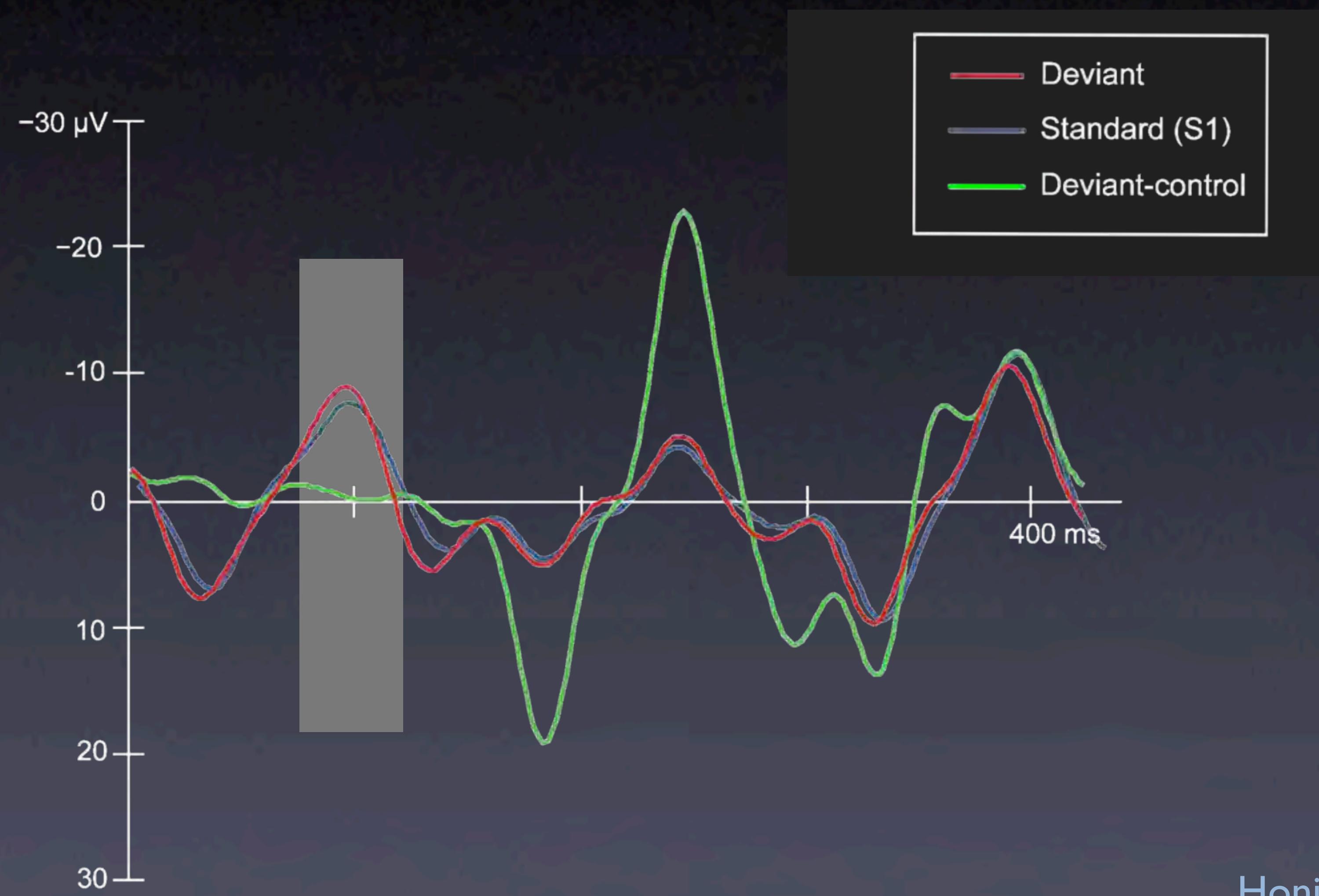
Zarco et al. (2009) *J. of Neurophysiology*

Can monkeys sense the *beat*?



Honing et al. (2012) PLoS ONE

Monkeys do not sense the beat



Honing et al. (2012) PLoS ONE

Can birds sense the beat?



Songbirds



Monkeys



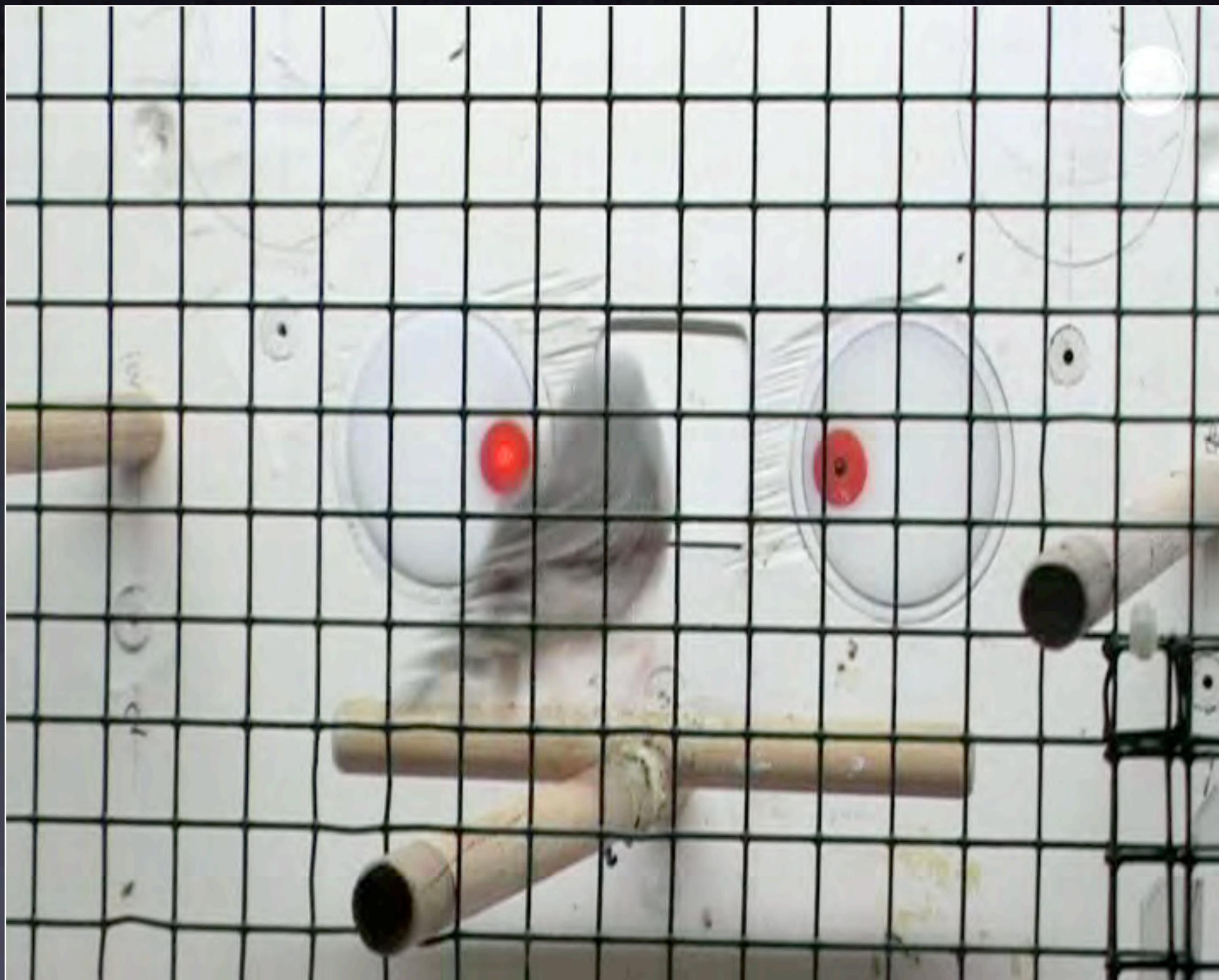
Great Apes



Humans



Can birds sense the beat?



Aa, Honing & Ten Cate (in prep.)

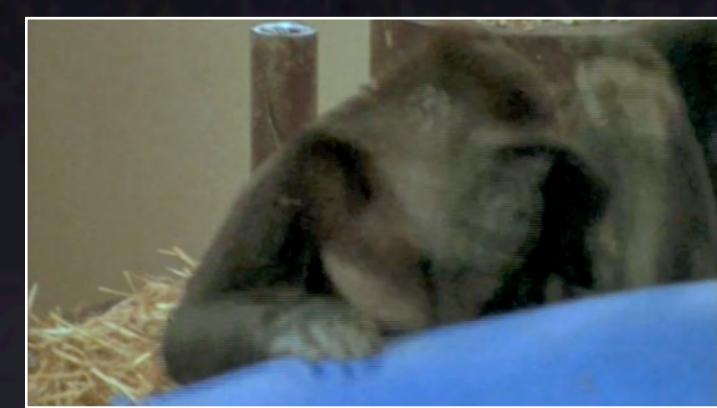
Is beat induction species-specific?



Songbirds



Monkeys



Great Apes

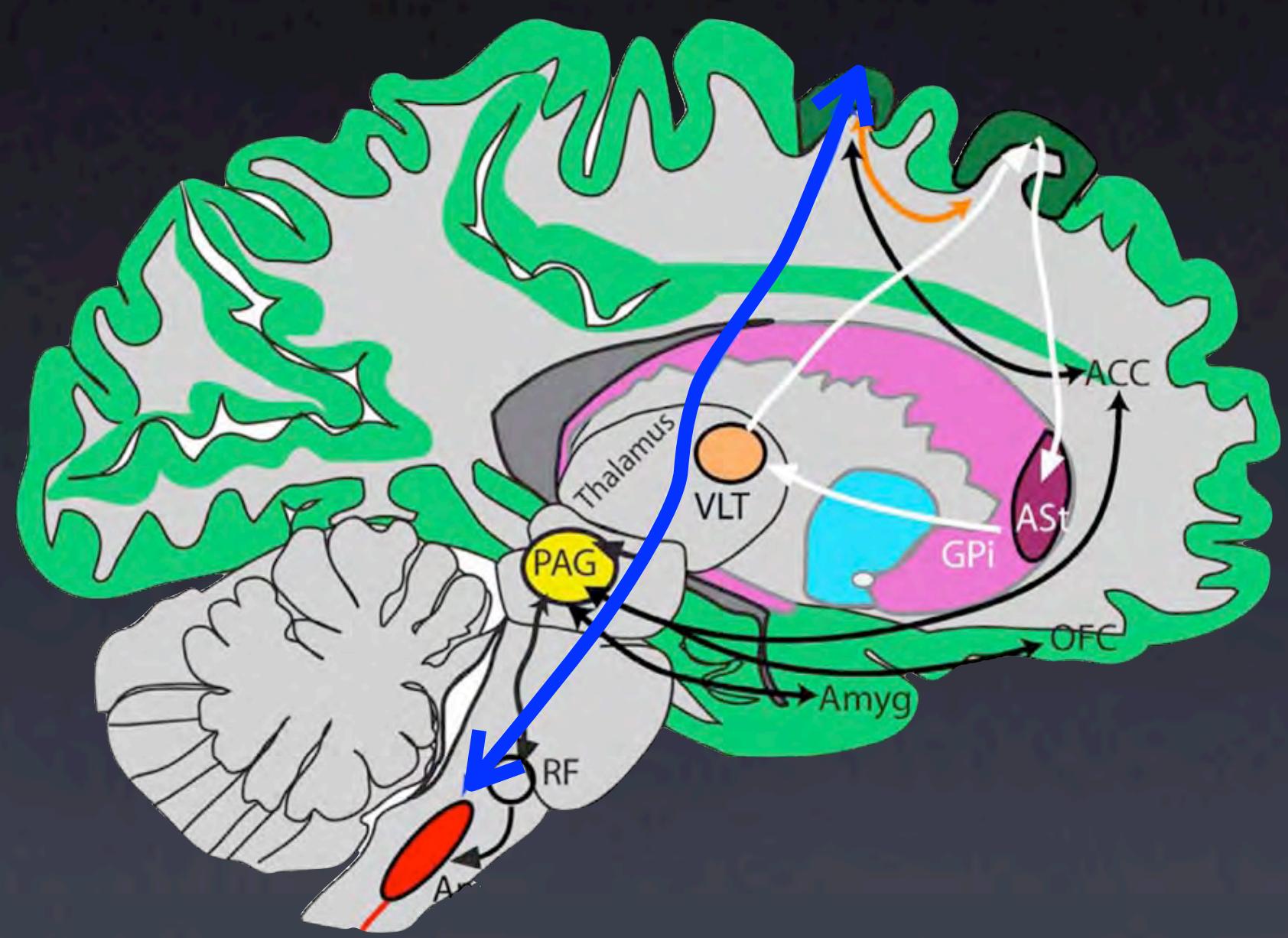


Humans

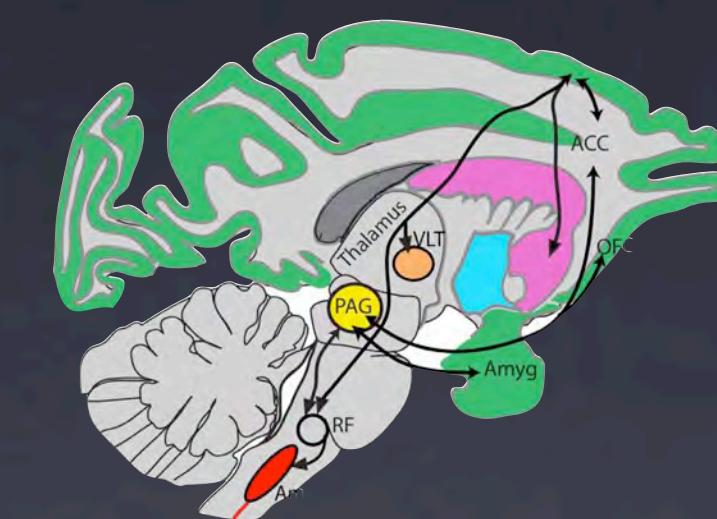


Honing (2011) NYAS

Brains of vocal learners/nonlearners



Human



Macaque

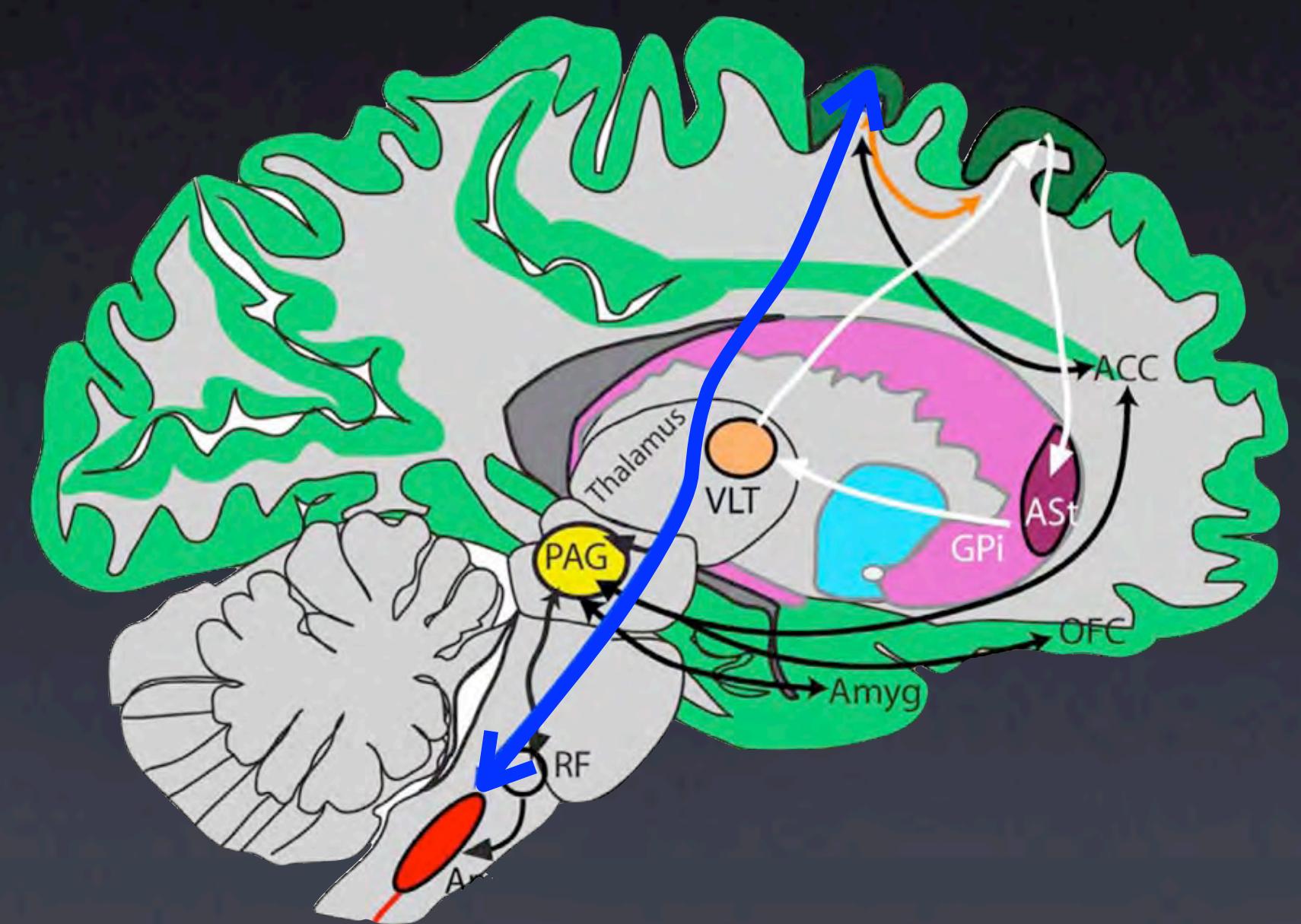


Songbird

- Cortex/Pallium
- Striatum
- Pallidum

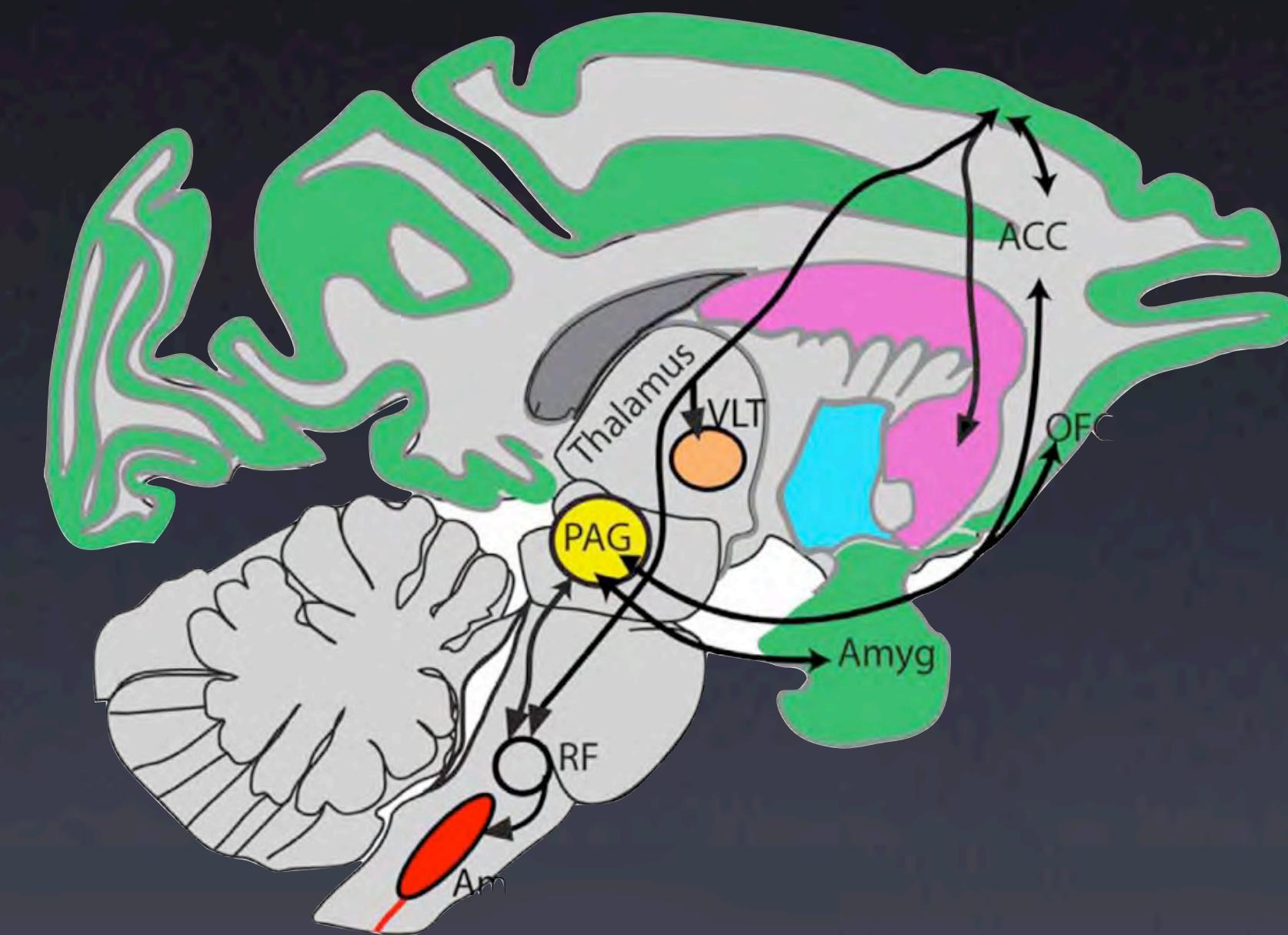
Jarvis (2004) New York Academy of Sciences

Brains of vocal learners/nonlearners



Human

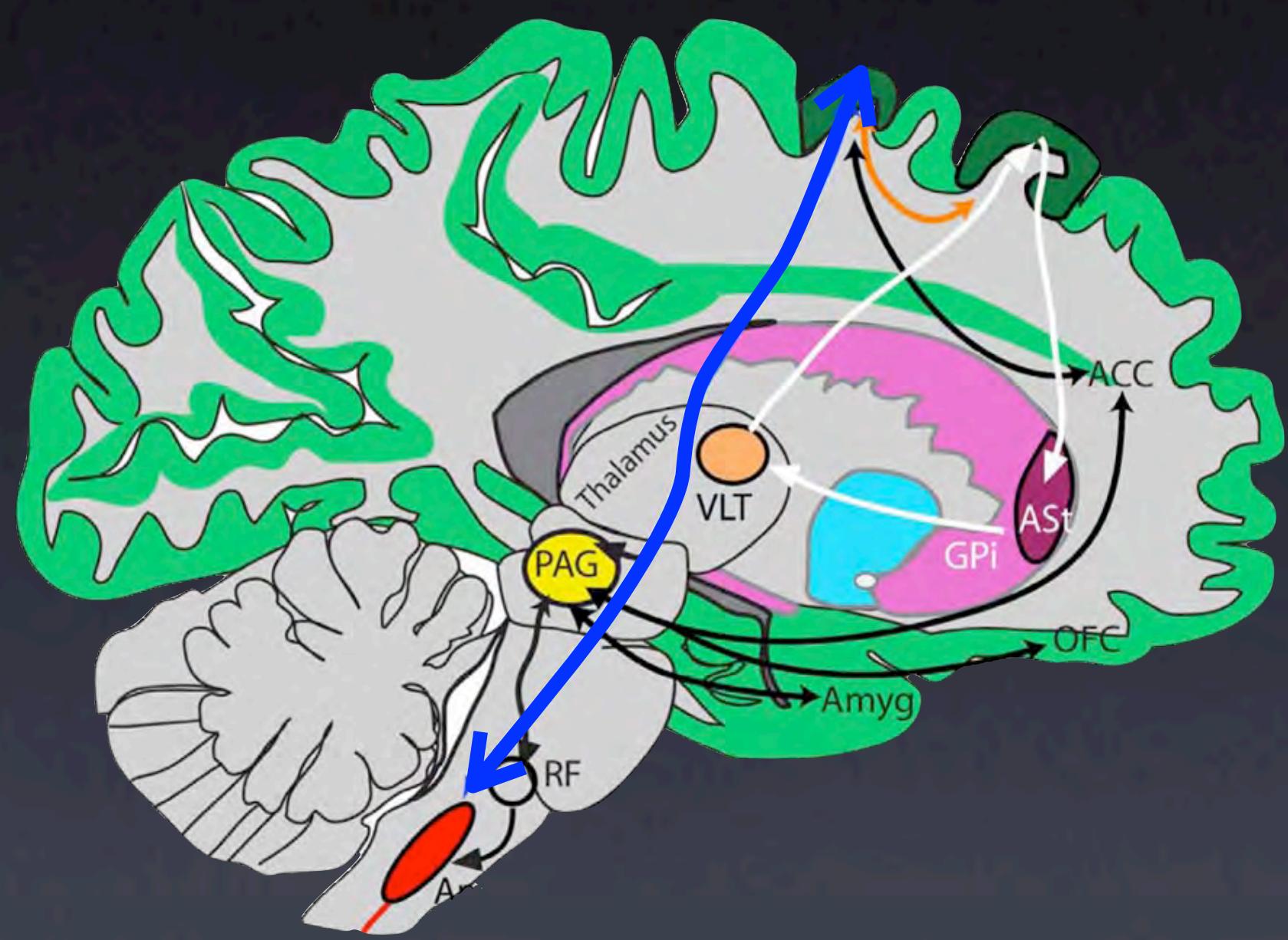
- Cortex/Pallium
- Striatum
- Pallidum



Macaque

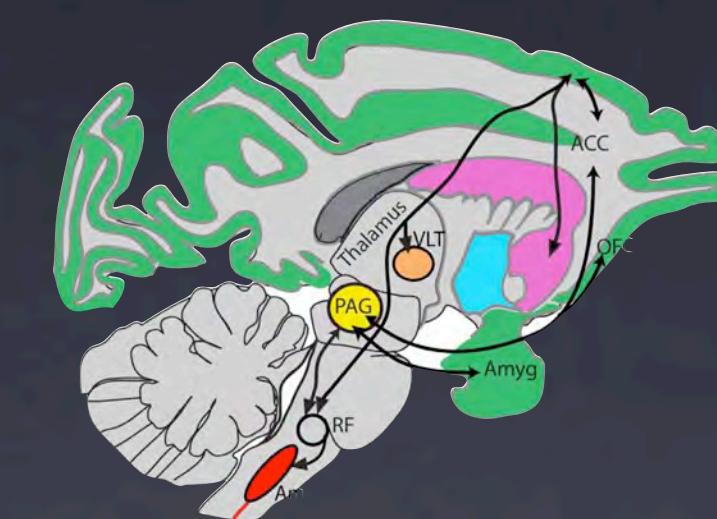
Jarvis (2004) New York Academy of Sciences

Brains of vocal learners/nonlearners



Human

- Cortex/Pallium
- Striatum
- Pallidum



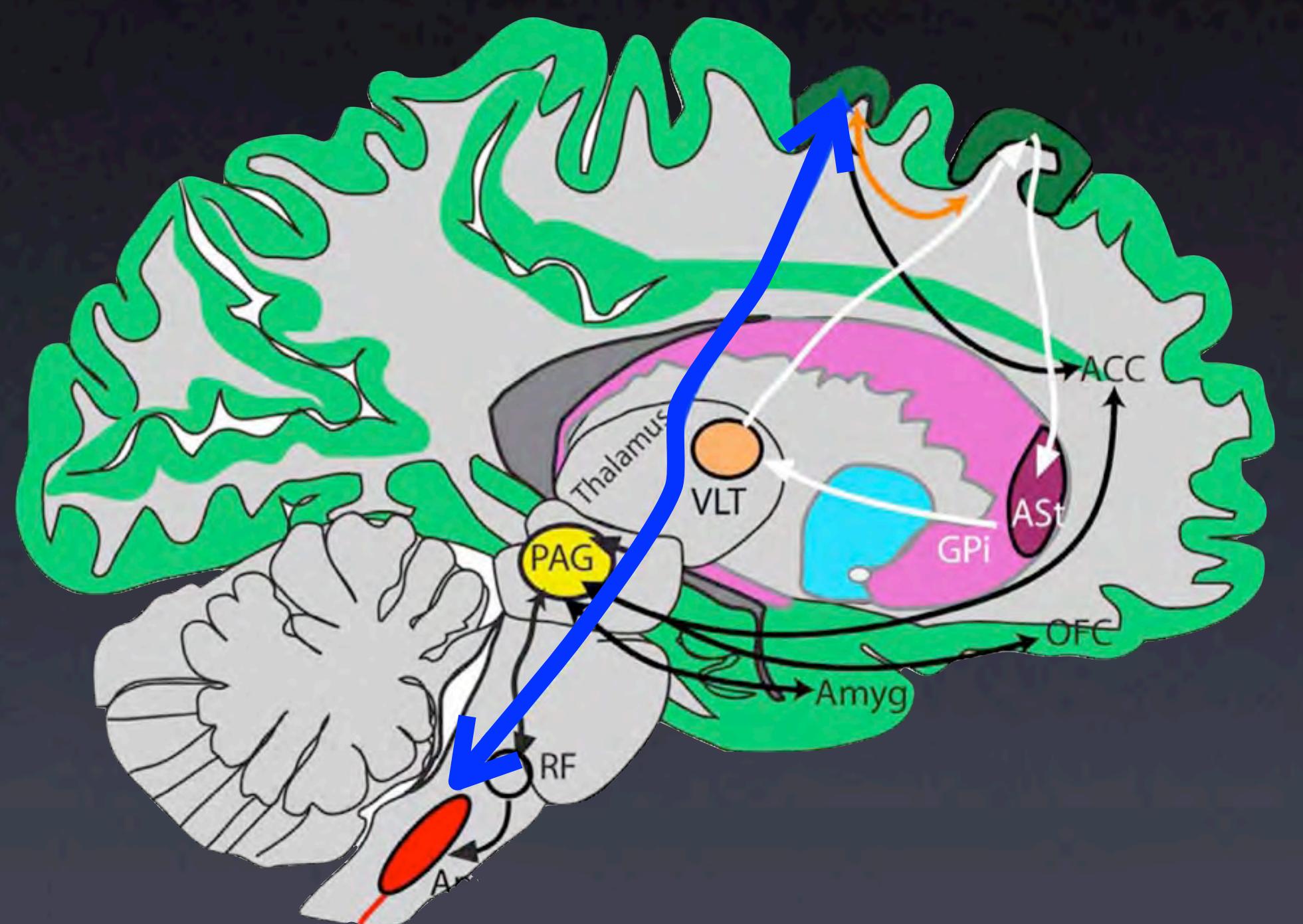
Macaque



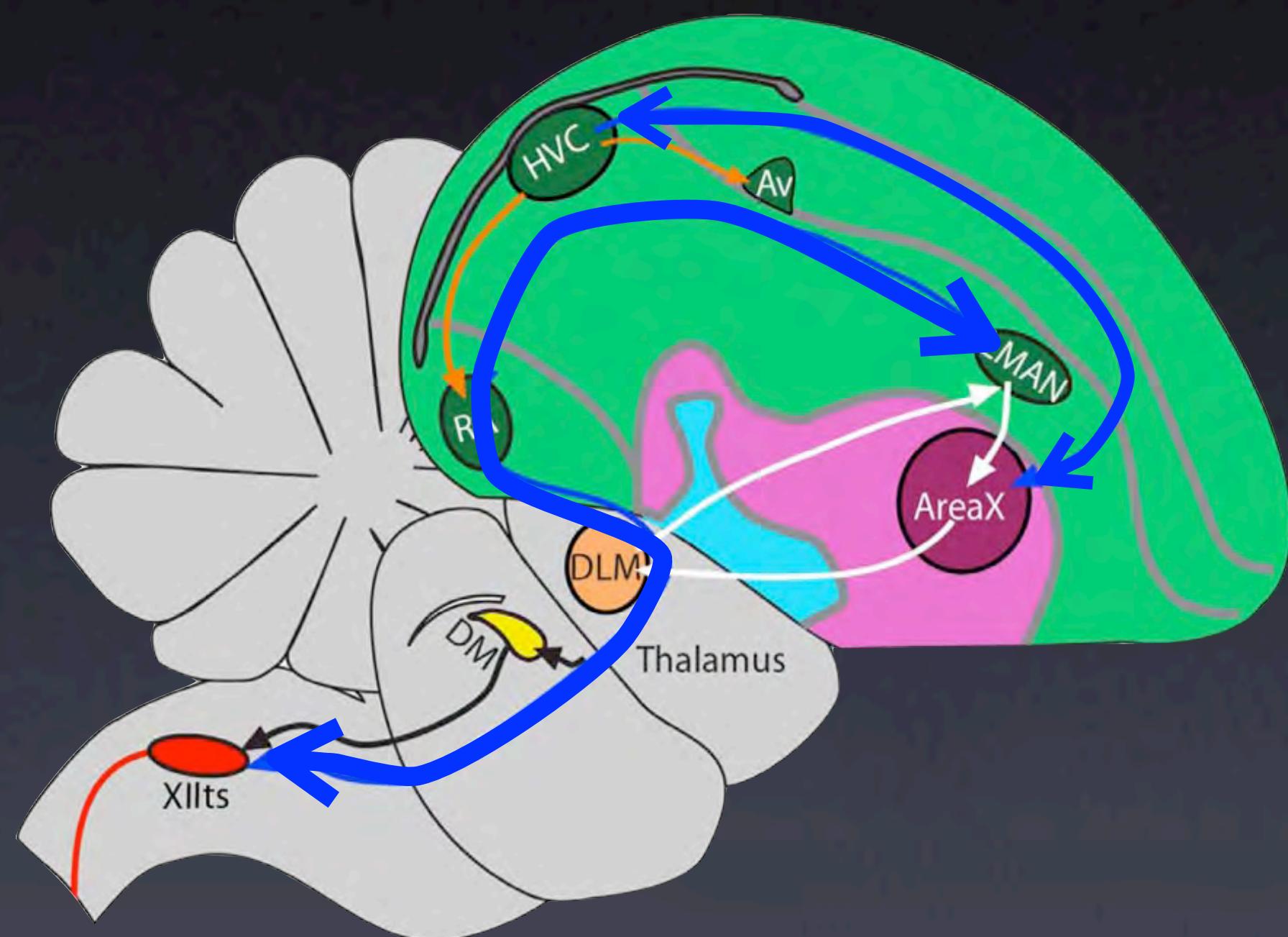
Songbird

Jarvis (2004) New York Academy of Sciences

Brains of vocal learners/nonlearners



Human



Songbird

Jarvis (2004) New York Academy of Sciences

Can a *limited vocal learner* sense the beat?

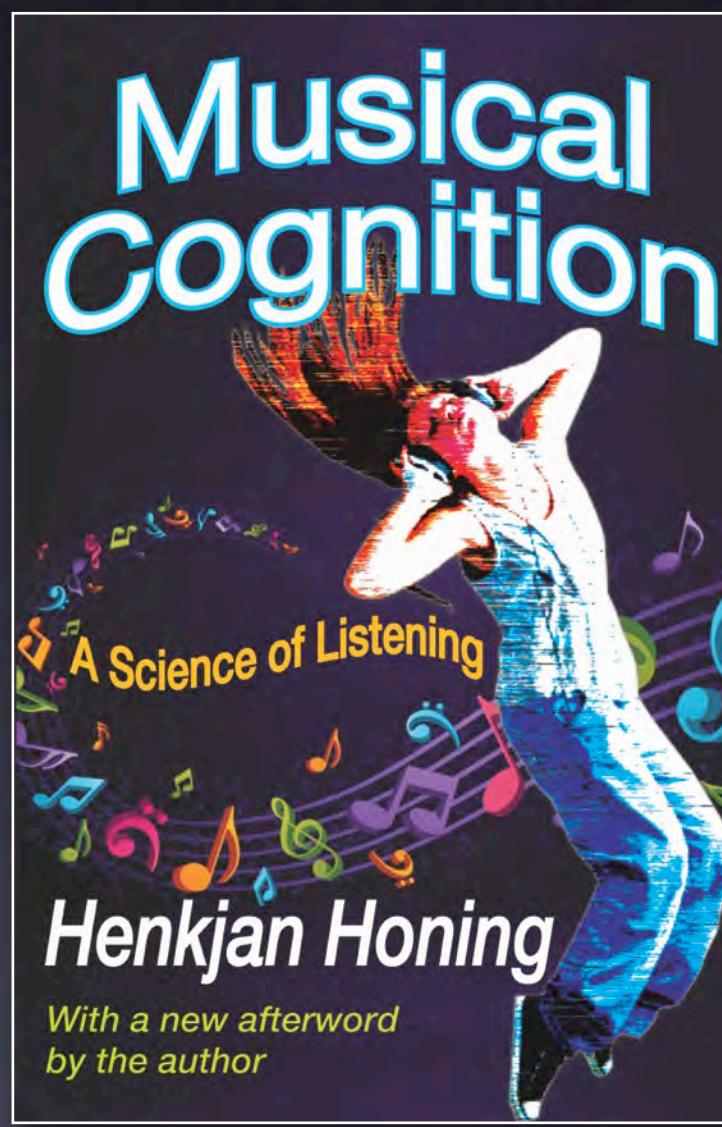


Cook et al. (2013) *Journal of Comparative Psychology*

Summary

1. We're *all* intrinsically musical (unless *amusic*);
2. *Musicality* consists of several cognitive skills, including *relative pitch* and *beat induction*;
3. If we can identify these core mechanisms in other animals, we might be able to say something on the origins of music: *What makes us musical animals?*

Thanks for your attention!



For more information, demonstrations
and free downloads, see:

www.iedereenismuzikaal.nl