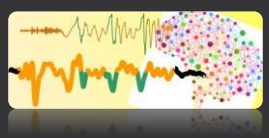
بسم الله الرحمن الرحیم



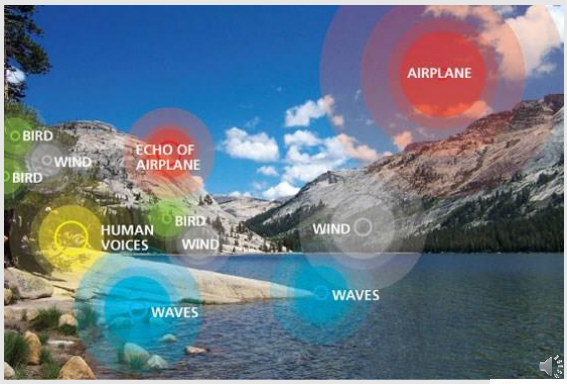
Applications of cABR

By:

Dr. Moslem Shaabani

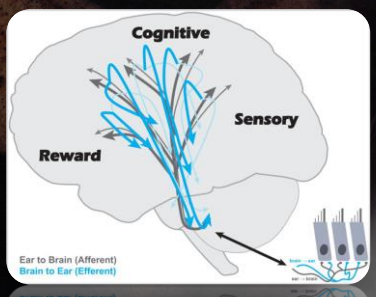
Assistant Professor (USWR)

From Sound booth to Soundscape

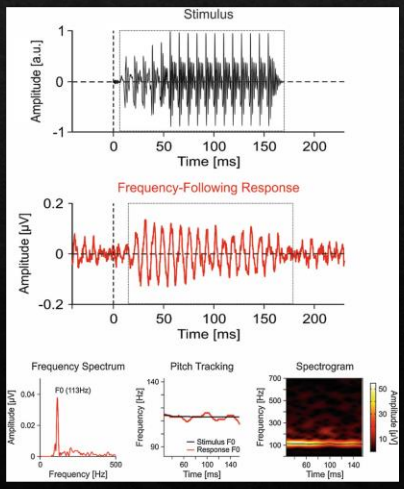


The auditory system, shaped by the activation of cognitive mechanisms, is a moving target and cABR moves right along with it.

Nina Kraus

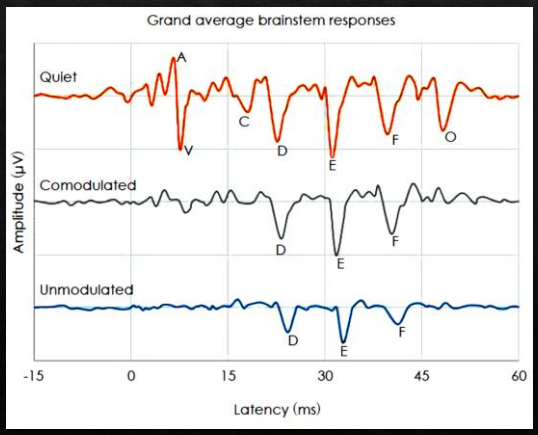


Auditory Frequency-Following Responses
Neural Signature (Marker)



- Basic Science Perspective
  - Central auditory processing (CAP)
    - Neural Markers of CAP
  - Experience and Expertise
    - Music and Communication Skills
    - Bilingualism
- Clinical Standpoint
  - Disorders in CAP
  - Communication Disorders
    - TBI

Neural Marker of Central auditory processing (CAP)
Hearing in Noise (Quiet vs. CM or UM Noises)



ORIGINAL ARTICLE
J Audiol Otol 2018;22(3):128-133
pISSN 2384-1621 / eISSN 2384-1710
https://doi.org/10.7874/jao.2017.00283

Brainstem Correlates of Comodulation Masking Release for Speech in Normal Hearing Adults

Soheila Rostami[1], Abdollah Moossavi[2], Mohsen Ahadi[1], and Shohreh Jalaei[3]

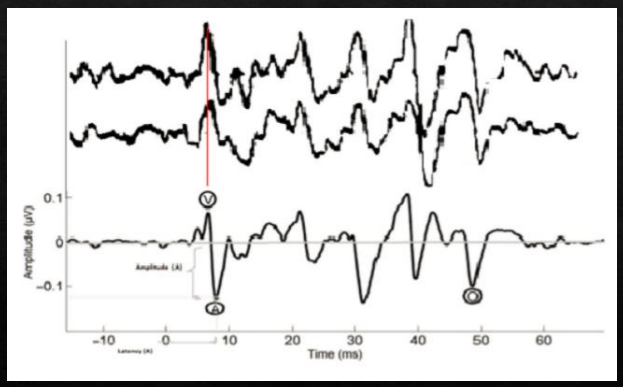
Developmental Science

PAPER

Brainstem transcription of speech is disrupted in children with autism spectrum disorders

Nicole Russo,[1,2] Trent Nicol,[1] Barbara Trommer,[2,3] Steve Zecker[1] and Nina Kraus[1,2,4]

Neural Marker of Central auditory processing (CAP)
Hearing in Noise (Quiet vs. CM or UM Noises)



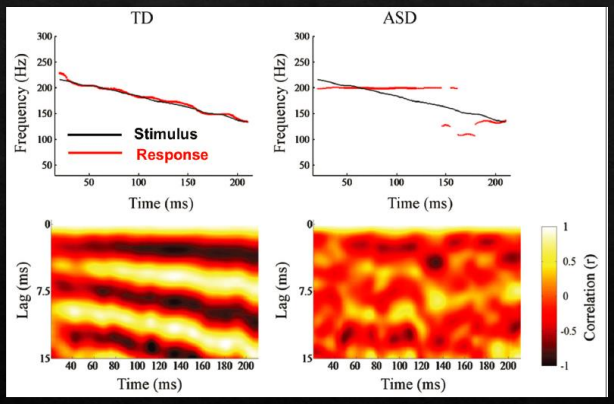
Neurological Sciences
https://doi.org/10.1007/s10072-019-04102-z
ORIGINAL ARTICLE

Speech-evoked auditory brainstem response; electrophysiological evidence of upper brainstem facilitative role on sound lateralization in noise

Abdollah Moossavi[1] · Yones Lotfi[2] · Mohanna Javanbakht[2] · Soghrat Faghihzadeh[3]

Neural Marker of CAP disorder

Communication disorders; Pitch tracking (Normal vs. ASD)



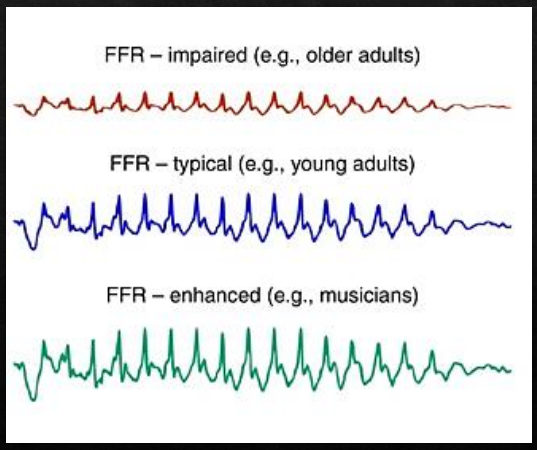
ELSEVIER
Clinical Neurophysiology 119 (2008) 1720–1731
www.elsevier.com/locate/clinph

Deficient brainstem encoding of pitch in children with Autism Spectrum Disorders

N.M. Russo[a,b,*], E. Skoe[a], B. Trommer[b,c,d], T. Nicol[a], S. Zecker[a], A. Bradlow[b,e], N. Kraus[a,b,f,g,*]

Neural Marker of CAP disorder

Aging; Grand Average (Young vs. Old)

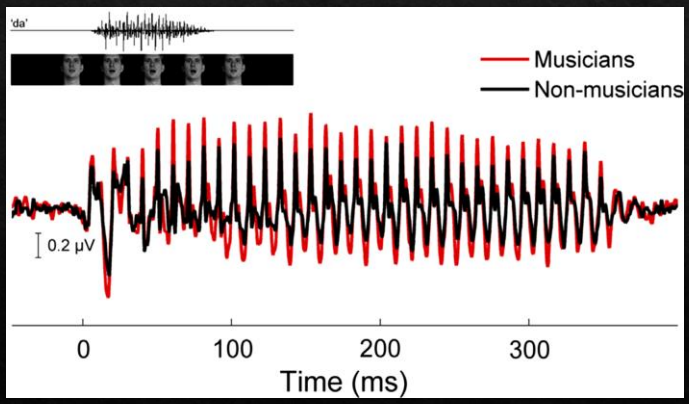


PERSPECTIVE
OPEN

Evolving perspectives on the sources of the frequency-following response

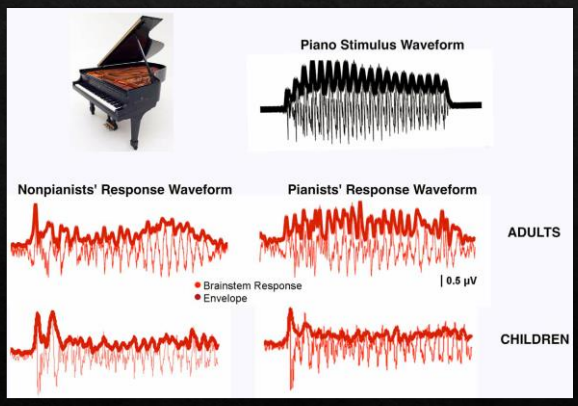
Emily B.J. Coffey[1,2,3*], Trent Nicol[4], Travis White-Schwoch[4], Bharath Chandrasekaran[5], Jennifer Krizman[4], Erika Skoe[6], Robert J. Zatorre[2,3,7] & Nina Kraus[4,8,9]

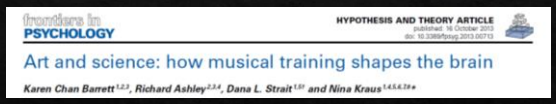
Neural Marker of Expertise
Experience-dependent plasticity in musicians
Unimodal vs. Multimodal; IC




Contents lists available at ScienceDirect
Hearing Research
journal homepage: www.elsevier.com/locate/heares
The layering of auditory experiences in driving experience-dependent subcortical plasticity
Erika Skoe, Bharath Chandrasekaran

Neural Marker of Expertise (Training Plasticity)
Experience-dependent plasticity in musicians
Stimulus-Response Correlation

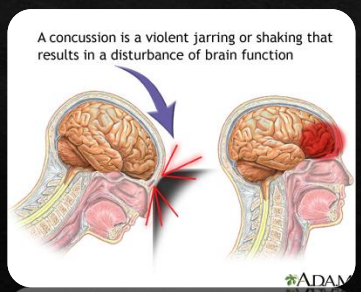


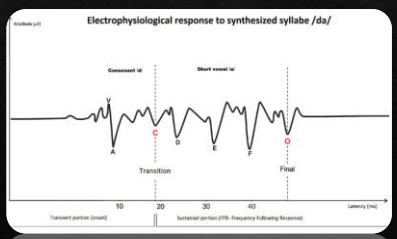

frontiers in PSYCHOLOGY
HYPOTHESIS AND THEORY ARTICLE
Art and science: how musical training shapes the brain
Karen Chan Barrett, Richard Ashley, Dana L. Strait and Nina Kraus

Clinical Application of FFR in TBI
Principle

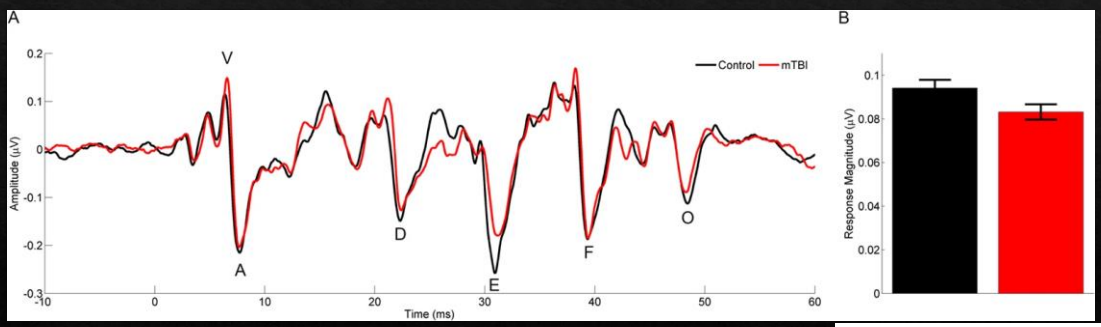
- HIN relationship with FFR
- HIN relationship with TBI

→ TBI relationship with FFR



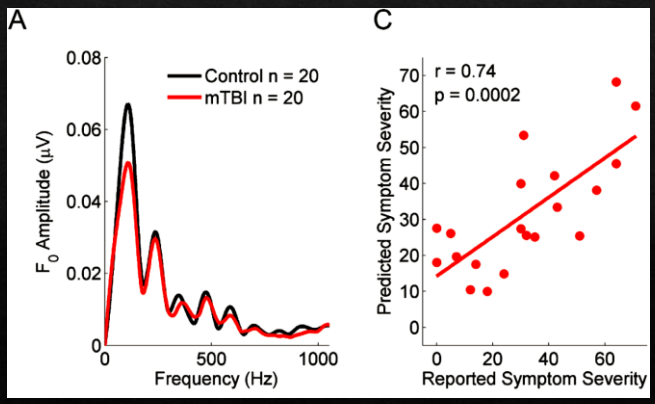


Neural Marker of CAP disorder
HIN in Concussion
Grand average: Accuracy; Timing; Amplitude



SCIENTIFIC REPORTS
OPEN Auditory biological marker of concussion in children

Neural Marker of CAP disorder
HIN in Concussion
F0 strength difference



SCIENTIFIC REPORTS

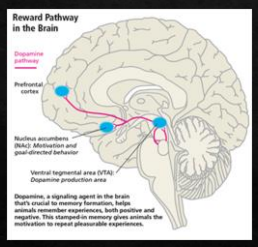
OPEN Auditory biological marker of concussion in children

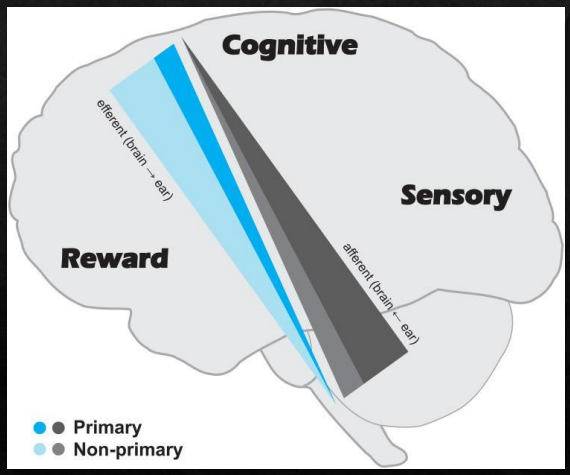
Nina Kraus[1,2,3,4], Elaine C. Thompson[1,2], Jennifer Krizman[1,2], Katherine Cook[3,4], Travis White-Schwoch[1,2] & Cynthia R. LaBella[3,4]

We are in fact, with cABR, studying cortical influences as much as local ones.

Nina Kraus

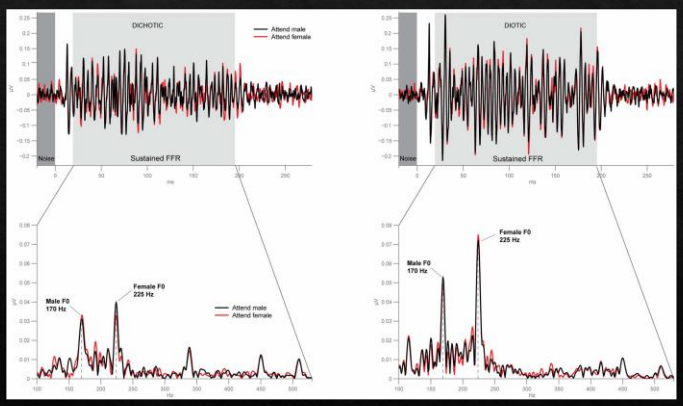
The primary and non-primary auditory pathways
Afferent vs. Efferent (Bottom-up vs. Top-down)





PERSPECTIVE
OPEN
Evolving perspectives on the sources of the frequency-following response
Emily B.J. Coffey[1,2,3], Trent Nicol[4], Travis White-Schwoch[4], Bharath Chandrasekaran[5], Jennifer Krizman[4], Erika Skoe[6], Robert J. Zatorre[2,3,7] & Nina Kraus[4,8,9]

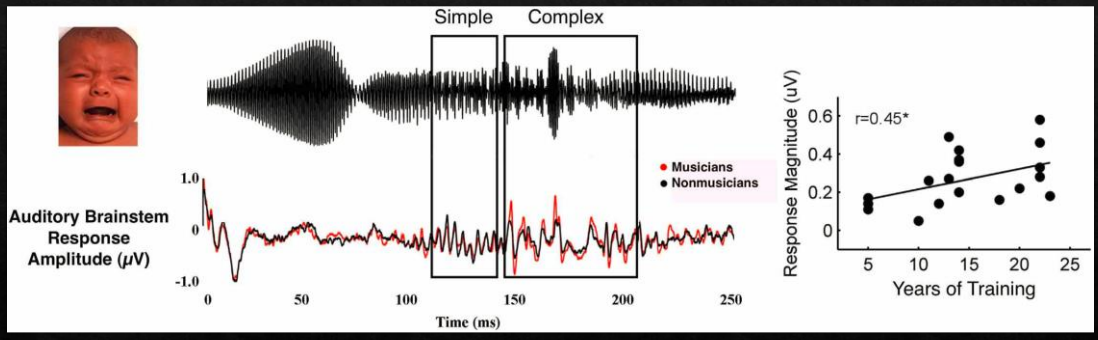
Neural Marker of CAP-Cognitive Link
Selective Attention (Dichotic vs. Diotic; Male vs. Female)
Efferent Modulation (Frequency cues; Spectral Cues)



OPEN ACCESS Freely available online
PLOS ONE
Selective Attention Modulates Human Auditory Brainstem Responses: Relative Contributions of Frequency and Spatial Cues
Alexandre Lehmann[1,2,3], Marc Schönwiesner[1,2,3,4]*

Neural Marker of CAP-Emotion (Reward System)

The complex portion of an emotional communication sound



frontiers in PSYCHOLOGY

HYPOTHESIS AND THEORY ARTICLE

Art and science: how musical training shapes the brain

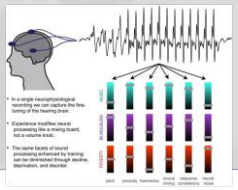
Karen Chan Barrett[1,2,3], Richard Ashley[2,3,4], Dana L. Strait[1,5†] and Nina Kraus[1,4,5,6,7*]

Speech-to-Song Illusion!

Diana Deutsch

زنده یاد استاد حسن کسایی

Conclusion



Lesson 1.
Neural Marker of Central auditory processing (CAP) and CAP disorders

Lesson 2.
Neural Marker of Experience and Experise
(online, short-term, life-long)

Lesson 3.
Neural Marker of CAP-Cognitive Link

Lesson 4.
Neural Marker of CAP-Cognitive-Reward Link

Lesson 5.
Neural Marker of Intervention (Training)
(CI and HA)