

DECODE

Développement des Comportements et Dépistage

www.decode.unicaen.fr

Imageries fonctionnelles non-invasives en néonatalogie

A la recherche de précurseurs néonataux du développement cognitif



Nadège Roche-Labarbe



COMETE

UMR 1075 UNICAEN / INSERM

UNICAEN

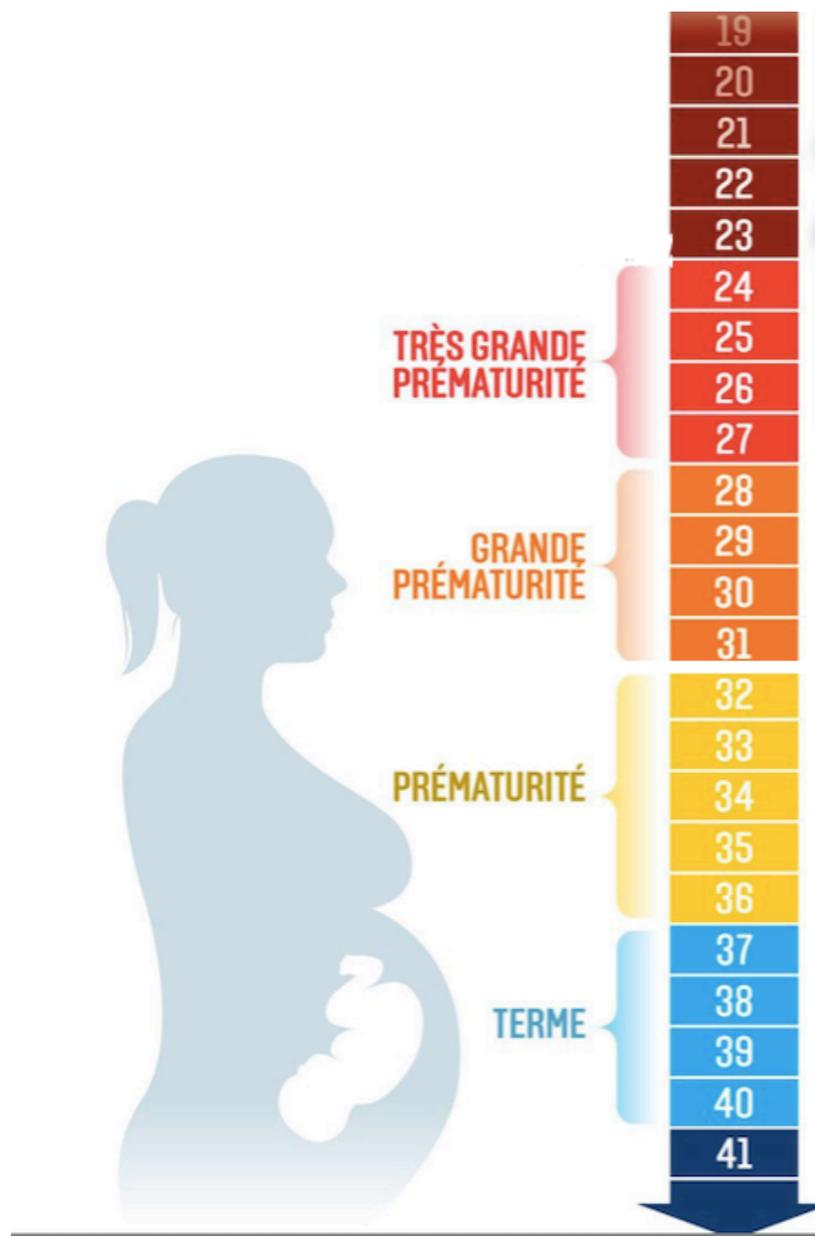


INSERM

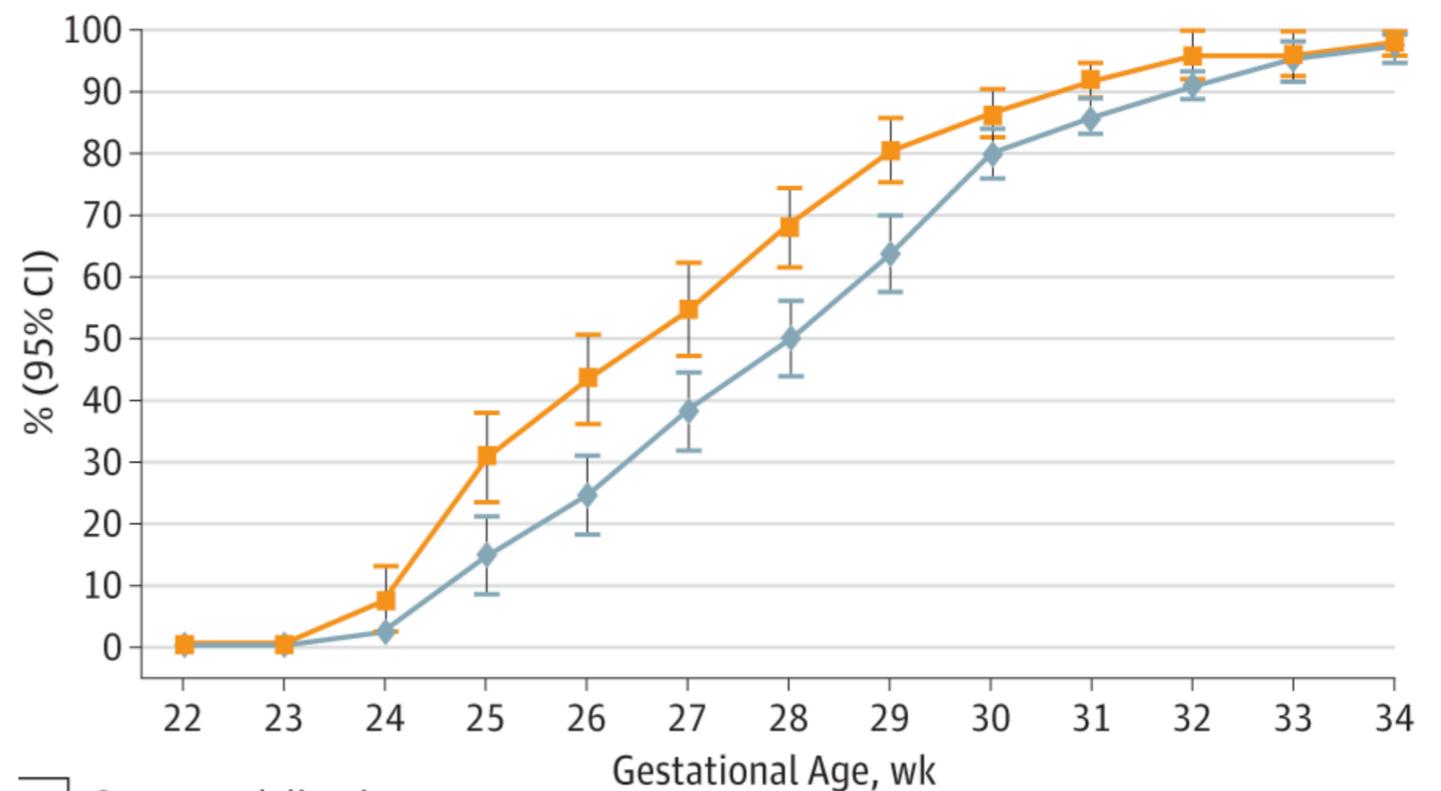
LA NAISSANCE PRÉMATURÉE

Modèle de trajectoire neurodéveloppementale atypique

7 à 10% des enfants, en augmentation



B Survival to discharge without morbidity

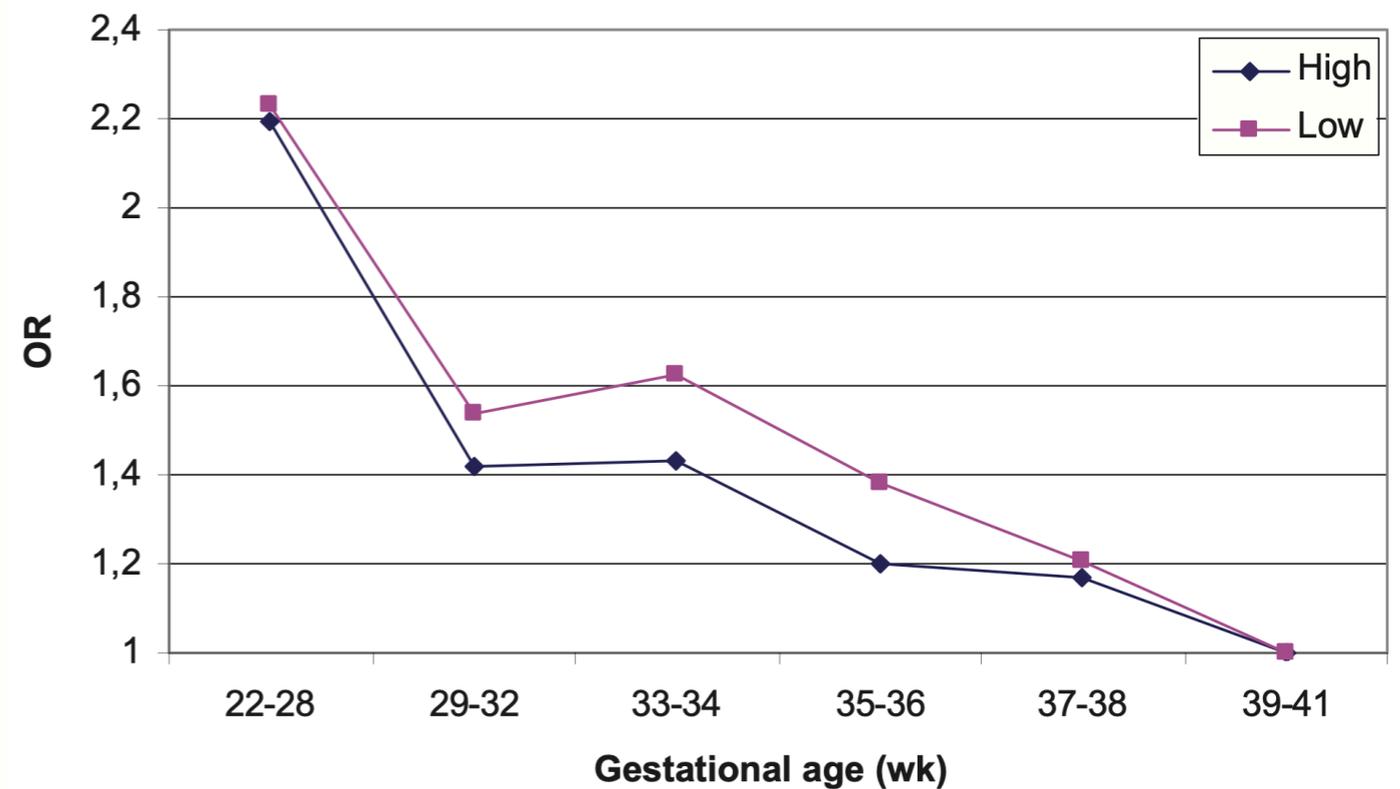
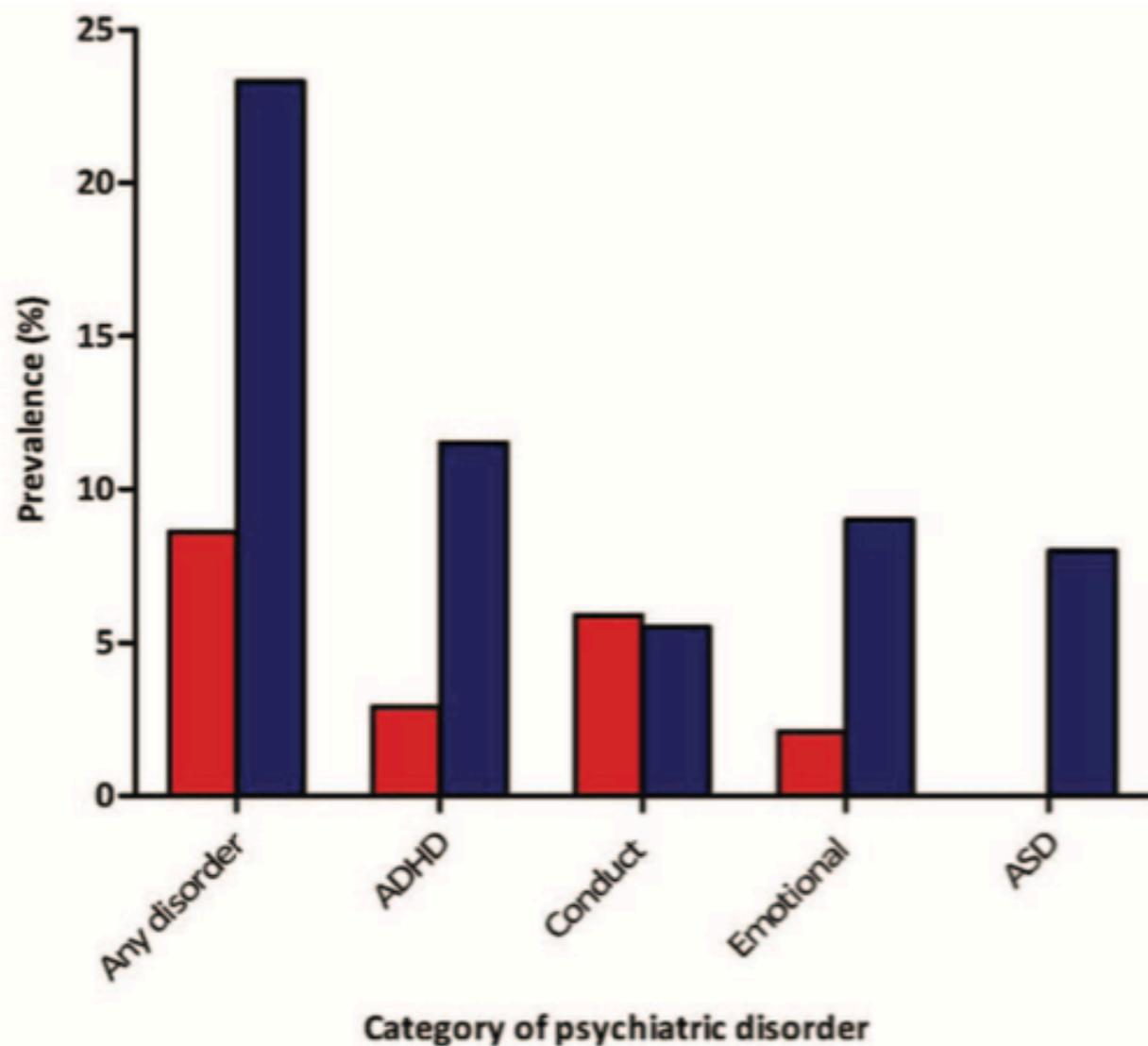


Comparison of Survival Rates and Obstetric and Neonatal Interventions in 1997 and 2011 (*EPIPAGE2, Ancel et al. 2015*)

LA NAISSANCE PRÉMATURÉE

Modèle de trajectoire neurodéveloppementale atypique

Prevalence of psychiatric disorders at 11 y of age in EPT (26 wk) children and term-born



ADHD medication (odds ratio) by maternal education and gestational age at birth (*Lindstrom et al. 2011*)

LA NAISSANCE PRÉMATURÉE

Modèle de trajectoire neurodéveloppementale atypique



Premature birth
Disturbed brain
development

+ Other risk factors
genetic susceptibility
biological environment
familial environment

Atypical (tactile)
sensory profile
(*Cascio et al., 2010*)

Motor deficits
(*Hadders-Algra., 2003 ;
McPhillips et al., 2014*)

Executive attention deficits
(*Tolsa et al., 2014 ; Sinha et al.,
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Neurodevelopmental disorders
(*Johnson et al., 2010 ; Johnson et
Marlow., 2011*)

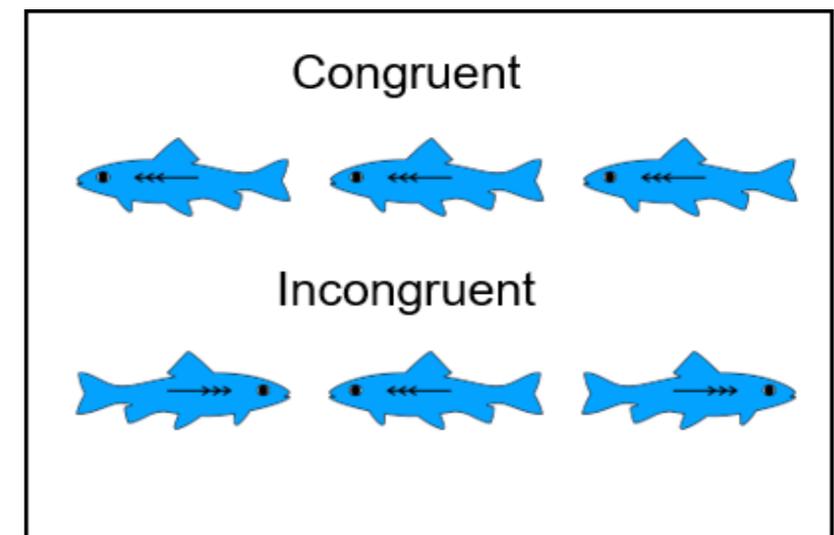
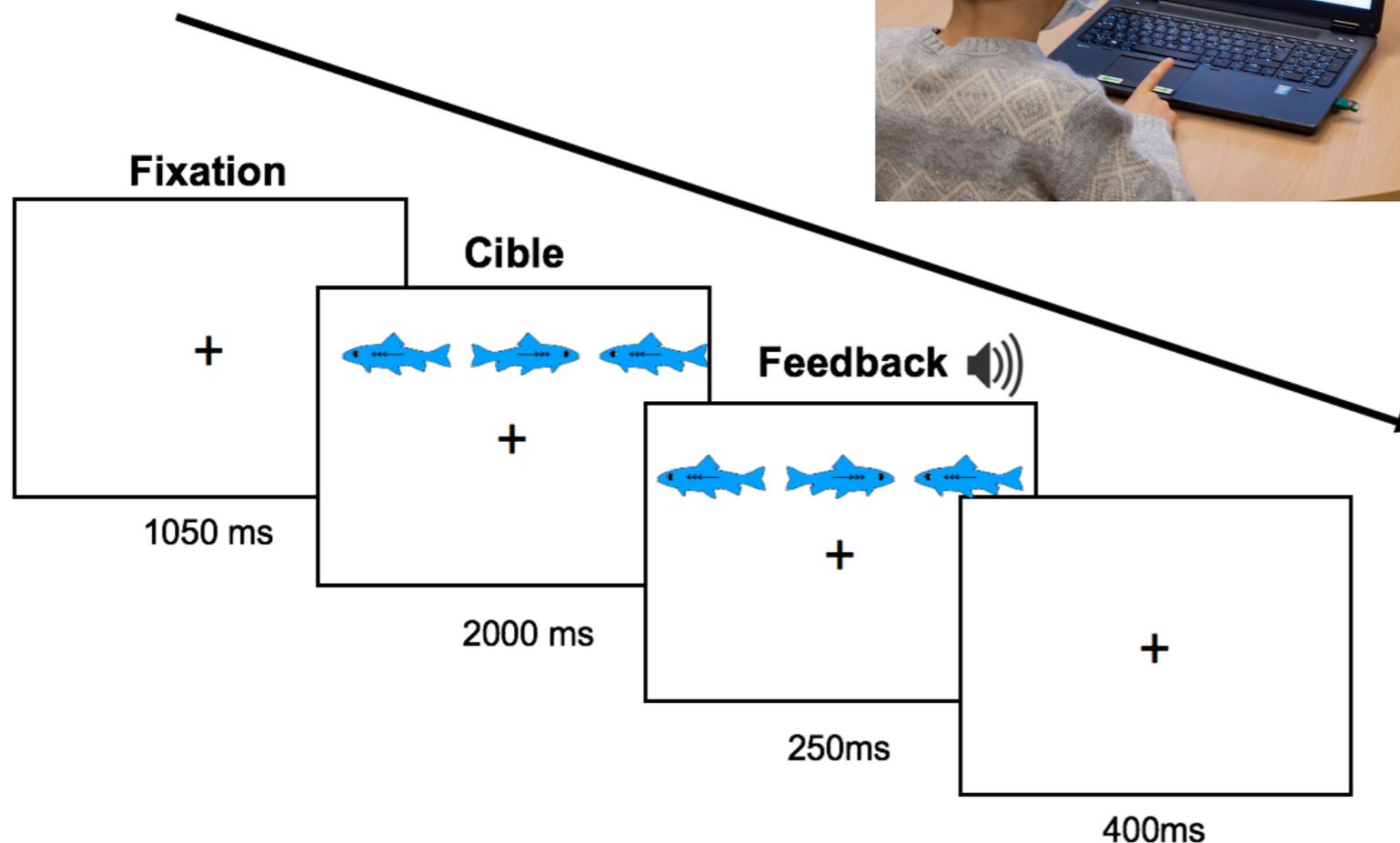
Bröring et al. 2017:
same patho process

MEDIATE - TRAITEMENT TACTILE ET ATTENTION EXECUTIVE

Différentes populations de 4 à 6 ans (prémas, placés, scolaires...)

Hétéro-questionnaires du traitement tactile (Profil sensoriel de W. Dunn)

Test d'attention exécutive Child Attention Network Task modifié (Rueda et al., 2004)



M. Anquetil

MEDIATE - TRAITEMENT TACTILE ET ATTENTION EXECUTIVE

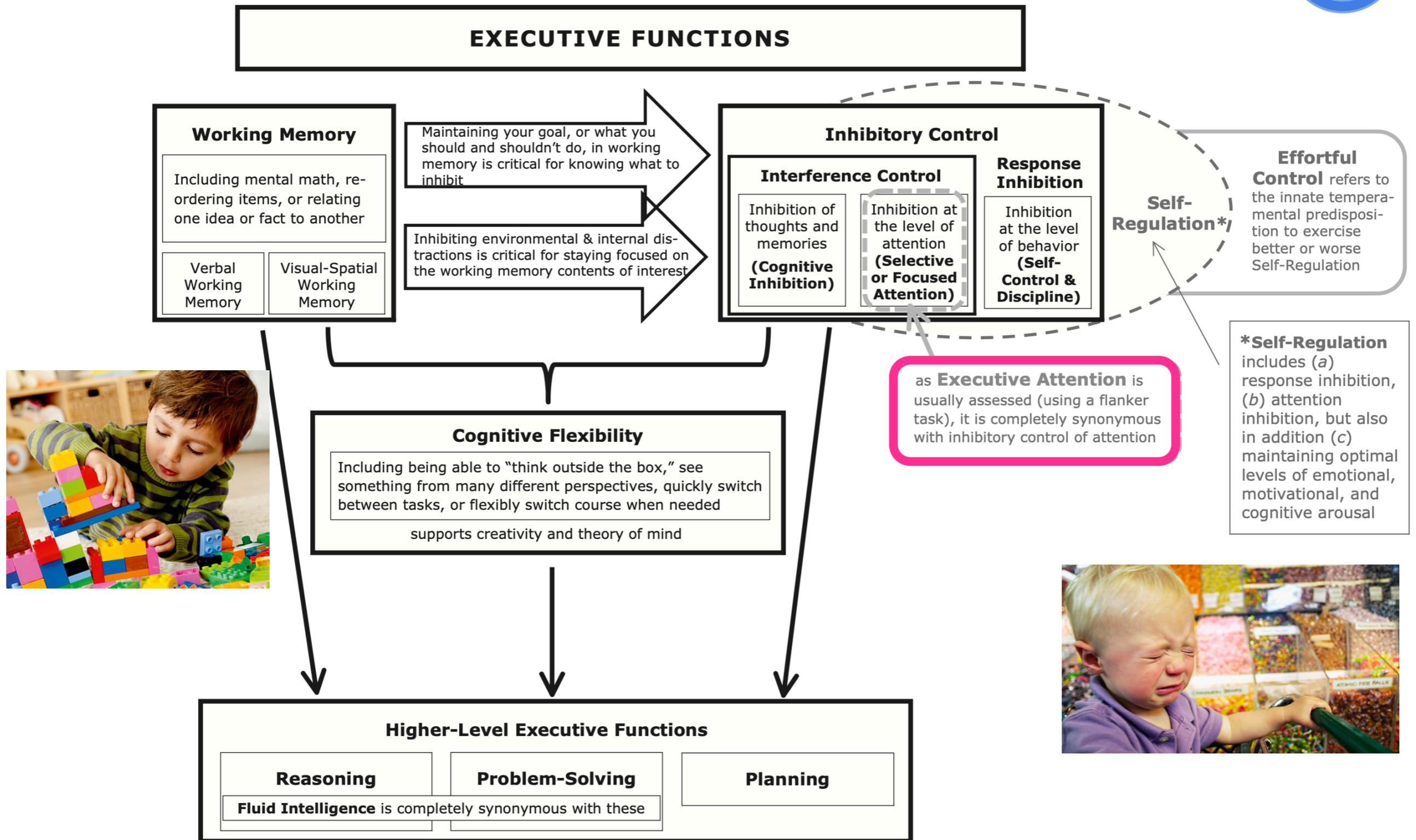


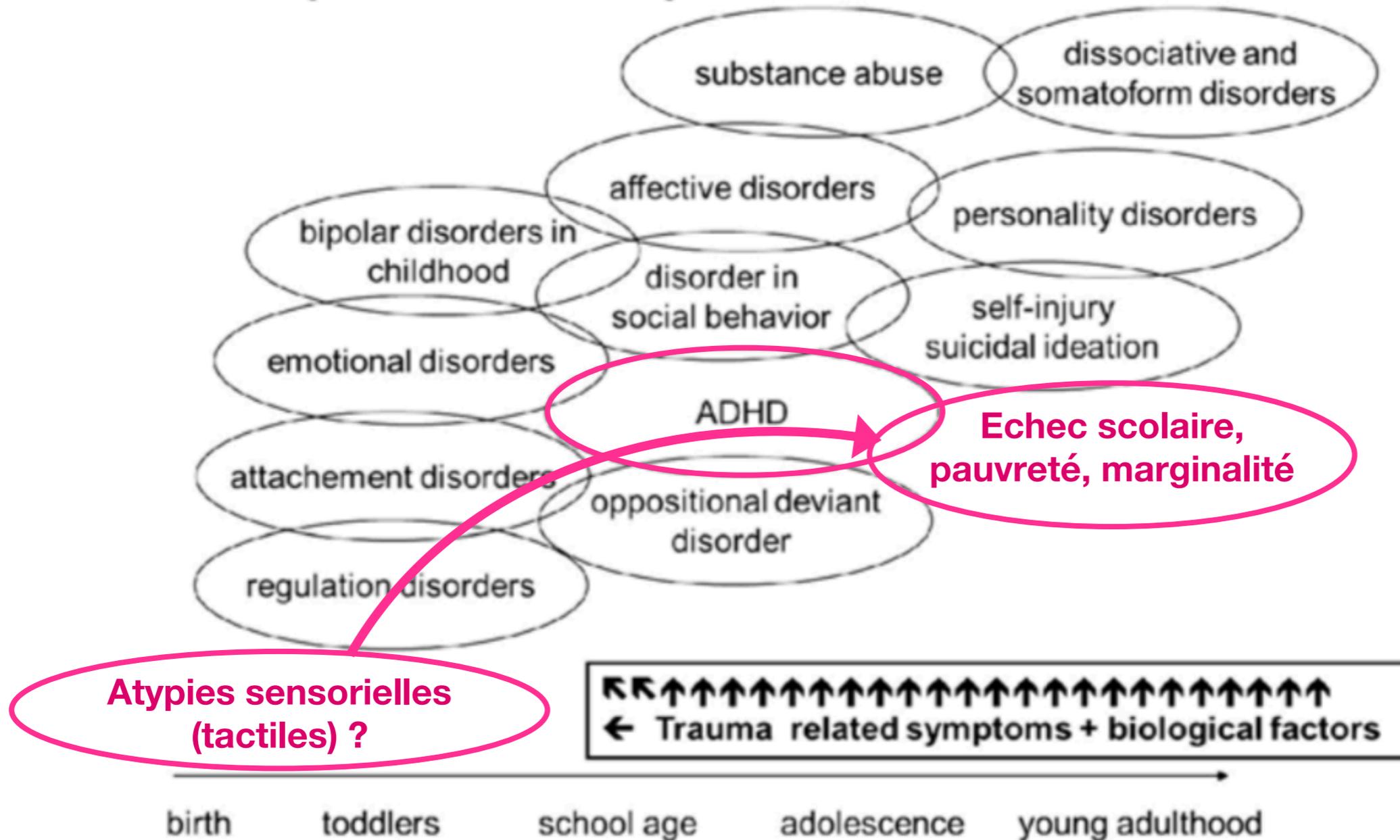
Figure 4

Executive functions and related terms.

MEDIATE - TRAITEMENT TACTILE ET ATTENTION EXECUTIVE

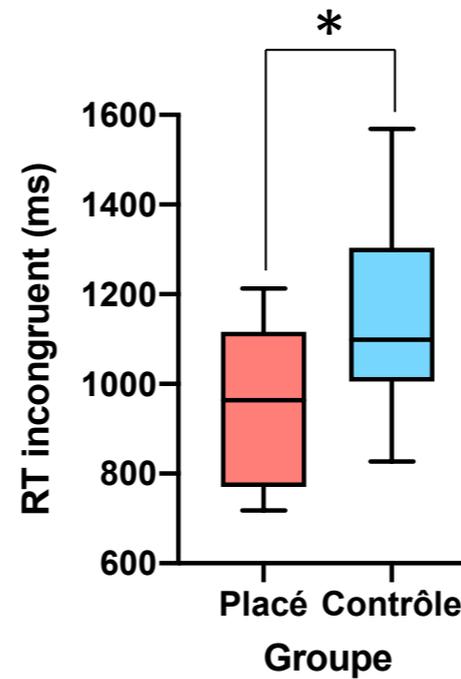
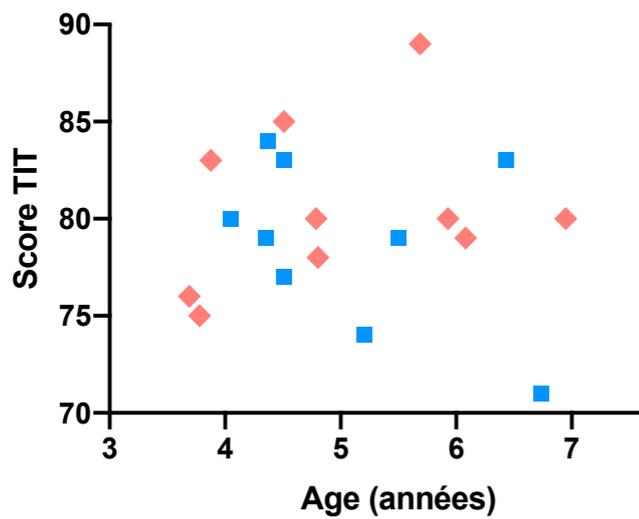
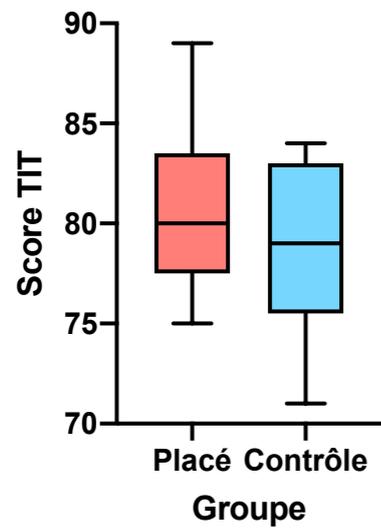
Différentes populations de 4 à 6 ans

Developmental heterotopia of trauma

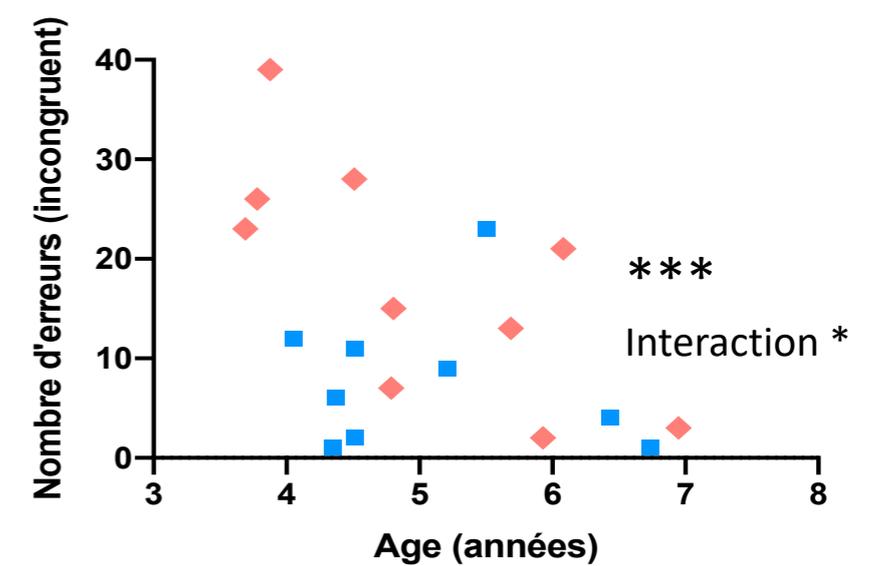
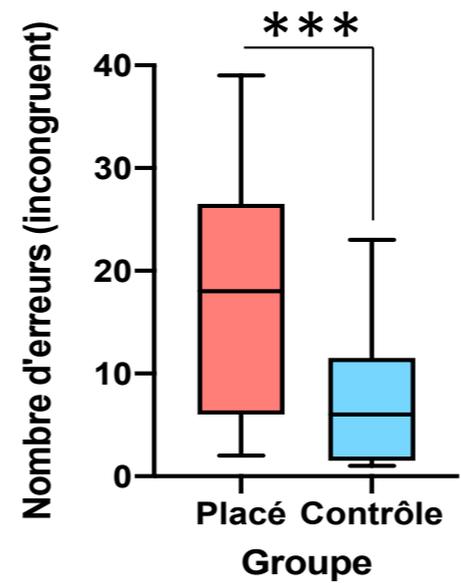
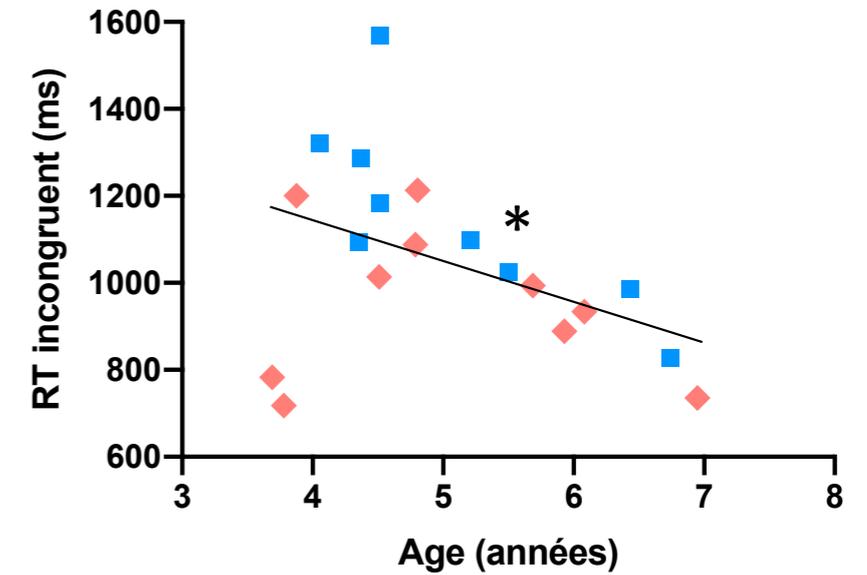


Enfants placés

Score TIT

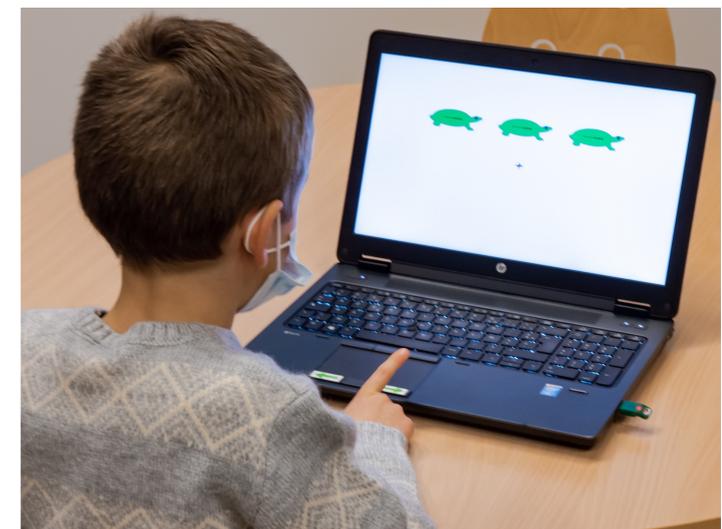
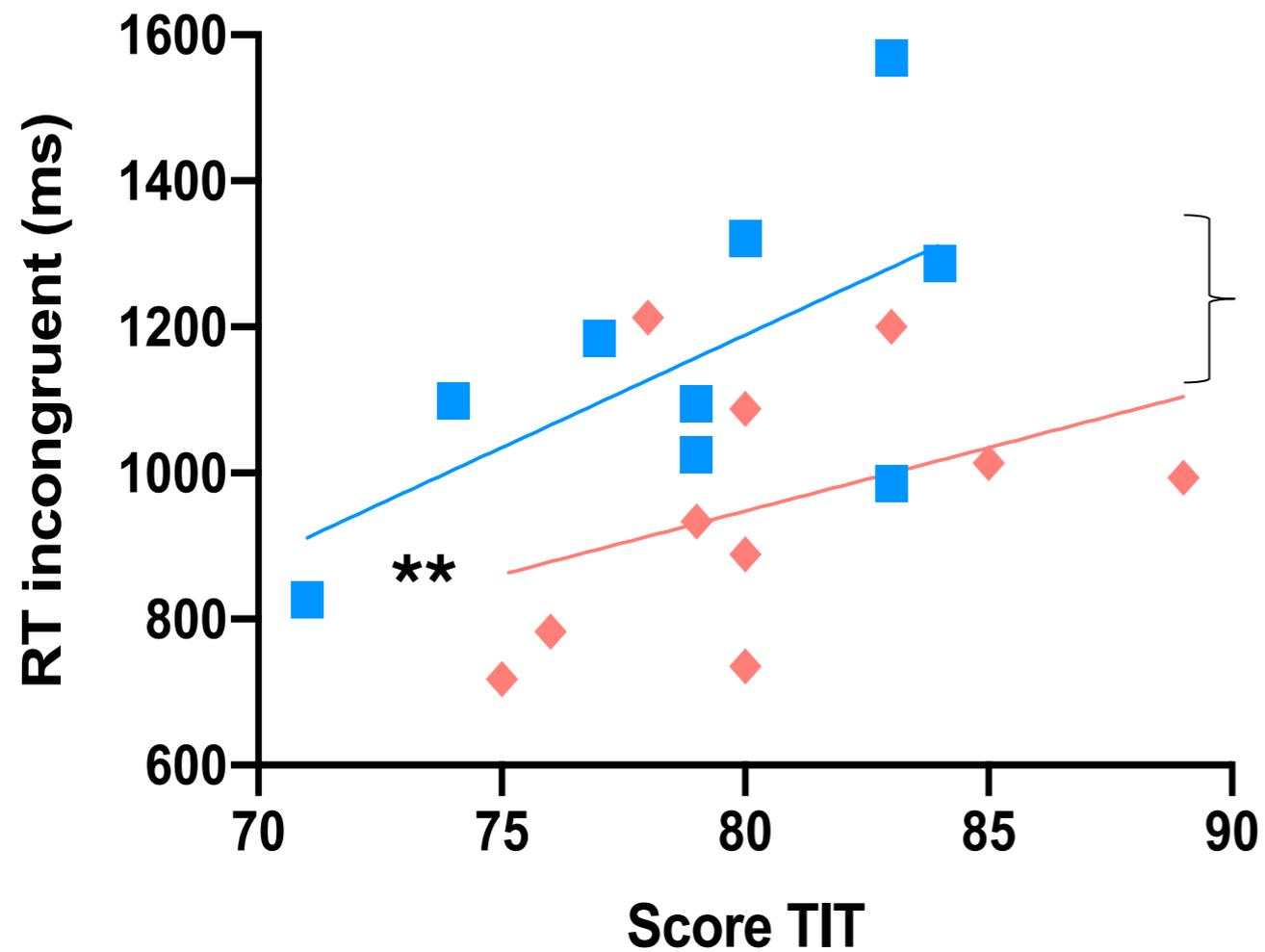


Score AE



MEDIATE - TRAITEMENT TACTILE ET ATTENTION EXECUTIVE

Enfants placés



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(*Johnson et al., 2010* ; *Johnson et Marlow., 2011*)

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LA PERCEPTION TACTILE DU NOUVEAU-NÉ PRÉMATURÉ

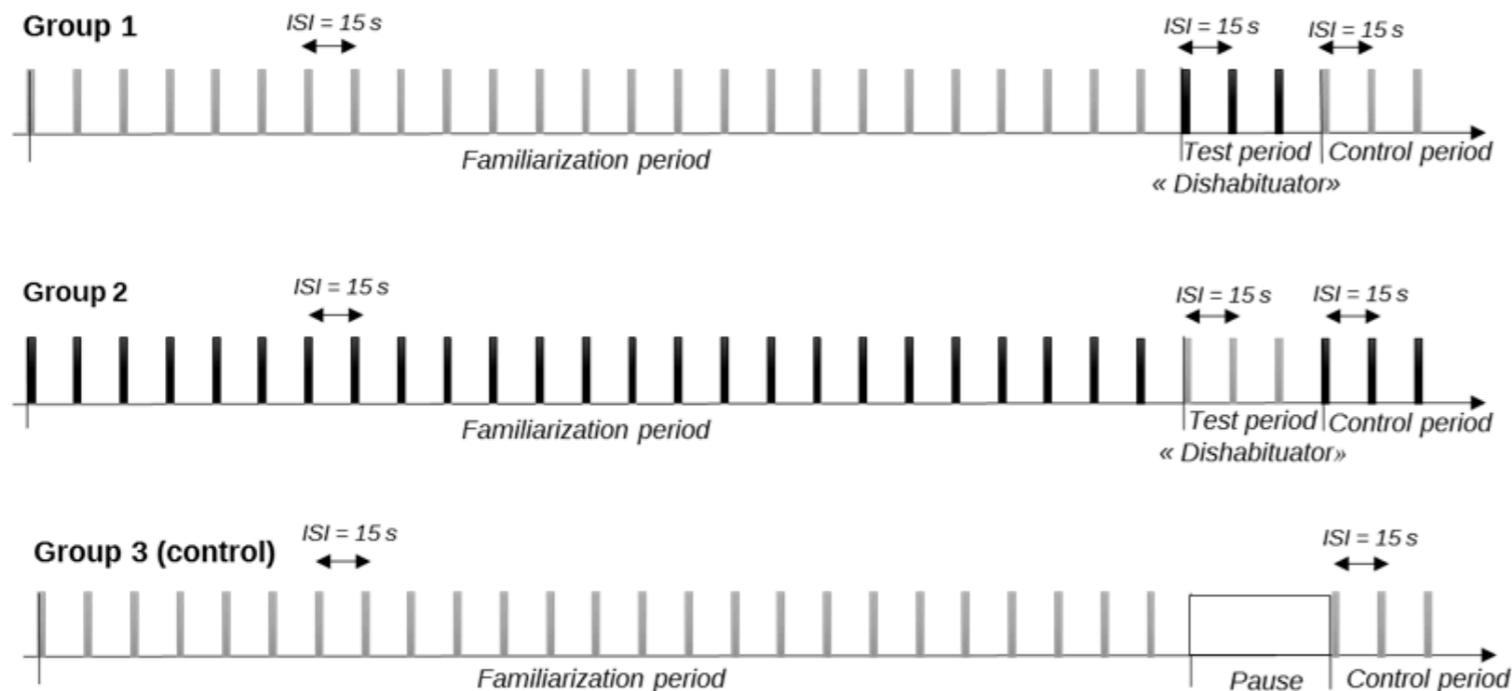
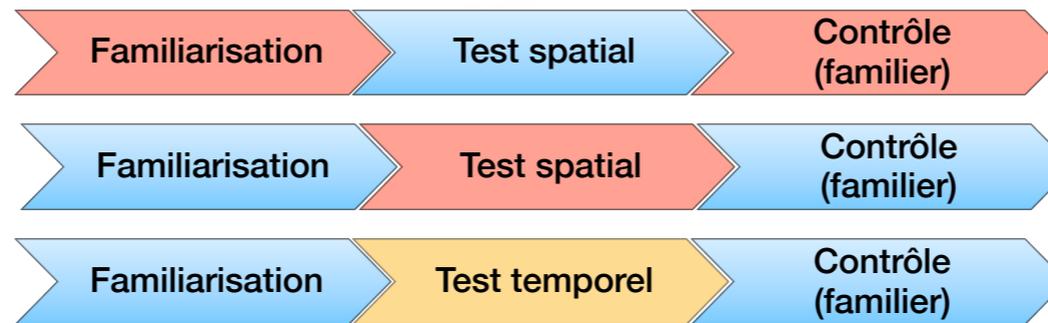


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CAEN NORMANDIE



Étude comportementale (quand on n'a pas de pétrole...)

- ▶ 61 nouveau-nés prématurés
- ▶ Nés entre 32 et 34+6 w GA
- ▶ Mesurés à 35 weeks cGA
- ▶ Vibration de 750 ms (ISI 15 s)
- ▶ 3 conditions
 - Déviant avant-bras
 - Déviant paume
 - Omission (pause 60 s)



200 Hz vibration, 750ms (palm of the hand)
 200 Hz vibration, 750ms (forearm)
 No vibration, 60 s

Score d'orientation tactile composé de la fréquence, durée et latence des mouvements



Dumont et al. 2017

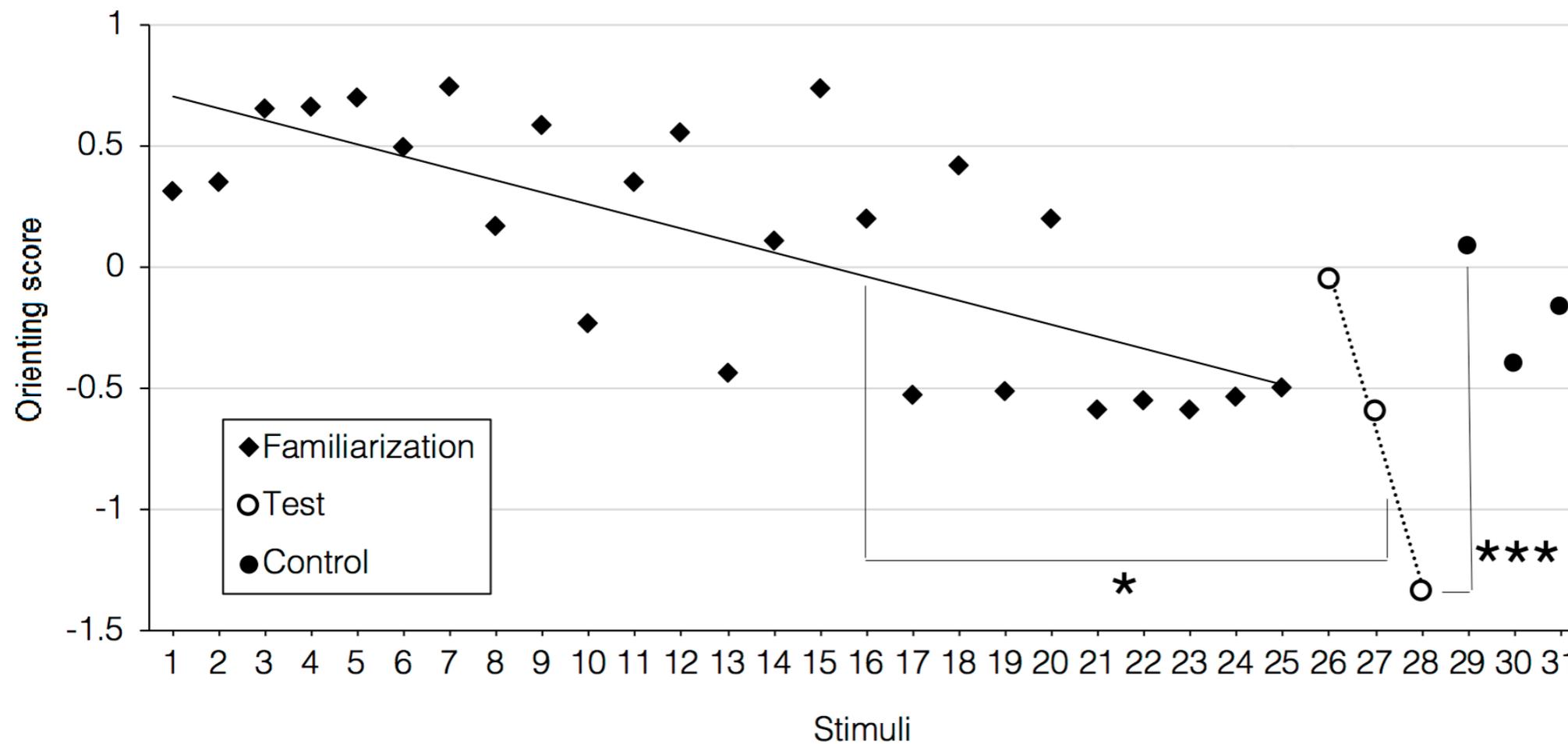
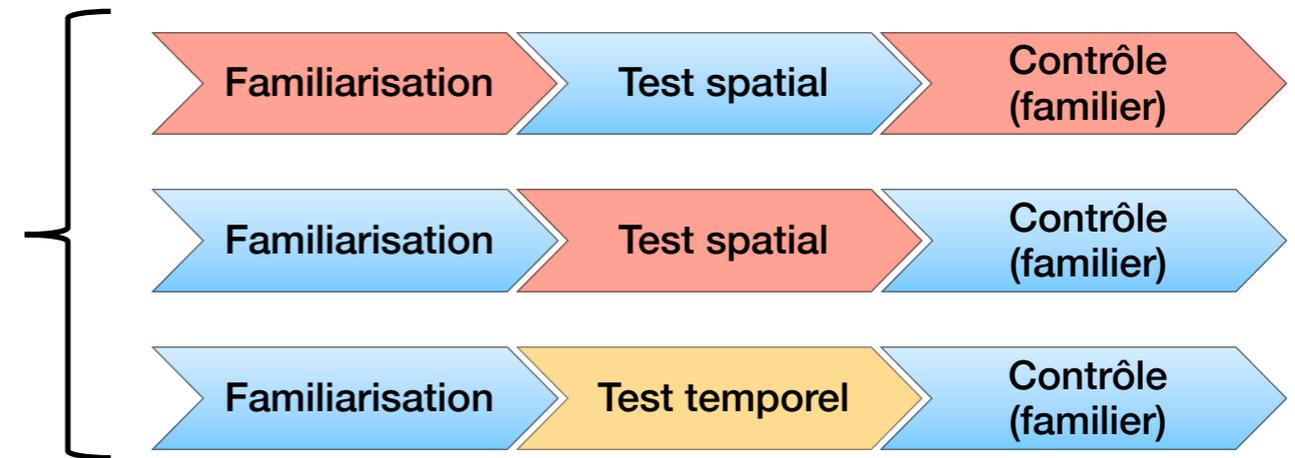
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Étude comportementale (quand on n'a pas de pétrole...)



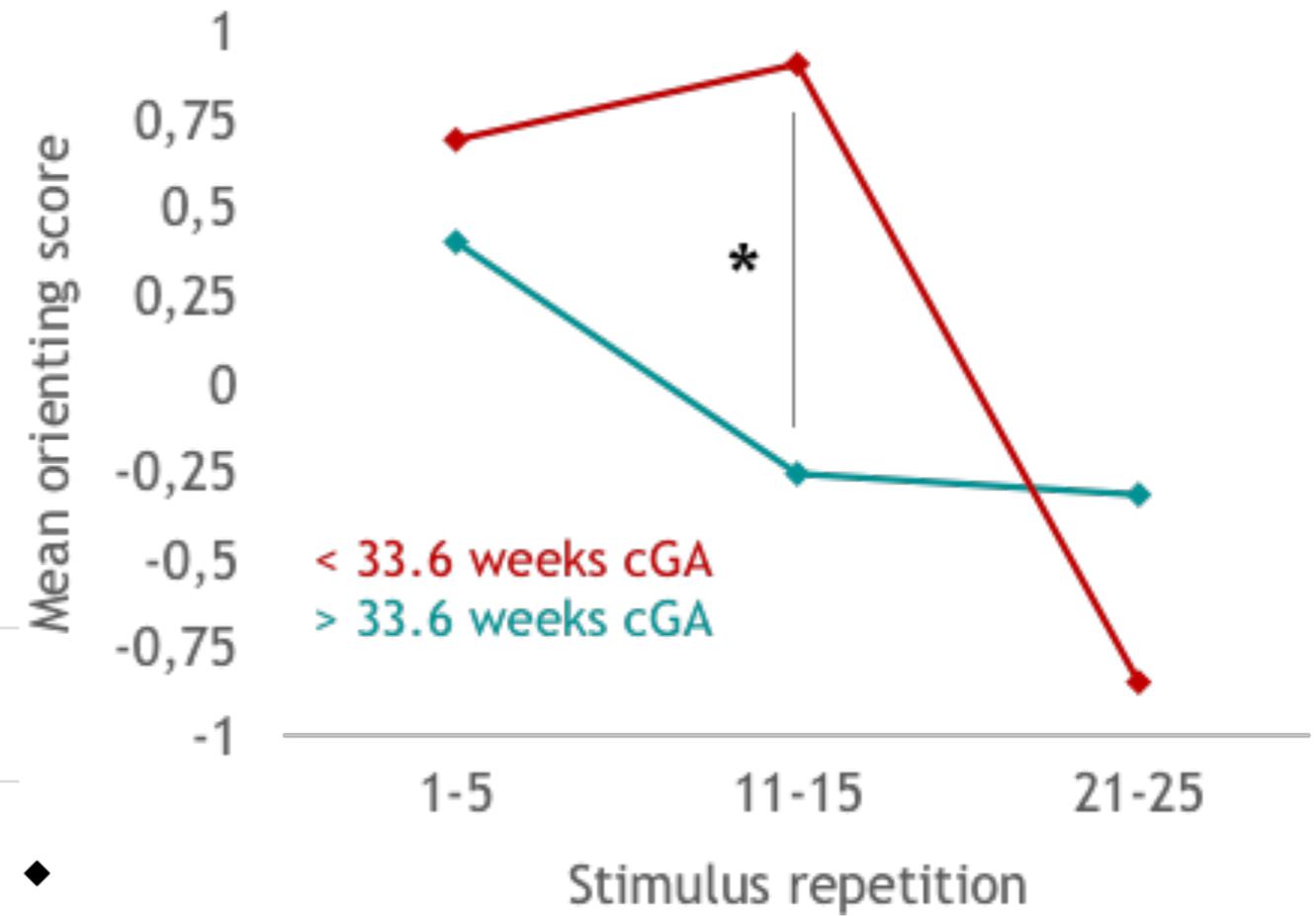
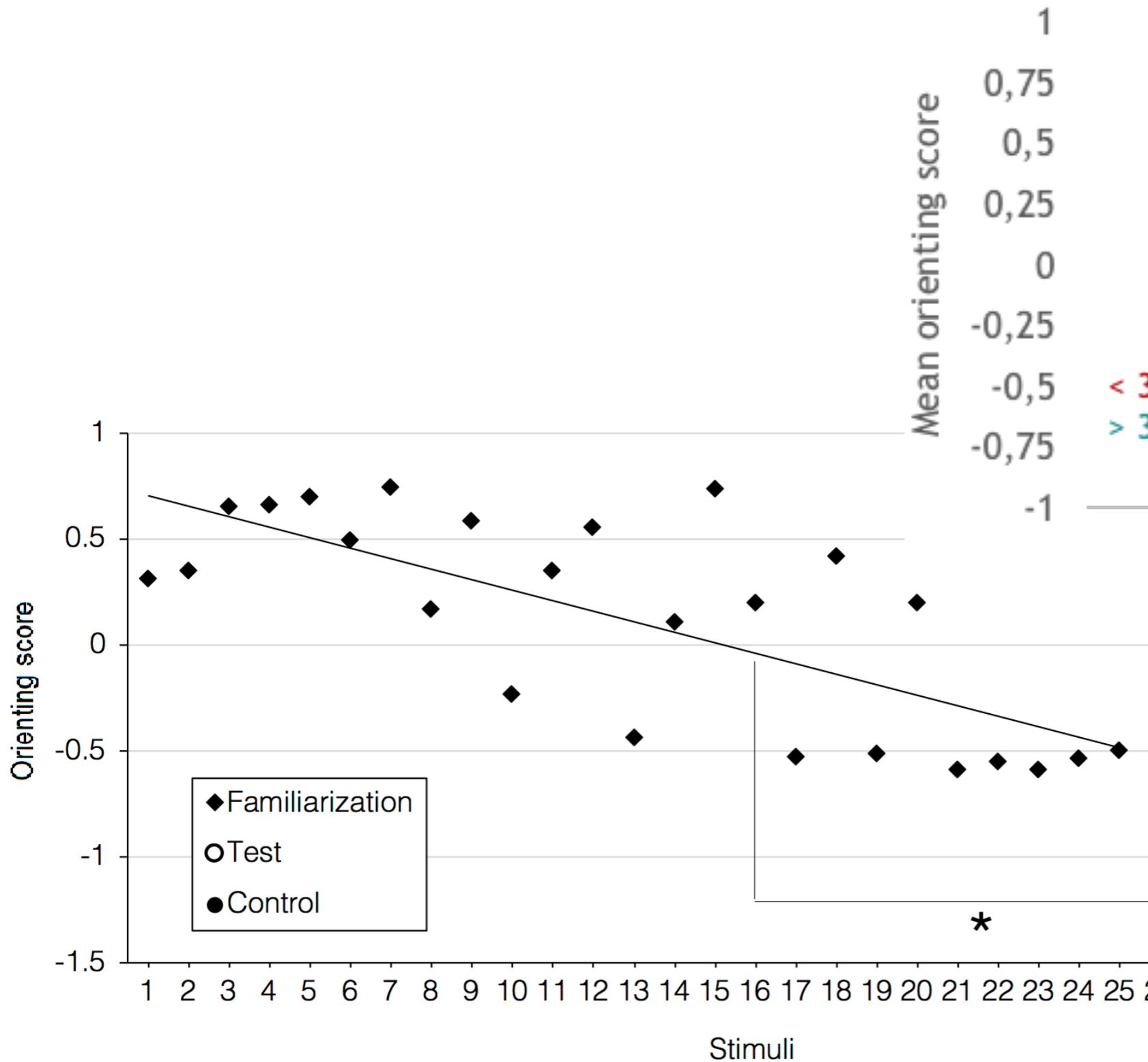
LA PERCEPTION TACTILE DU NOUVEAU-NÉ PRÉMATURÉ



LABORATOIRE
DE PSYCHOLOGIE
CAEN NORMANDIE

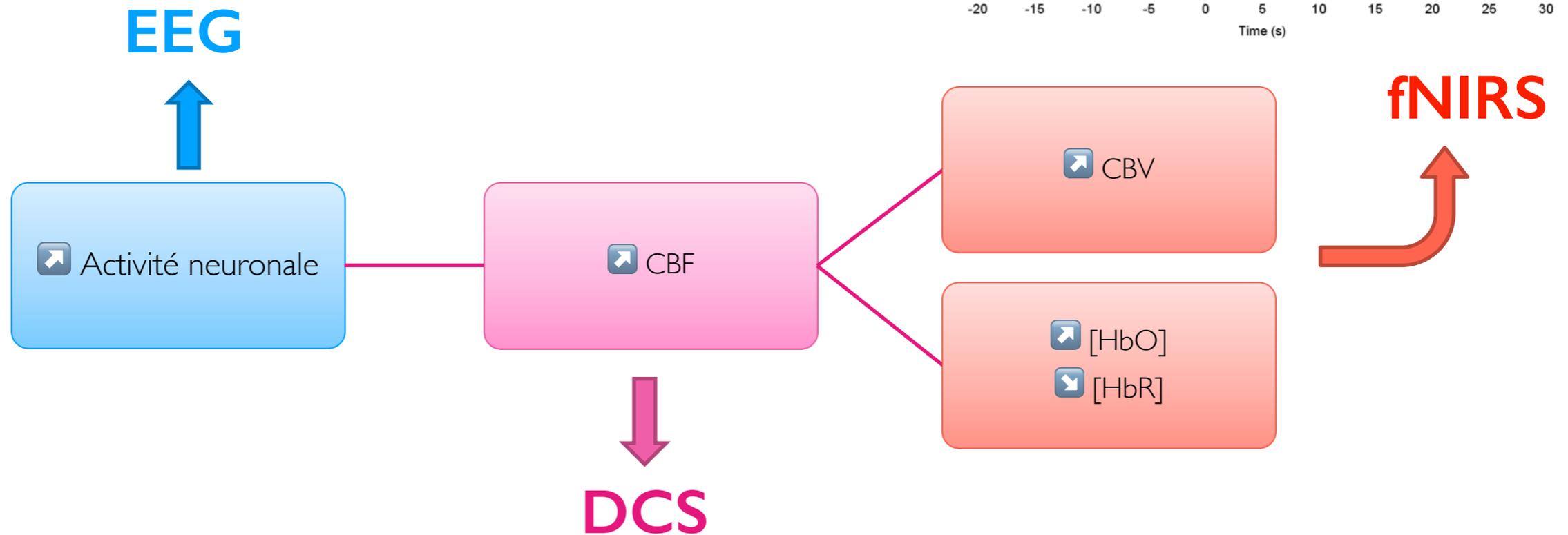
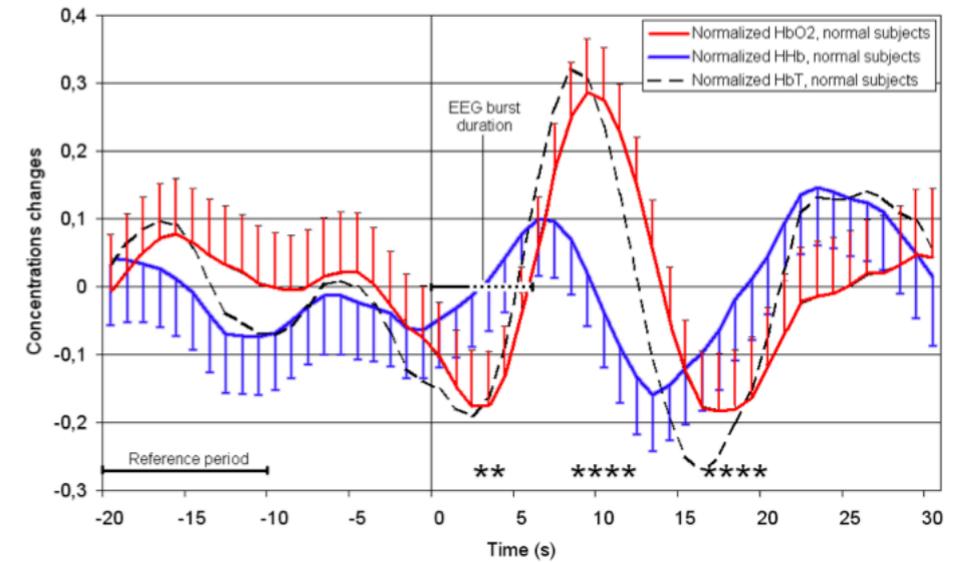
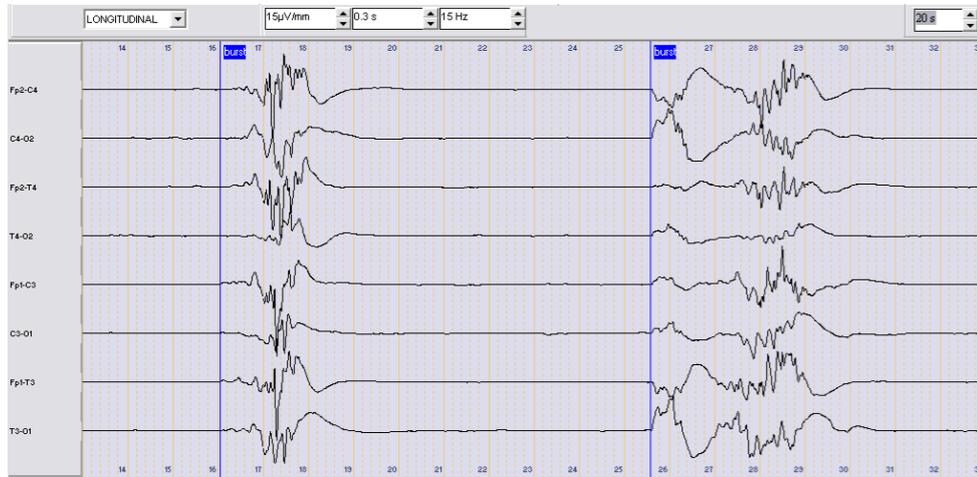


Étude comportementale (quand on n'a pas de pétrole...)



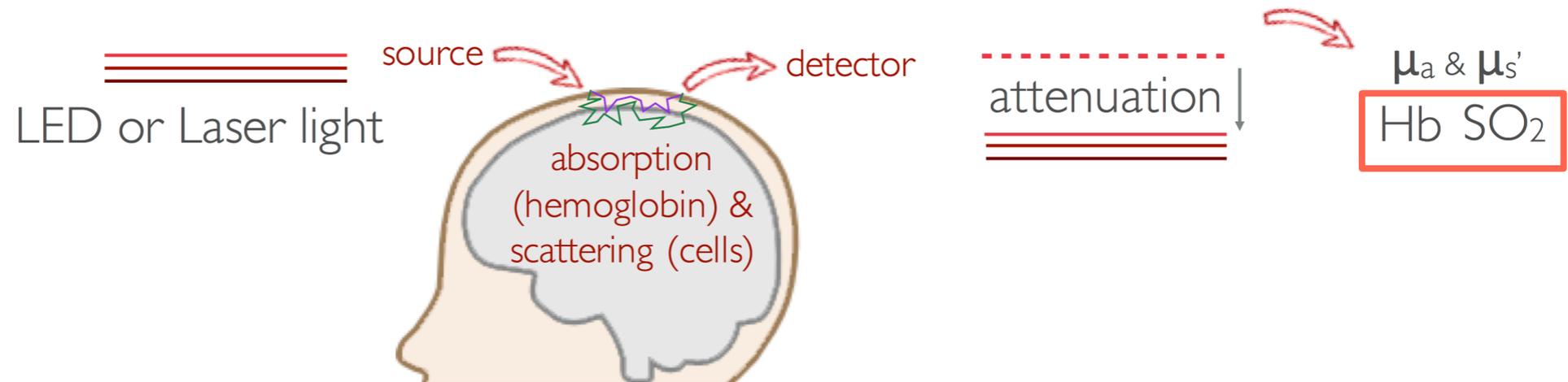
Dumont et al. 2017

LA RÉPONSE NEUROVASCULAIRE DU NOUVEAU-NÉ PRÉMATURÉ

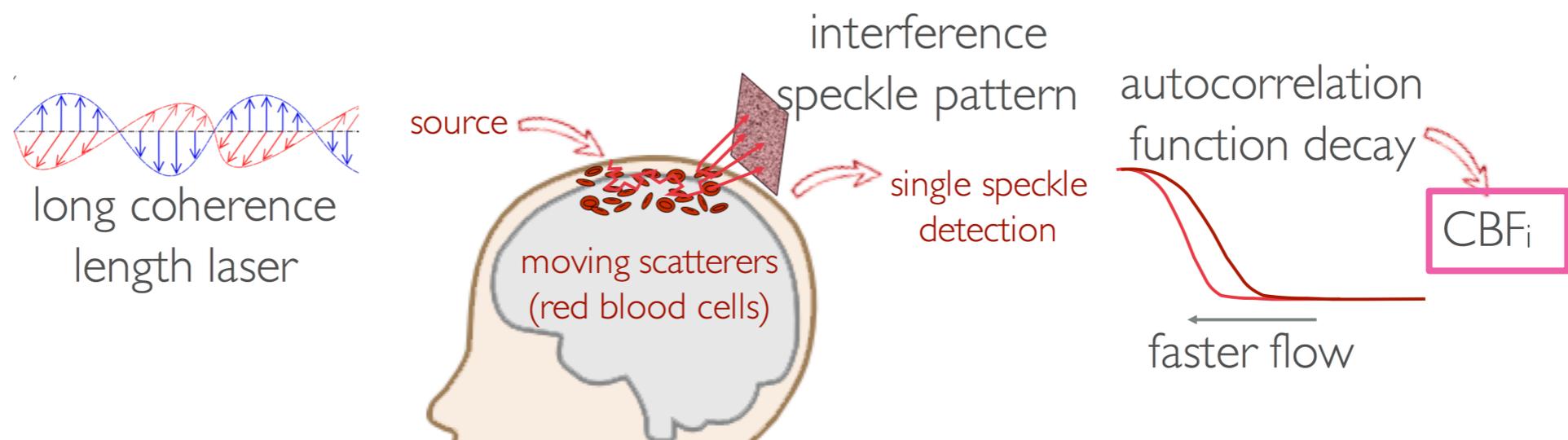


DCS – DIFFUSE CORRELATION SPECTROSCOPY

fNIRS



DCS



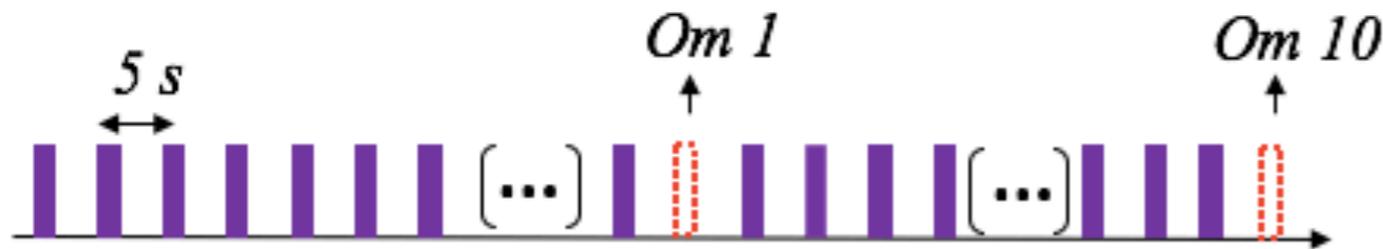
PREMATEMP

Suppression par répétition et prédiction

40 premature neonates
born between 31+0 and 32+6 wGA
measured at 33 and 35 weeks cGA
2 conditions : Fixed ISI (N=20) & Wiggled ISI (N=20)

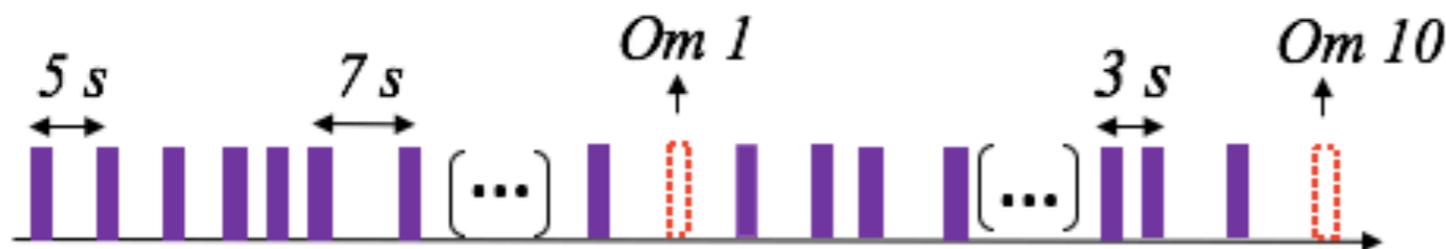


Séquence régulière groupe test



■ vibration de 3 s (paume de la main)
▤ omission du stimulus
↔ 5 s d'intervalle interstimulus

Séquence irrégulière groupe contrôle



■ vibration de 3 s (paume de la main)
▤ omission du stimulus
↔ 3 à 7 s d'intervalle interstimulus



V. Dumont

PREMATEMP

Suppression par répétition et prédiction

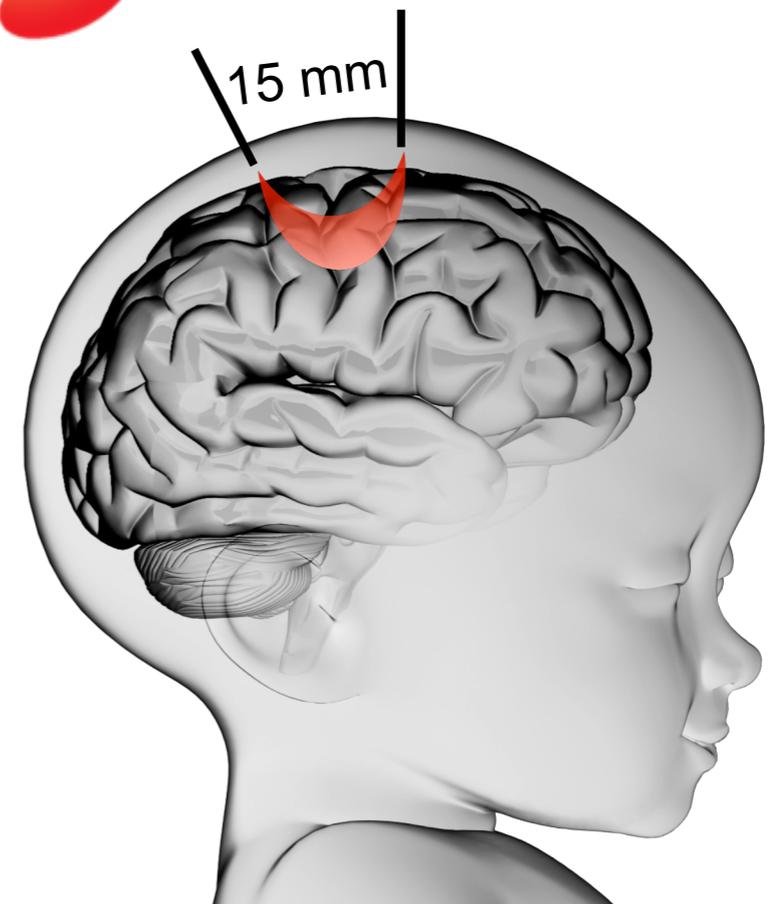
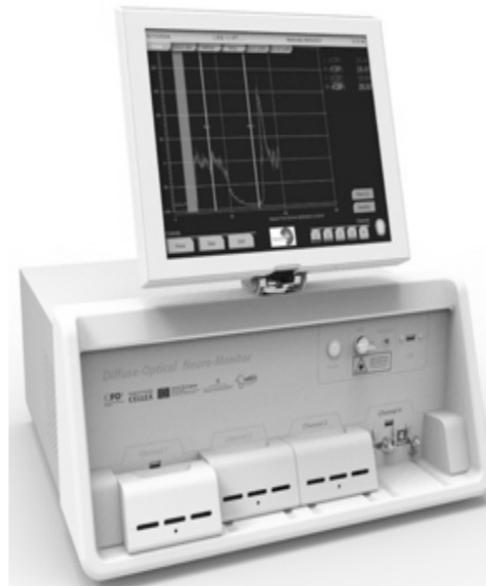
DCS of the primary somatosensory cortex, contralateral to stimulation

Measure of BFi response to tactile stimuli, and omission of expected (?) stimuli

PROJET
SOUTENU
PAR

FONDATION
DE
FRANCE

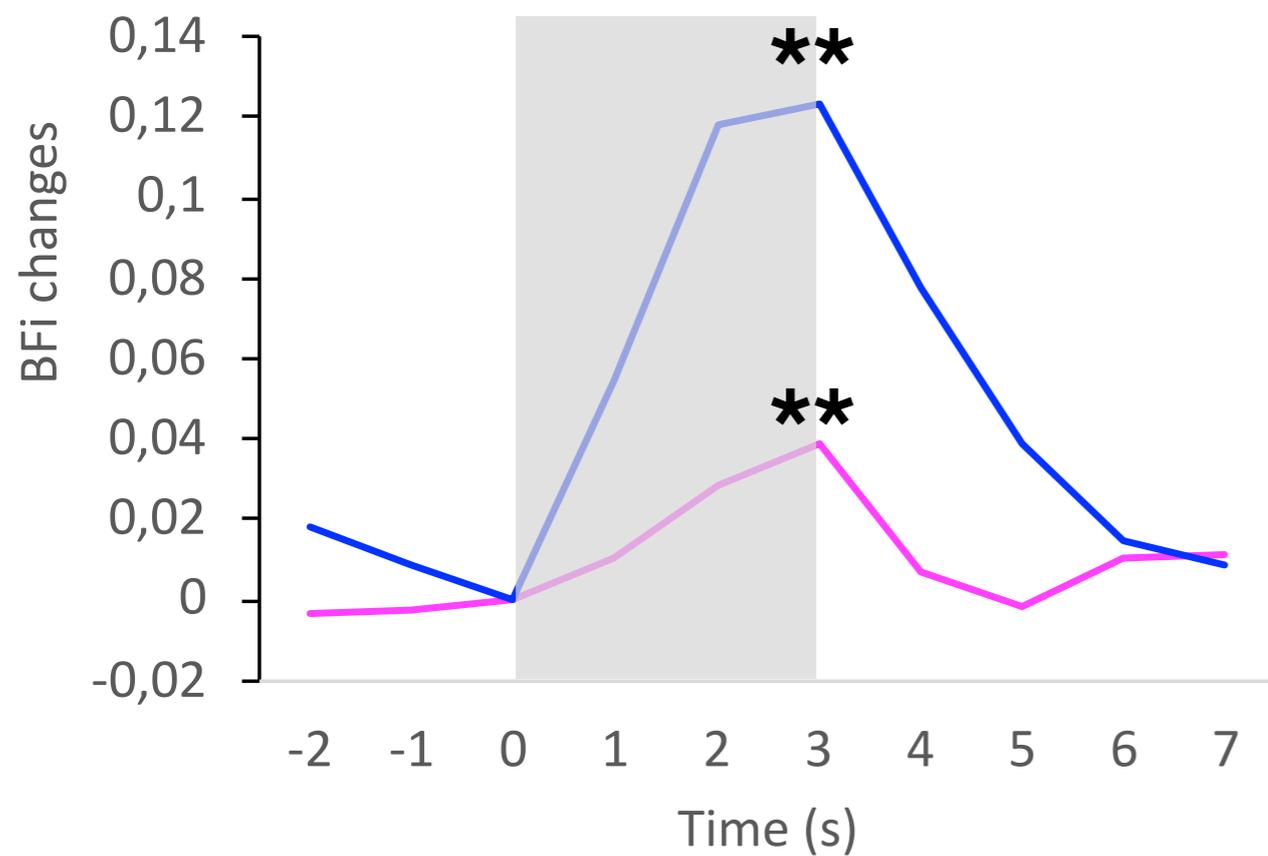
CHU
CAEN NORMANDIE



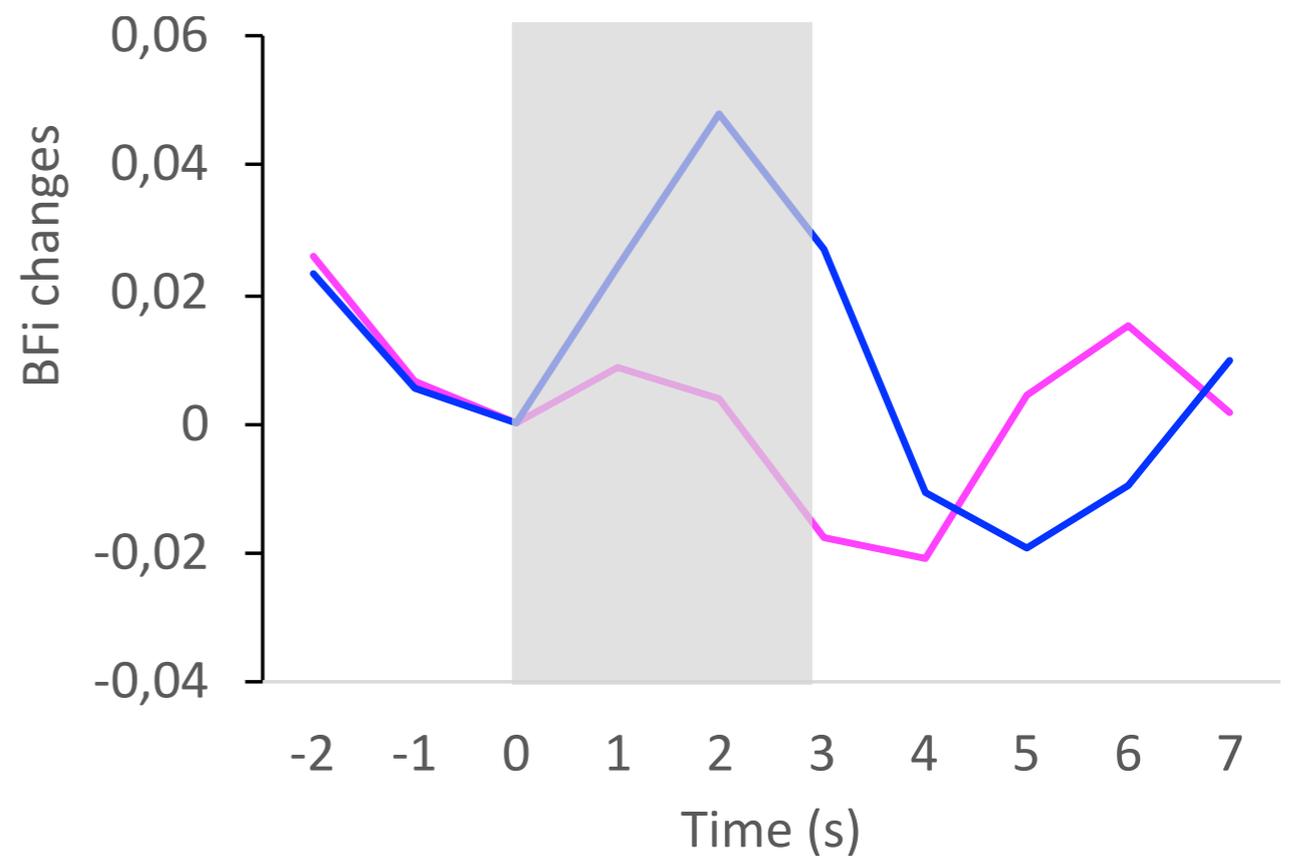
PREMATEMP

Réponses de BFi dans S1 aux stimuli tactiles

33 semaines AGc
N=20 / groupe



35 semaines AGc
N=15 F / 14 W

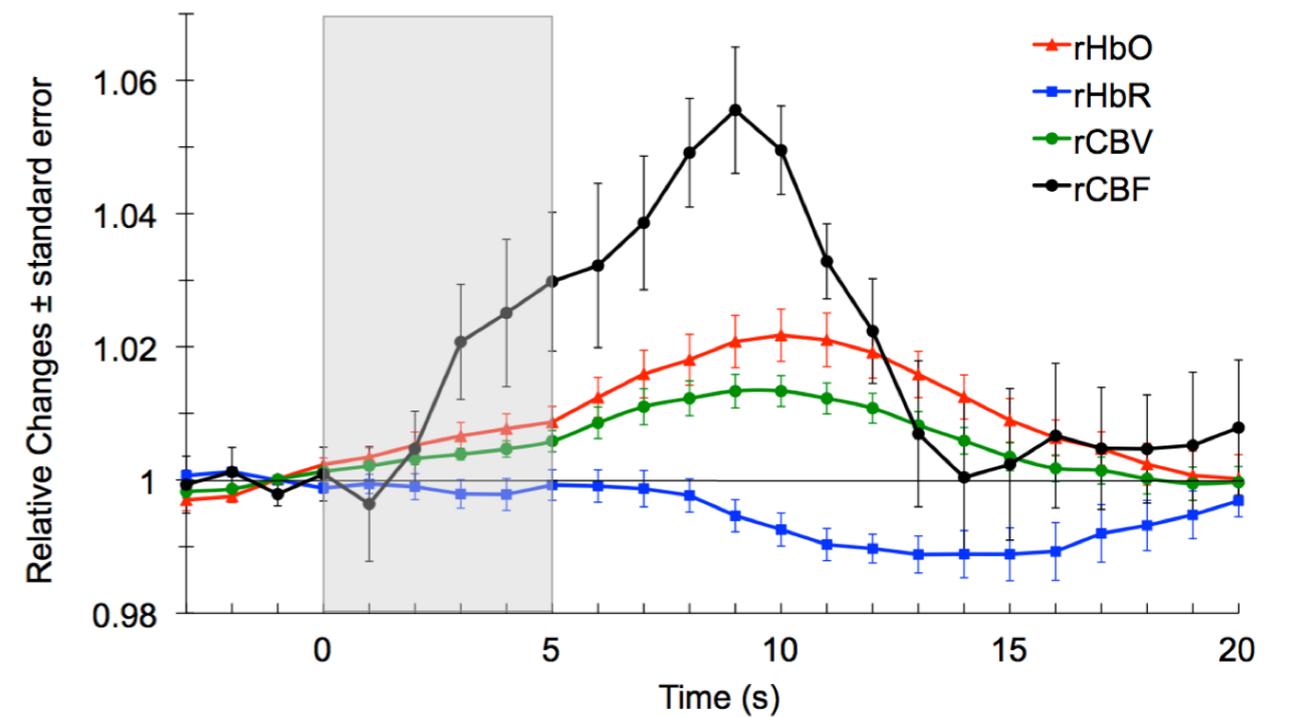
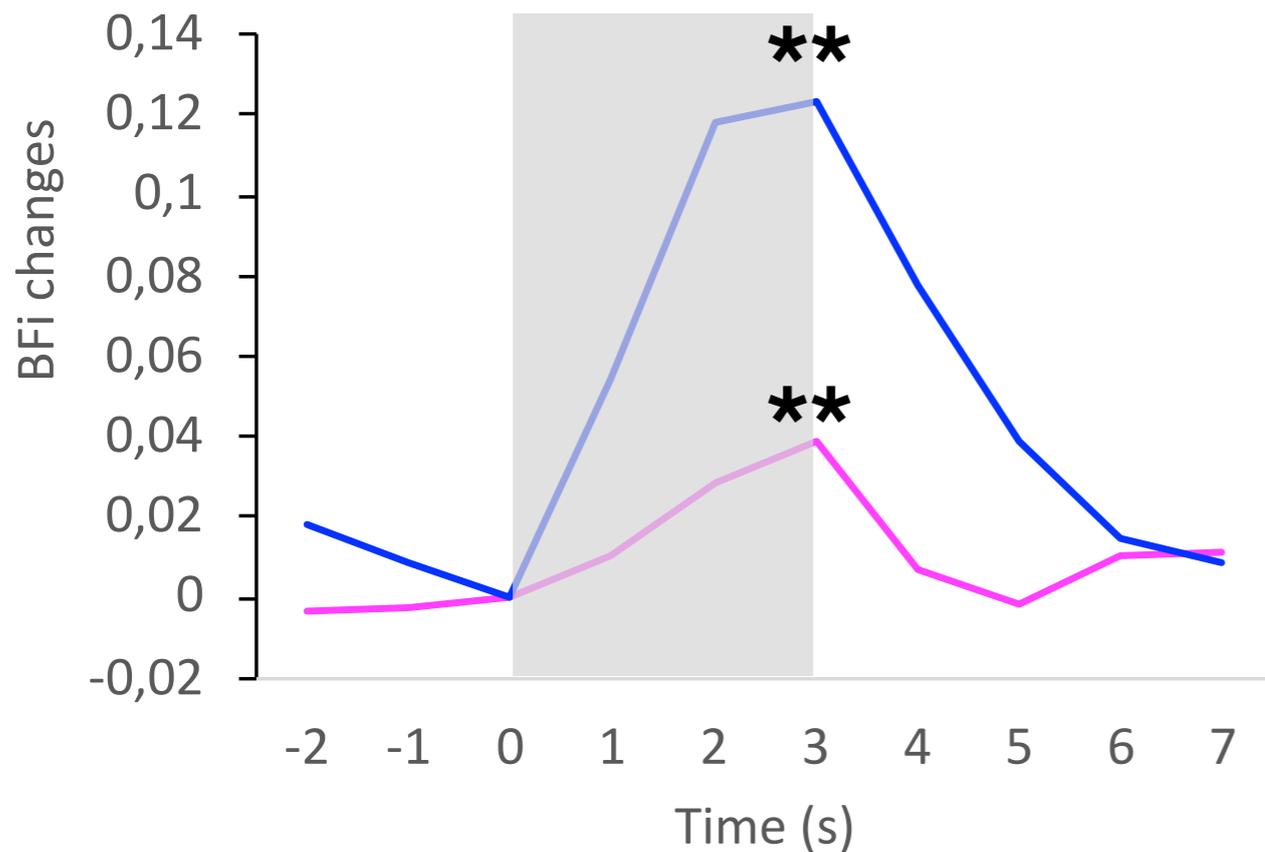


— Fixed

— Wiggled

PREMATEMP

Réponses de BFi dans S1 aux stimuli tactiles

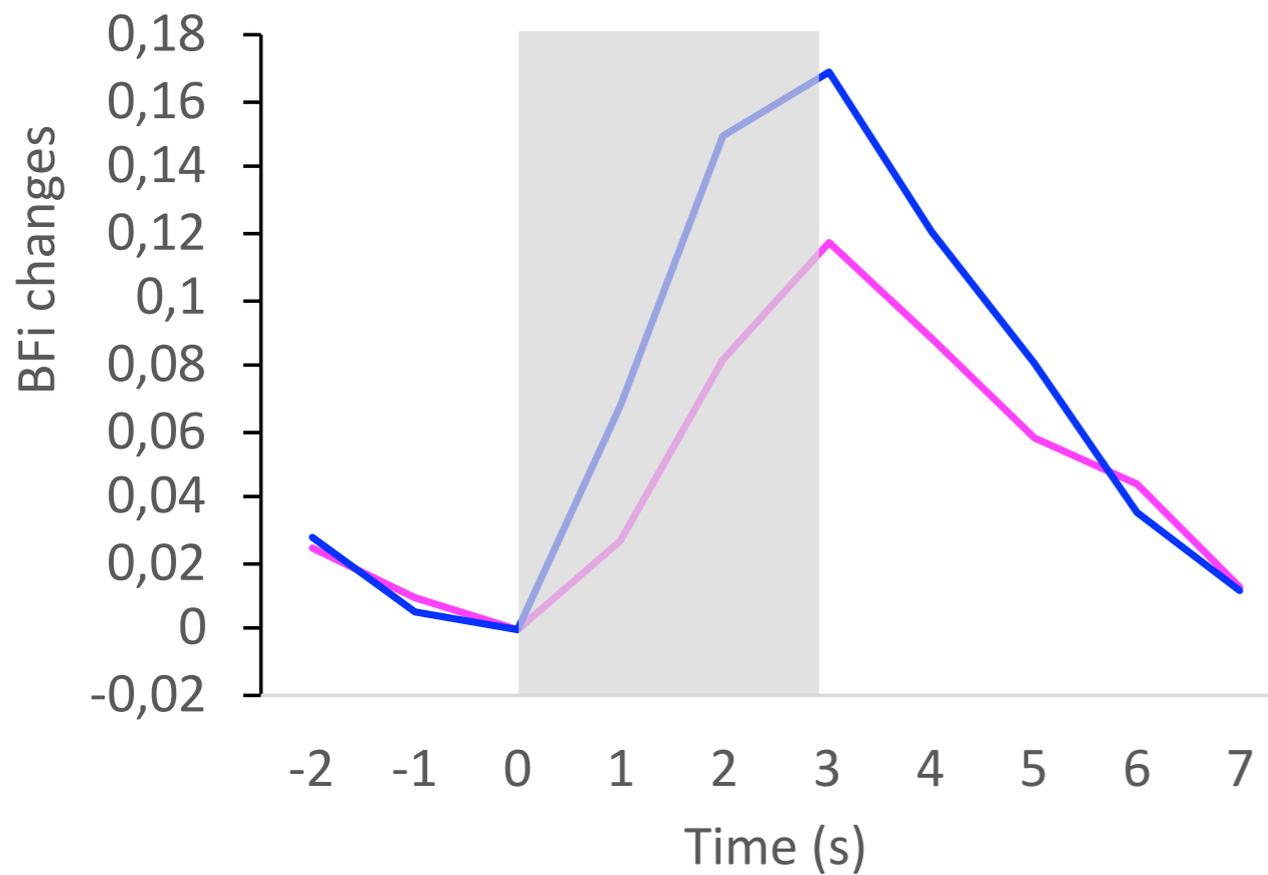


— Fixed
 — Wiggled

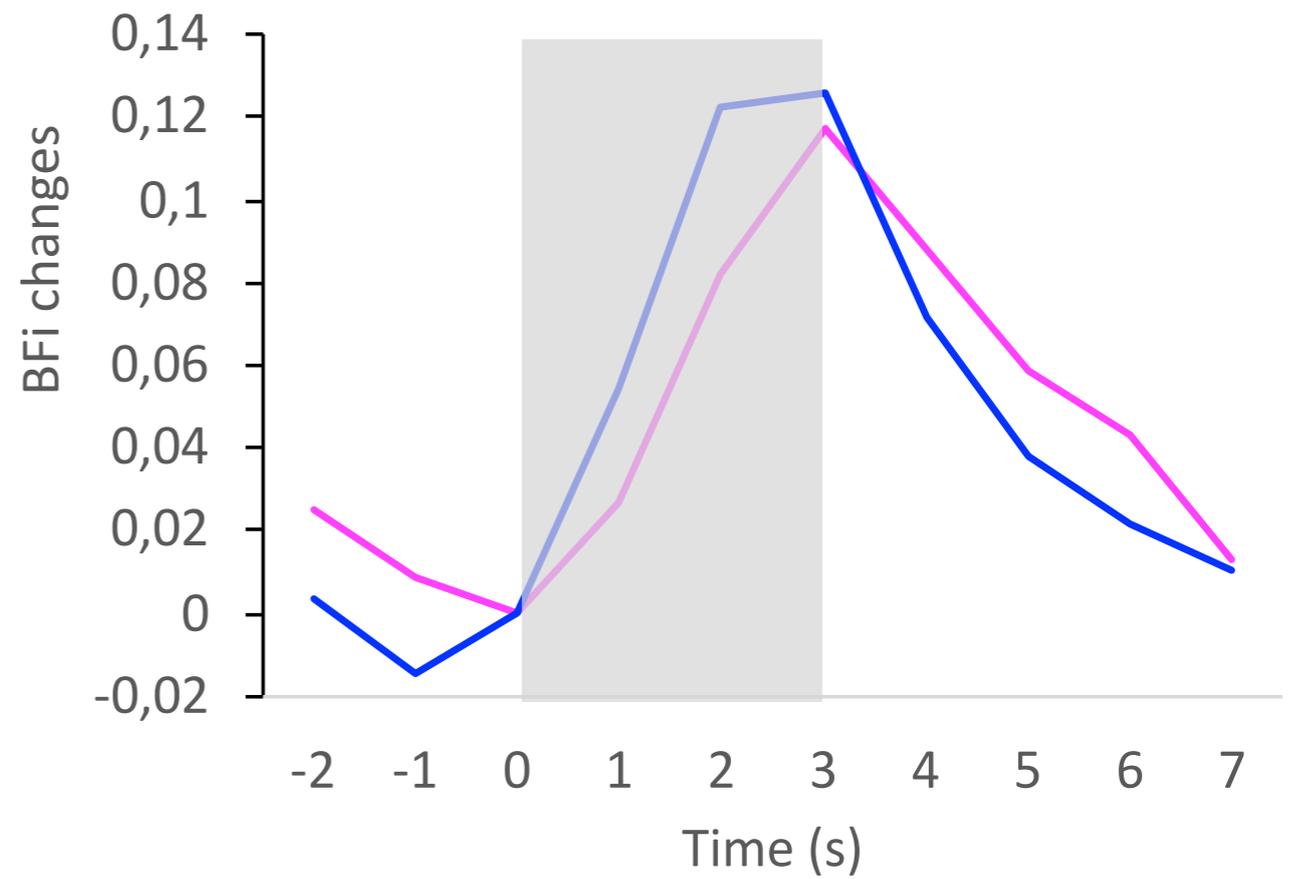
PREMATEMP

Répondants : Réponse individuelle significative ($p > 1,96$)
et réponse individuelle moyenne positive

33 w cGA, N = 12 F et 16 W



35 w cGA, N = 10 F et 9 W

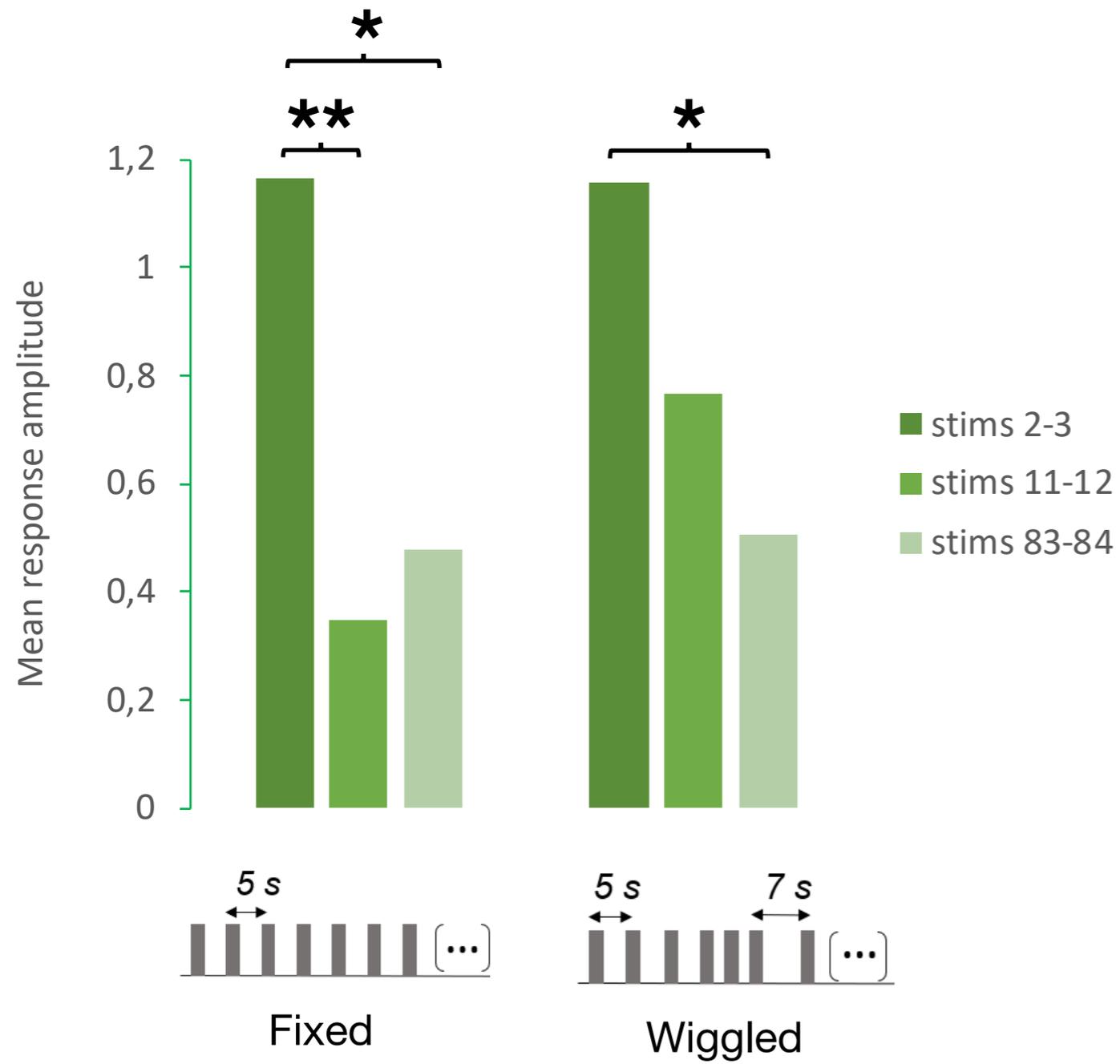


— Fixed

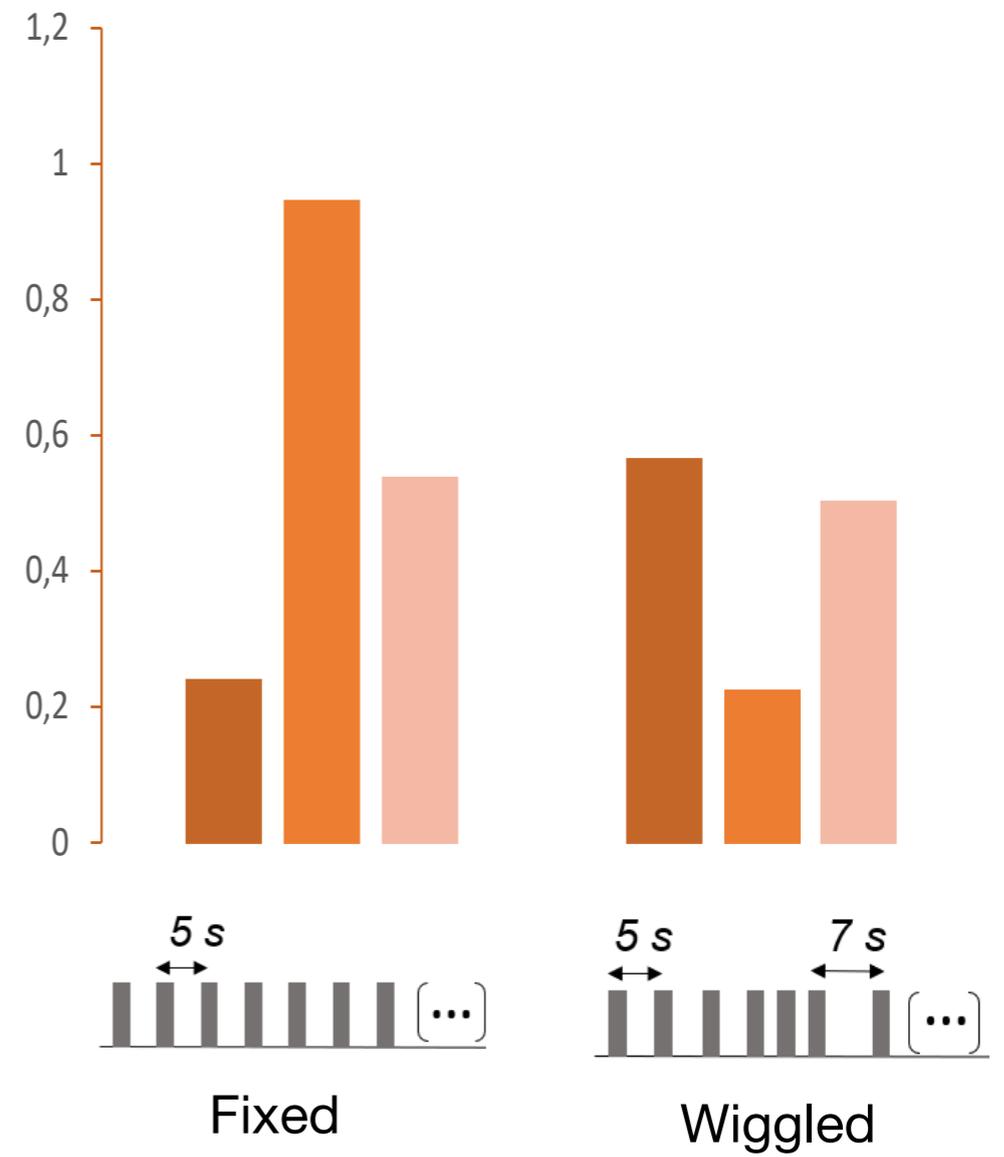
— Wiggled

PREMATEMP

Suppression par répétition dans la modalité tactile



33 weeks cGA

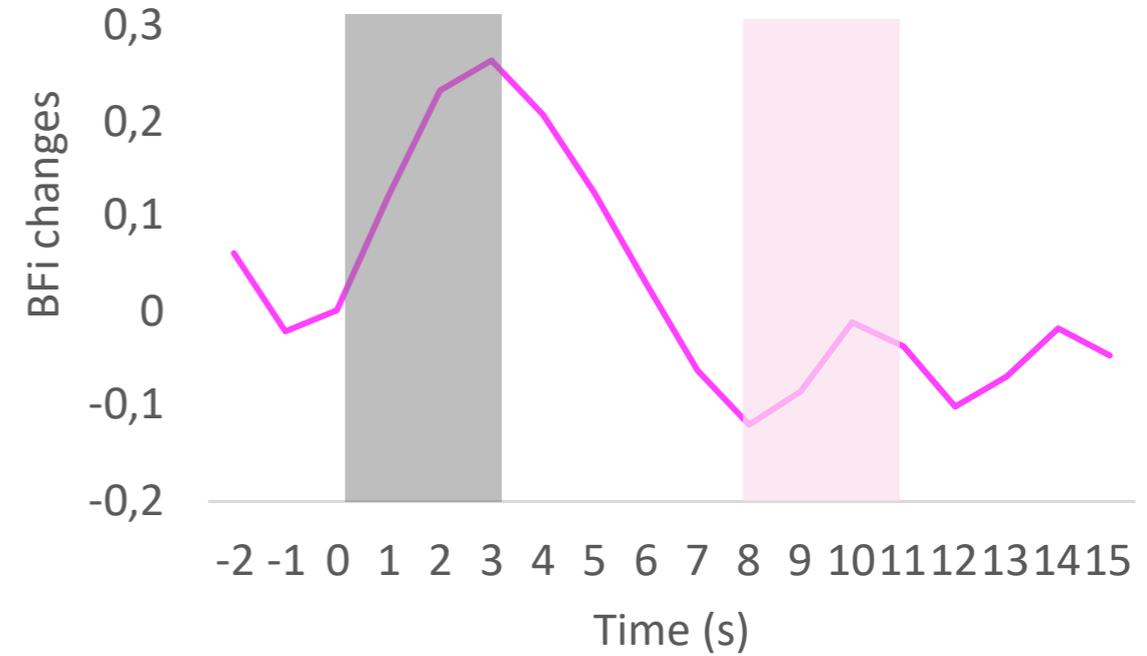
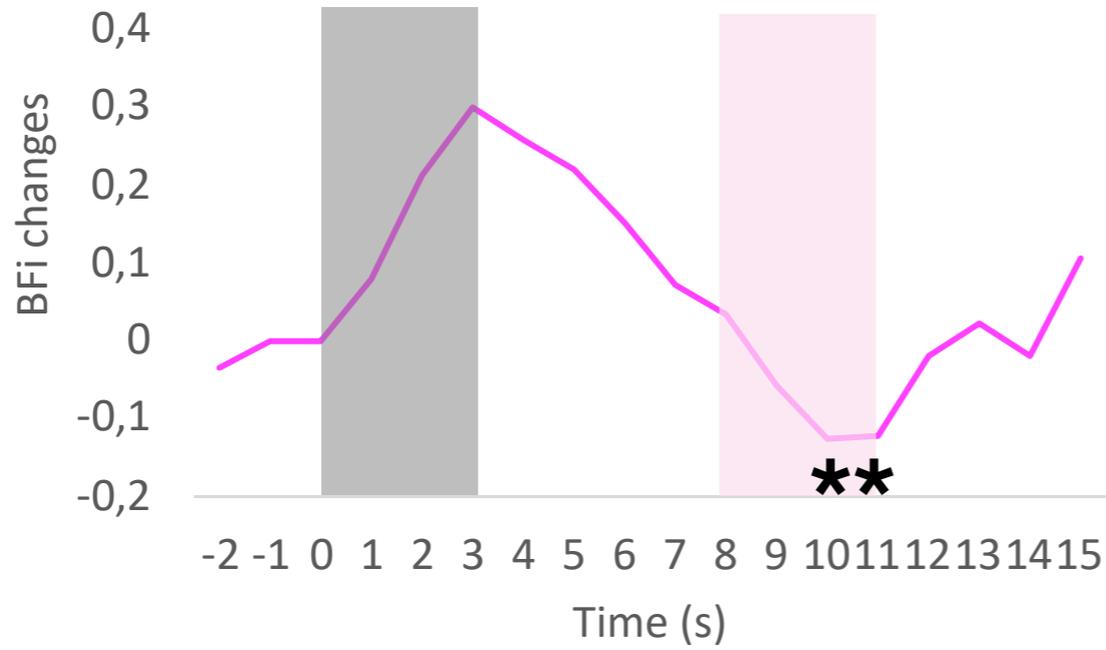


35 weeks cGA

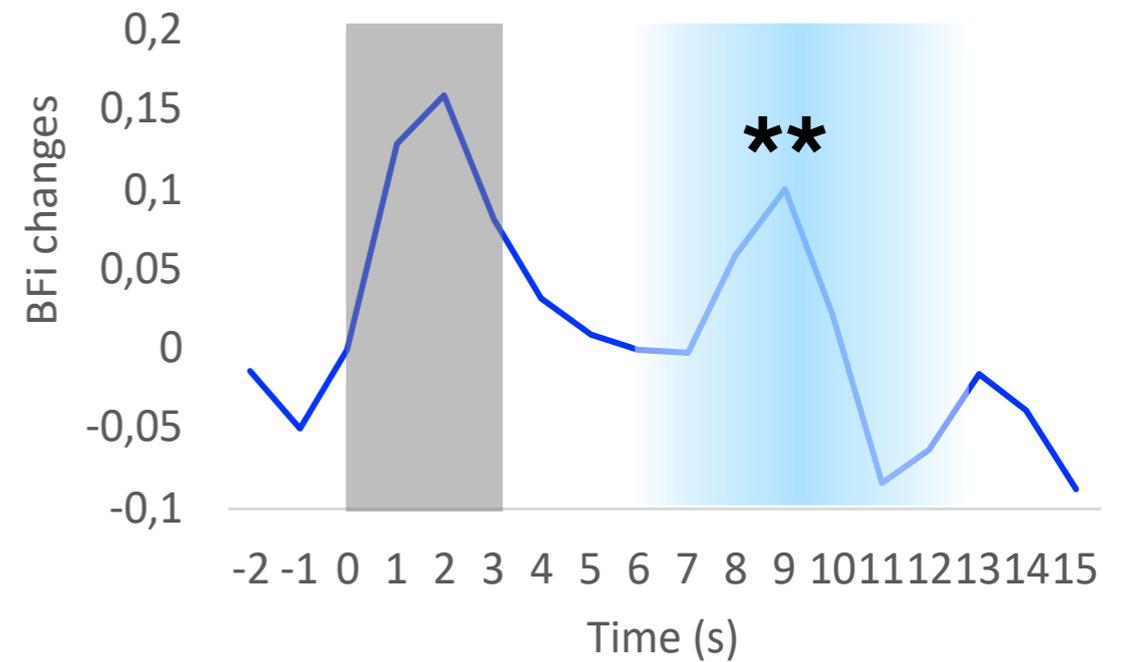
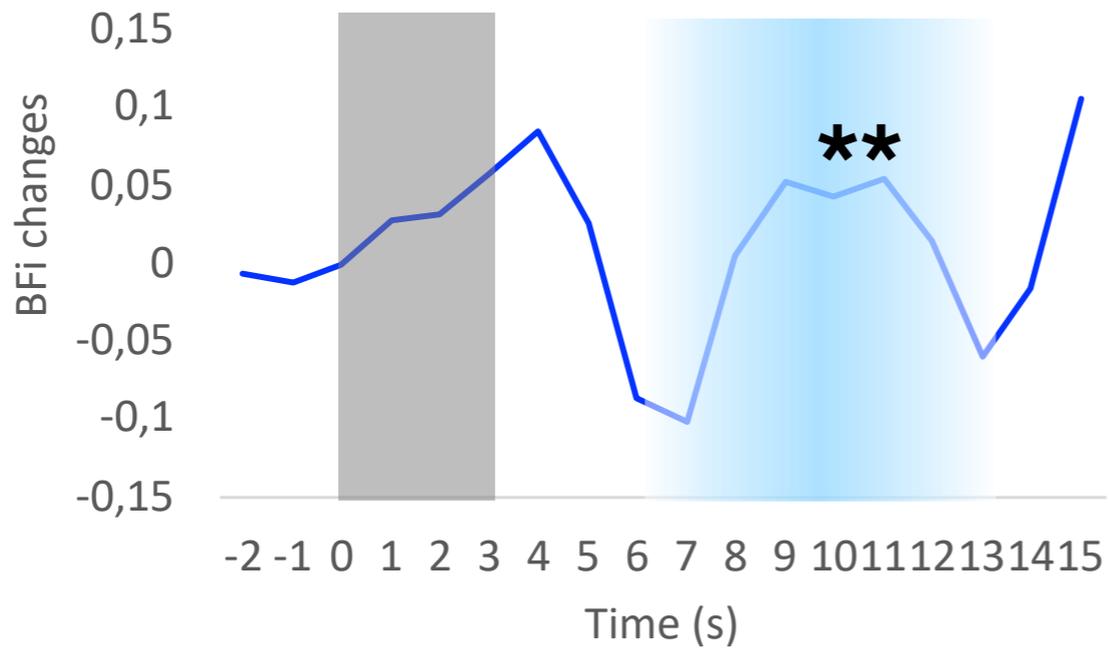
PREMATEMP

Réponse lors d'omissions : suppression vs. prédiction

— Fixed

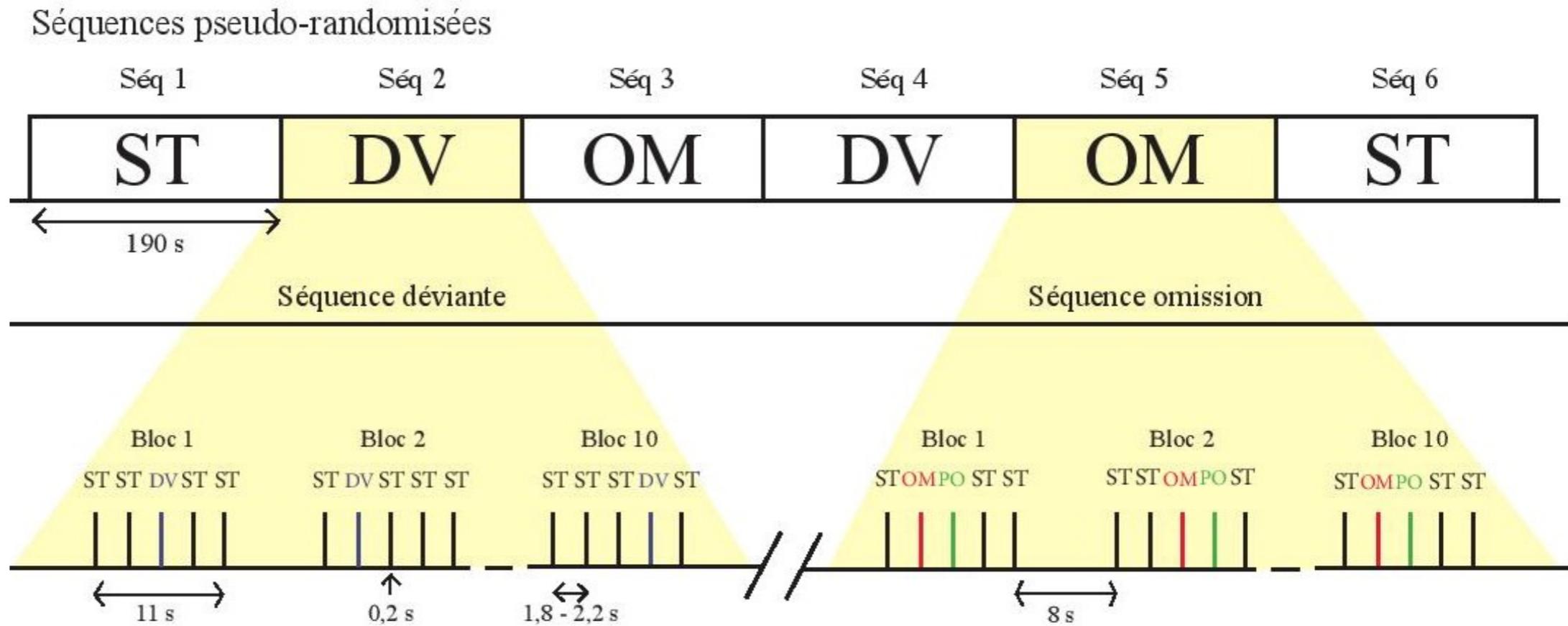


— Wiggled



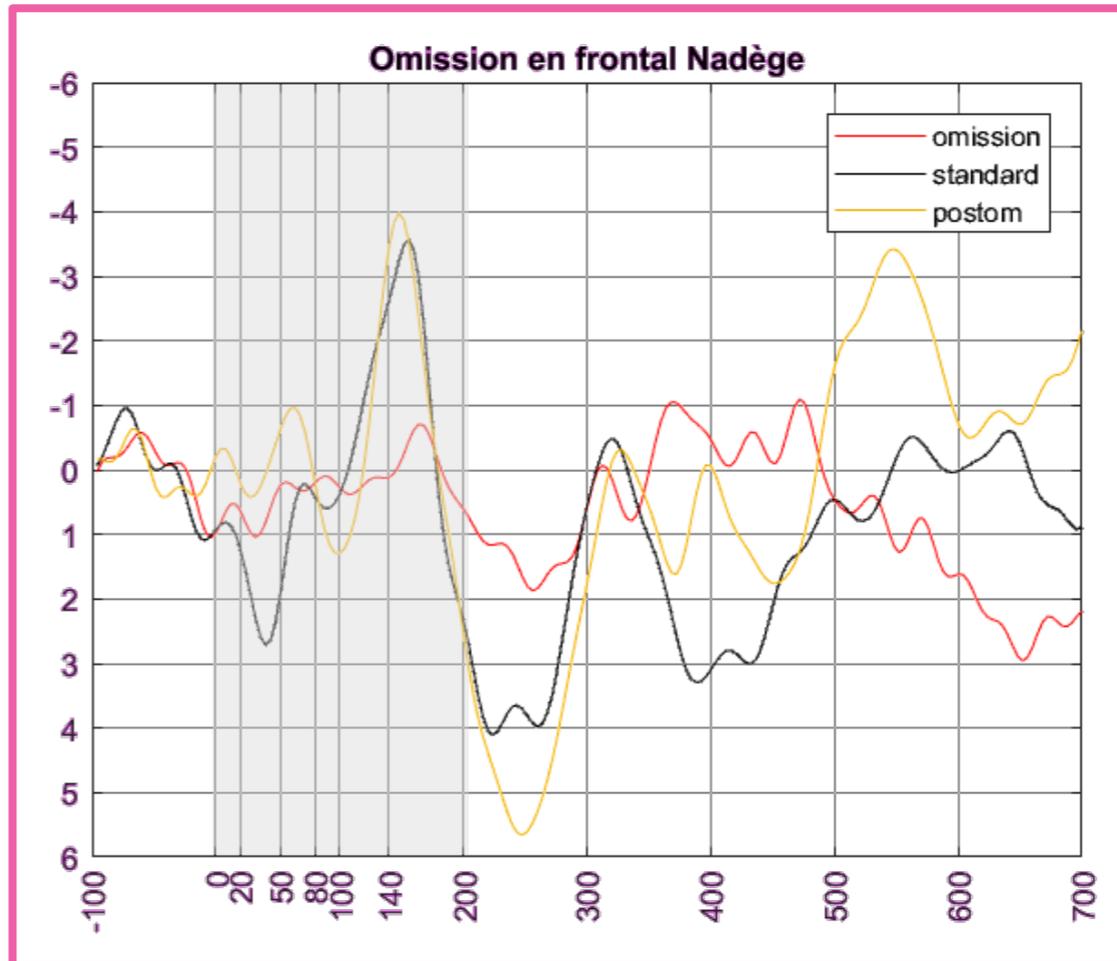
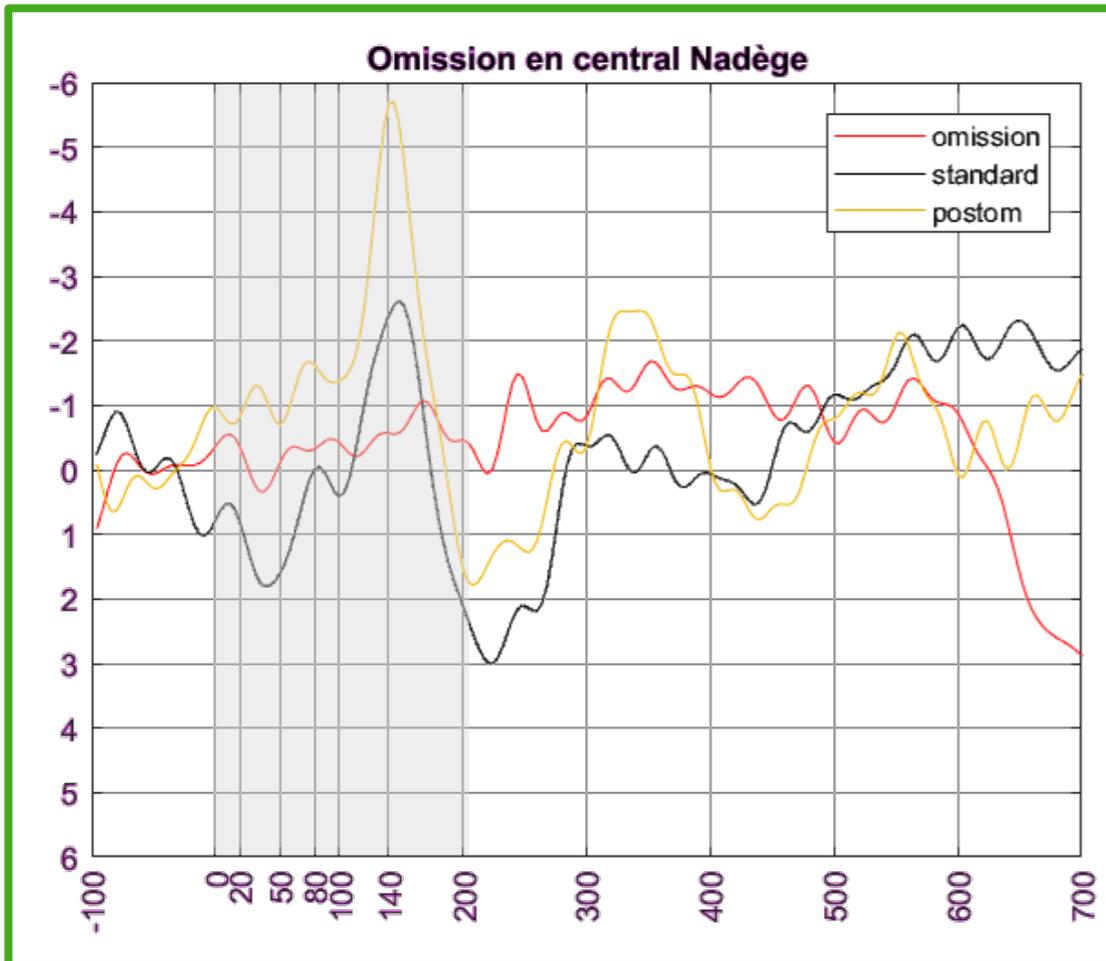
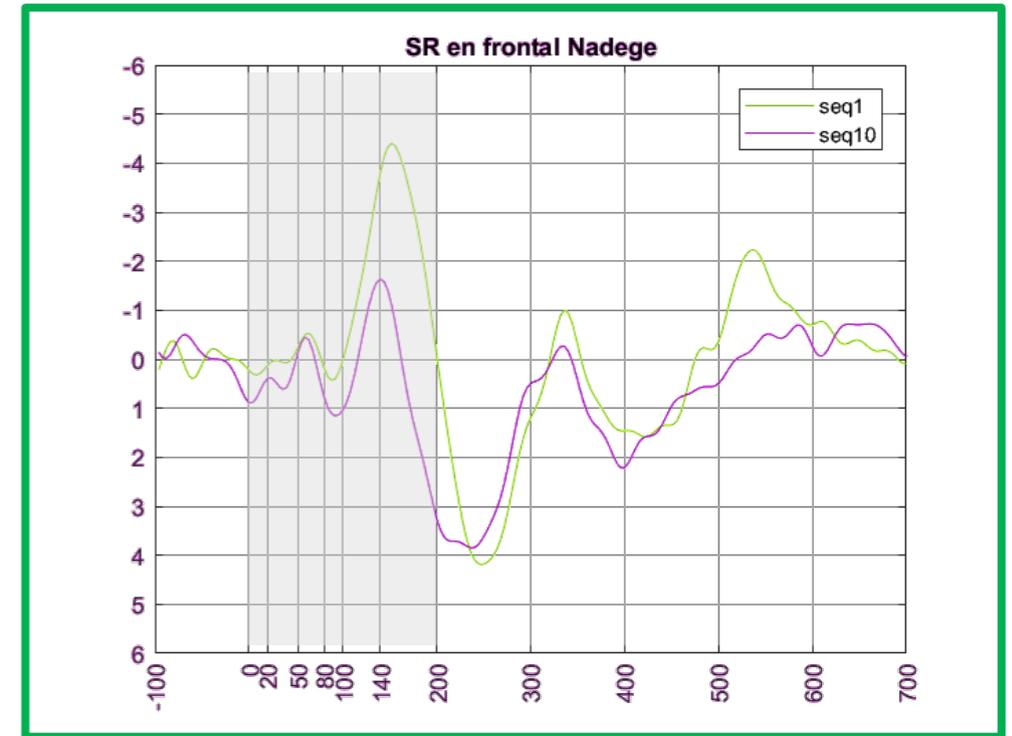
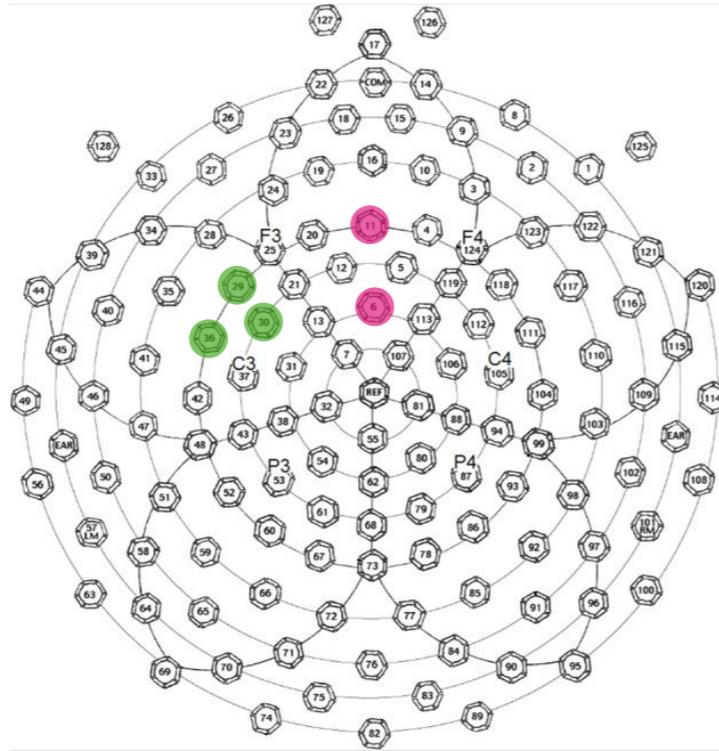
33

35



A-L. Marais

HABITUATION, PREDICTION, ATTENTION, COGNITION



A-L. Marais

MEDIATE - TRAITEMENT TACTILE ET ATTENTION EXECUTIVE



Etude transversale EEG HR

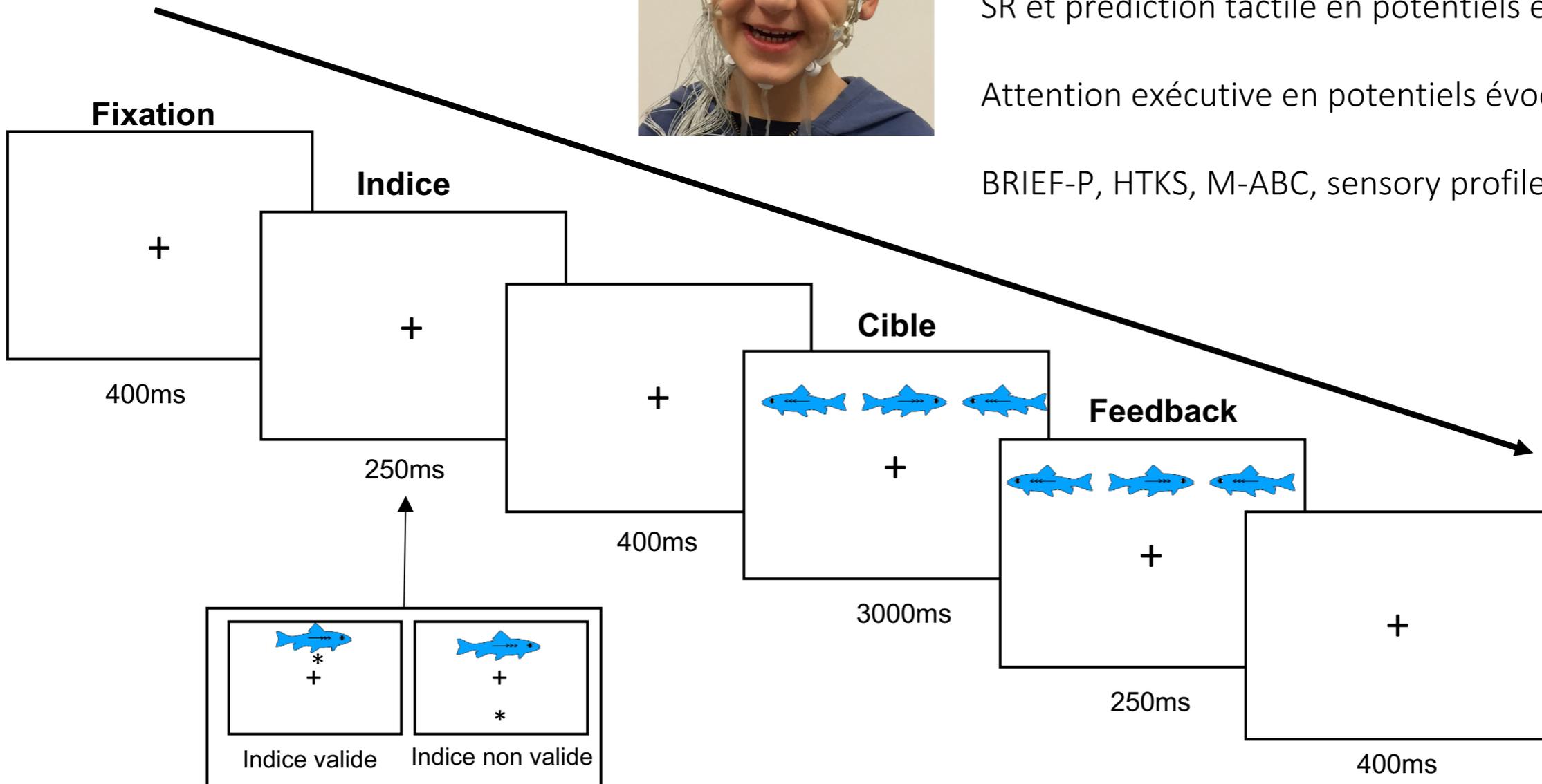


60 enfants, 4 à 5 ans
30 typiques
30 nés prématurés

SR et prédiction tactile en potentiels évoqués

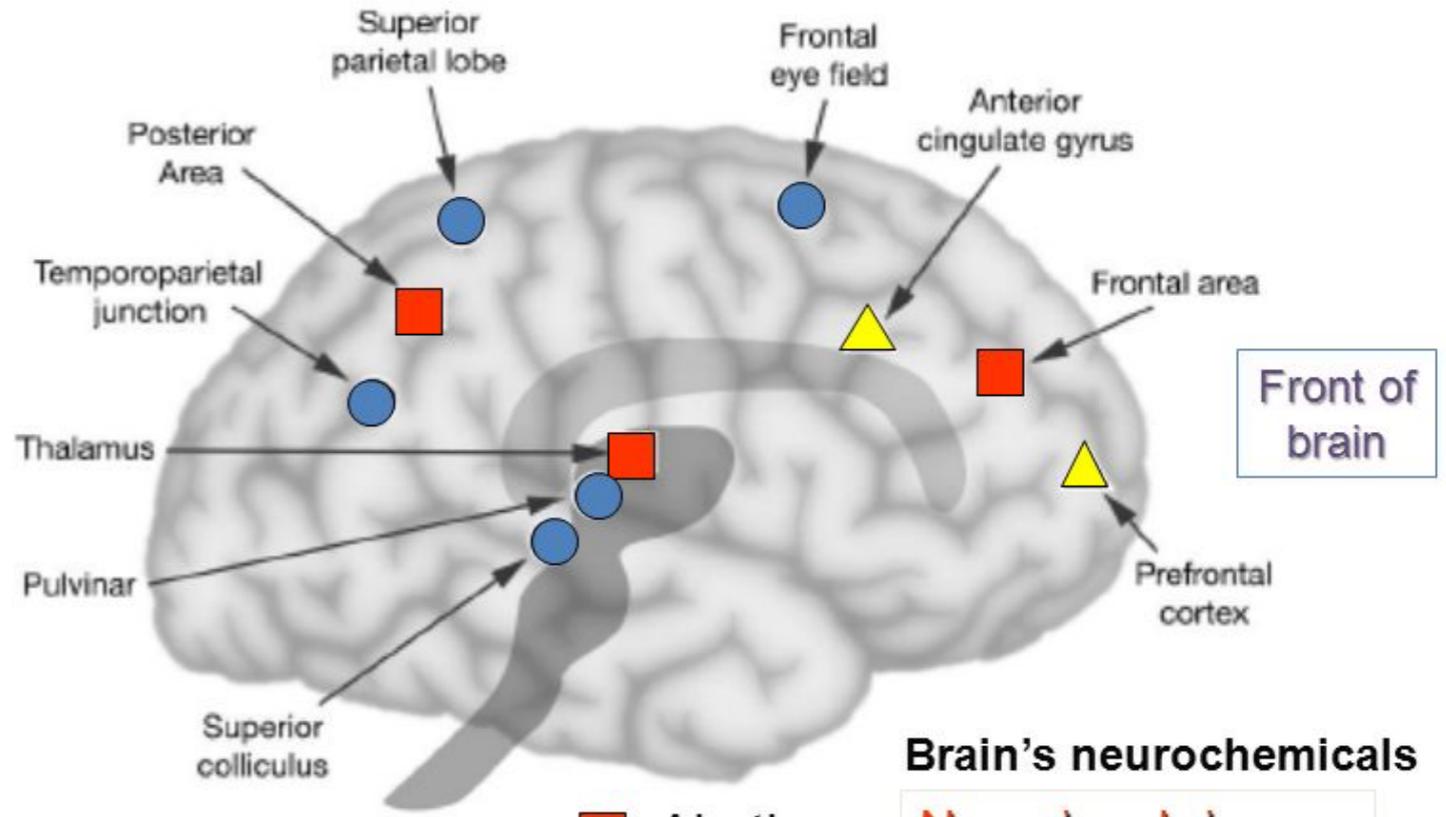
Attention exécutive en potentiels évoqués (Child ANT)

BRIEF-P, HTKS, M-ABC, sensory profiles



M. Anquetil

Attention Networks



Brain's neurochemicals

- Alerting
- Focusing
- ▲ Executive
- Norepinephrine
- Acetylcholine
- ▲ Dopamine

Annual Review of Psychology, 58:1-23



Contrôle exogène



Attention d'alerte



Attention d'orientation



Attention exécutive



Contrôle endogène

Posner et al. 2013 ; Rothbart et al. 2011 ; Rueda et al. 2004

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Etude transversale EEG HR



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BRIEF-P, HTKS, M-ABC, Laby, sensory profiles



M. Anquetil

NEOPRENE ANR-19-CE37-0015 JCJC

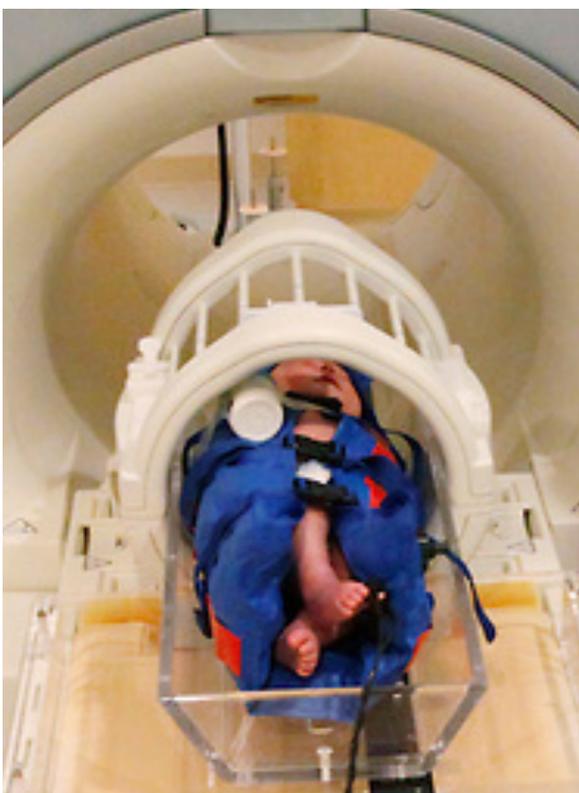
SR et Prédiction à la naissance, substrats cérébraux de l'attention et devenir à 2 ans (et +)



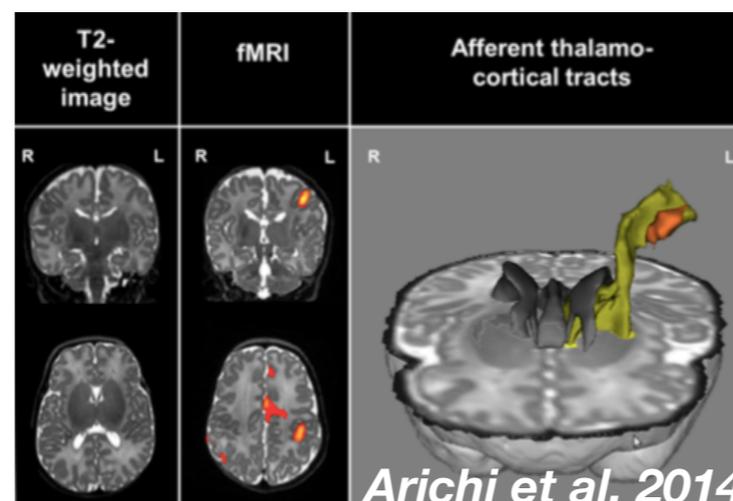
90 premature neonates (all GA)
measured at 34-35 weeks cGA
Tactile sequence with omissions and deviants
HR EEG + S1 NIRS



V. Dumont



40 premature neonates GA < 32+6 weeks cGA (subsample)
MRI at 34-35 weeks cGA
T2, tractographie/DTI et resting-state functional connectivity



NEOPRENE ANR-19-CE37-0015 JCJC

SR et Prédiction à la naissance, substrats cérébraux de l'attention et devenir à 2 ans (et +)



Evaluation du devenir à 2 ans

- Suivi de cohorte « Petit Deviendra Grand » (PDG)
3, 6, 9 12, 18, 24 mois puis tous les ans jusqu'à 7 ans



- **Evaluations prévues**

- Développement langagier
- Compétences cognitives et sociales
- Développement neurosensoriel
- Dépistage TND (TSA)

- **Evaluations supplémentaires:**

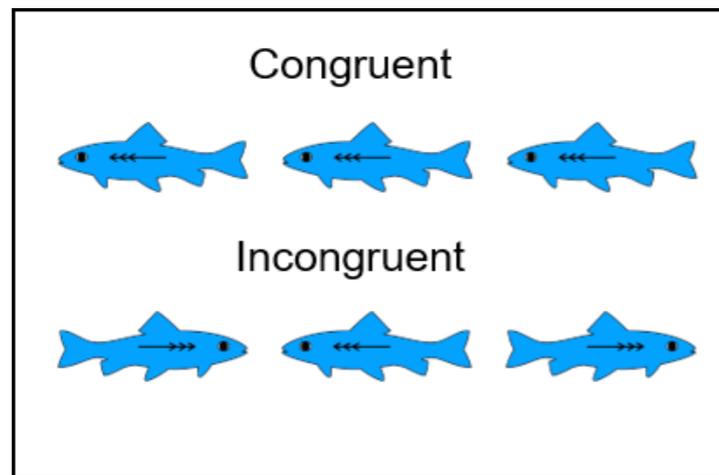
- Profils sensoriels de Dunn
- 2-5 ESSENCE questionnaire de Gilberg



SR et Prédiction à la naissance, substrats cérébraux de l'attention et devenir à 2 ans (et +)

Evaluation du devenir à 4 ans ?

- Suivi de cohorte « Petit Deviendra Grand » (PDG)
+ Protocole MEDiATE + évaluation posturales et locomotrices



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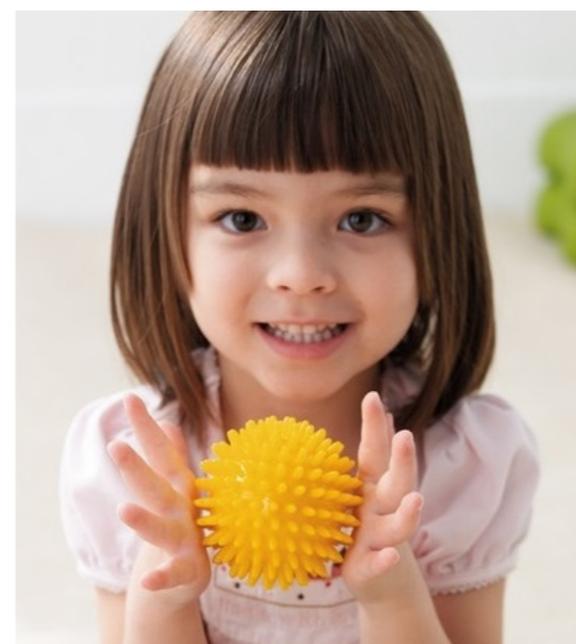
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(*Tolsa et al., 2014* ; *Sinha et al., 2014* ; *Sayeur et al., 2011*)



Neurodevelopmental disorders
(*Johnson et al., 2010* ; *Johnson et Marlow., 2011*)

PERSPECTIVES

Dépistage précoce et remédiation sensorielle



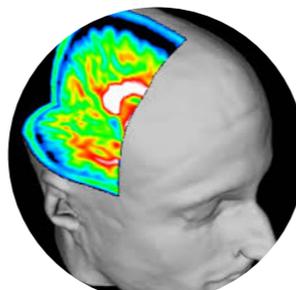
MERCI



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Nicolas Delcroix
Mikaël Naveau



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Martina Giovannella



Daniel Zuba



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CAEN NORMANDIE

Sandrine Rossi



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Marie Anquetil
Anne-Lise Marais

