

Oscillazioni neuronali e risonanze musicali

Daniele Schön

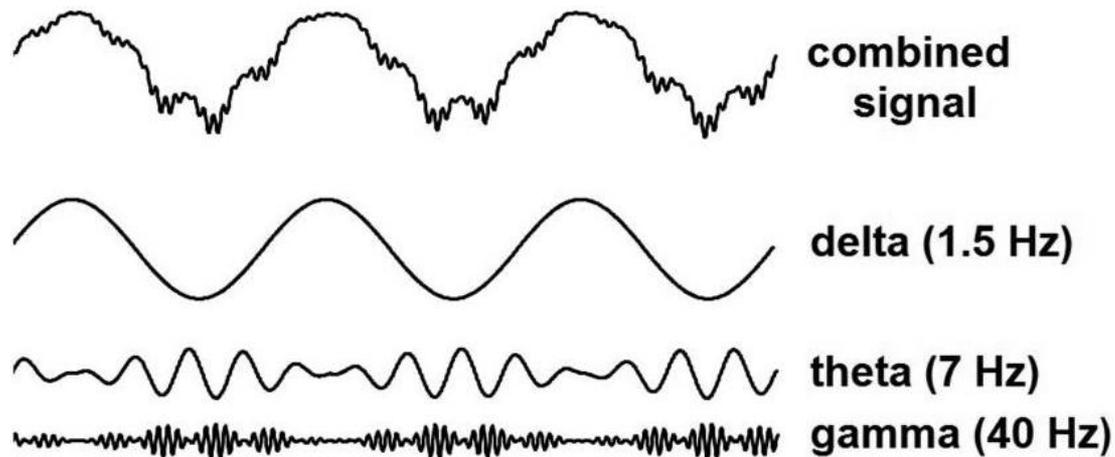
Institut de neurosciences des systèmes

Marseille



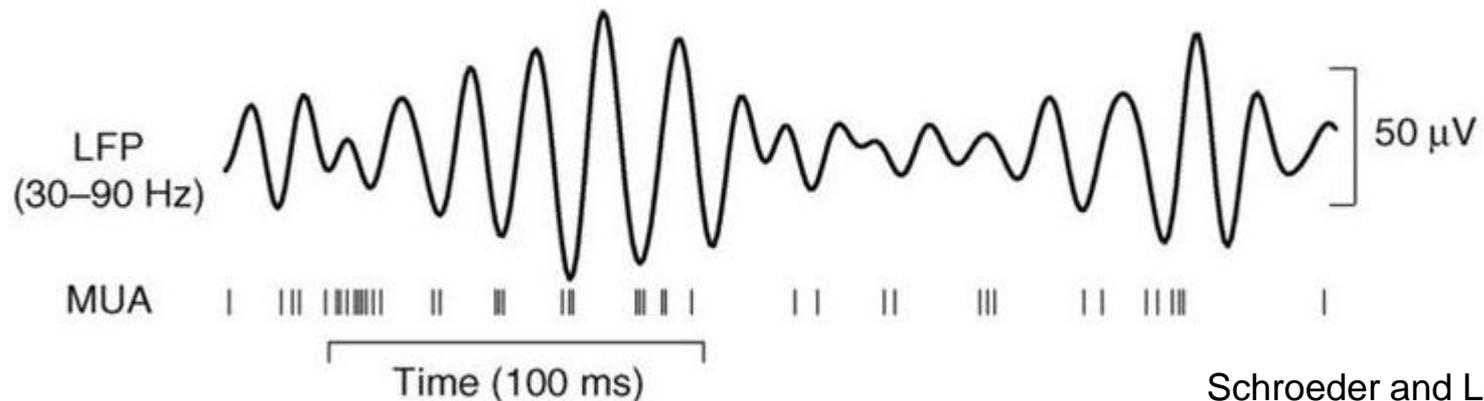
Oscillazioni neuronali

Nesting dell'attività oscillatoria



Calderone et al, 2014

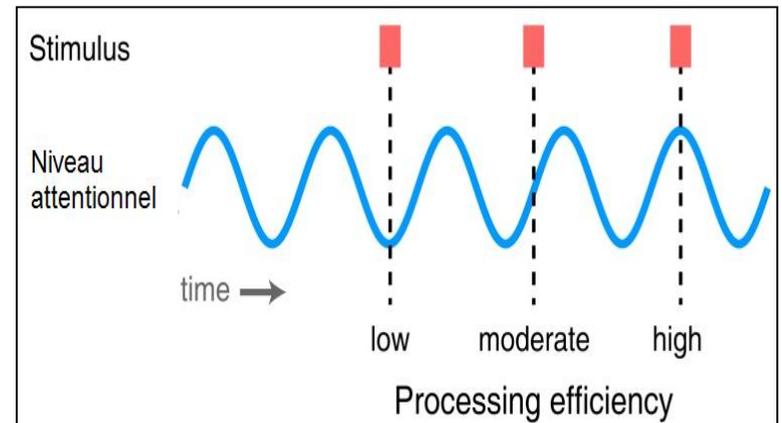
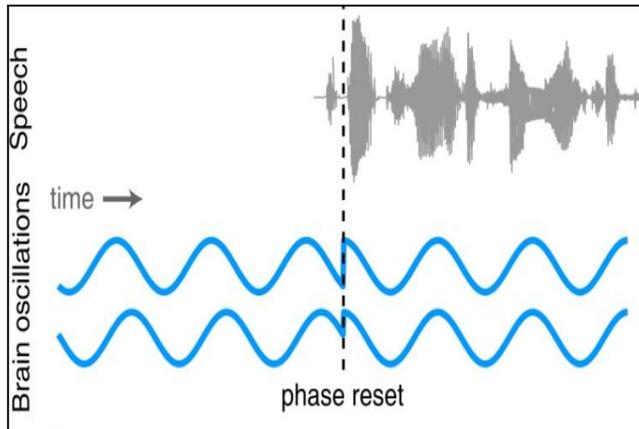
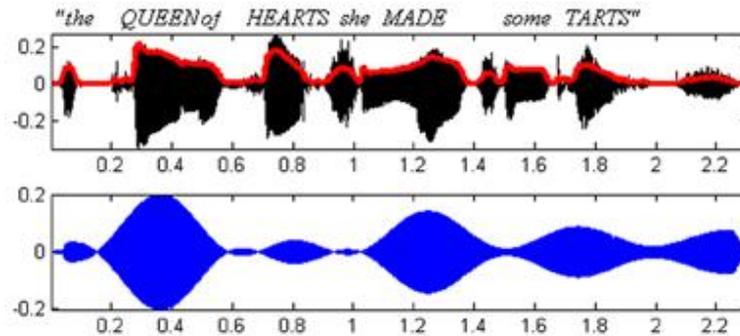
Oscillazioni neuronali come strumento di selezione sensoriale



Schroeder and Lakatos, 2009

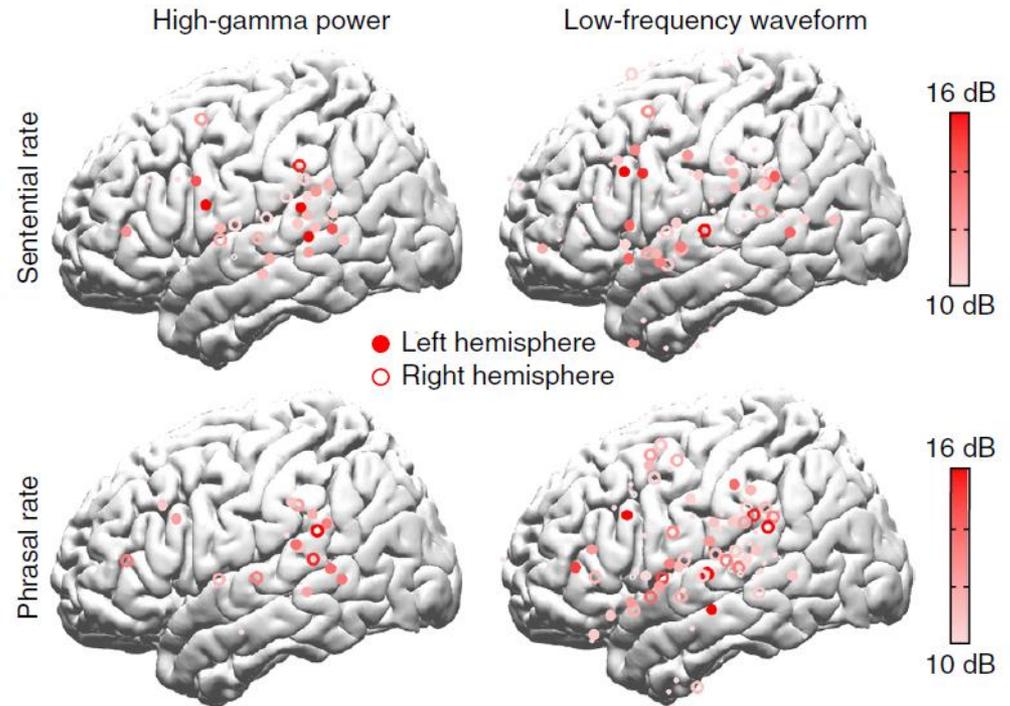
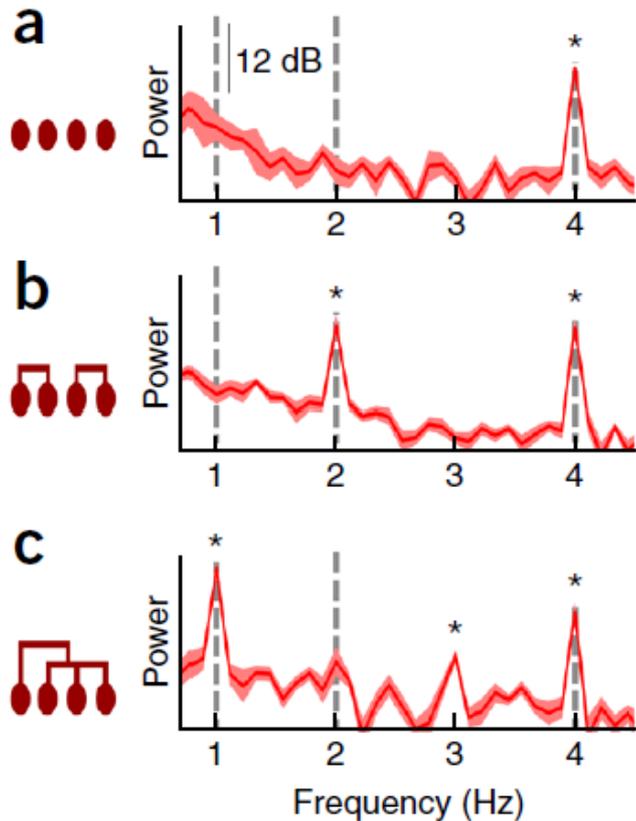
Oscillazioni neuronali e percezione della parola

Oscillazioni neuronali portano il ritmo della parola



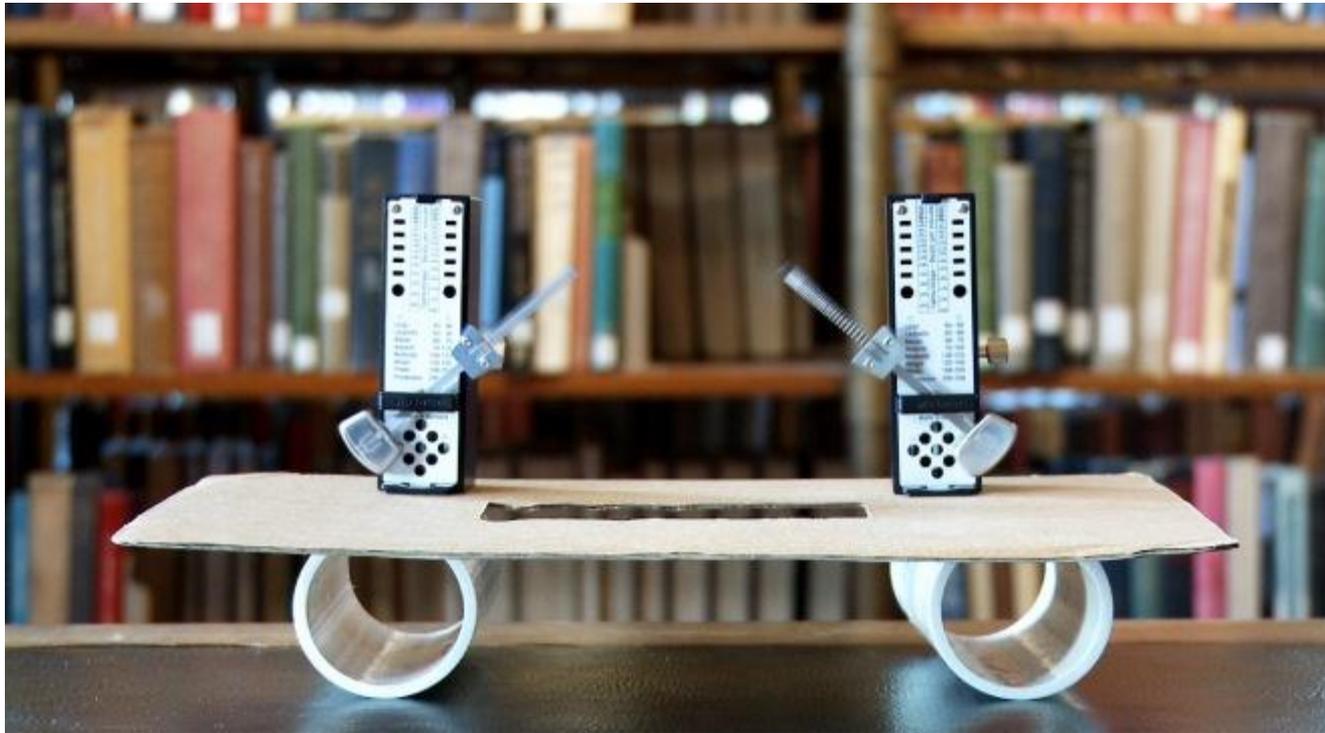
Oscillazioni neuronali e percezione della parola

Oscillazioni e strutture linguistiche complesse



Proprietà di un semplice sistema oscillatorio

Entrainment/Sincronizzazione



oscillatorio

ne



[oscillations](#)

Music to speech entrainment: perché?

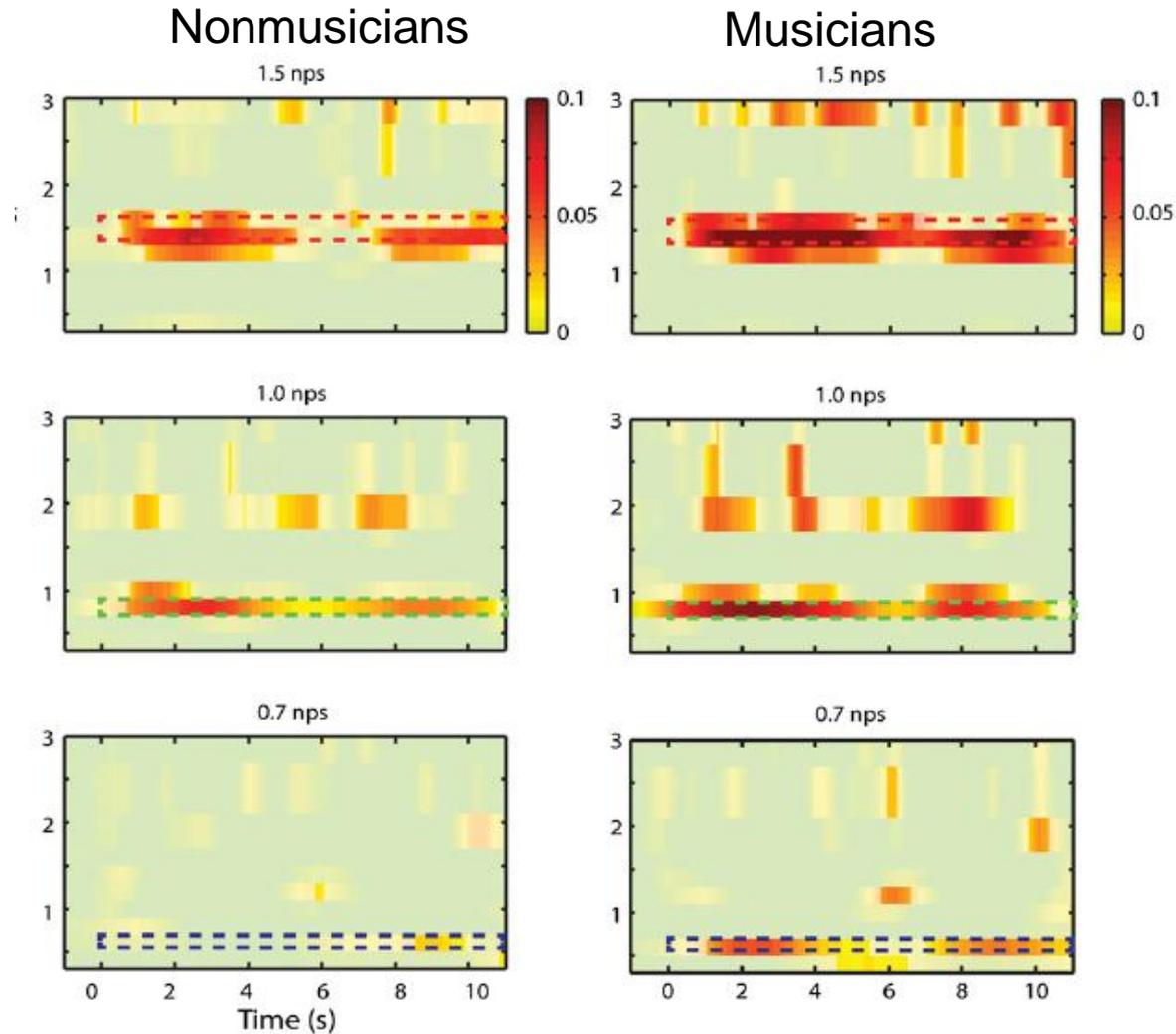
Music puts higher demands on the neural system

(Patel, 2011, 2013)



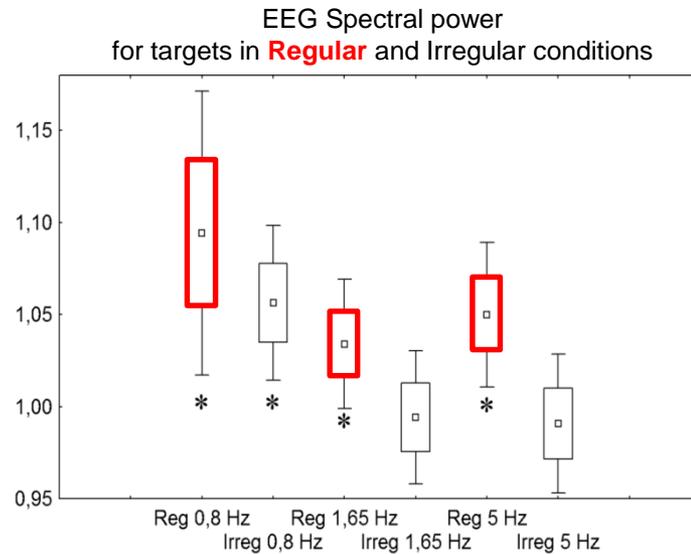
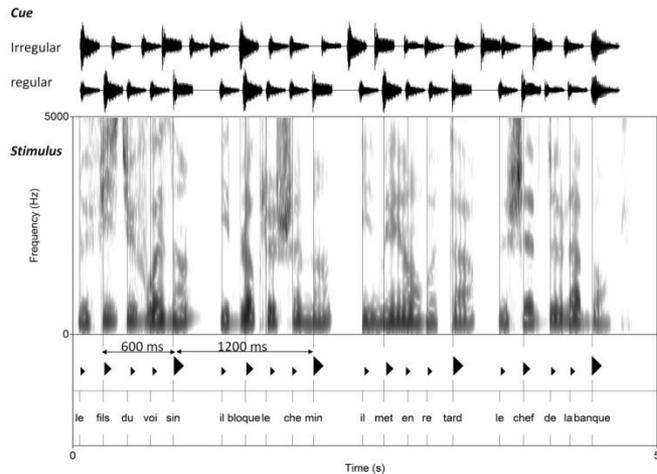
Music to speech entrainment: perché?

Musicians brains entrain to slow temporal structures

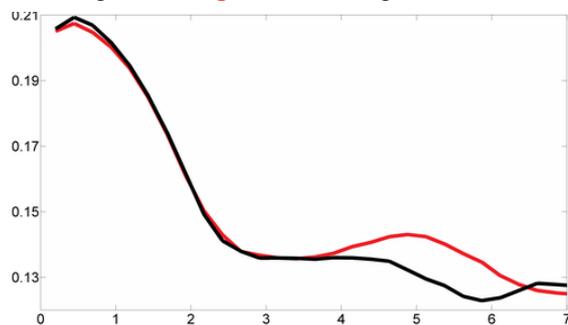


Music to speech entrainment: come?

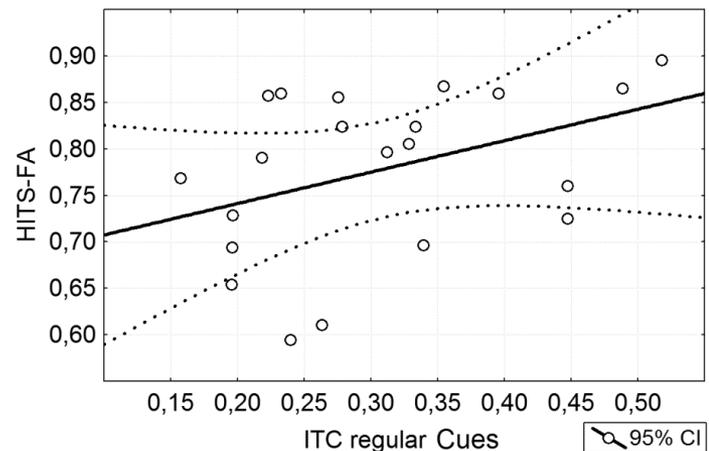
Increasing slow oscillatory activity and phase coupling



Inter-trial phase coherence
for targets in **Regular** and Irregular conditions

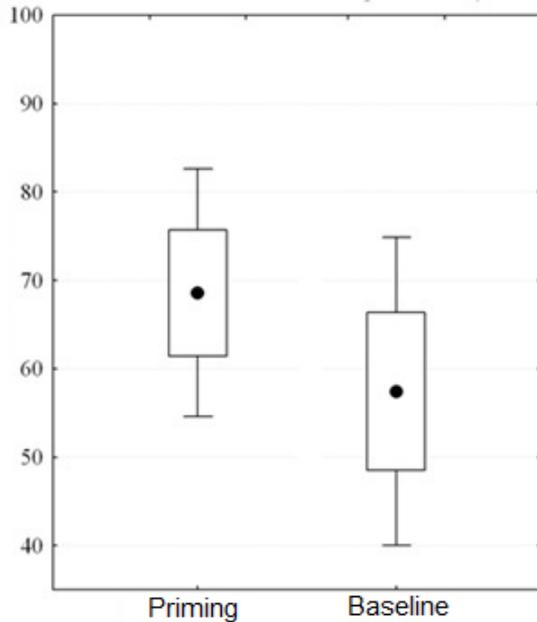


Behavioural relevance of phase coherence



Music to speech entrainment: per cosa?

Migliorare l'elaborazione della parola nei disturbi del linguaggio



Appredimento del ritmo

Baseline

phrase



Tâche: réproduction



"x x **X** x x **X**"



"ti ti PA ti ti PA"



Compito

"x x **X** x x **X**"



"ti ti PA ti ti PA"

sentence



Task: reproduction



30 minuti di stimolazione ritmica migliorano le competenze linguistiche di bambini sordi oralizzanti

Speech therapy training
(30 min)



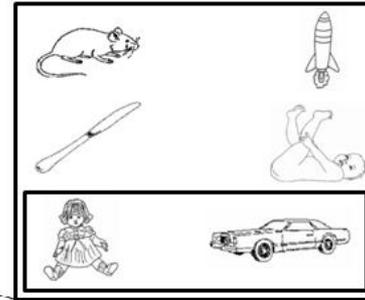
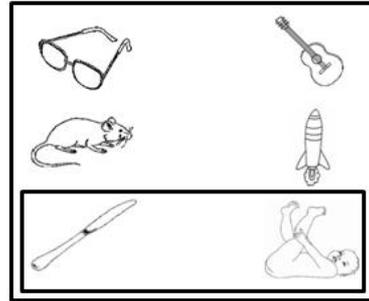
&

Active rhythmic training
(30 min)



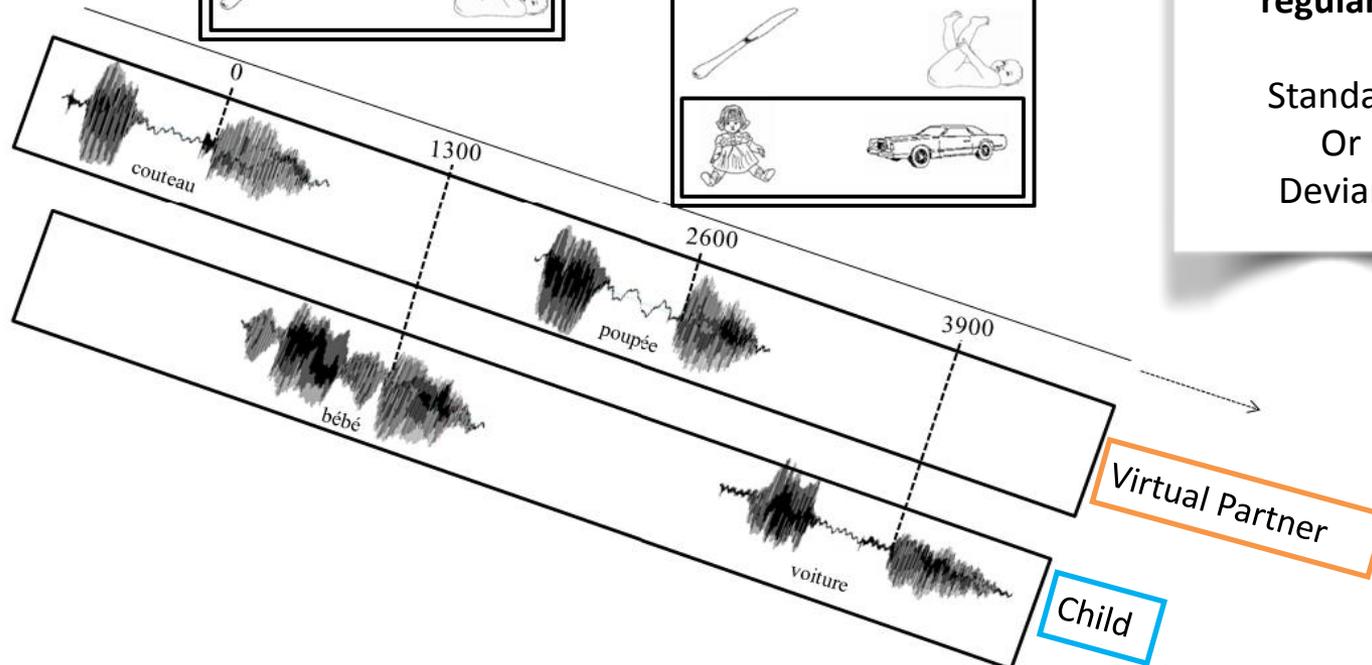
Word Stress Regularity

Match
Or
Mismatch



Alternation regularity

Standard
Or
Deviant

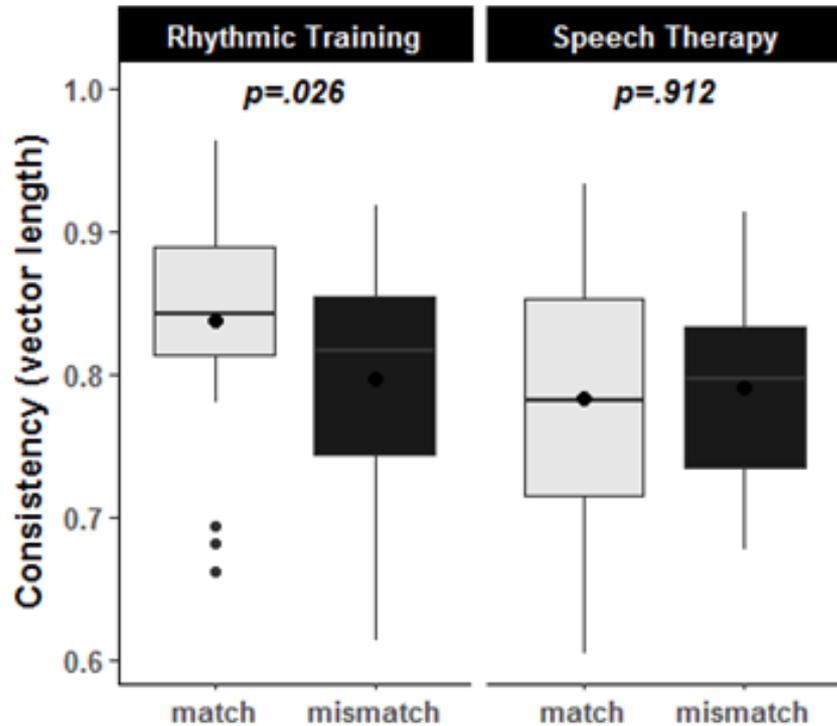


(Hidalgo, Falk and Schön, 2017; Hidalgo et al., in preparation)

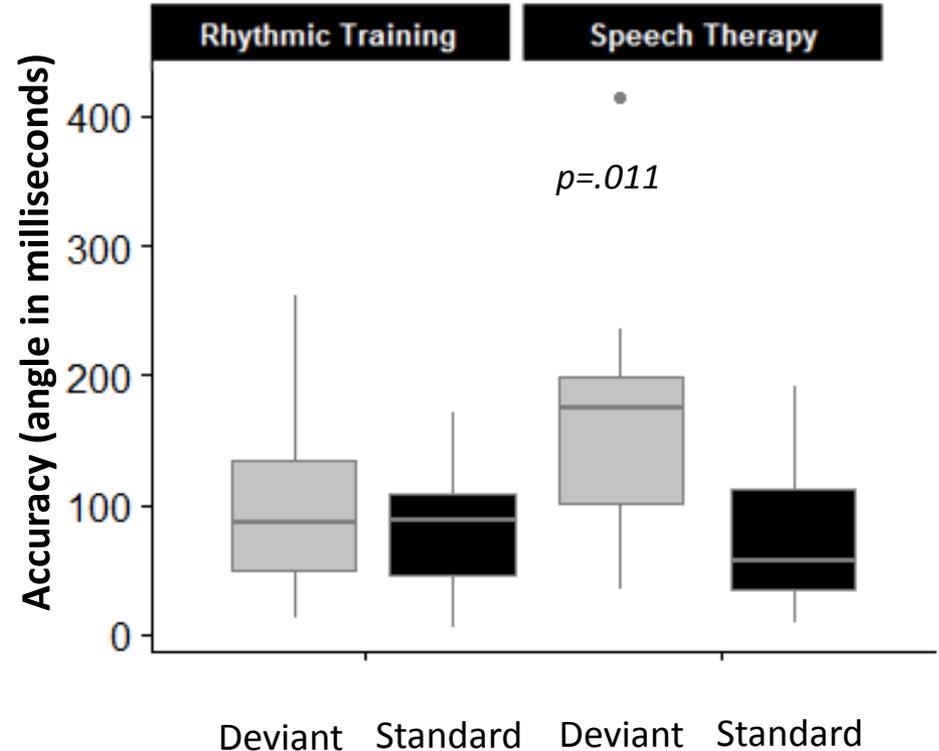
- 16 children with **Normal Hearing** aged 5,4 years in average, included in a mainstream primary school
- 15 children with **Hearing Loss** aged 7,4 years in average, 11 with a cochlear implant, 4 with a conventional hearing aid included in a mainstream primary school

30 minuti di stimolazione ritmica migliorano le competenze linguistiche di bambini sordi oralizzanti

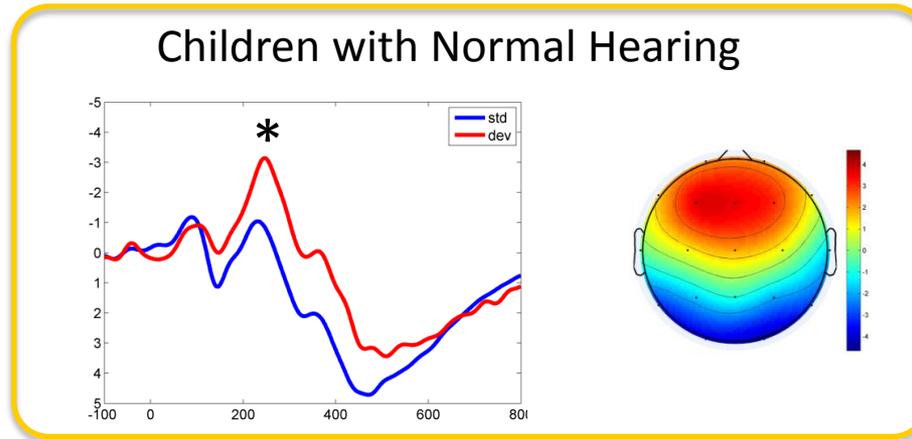
Sensitivity to word regularity (local)



Sensitivity to alternation regularity (global)

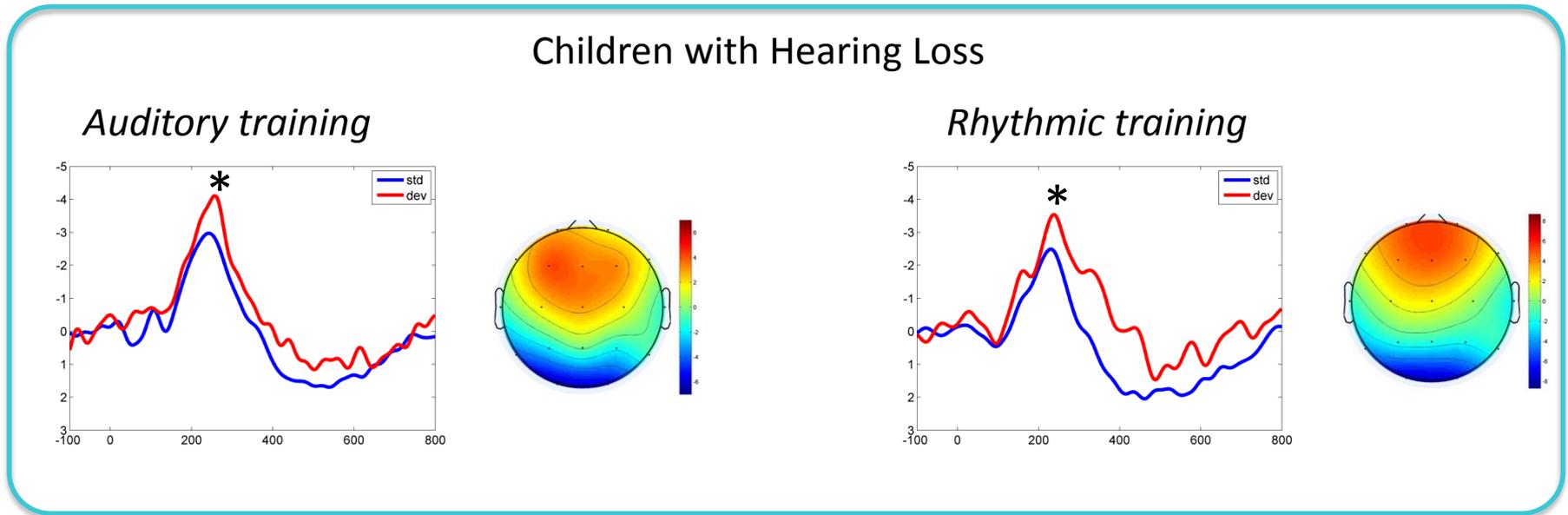


Effetto del training ritmico sulla predizione temporale



Regular Turn Intervals
=
Standards

Irregular Turn Intervals
=
Deviant



Music to speech entrainment: per cosa?

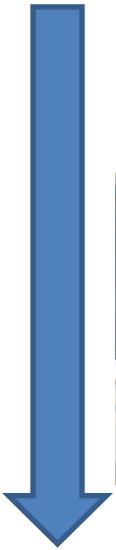
Improving speech processing in language impairment

Test

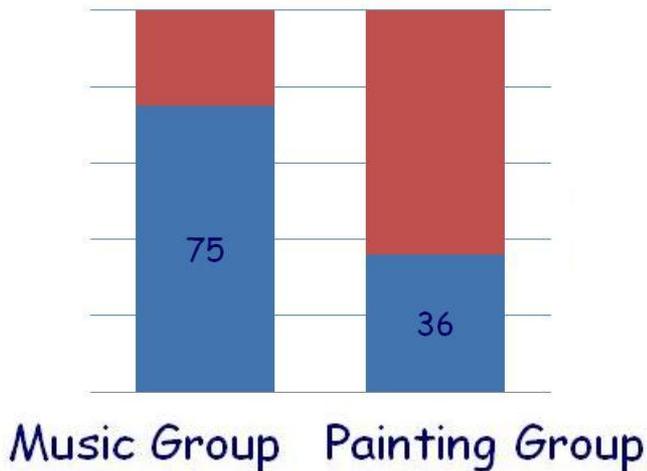
Training (7 months, 1h twice a week)



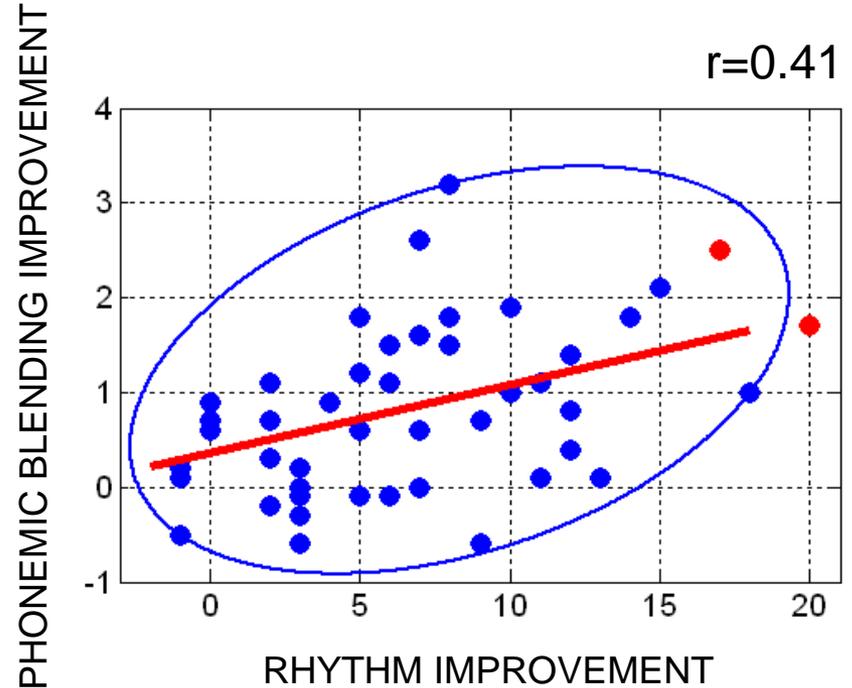
Retest



Pseudo-word Reading Test



Flaugnacco et al (2015, *PlosOne*)





**Le oscillazioni neuronali agiscono come un filtro temporale che struttura la percezione
Le risposte neuronali si accoppiano in fase a diversi livelli della parola e della musica
(a diverse scale temporali)**

La musica richiede una precisione temporale elevata



Elevata coerenza neuronale



Percezione e comprensione della parola facilitata



Musica nel processo rieducativo del linguaggio e comunicazione

Céline Hidalgo

Clement François

Corine Astesano

Elena Flaugnacco

Luisa Lopez

Nia Cason

Simone Falk

