4° CORSO RESIDENZIALE
EEG e POTENZIALI EVOCATI
22 – 27 NOVEMBRE 2021

PE visivi: aspetti metodologici e applicazioni cliniche

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Novara

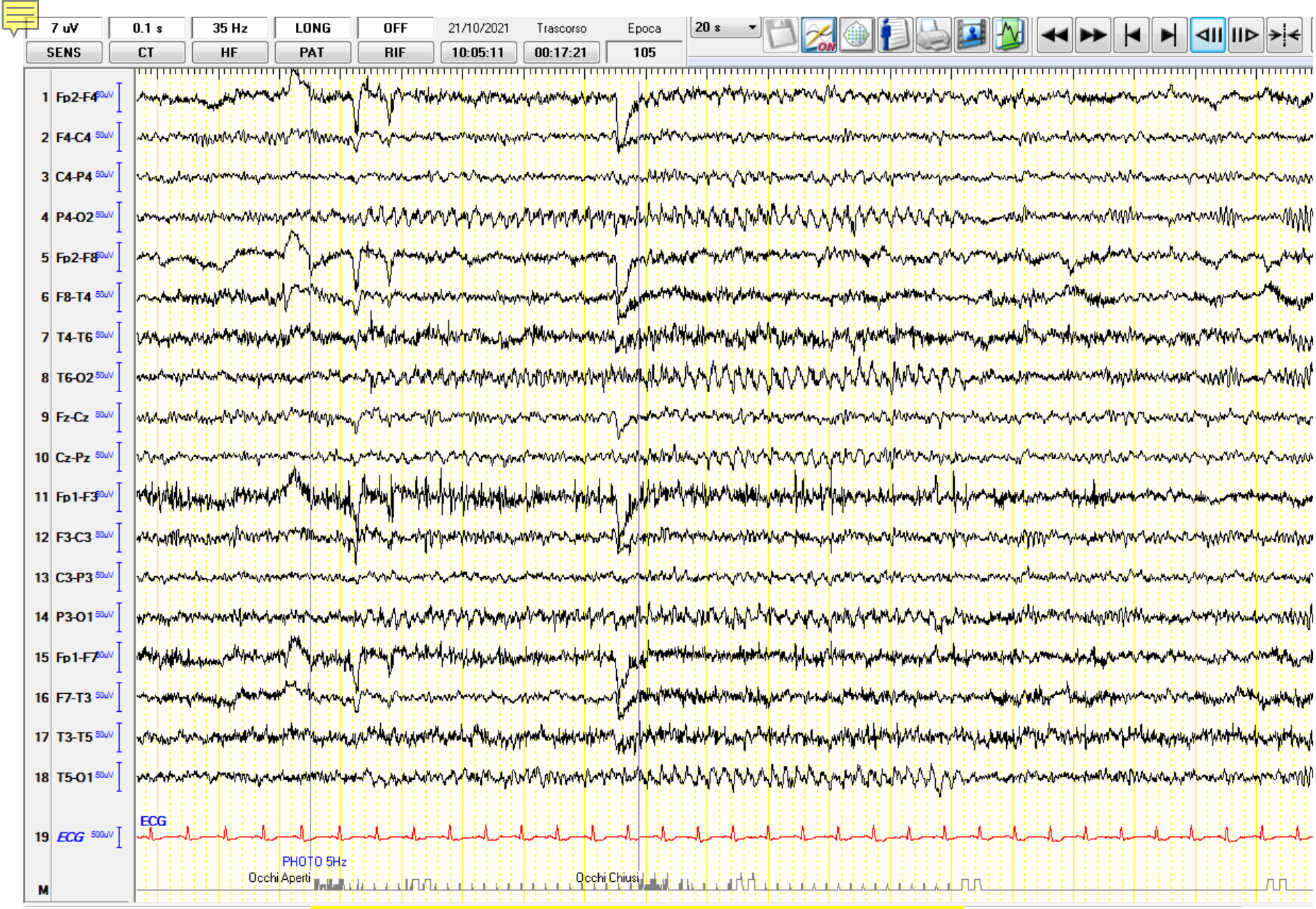
27 novembre 2021

UNIVERSITÀ DEL PIEMONTE ORIENTALE

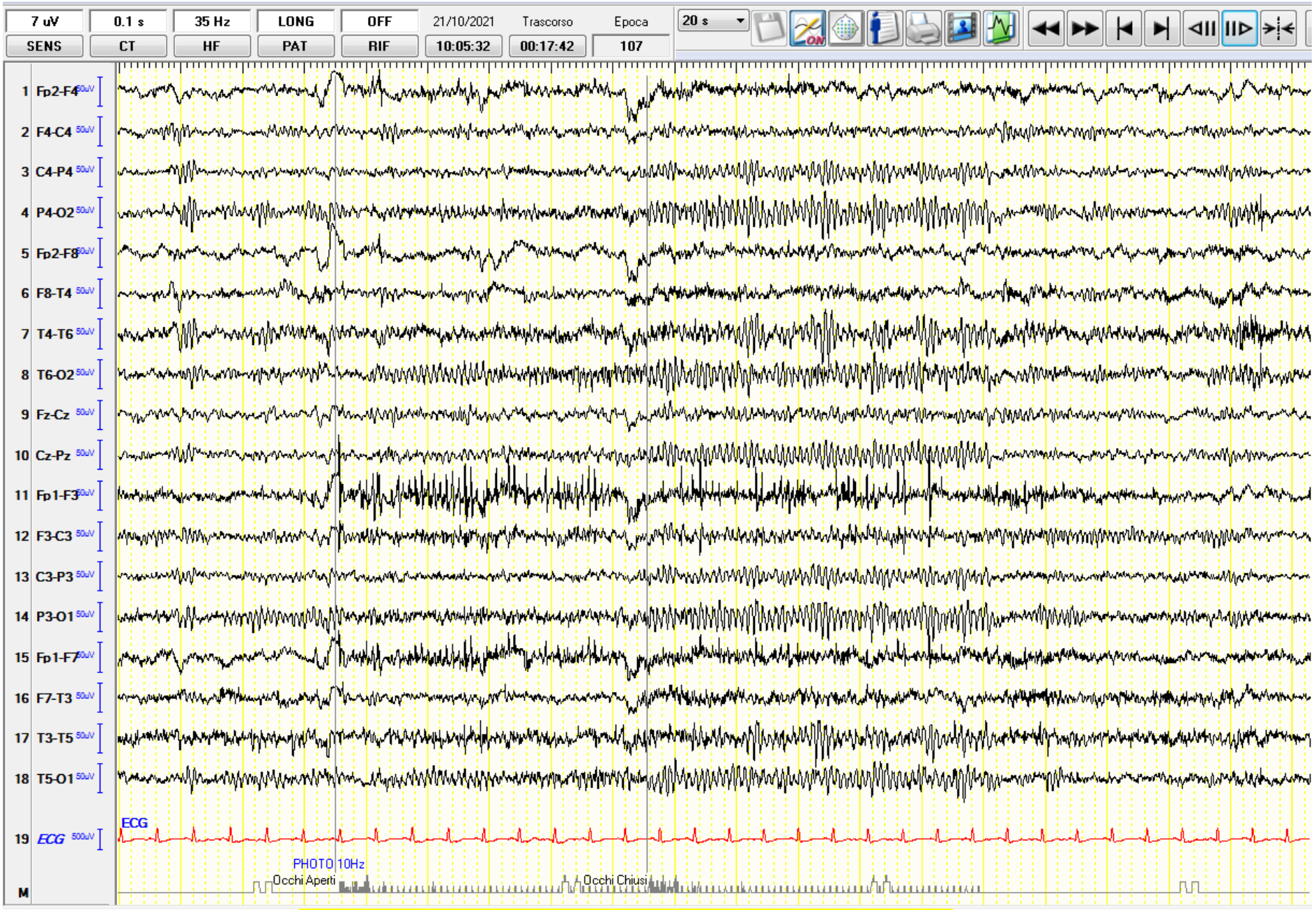
HOSPITALIS MAIORIS CHARITATIS NOVARIAE CIVITATIS

Sommario

1. Dall'EEG ai PEV
2. Come si fanno?
3. A cosa servono?
4. Spunti di ricerca


7 uV
0.1 s
35 Hz
LONG
OFF
21/10/2021
Trascorso
Epoca
20 s
SENS
CT
HF
PAT
RIF
10:05:11
00:17:21
105
1 Fp2-F4
2 F4-C4
3 C4-P4
4 P4-O2
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fz-Cz
10 Cz-Pz
11 Fp1-F3
12 F3-C3
13 C3-P3
14 P3-O1
15 Fp1-F7
16 F7-T3
17 T3-T5
18 T5-O1
19 ECG
ECG
PHOTO 5Hz
Occhi Aperti
Occhi Chiusi
M

Sli 5 Hz


7 uV
0.1 s
35 Hz
LONG
OFF
21/10/2021
Trascorso
Epoca
20 s
SENS
CT
HF
PAT
RIF
10:05:32
00:17:42
107
1 Fp2-F4
2 F4-C4
3 C4-P4
4 P4-O2
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fz-Cz
10 Cz-Pz
11 Fp1-F3
12 F3-C3
13 C3-P3
14 P3-O1
15 Fp1-F7
16 F7-T3
17 T3-T5
18 T5-O1
19 ECG
ECG
PHOTO 10Hz
Occhi Aperti
Occhi Chiusi
M

Sli 10 Hz

Trascinamento fotico

Risposta fisiologica con attività EEG ritmica in risposta alla SLI.

- frequenza: identica o armonica della SLI.
- durata: limita alla SLI.
- risposta evocata, massima sulle regioni posteriori
- si riferisce ai potenziali evocati visivi steady state (S-PEV)
- contiene: Ongoing EEG spontaneo + risposte evocate + artefatti

A. Birca et al. / Clinical Neurophysiology 117 (2006) 279–288

- I **PE** da ***flash*** individuati nei primi anni della storia dell'elettroencefalografia

- Talora si distinguono nell'attività di fondo registrata dallo scalpo, sulle derivazioni occipitali

DECEMBER, 1934.

BRAIN.

PART 4, VOL. 57.

THE BERGER RHYTHM: POTENTIAL CHANGES FROM THE OCCIPITAL LOBES IN MAN.

BY E. D. ADRIAN AND B. H. C. MATTHEWS.

(*From the Physiological Laboratory, Cambridge.*)

Lord Adrian: 45 anni
Matthews: 28 anni

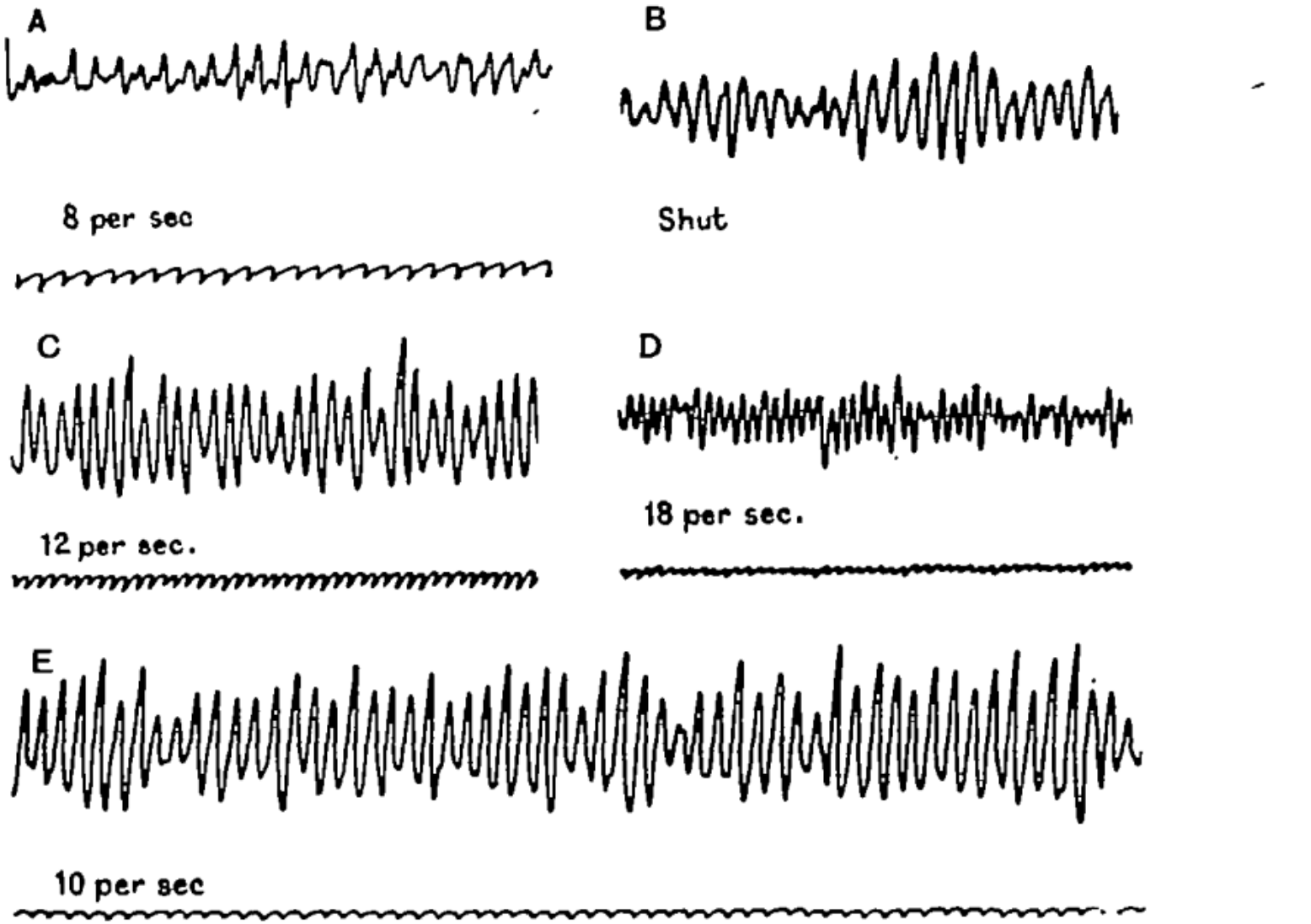
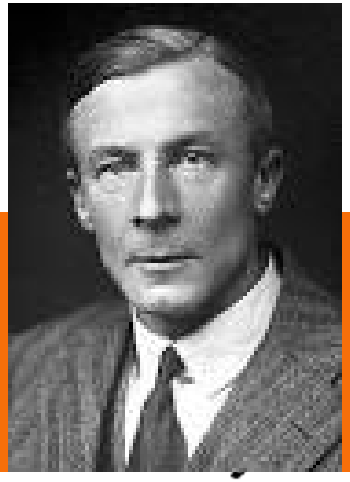


FIG. 19.—Examples of different rhythms induced by flicker. Subject E. D. A. Signal line shows frequency of flicker.

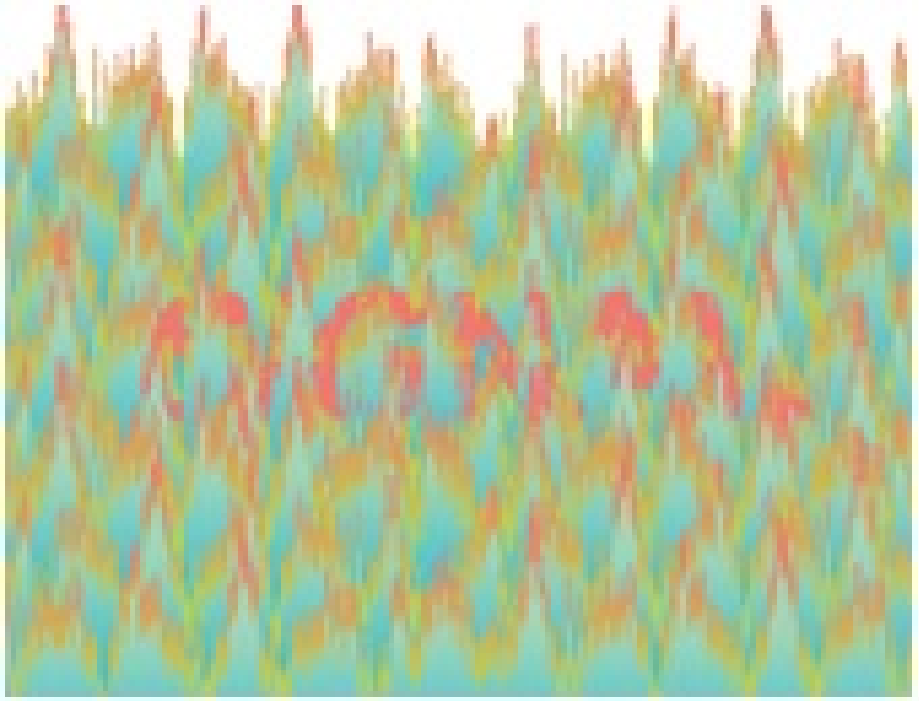
A. Flicker at 8 a sec.
B. Eyes closed and field dark. Berger rhythm at 10 a sec.
C. Flicker at 12 a sec.
D. Flicker at 18 a sec.
E. Flicker at 10 a sec. Compare with B.



One of us (E.D.A.) gives the rhythm as soon as the eyes are closed, and maintains it with rare and brief intermissions as long as they remain closed. The other (B.H.C.M.) is better in the role of observer than of subject, for in him the rhythm may not appear at all at the beginning of an examination, and seldom persists for long without intermission.

Adrian ED, Matthews BH. The Berger rhythm: potential changes from the occipital lobes in man. Brain 1934;57:355 3–85.

Rapporto segnale-rumore



Nella maggioranza dei soggetti sani la forma di questi potenziali è oscurata dai potenziali cerebrali spontanei, relativamente più ampi.

A SUMMATION TECHNIQUE FOR THE DETECTION OF SMALL EVOKED POTENTIALS

G. D. Dawson, M.B., M.Sc.
Neurological Research Unit, Medical Research Council, The National Hospital, Queen Square, London

(Received for publication: July 10, 1953)

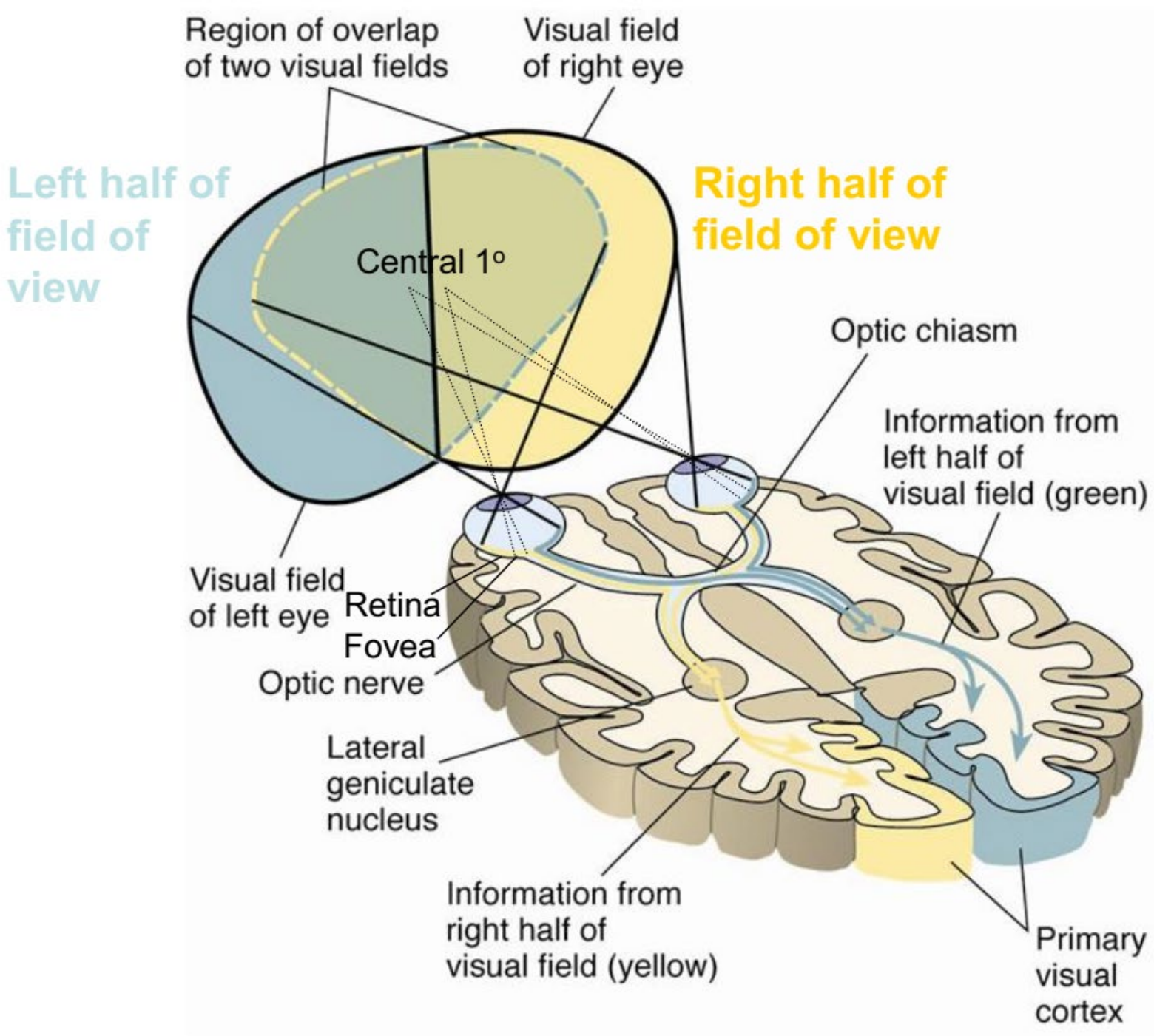
"the discrimination against irregular deflections, in favour of those waves regularly evoked by the stimuli, would be greatly increased if the records could in some way be added instead of being superimposed".

= signal averaging!

PE visivi

potenziali elettrici generati in seguito a stimoli visivi, estratti dall'attività EEG, a livello della corteccia visiva, registrata da elettrodi posti sullo scalpo in sede occipitale

= quantificare la funzione del sistema visivo nel contesto clinico.

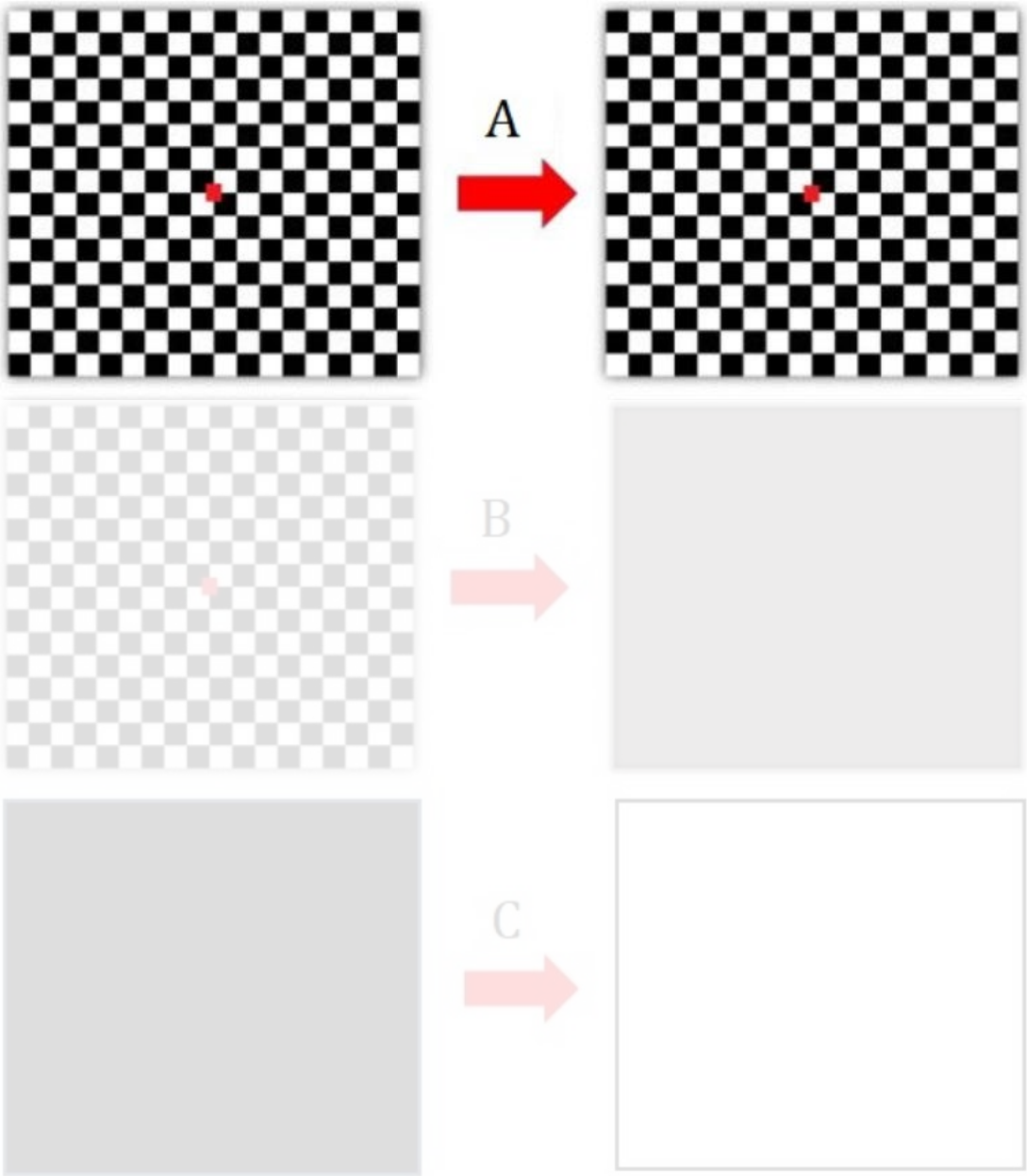

Region of overlap of two visual fields
Visual field of right eye
Left half of field of view
Right half of field of view
Central 1°
Optic chiasm
Information from left half of visual field (green)
Visual field of left eye
Retina
Fovea
Optic nerve
Lateral geniculate nucleus
Information from right half of visual field (yellow)
Primary visual cortex

PE visivi

La morfologia dei PEV dipende fortemente da:

1. *caratteristiche dello* ***stimolo***

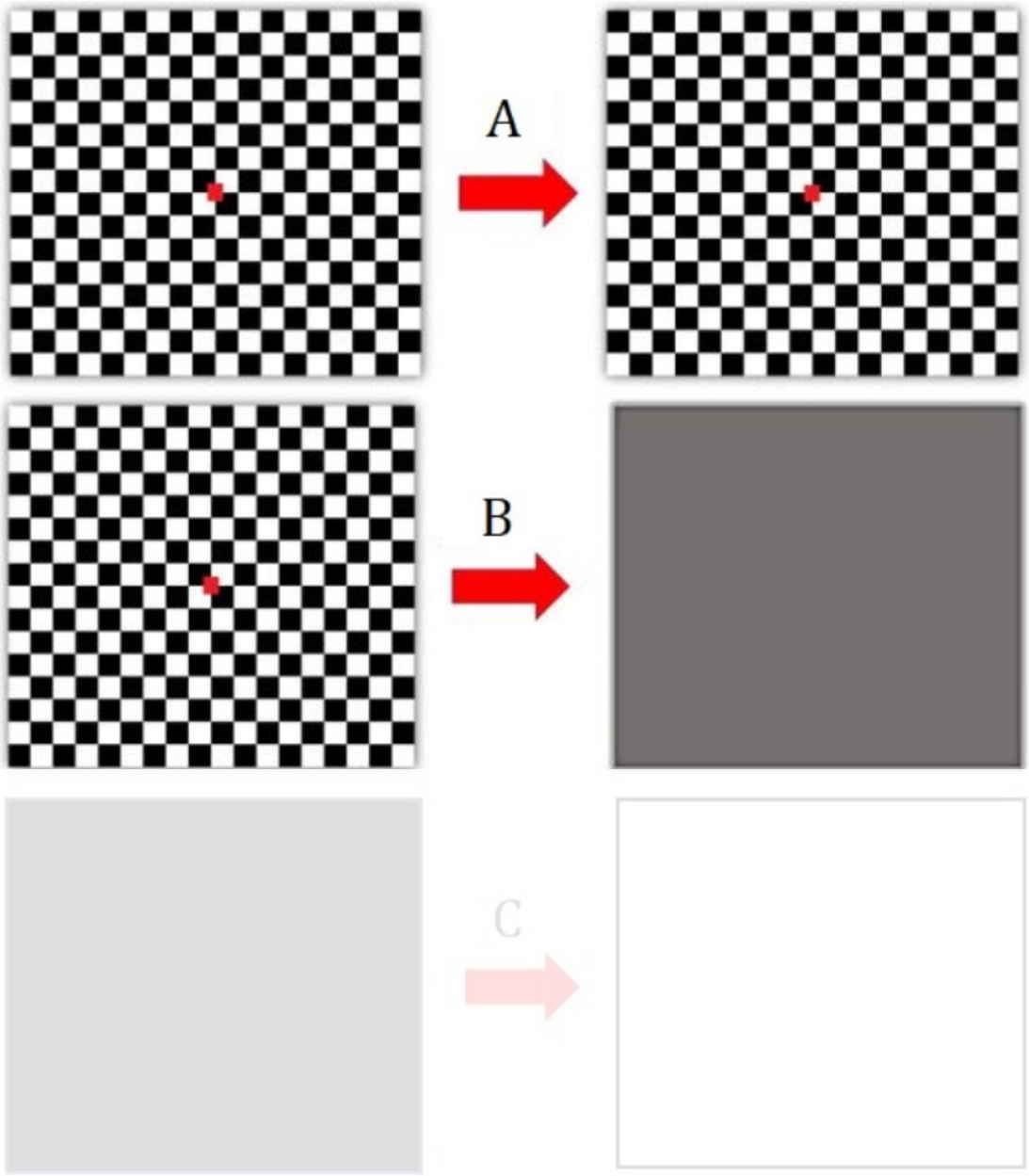
2. ***frequenza*** *di stimolazione*



PR-PEV

Pattern onset PEV

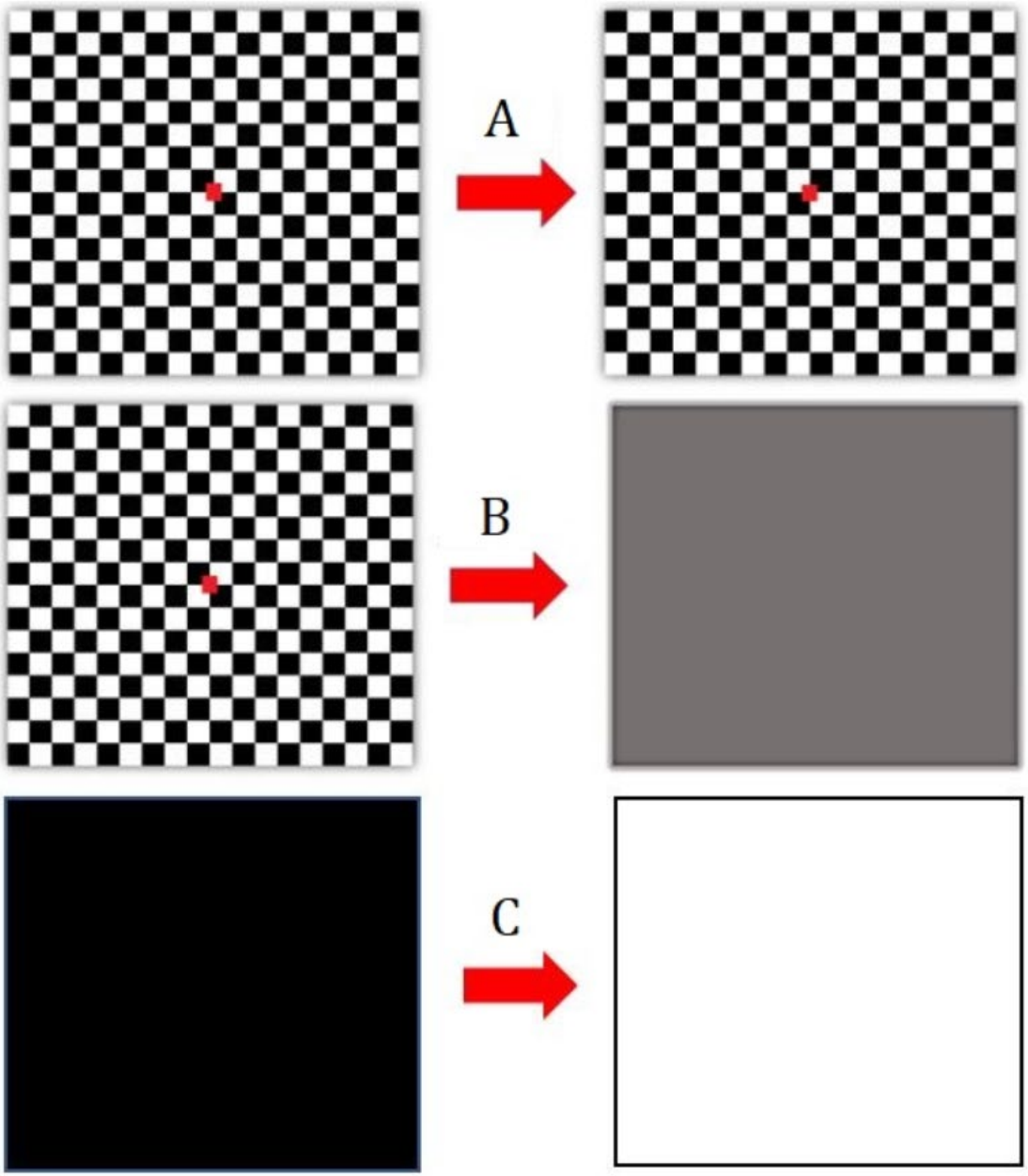
Flash PEV



PR-PEV

Pattern onset PEV

Flash PEV



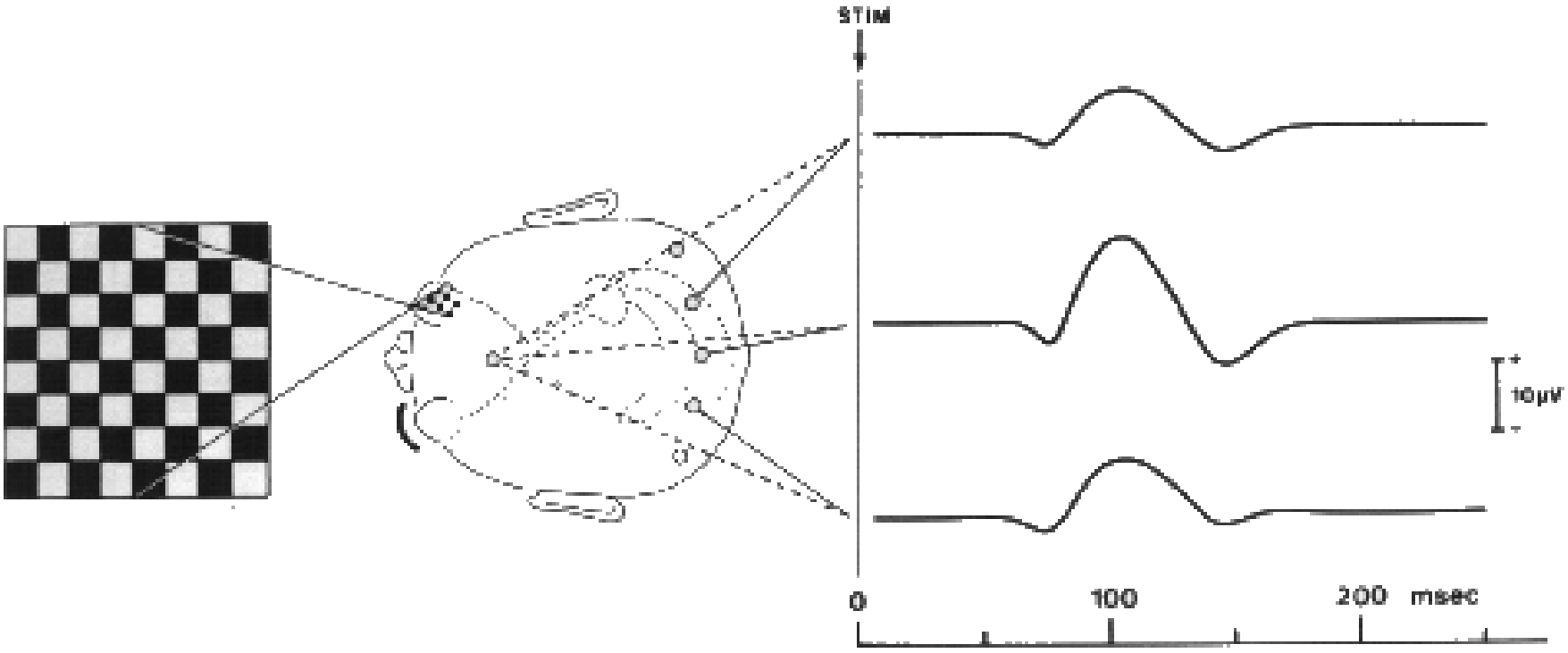
PR-PEV

Pattern onset PEV

Flash PEV

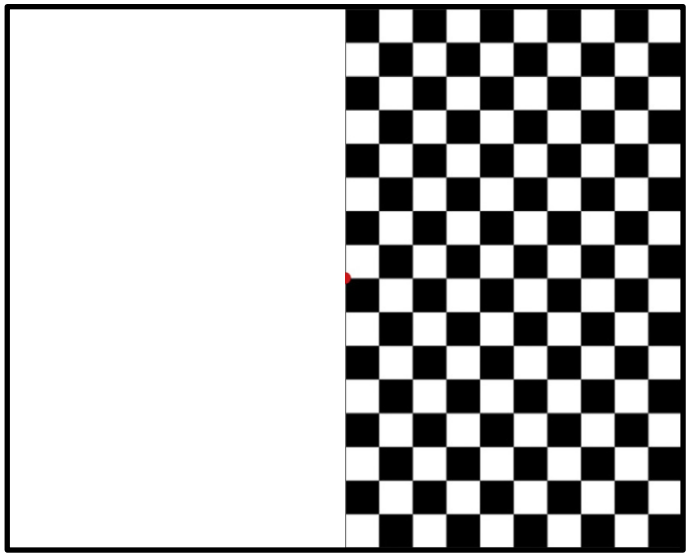
Full field - emicampo

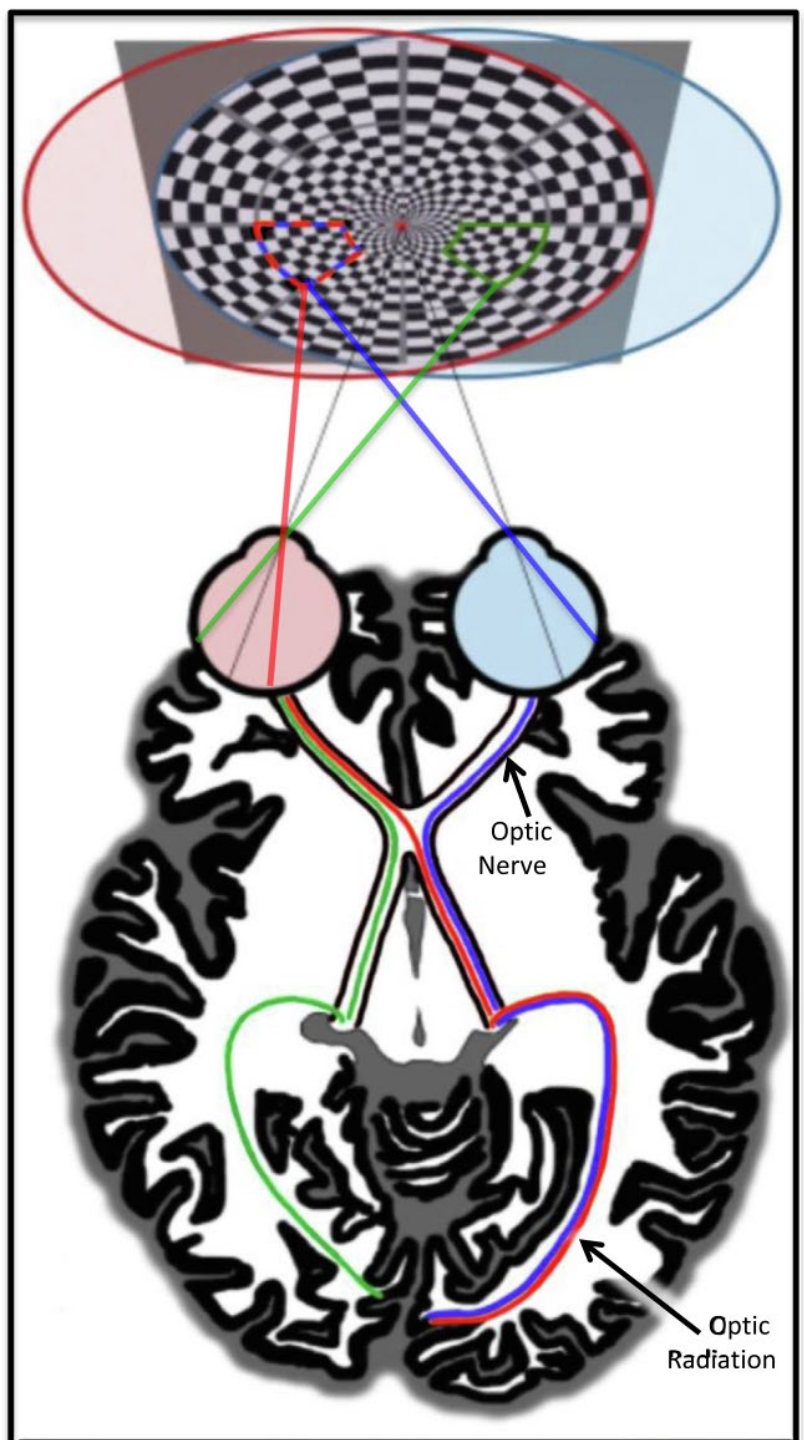
- **Full-Field:** il pattern si estende in misura uguale in entrambe le direzioni rispetto al punto di fissazione



Full field - emicampo

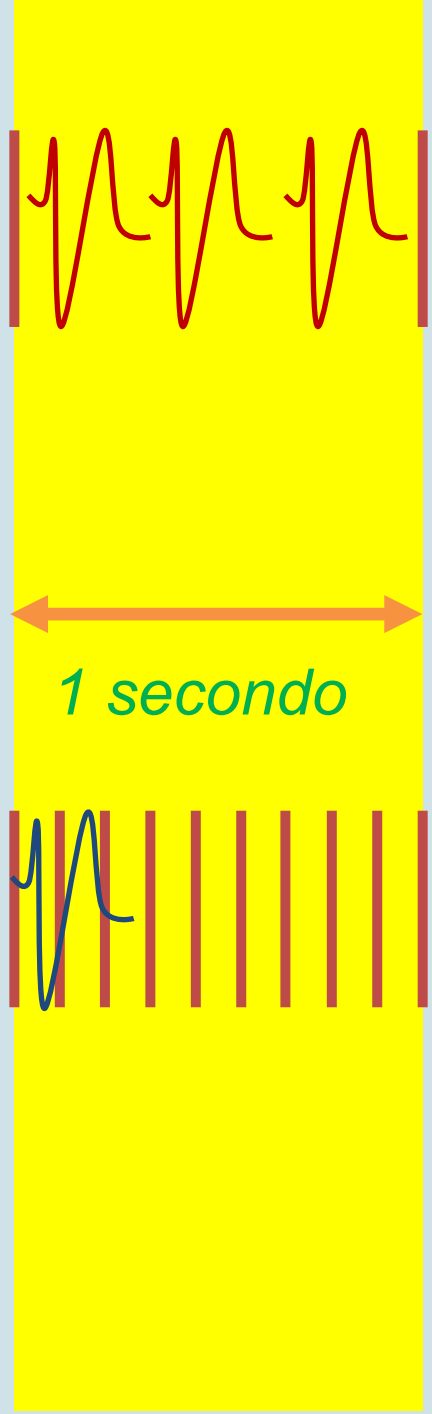
- **Partial-Field (emicampo):** solo una metà del campo visivo contiene lo stimolo pattern. Emicampi verticali.





PEV multifocali

- Sequenza pseudo-random di stimoli (Sutter, 1991) con pattern focale
- Registrazione di PEV indipendenti da diverse parti del campo visivo

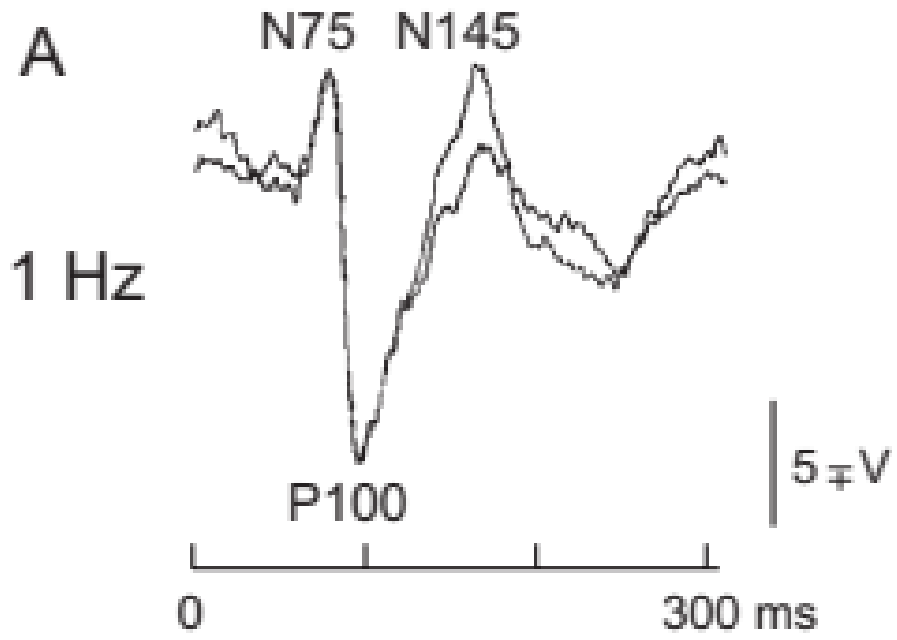


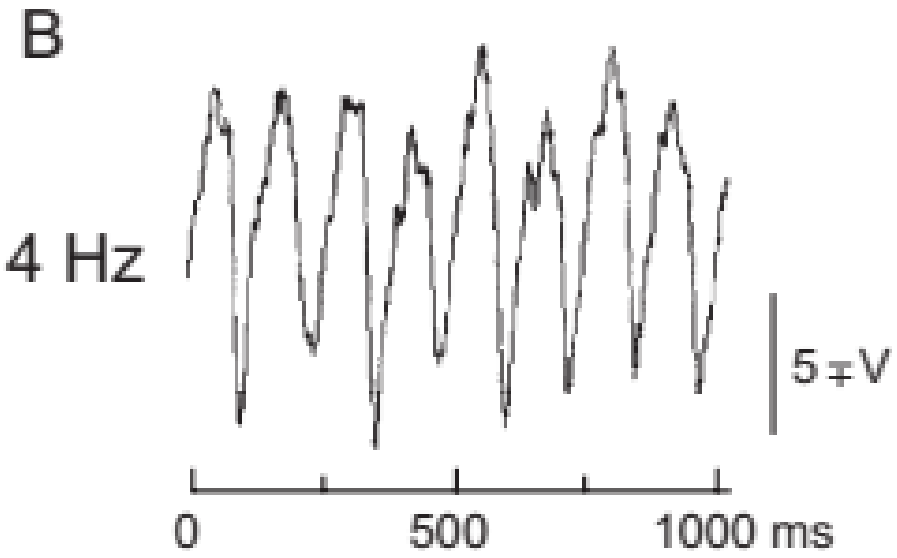
- ***transient* (T-PEV)**: stimolazione a bassa frequenza (1 - 3 Hz) > utilizzato nella pratica clinica.

- ***steady state* (S-PEV):** stimolazione ad alta frequenza (> 3-4 Hz)

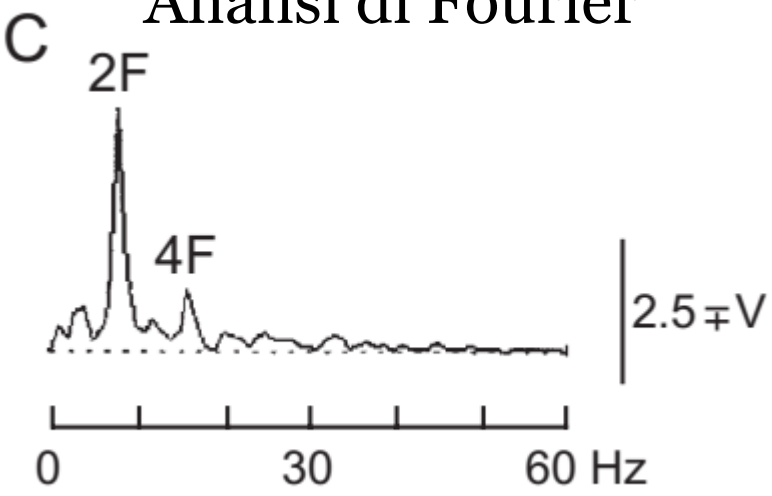
I PEV si mescolano in un'onda quasi sinusoidale

PEV transient



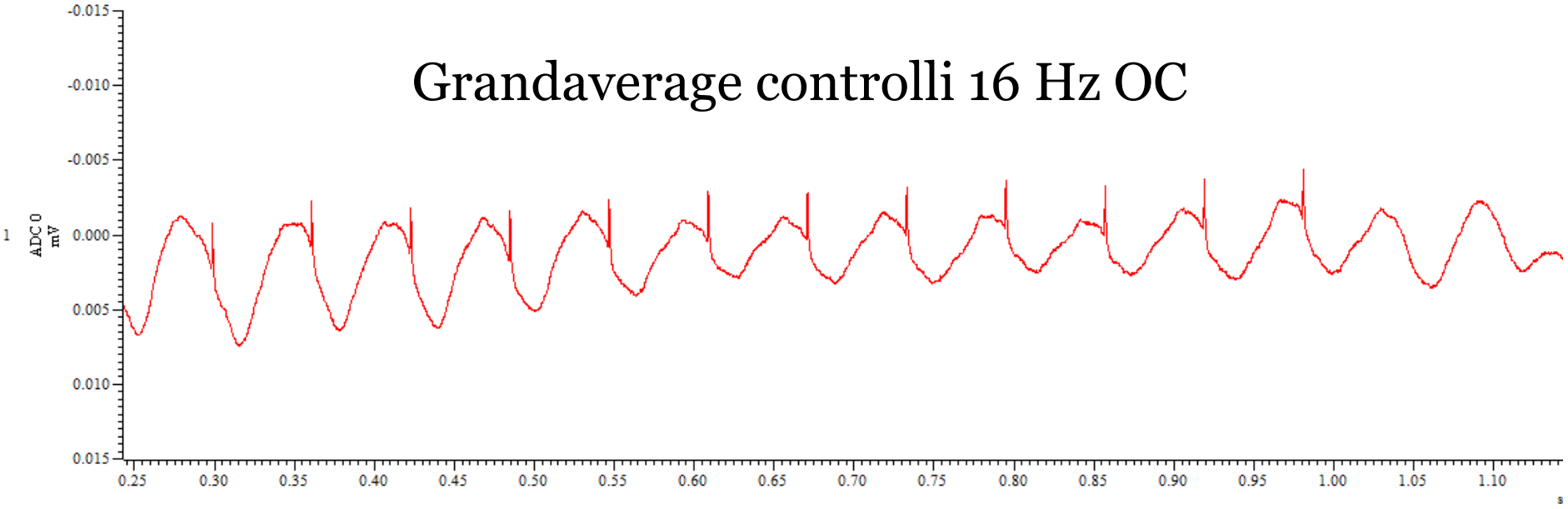


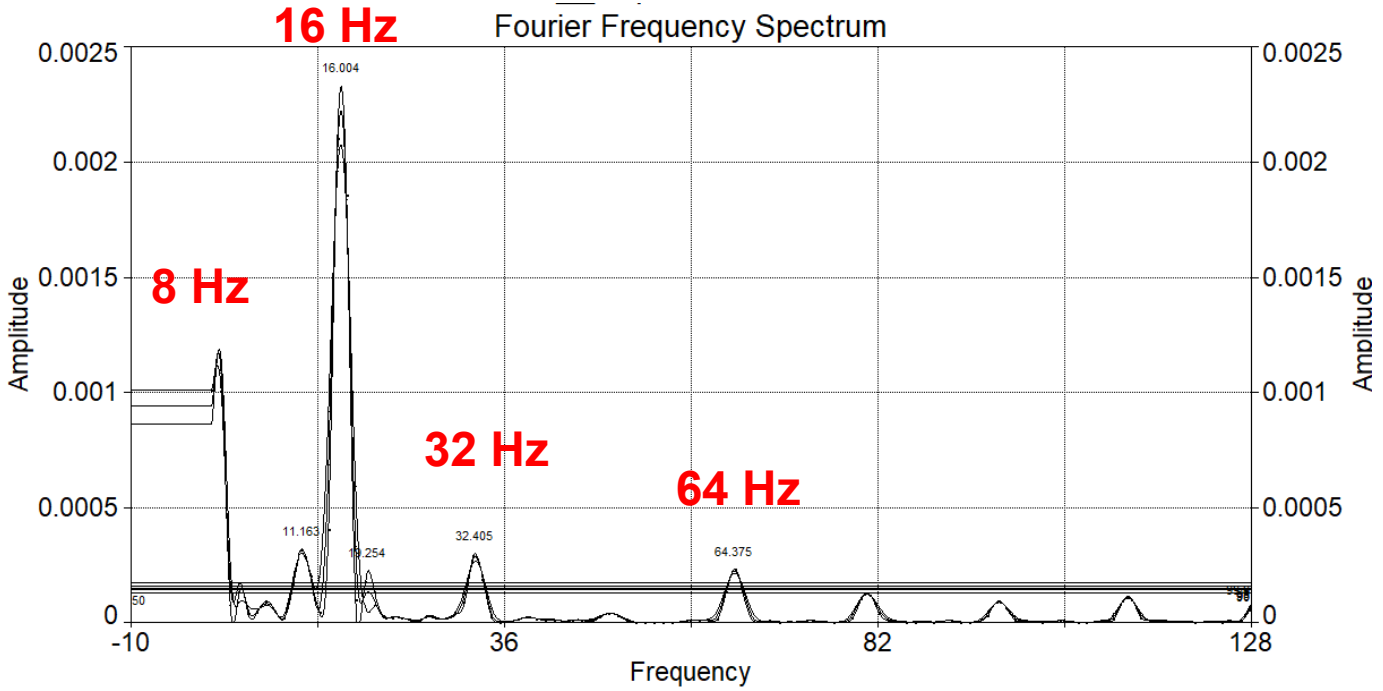
Analisi di Fourier



S. Tobimatsu, G.G. Celesia / Clinical Neurophysiology 117 (2006) 1414–1433

Grandaverage controlli 16 Hz OC





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Doc Ophthalmol (2016) 133:1–9
DOI 10.1007/s10633-016-9553-y

ISCEV STANDARDS

ISCEV standard for clinical visual evoked potentials: (2016 update)

J. Vernon Odom · Michael Bach · Mitchell Brigell · Graham E. Holder · Daphne L. McCulloch · Atsushi Mizota · Alma Patrizia Tormene · International Society for Clinical Electrophysiology of Vision

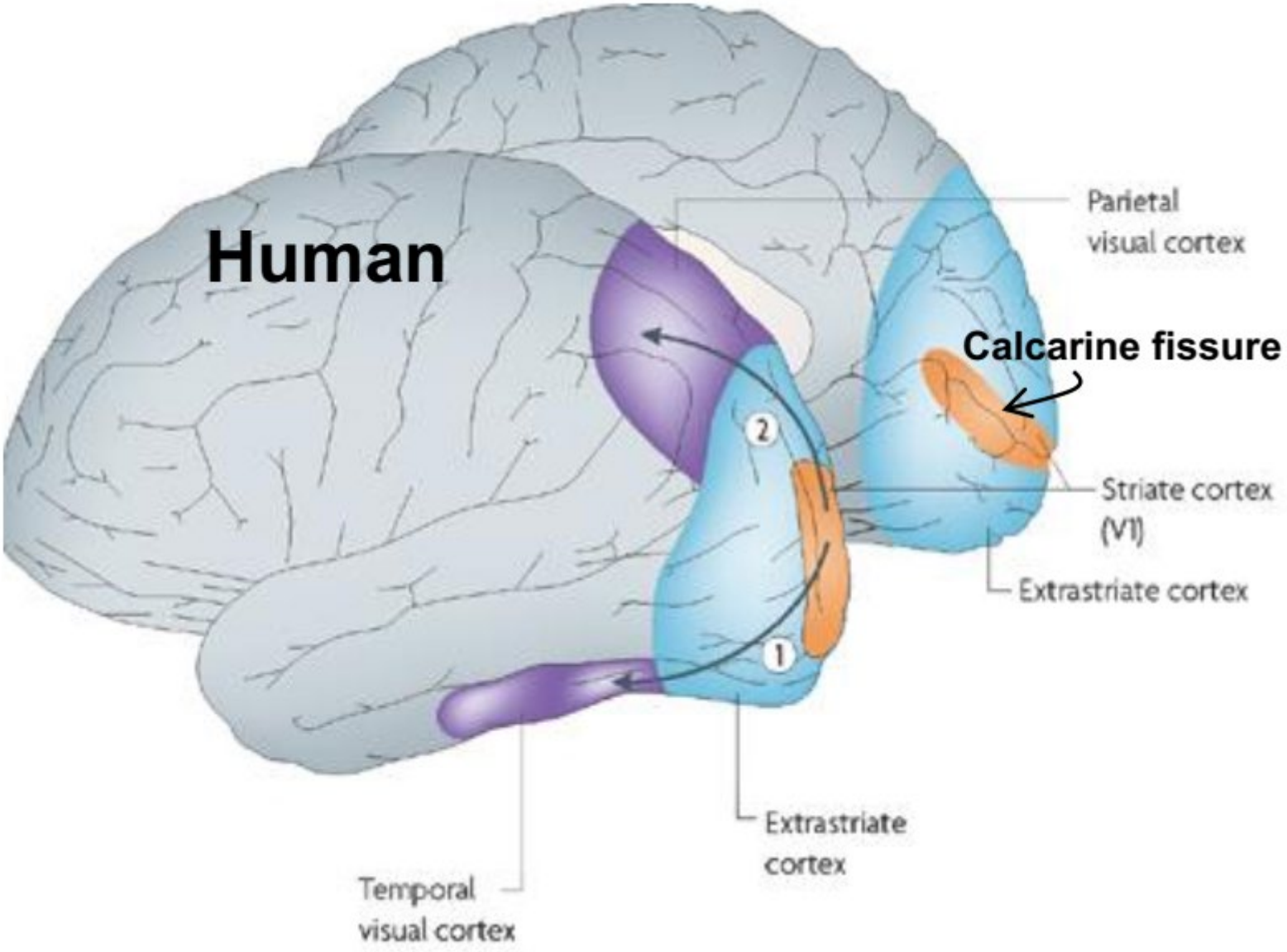
Contents lists available at ScienceDirect

Clinical Neurophysiology

journal homepage: www.elsevier.com/locate/clinph

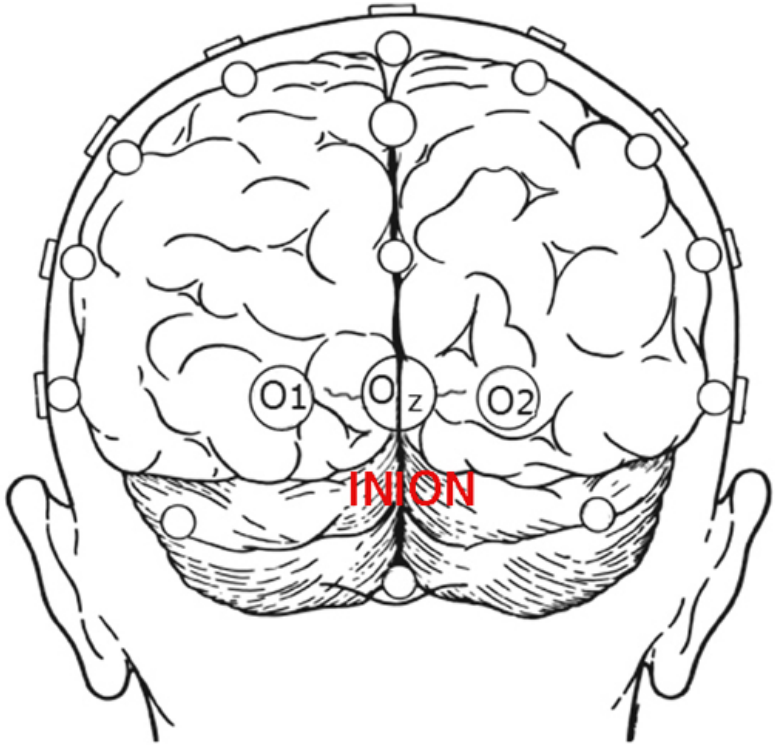
International Federation of Clinical Neurophysiology: Recommendations for visual system testing

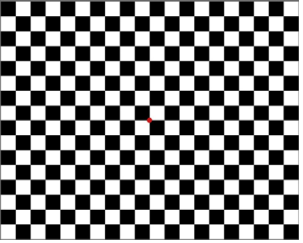
Graham E. Holder [a,*], Gastone G. Celesia [b], Yozo Miyake [c], Shozo Tobimatsu [d], Richard G. Weleber [e], for the International Federation of Clinical Neurophysiology


Human
Parietal
visual cortex
Calcarine fissure
2
Striate cortex
(V1)
Extrastriate cortex
1
Extrastriate
cortex
Temporal
visual cortex

PE visivi

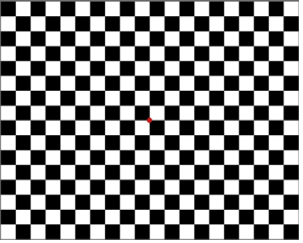
- **Elettrodo attivo**: in sede occipitale (Oz)
- **Referenza**: Fz o Cz
- **Terra**: fronte, vertice, mastoide, A1 e/o A2
- Sistema 10/20

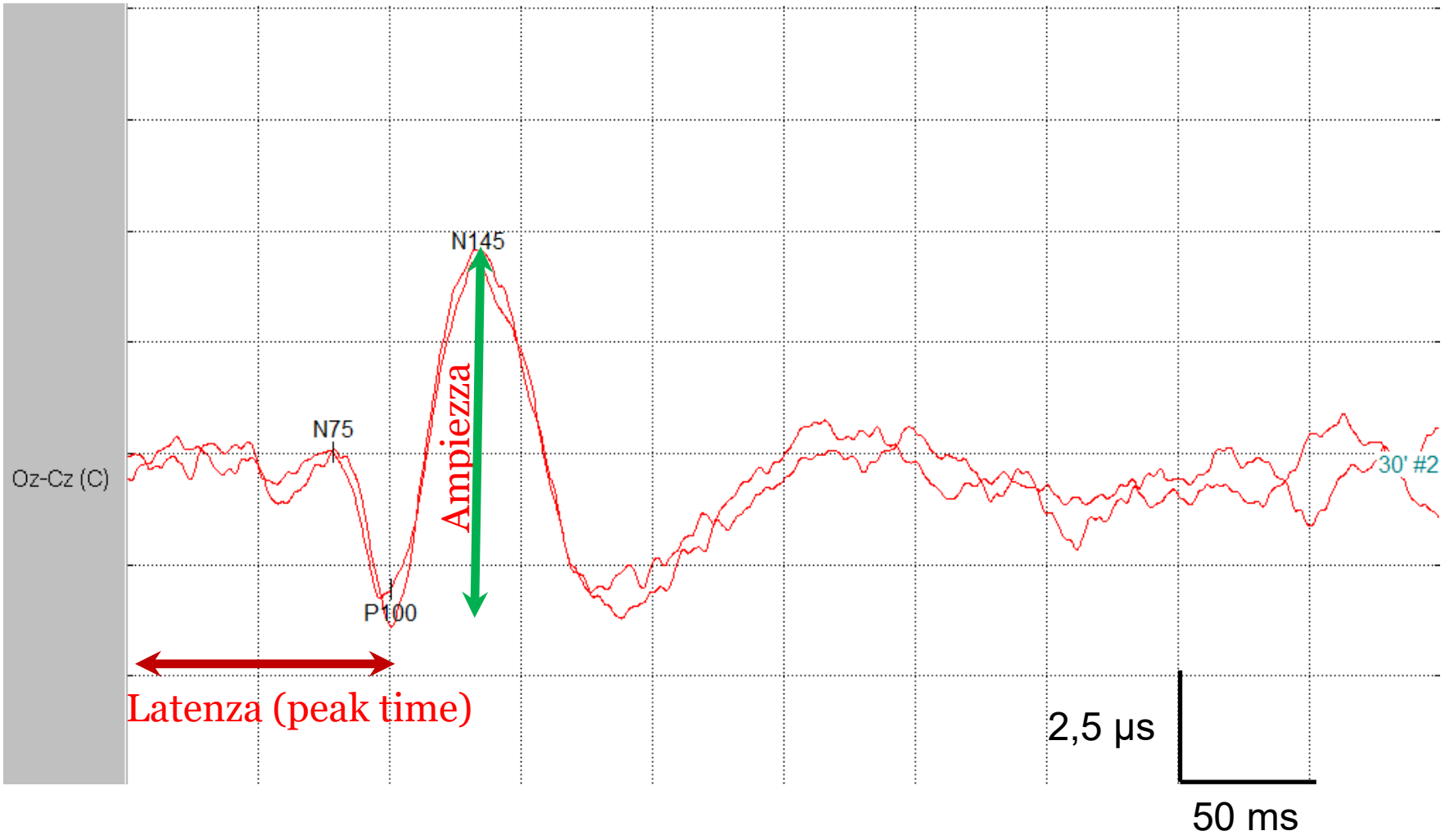


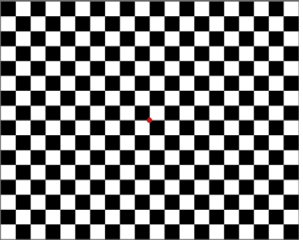


PE visivi

- Frequenza campionamento: 1000 Hz
- Filtri: 1-100 Hz . Notch **NO**
- Stim. 1 Hz , binoculare o monoculare
- 2 serie da 100 tracce (almeno 50)
- Tempo di analisi: minimo 250 ms post stimolo (solitamente tot. 500 ms)




Oz-Cz (C)
N145
N75
P100
Ampiezza
30' #2
Latenza (peak time)
2,5 µs
50 ms



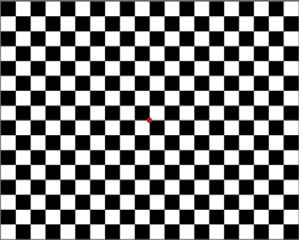
Latenza

- Latenza: tempo dall'artefatto da stimolo alla massima deflessione, positiva o negativa (*peak time*)

- In molti altri casi, per latenza si intende il tempo dallo stimolo all'inizio della risposta (*onset time*)

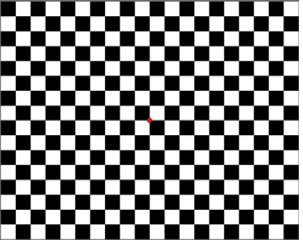
Ampiezza

N75-P100



P100

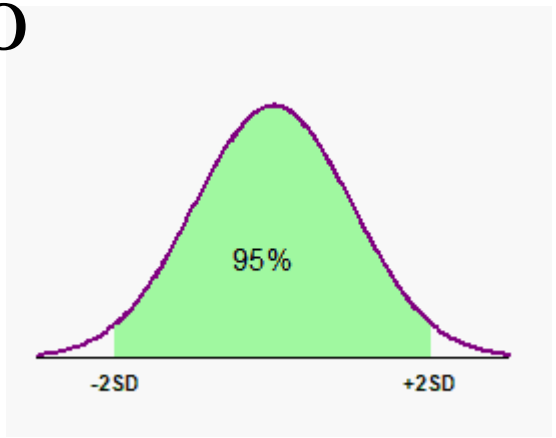
- Picco prominente, minore variazione intersoggetto, intrasoggetto, interoculare, e su misure ripetute.
- **Influenzata** da: tipo di stimolo, dimensione del pattern e del campo visivo, contrasto, luminanza, filtraggio, età, scarsa fissazione, difetti di rifrazione, modificazioni pupillari estreme



Ripetibilità

- Valori normativi per singolo laboratorio
- Con occhiali

- Cosa è patologico? Rallentamento > 2 deviazioni standard della P100



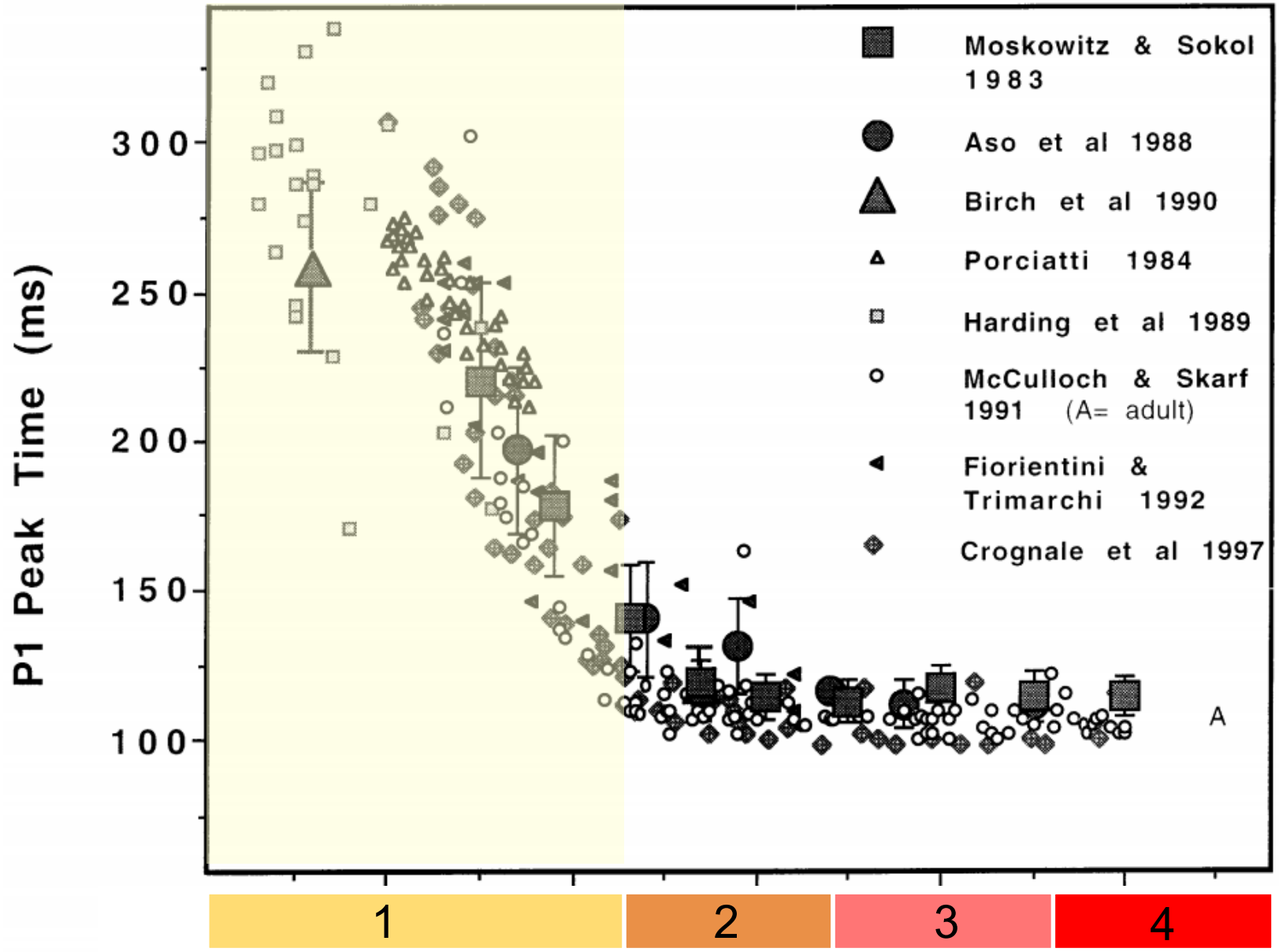
Maturazione dei PEV

< 3 anni: difficoltà a mantenere la fissazione

= PEV da flash

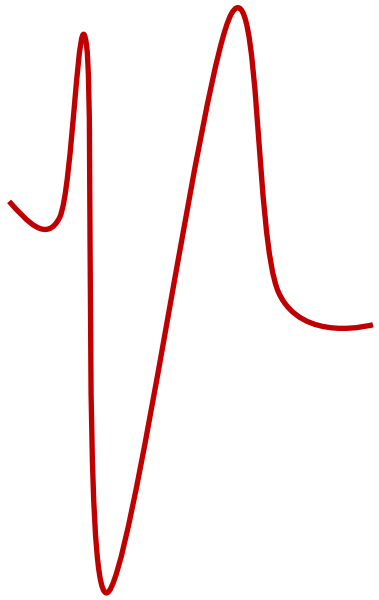
> 5 anni: sviluppo retinico-densità cellulare corticale e mielinizzazione, acuità visiva simili all'adulto

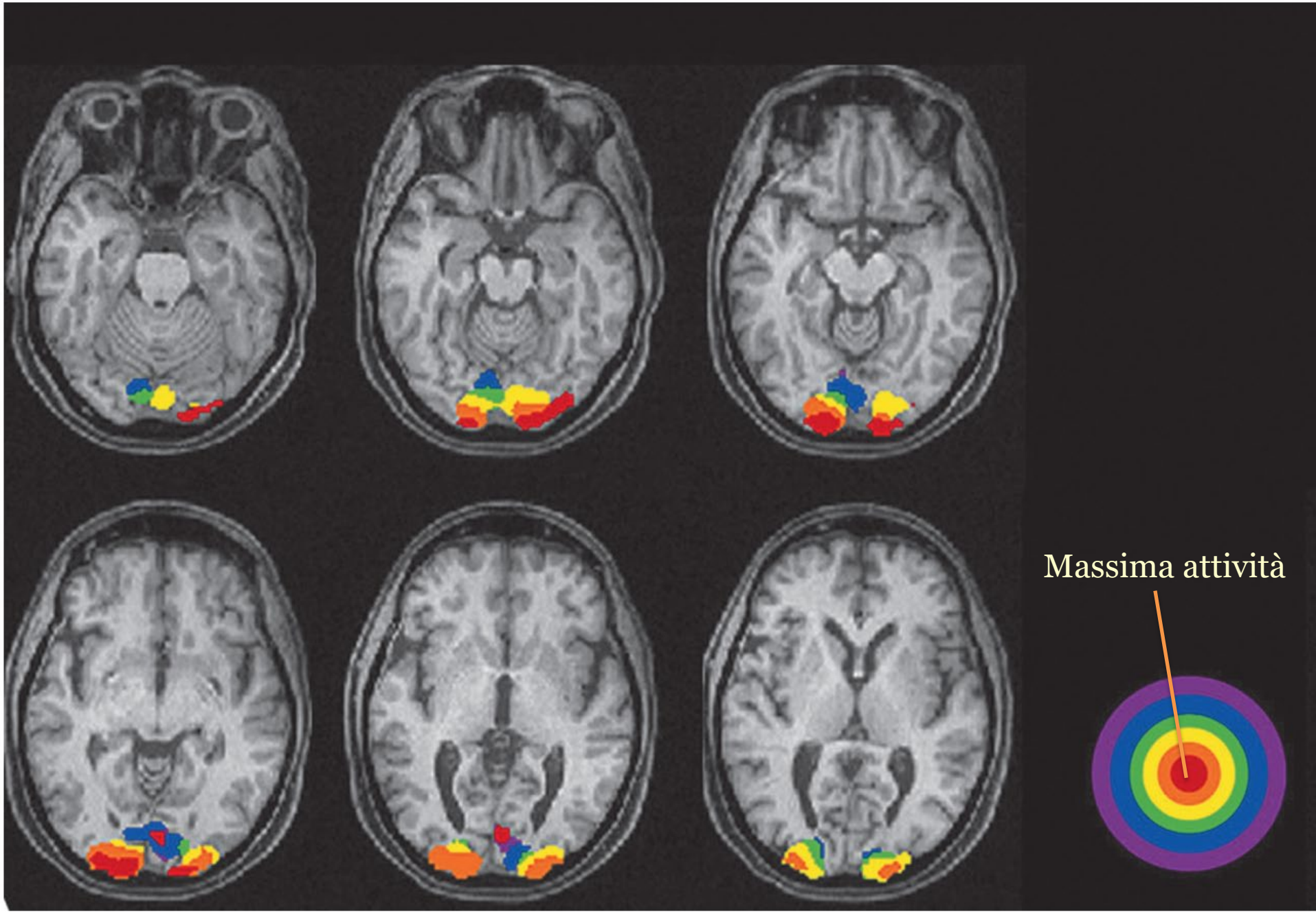
Molte variazioni nei primi anni di vita, con cambiamenti latenza, forma e complessità.



McCulloch et al. Vision Res. 1999 Nov;39(22):3673-80.

Perché il PEV ha questa forma?





Creel DJ. Visually evoked potentials. Handb Clin Neurol. 2019;160:501-522.

PEV = segnale complesso

- Oz: più vicino alla corteccia visiva primaria

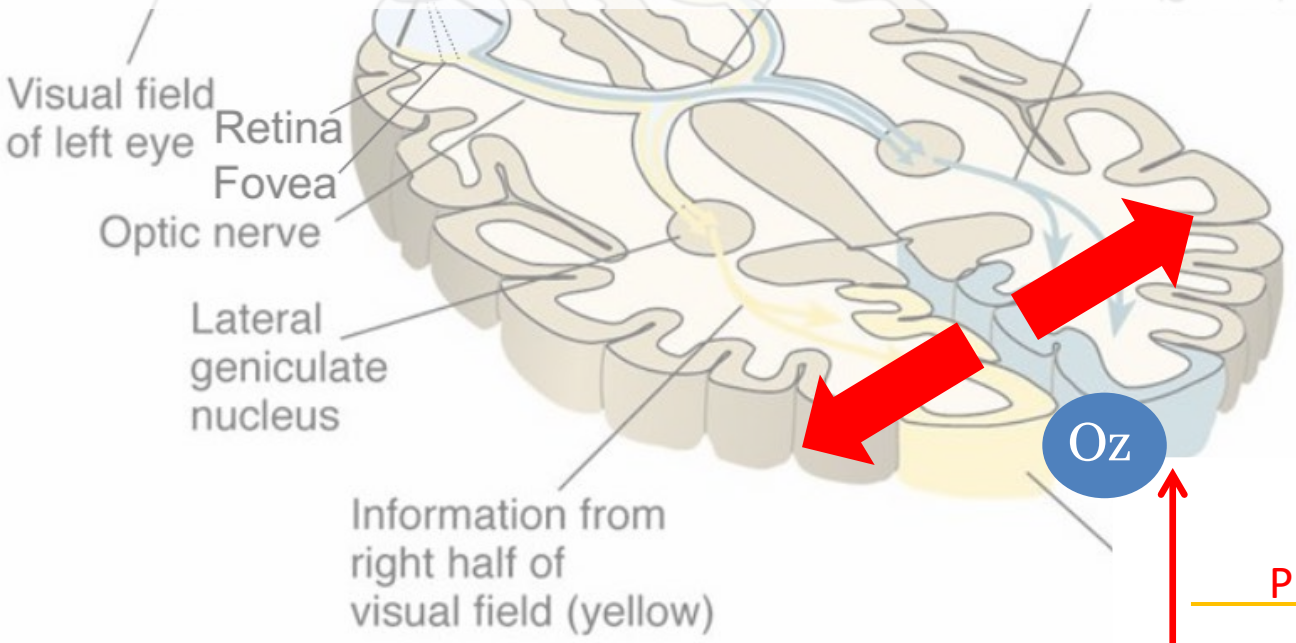
intorno alla scissura calcarina, non sulla superficie del lobo occipitale. Variabilità anatomica.

- Lateralizzazione difficile

PEV = segnale complesso

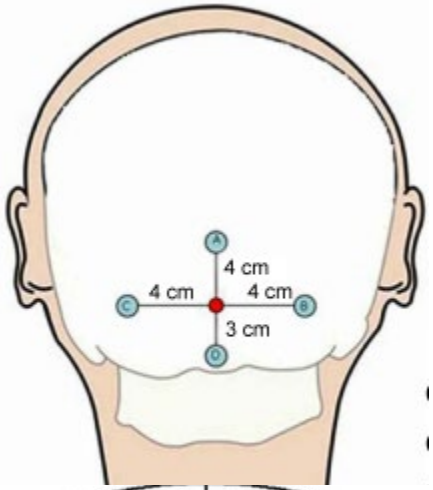
- La stimolazione visiva crea una serie di dipoli, che si combinano.
- Il PEV è un'onda = sommazione di tutti i dipoli
- Effetti di cancellazione di fase dei potenziali

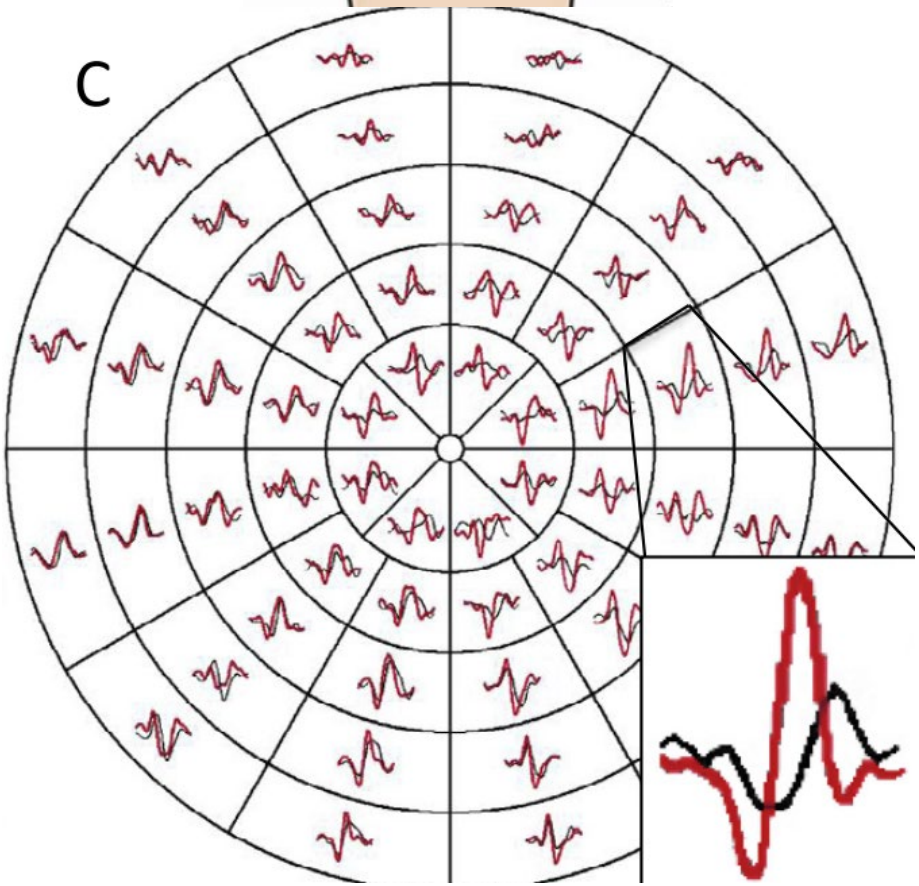
- Se la rappresentazione corticale è di *opposta polarità*, si ha il fenomeno della **cancellazione** elettrica, per cui molto del contibuto al VEP è negato.

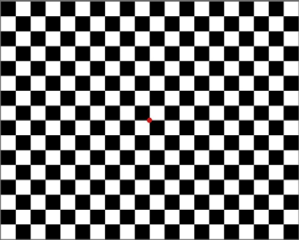


PEV multifocali

- I dipoli elettrici generati dalla corteccia non vanno incontro a cancellazione di fase
- Aumenta la sensibilità per deficit minori (con PEV convenzionale normale)





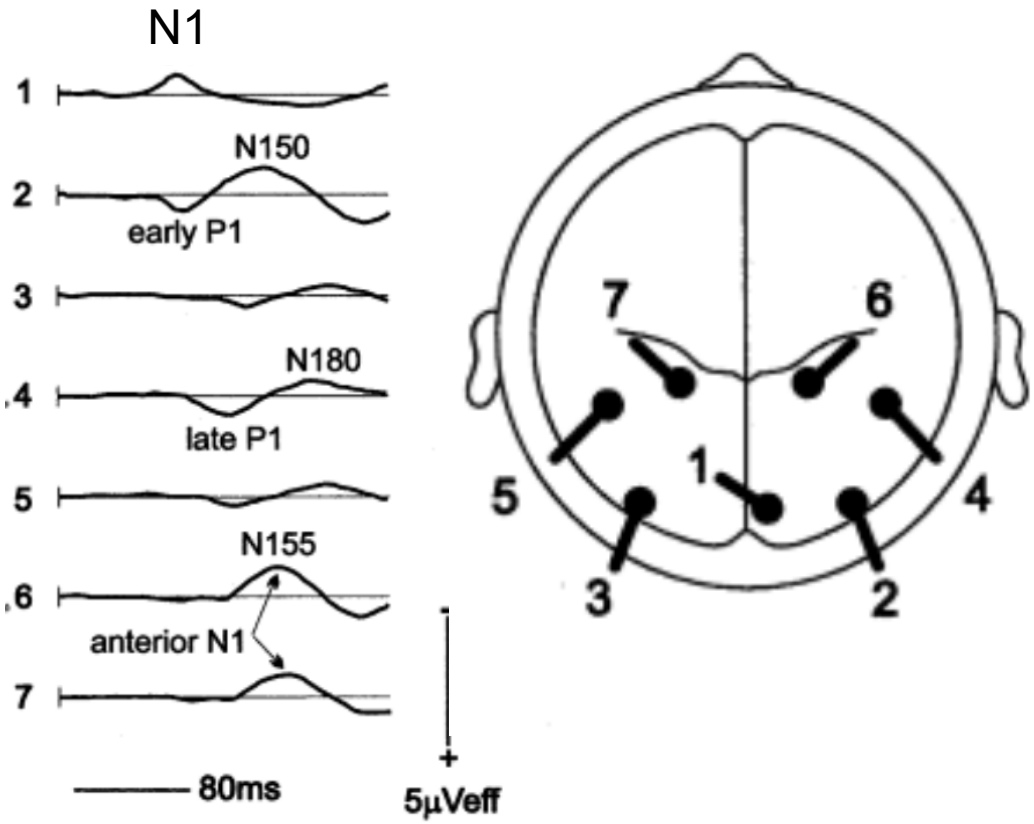


Generatori

V1 è la sorgente delle componenti precoci (N1, N75) prima della P1 (P100)

La precoce fase della P100, generata dalla corteccia extrastriata dorsale

N2 generata da molte aree, anche il lobo parietale (associative)



Modificato da: **Human Brain Mapping 15:95–111(2001)**

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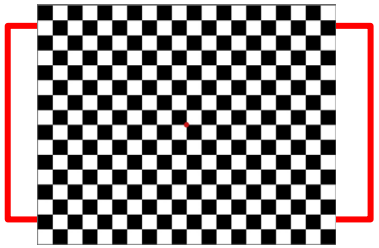
Applicazioni cliniche



PR-PEV: affidabile e sensibile per valutazione:

1. porzione prechiasmatica

   (retina e nervo ottico)

2. chiasma ottico
3. porzione retrochiasmatica

   (tratto ottico, corpo genicolato laterale, radiazioni ottiche, corteccia visiva)

Tipi di alterazioni

- Assenza di risposte
- Aumento di latenza della P100
- Asimmetria interoculare
- Anomalie d'ampiezza

La latenza del PEV dipende in parte dalla velocità di conduzione delle fibre del nervo ottico…

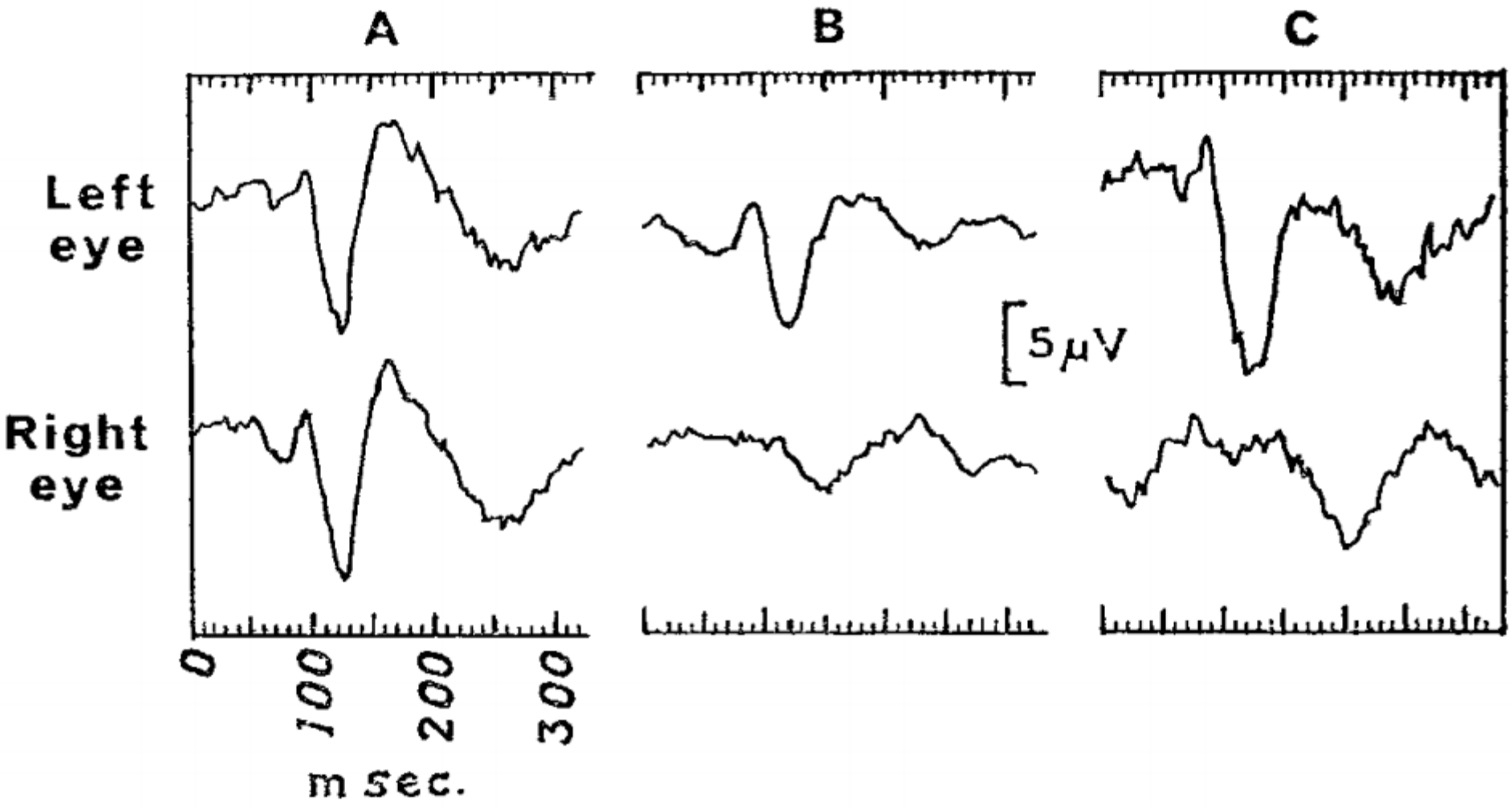
THE LANCET, MAY 6, 1972

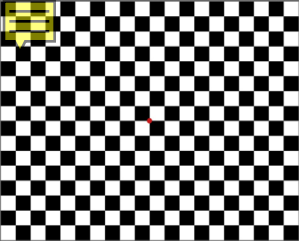
DELAYED VISUAL EVOKED RESPONSE IN OPTIC NEURITIS

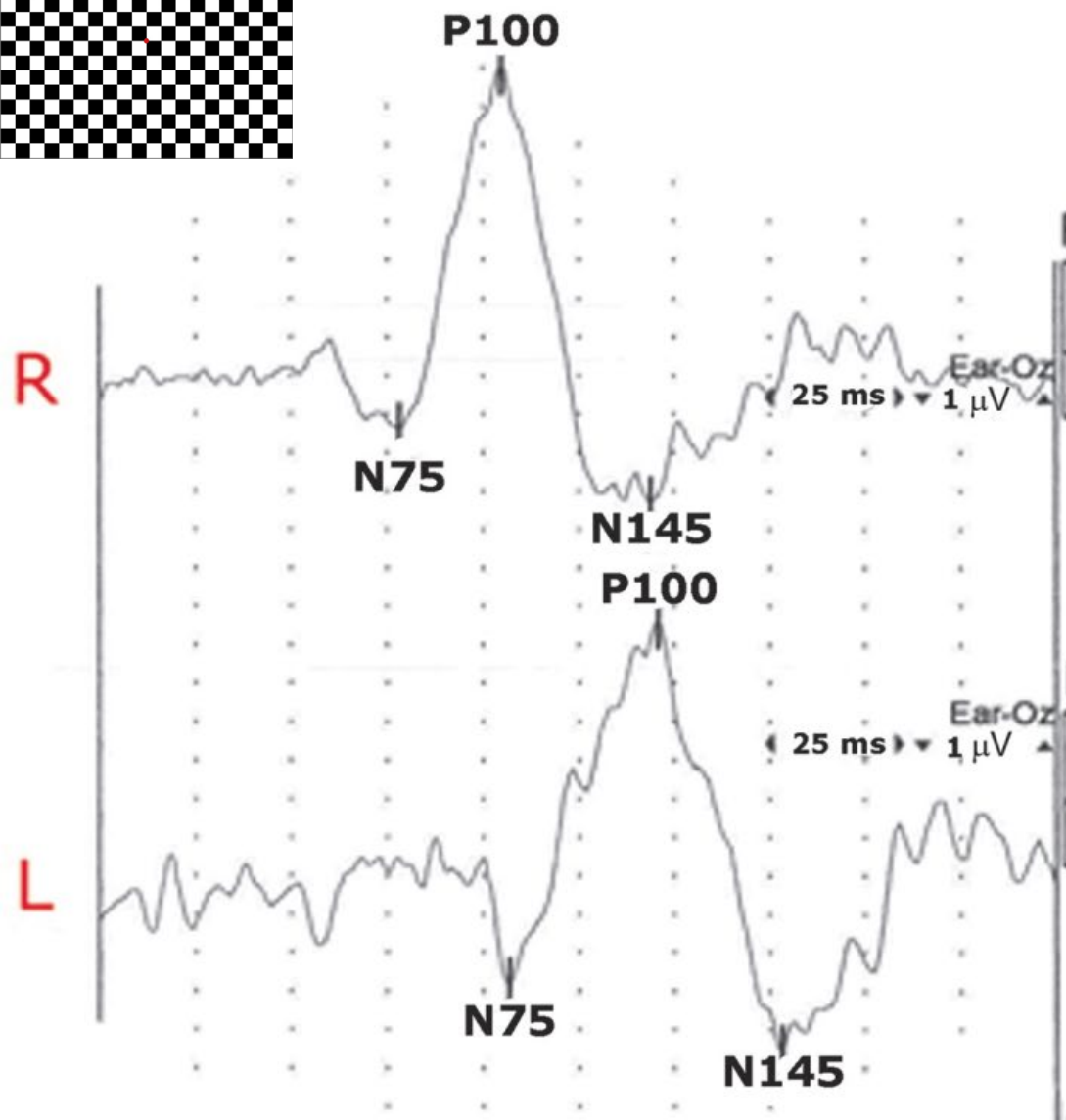
A. M. HALLIDAY W. I. MCDONALD
JOAN MUSHIN

Institute of Neurology, Queen Square, London WC1N 3BG

Pattern PEV e flash PEV


A
B
C
Left eye
Right eye
5μV
0
100
200
300
m sec.





RIGHT eye VEP

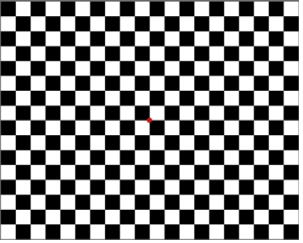
Text	Lat N75 ms	Lat P100 ms	Lat N145 ms	PP Amp 75–100 µV
	1:1:N75	1:1:P100	1:1:N145	1:1:N75 P100
Oz	78.0	105	144	9.48

LEFT eye VEP

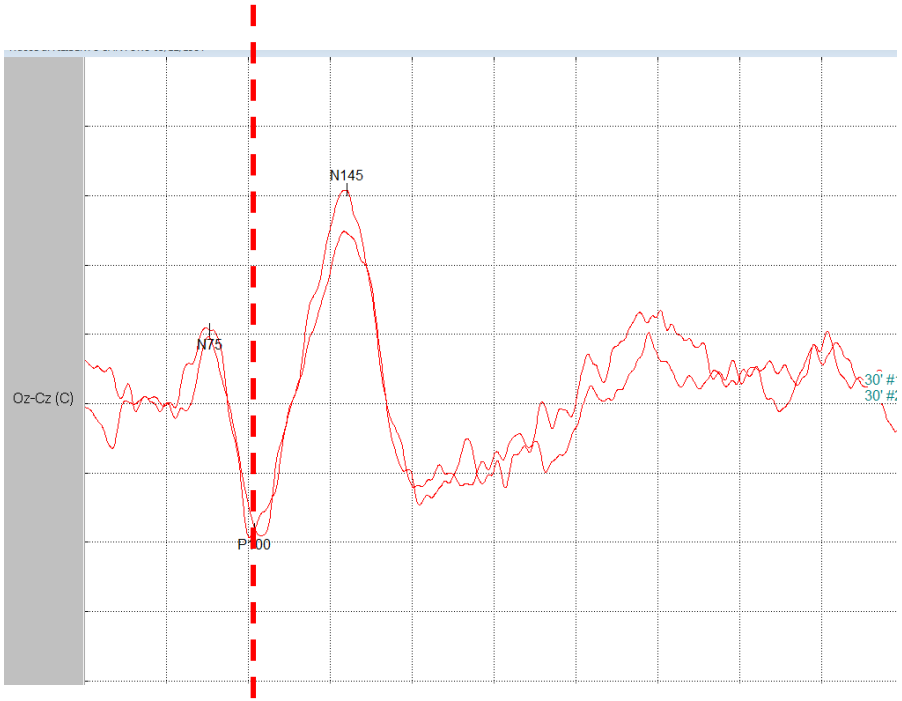
Text	Lat N75 ms	Lat P100 ms	Lat N145 ms	PP Amp 75–100 µV
	2:1:N75	2:1:P100	2:1:N145	2:1:N75 P100
Oz	106	145	178	9.47

Interocular comparison

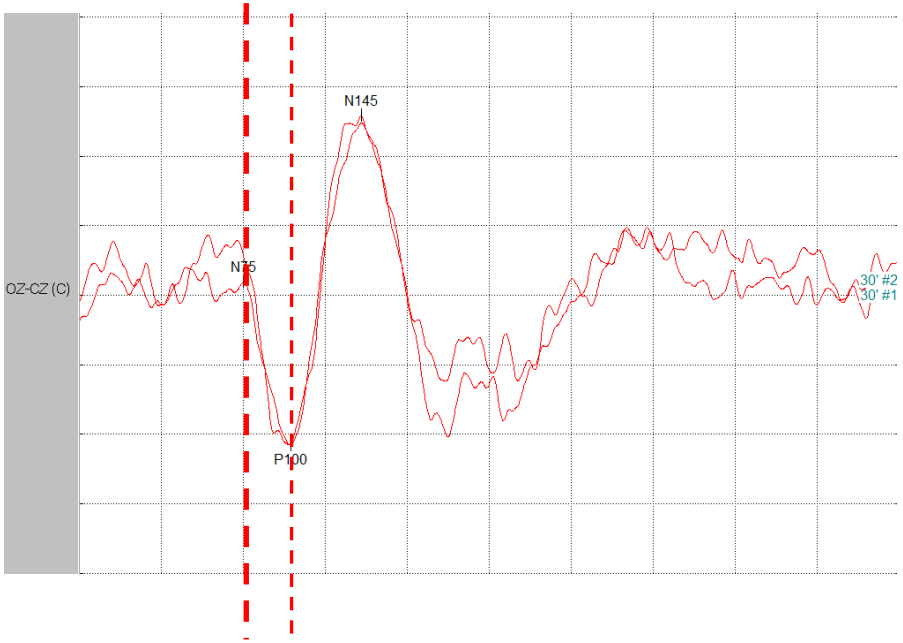
Text	LatDiff LT–RT	PP amp ratio LT–RT
	40.8 ms	99.8%



OD



OS



2,5 us

50 ms

Sclerosi multipla

CRITERI POSER
1983 CRITERI

…

CRITERI MC
DONALD 2017

PEV usati per supportare diagnosi SM

Evidenza para-clinica di demielinizzazione

…

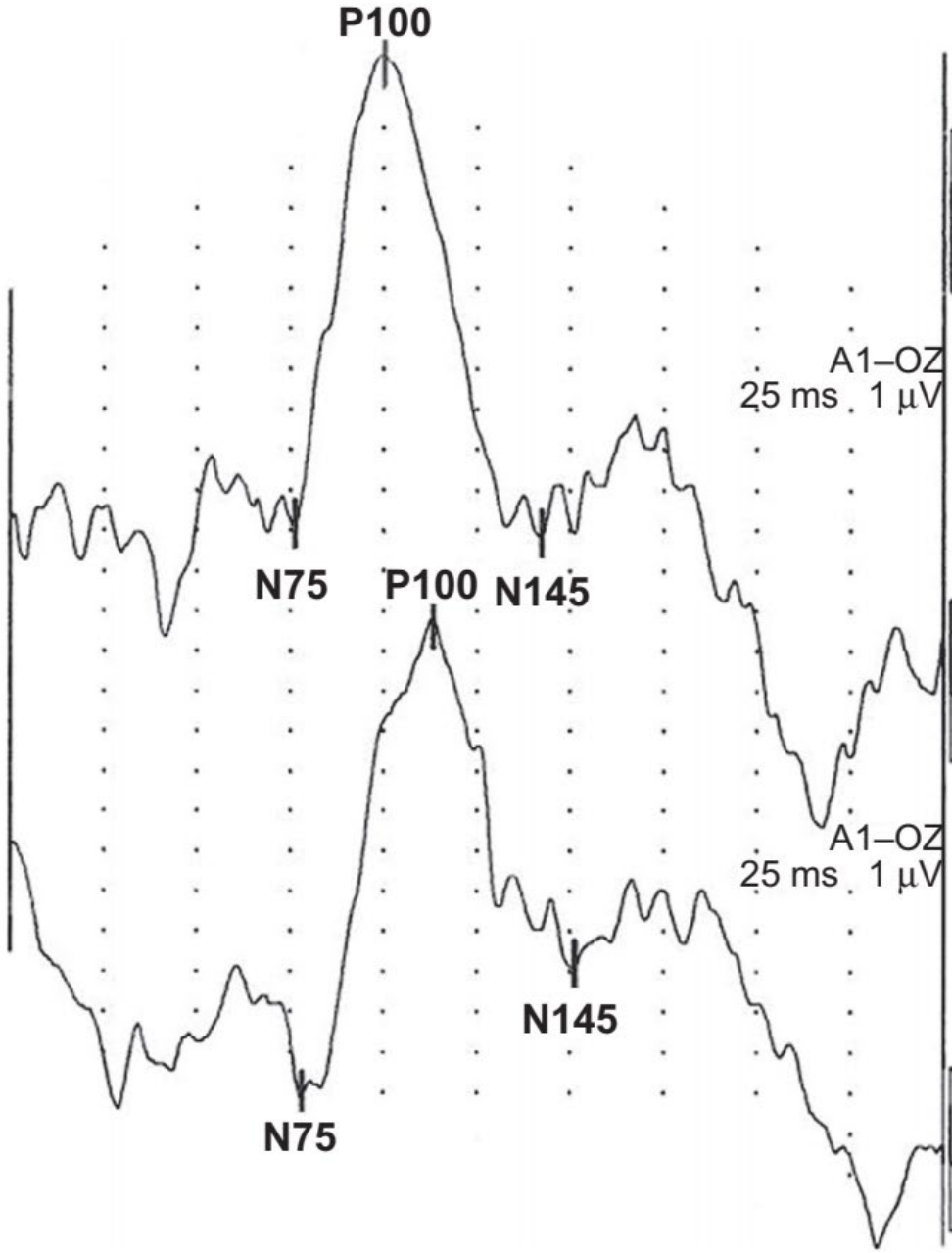
Sono stati sostituiti dalla RM, più sensibile e…specifica

Sclerosi multipla

- Diagnosi della neurite ottica
- Follow-up
- Monitoraggio della terapia

Altre indicazioni

- Traumi
- Quantificare e seguire la progressione di Tumori (neurofibromatosi) e malattie del nervo ottico (neuropatie a varie eziologie)
- Idrocefalo
- Demenze?



Right eye measurements

Text	Lat N75 ms	Lat P100 ms	Lat N145 ms		PP amp 75–100 µV
	1.1:N75	1.1:P100	1.1:N145		1.1:N75 P100
M0	75.8	100	142		11.8

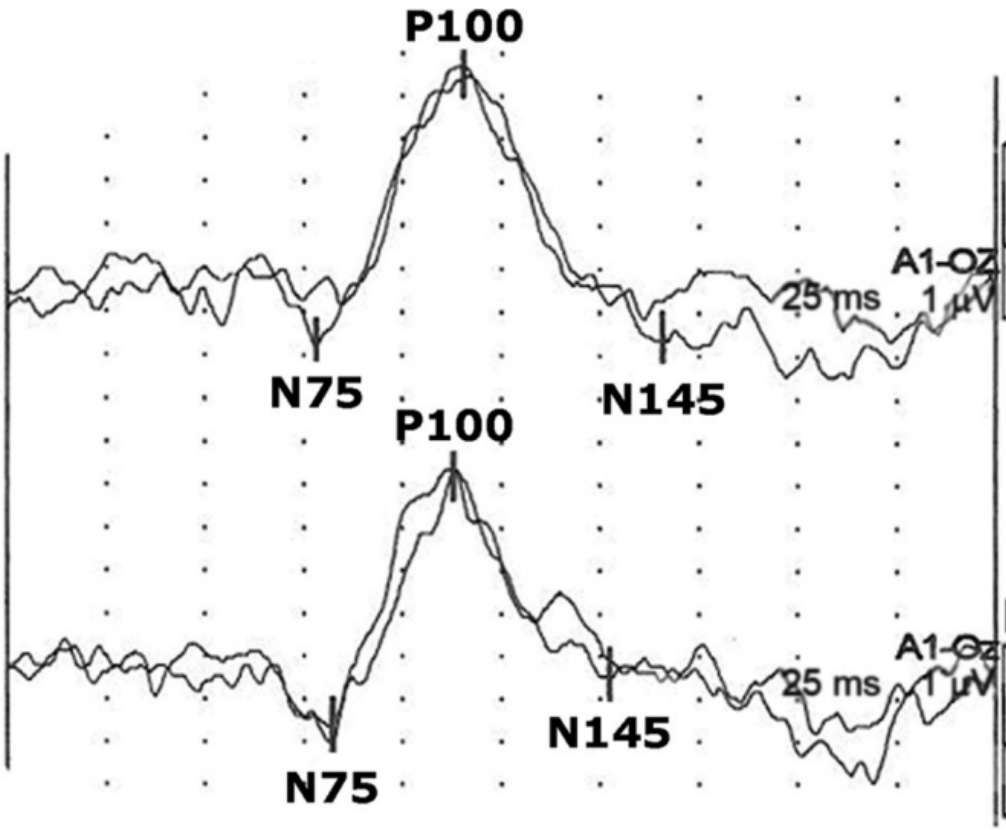
Left eye measurements

Text	Lat N75 ms	Lat P100 ms	Lat N145 ms		PP amp 75–100 µV
	2.1:N75	2.1:P100	2.1:N145		2.1:N75 P100
MO	78.0	113	151		120

Interocular measurements

Text	LatDiff RT–LT ms	PP amp ratio RT–LT %
	1.1:P100|2.1:P100	1.1:N75 P100|2.1:N75 P100
MO	128	102

Fig. 34.13. Initial pattern reversal VEPs recorded from an 8-year-old with NF1 showing slowing of left nerve, but good amplitudes.



Right eye measurements

Text	Lat N75 ms	Lat P100 ms	Lat N145 ms		PP amp 75–100 µV
MO	1.1:N75 78.0	1.1:P100 115	1.1:N145 165		1.1:N75 P100 6.59

Left eye measurements

Text	Lat N75 ms	Lat P100 ms	Lat N145 ms		PP amp 75–100 µV
MO	2.1:N75 82.0	2.1:P100 112	2.1:N145 152		2.1:N75 P100 6.13

ig. 34.19. Pattern reversal VEPs recorded from an adult with meningeal tuberculosis, showing prolonged P100s.

Creel DJ. Visually evoked potentials. Handb Clin Neurol. 2019; 160:501-522.

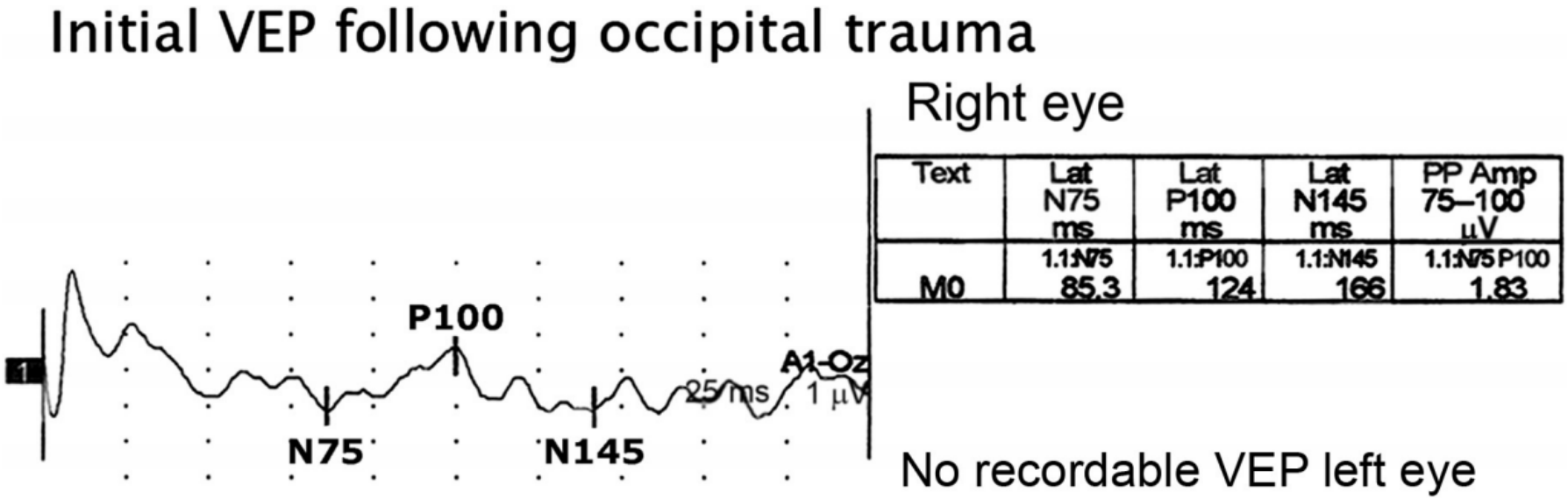
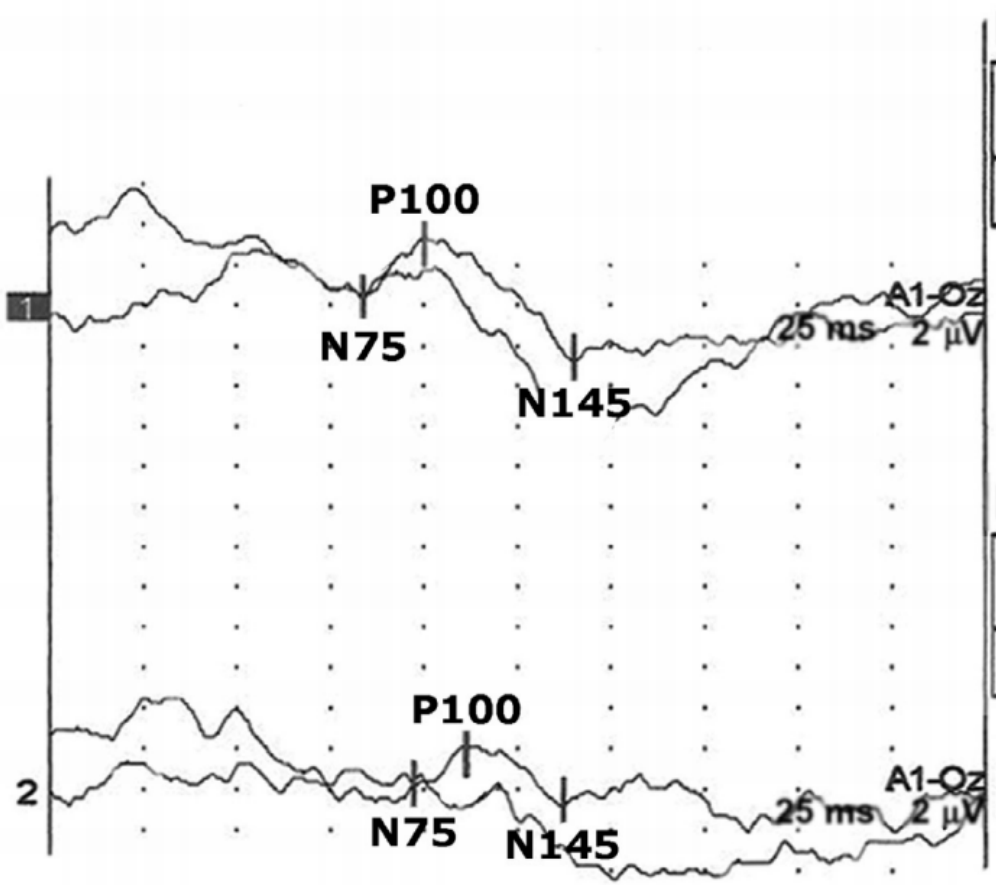


Fig. 34.9. Flash VEPs recorded soon after occipital trauma in 2-year-old showing small amplitude VEP in the right eye and no recordable VEP in the left eye.



Right eye measurements

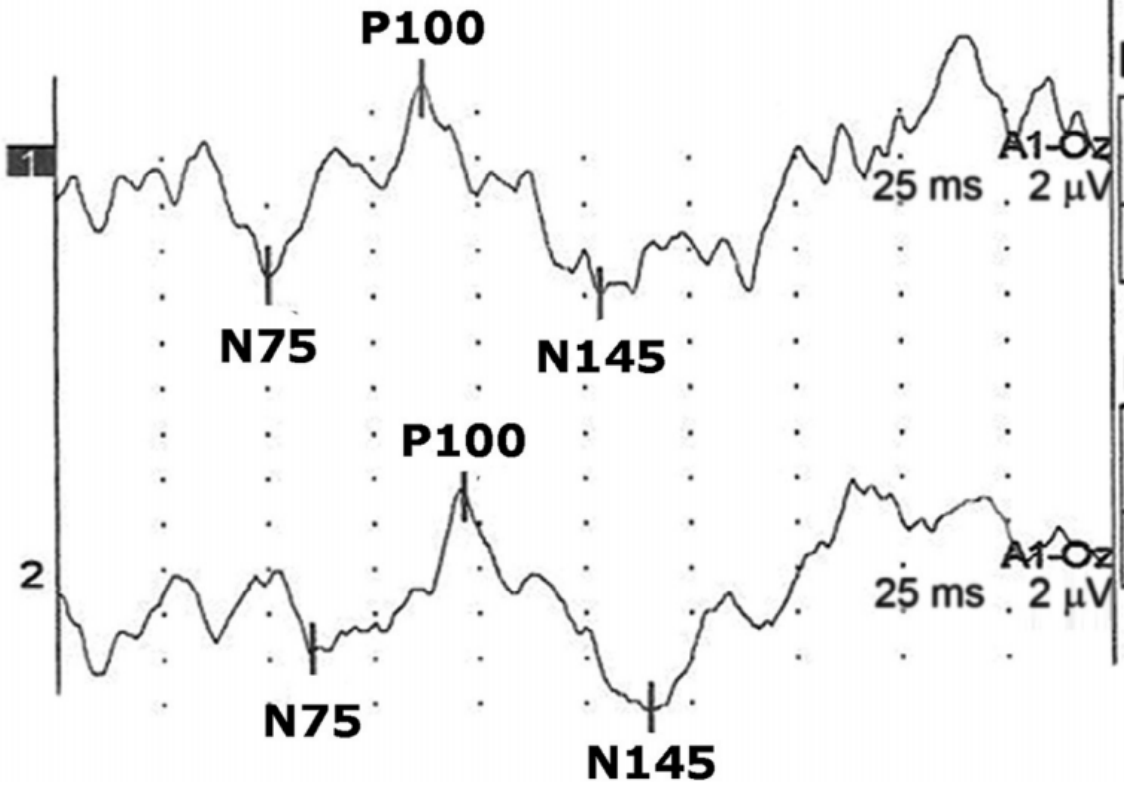
Text	Lat N75 ms	Lat P100 ms	Lat N145 ms	PP amp 75–100 µV
	1.1:N75	1.1:P100	1.1:N145	1.1:N75 P100
M0	83.5	100	140	3.03

Left eye measurements

Text	Lat N75 ms	Lat P100 ms	Lat N145 ms	PP amp 75–100 µV
	2.1:N75	2.1:P100	2.1:N145	2.1:N75 P100
MO	97.0	111	137	1.72

Fig. 34.10. Flash VEPs recorded from same 2-year-old 1 month after occipital trauma, showing some recovery of optic pathway function.

Three months after trauma



Right eye

Lat N75 ms	Lat P100 ms	Lat N145 ms	PP amp 75–100 µV
1.1:N75	1.1:P100	1.1:N145	1.1:N75 P100
50.0	86.5	129	8.47

Left eye

Lat N75 ms	Lat P100 ms	Lat N145 ms	PP amp 75–100 µV
2.1:N75	2.1:P100	2.1:N145	2.1:N75 P100
60.0	95.8	140	7.54

Interocular comparison

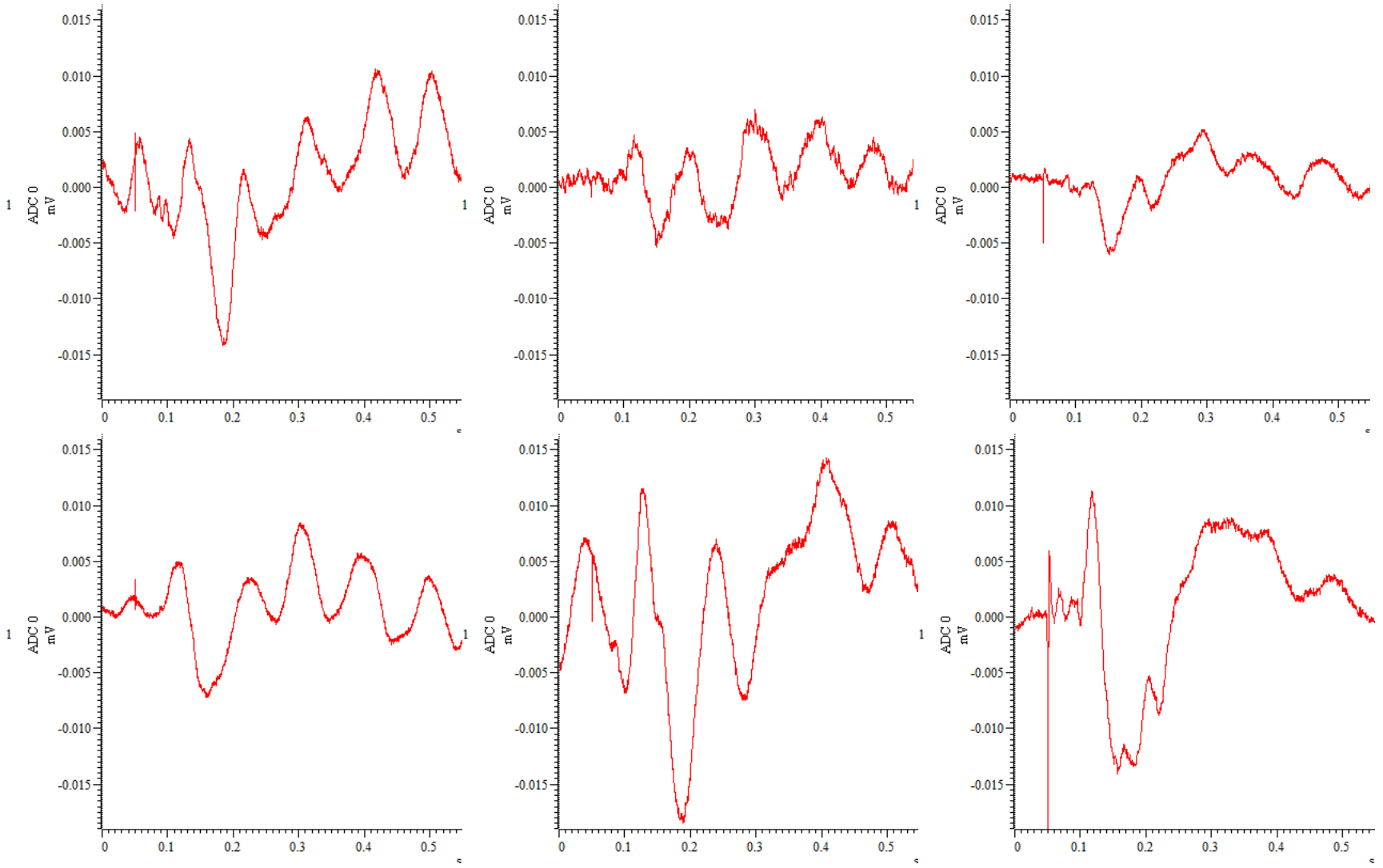
LatDiff RT–LT ms	PP amp ratio RT–LT %
1.1:P100| 2.1:P100	1.1:N75 P100| 2.1:N75 P100
9.25	88.9

Fig. 34.11. Flash VEPs recorded from same 2-year-old 2 months after occipital trauma, showing further recovery.

PEV da flash

- Durata flash con lampada allo xenon: 20 μs; 0.64 J
- Durata flash con LED: 1-5 ms. Energia minore

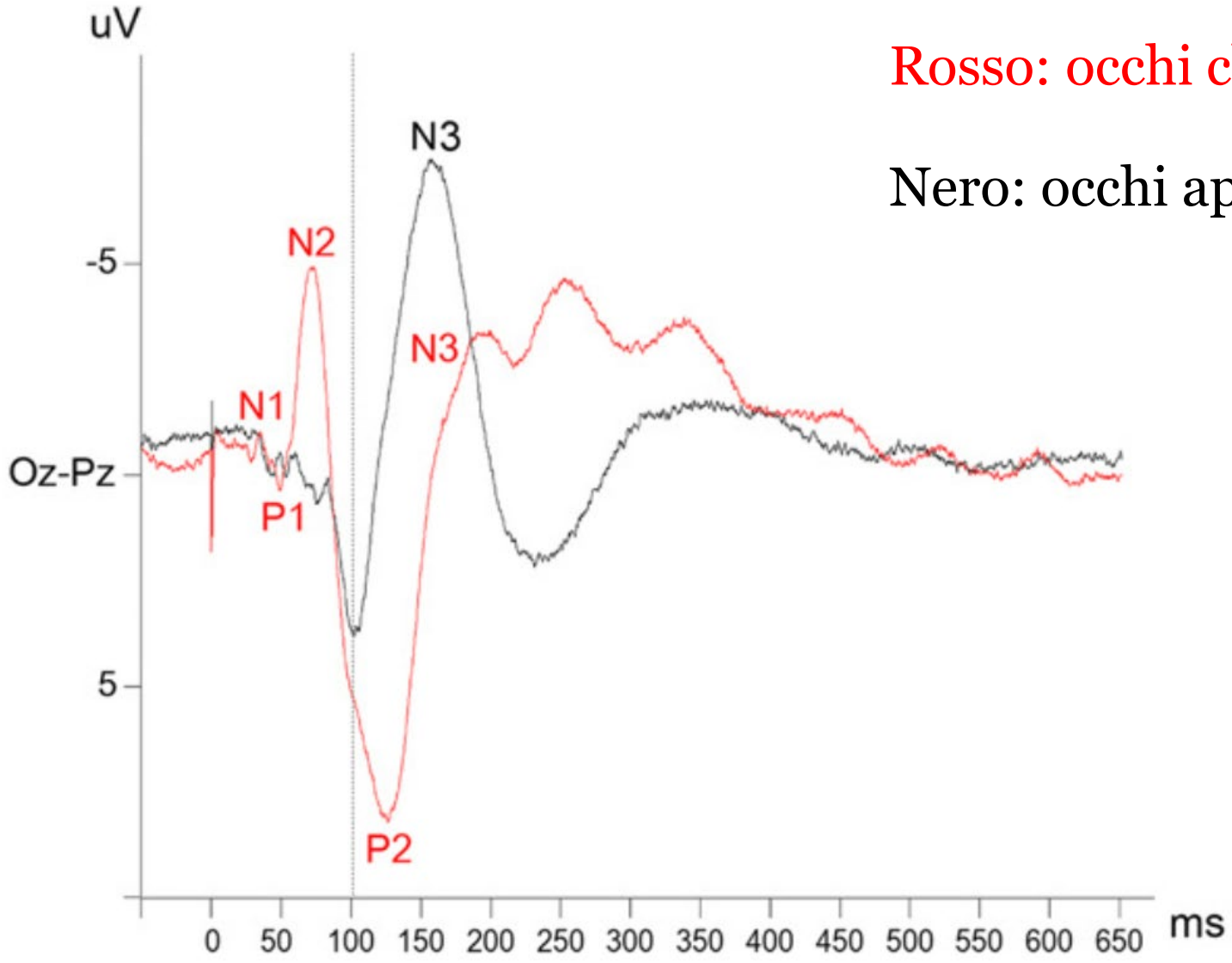
Variabilità PEV da flash



PEV da flash

- Molto variabili in ***ampiezza*** e ***morfologia***
- Quando sono utili: scarsa collaborazione, inadeguata fissazione

  (bambini piccoli, pazienti con nistagmo, ipovisus e sopore, coma)
- I picchi sono positivi e negativi, sequenza di numeri



Rosso: occhi chiusi

Nero: occhi aperti

		Amplitude (uV)	Latency (ms)
Oz-Pz	EC	16.4 SD 6.4[a]	124.5 SD 8.4[a]
	EO	12.3 SD 4.4	103.1 SD 4.9

Clinical Neurophysiology 122 (2011) 1622–1628

Contents lists available at ScienceDirect

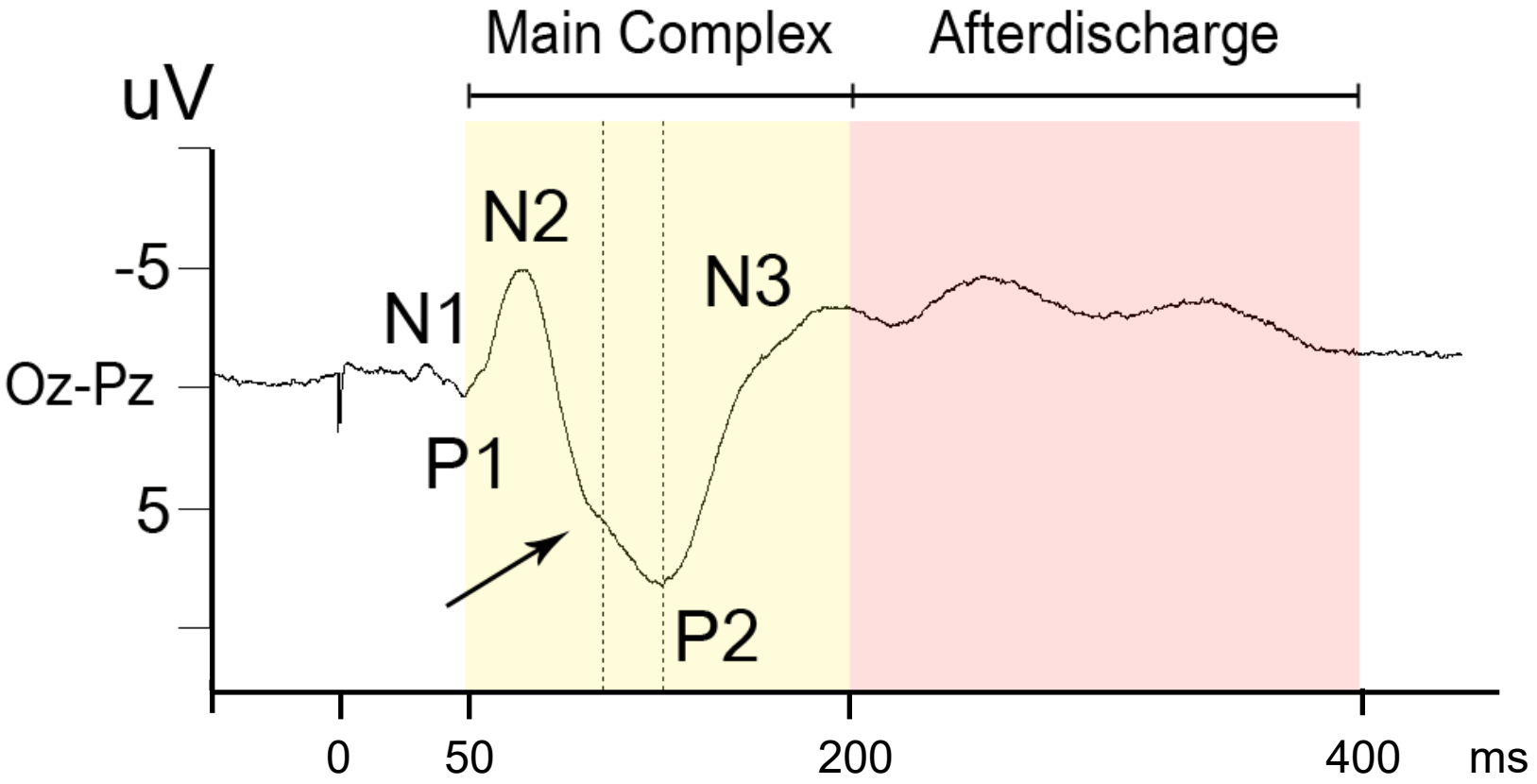
Clinical Neurophysiology

journal homepage: www.elsevier.com/locate/clinph

Paired-pulse flash-visual evoked potentials: New methods revive an old test

Roberto Cantello *, Gionata Strigaro, Paolo Prandi, Claudia Varrasi, Marco Mula, Francesco Monaco

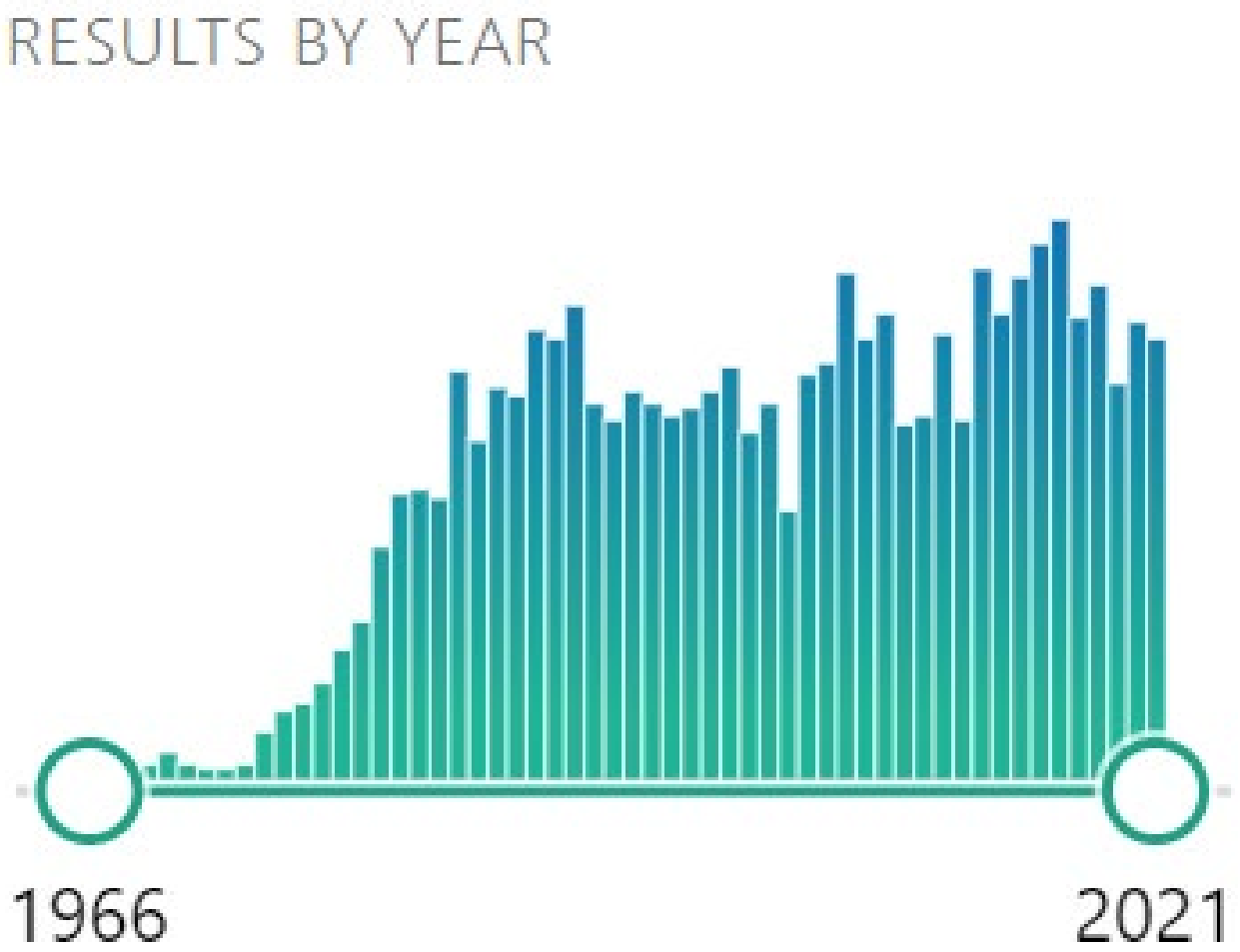
Department of Clinical and Experimental Medicine, Section of Neurology, University of Piedmont East "A. Avogadro", Novara, Italy



Sommario

1. Dall'EEG ai PEV
2. Come si fanno?
3. A cosa servono?
4. Spunti di ricerca

I PEV non sono antiquariato



Epilepsy Research 172 (2021) 106597

Contents lists available at ScienceDirect

Epilepsy Research

journal homepage: www.elsevier.com/locate/epilepsyres

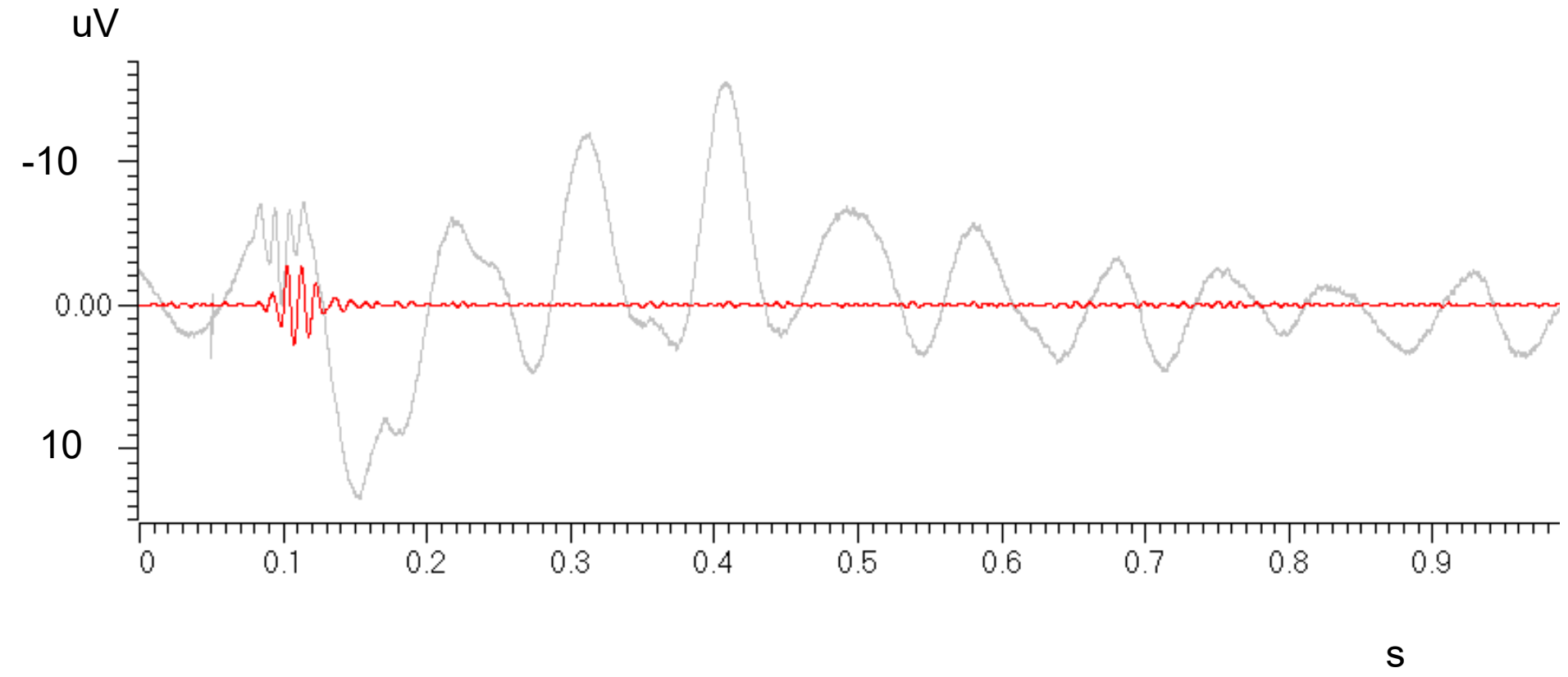
Flash-evoked high-frequency EEG oscillations in photosensitive epilepsies

Gionata Strigaro *, Benedetta Gori, Claudia Varrasi, Thomas Fleetwood, Giorgio Cantello, Roberto Cantello

Neurology Unit, Department of Translational Medicine, University of Piemonte Orientale, Azienda Ospedaliero-Universitaria "Maggiore della Carità", Novara, Italy

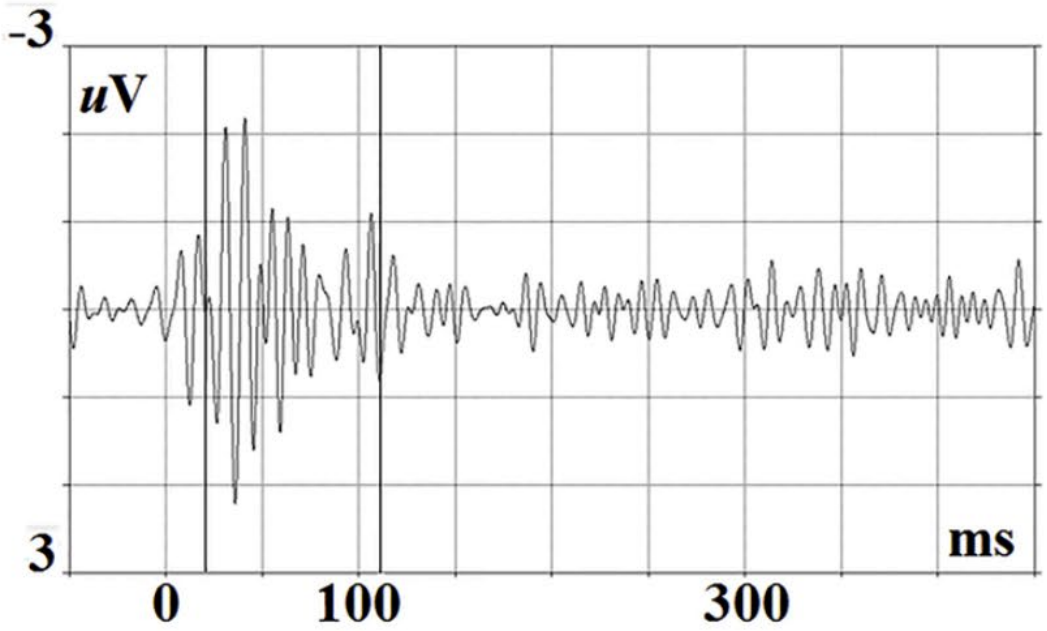
Oscillazioni ad alta frequenza (OAF)

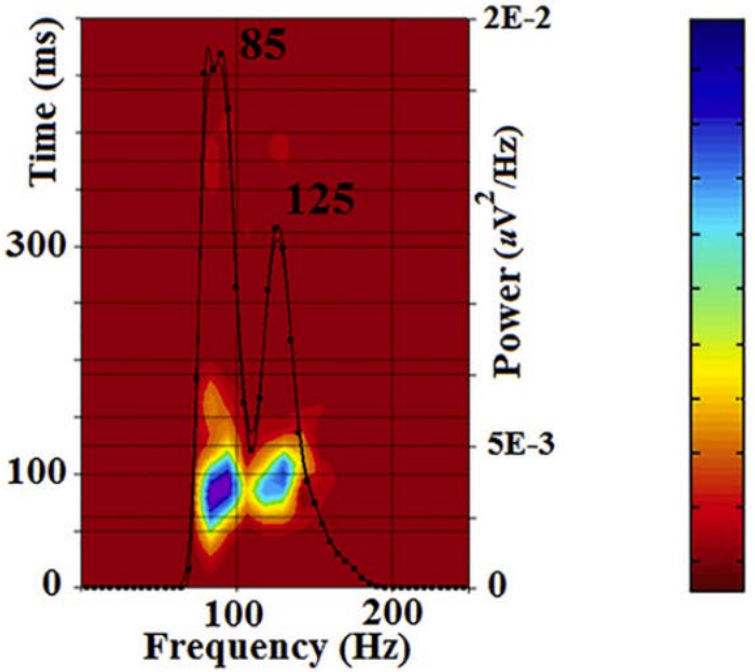
F-PEV filtrati per estrarre la banda in frequenza da 75 a 175 Hz



Strigaro et al. 2021

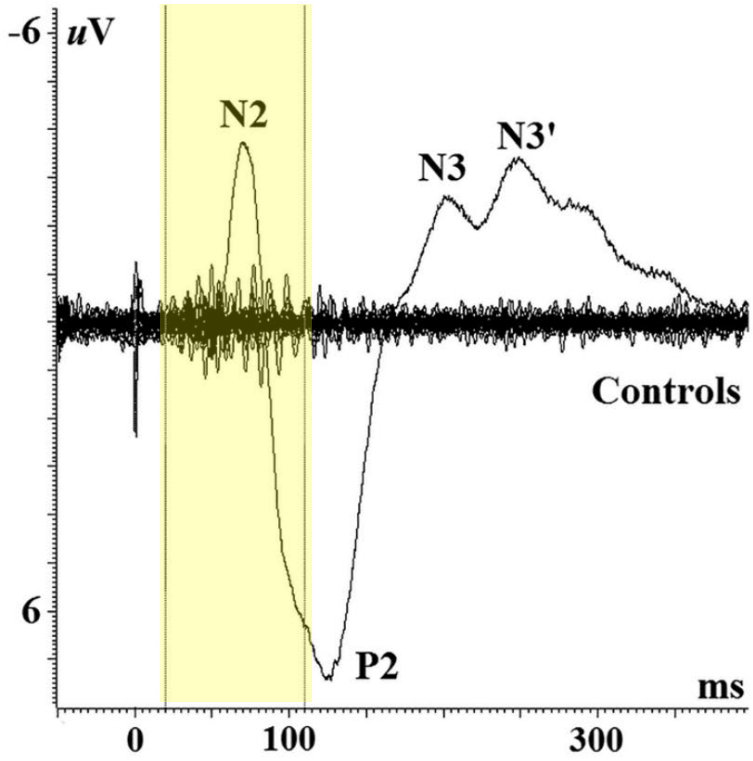
Oscillazioni ad alta frequenza (OAF)





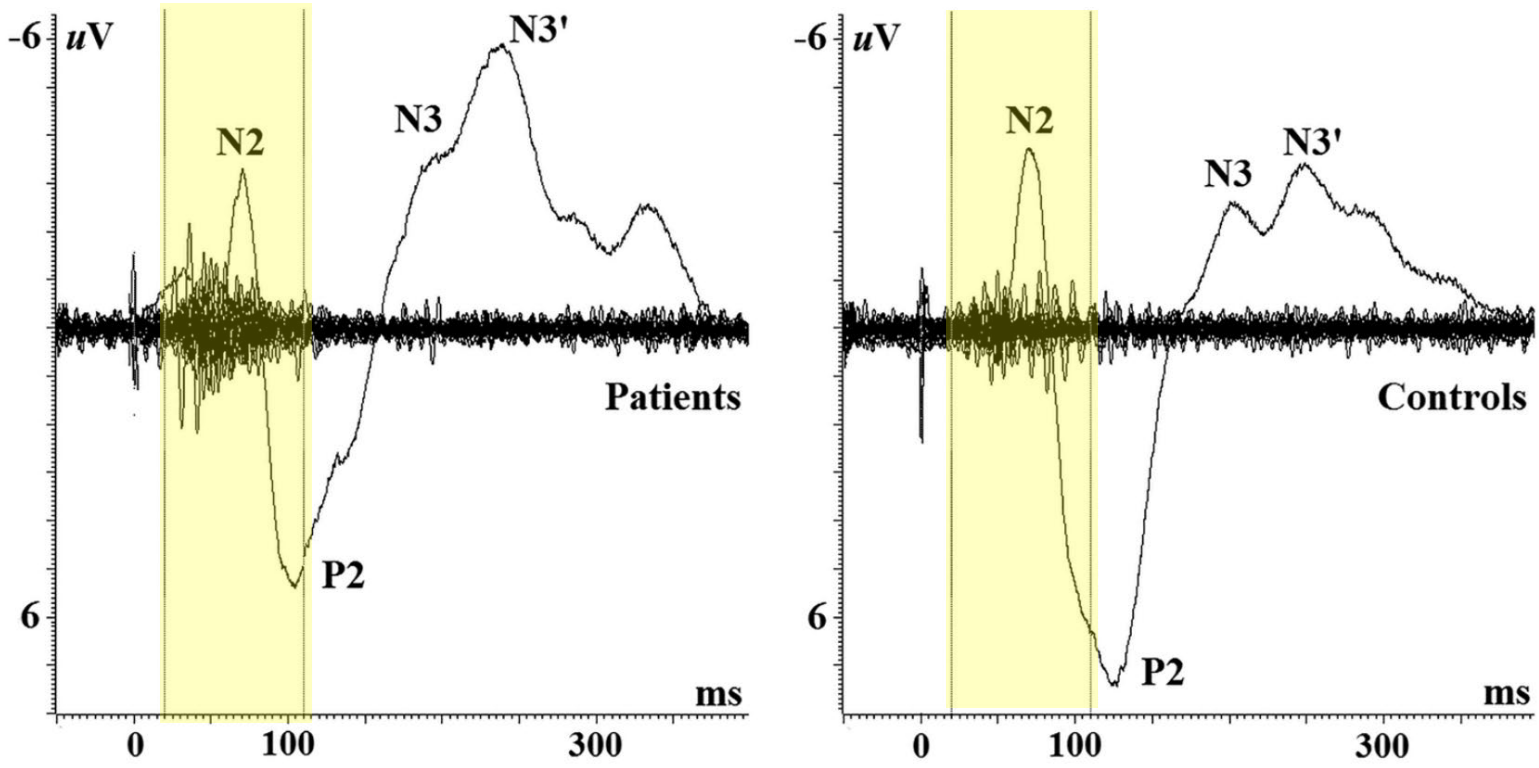
Strigaro et al. 2021

Oscillazioni ad alta frequenza (OAF)



Strigaro et al. 2021

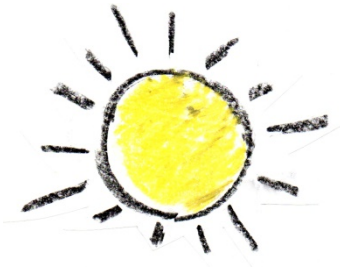
Oscillazioni ad alta frequenza (OAF)



Strigaro et al. 2021

Il F-PEV contiene dell'attività oscillatoria ad alta frequenza (OAF).
RFP: OAF incrementate in termini di **ampiezza** e di **potenza spettrale** = suggerendo un ruolo nella generazione della risposta fotoparossistica.

FOTOSENSIBILITA’



L’attività epilettica è indotta da stimoli luminosi intermittenti nei soggetti predisposti

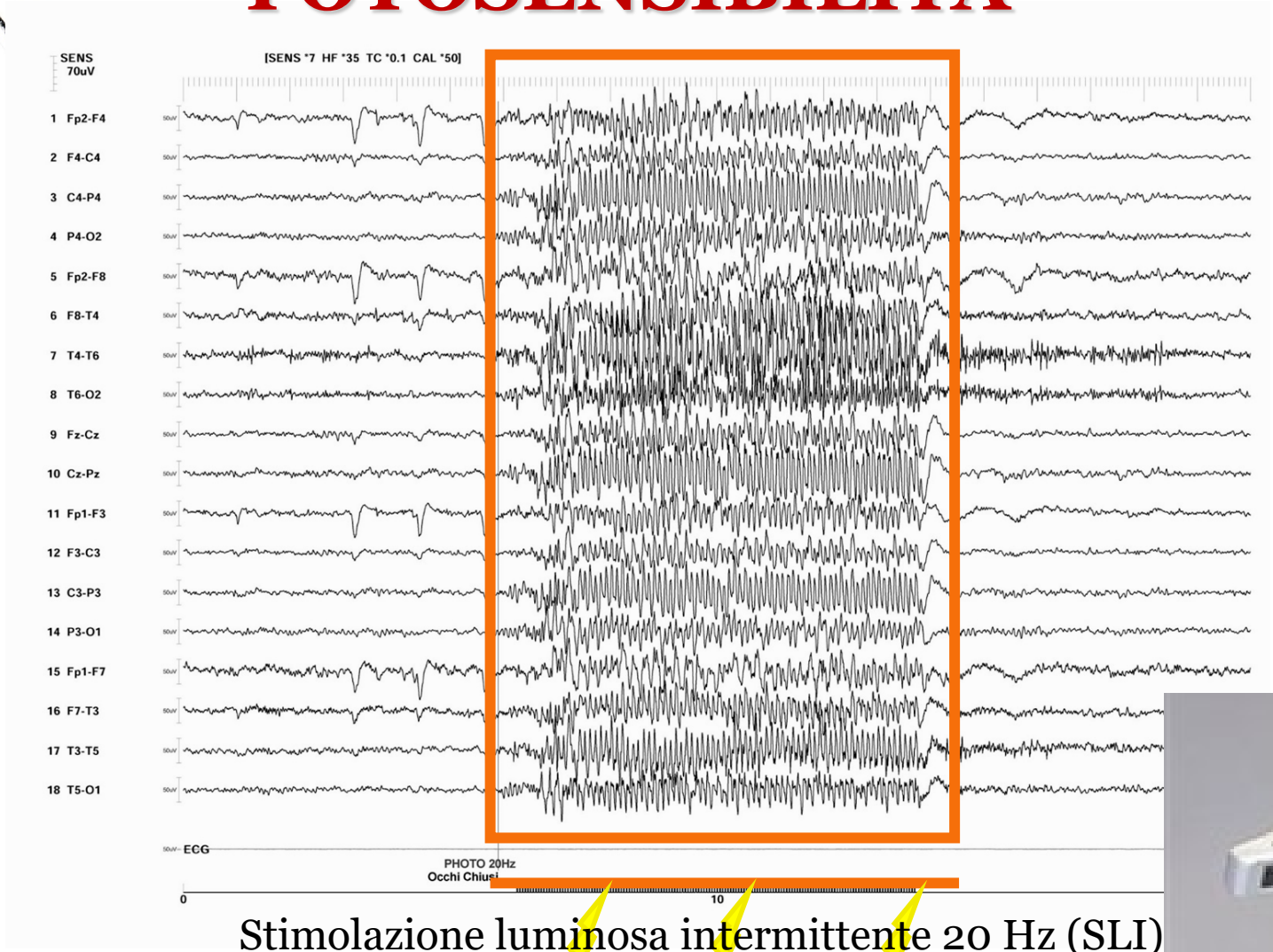
Manifestazione cliniche:

- sintomi visivi
- movimenti involontari

  (es. **mioclonie** agli arti)
- assenze

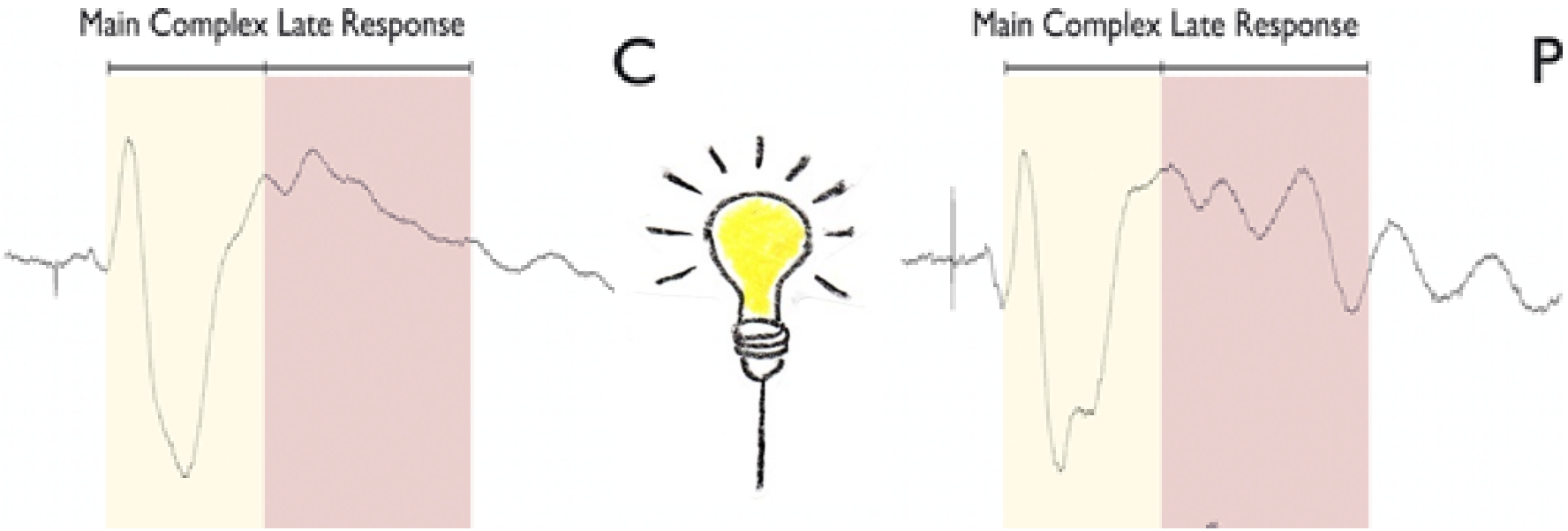
Crisi tonico-cloniche generalizzate

RISPOSTA FOTOPAROSSISTICA: FORMA ELEMENTARE DI FOTOSENSIBILITA’

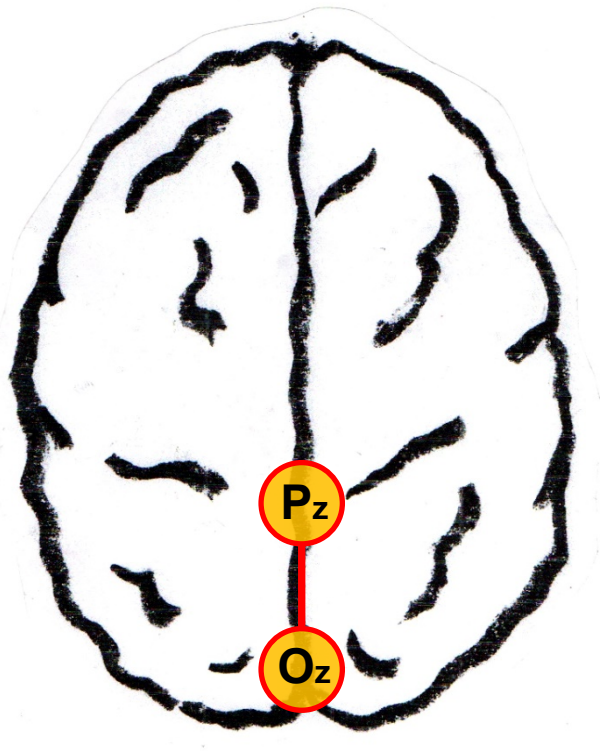


Stimolazione luminosa intermittente 20 Hz (SLI)

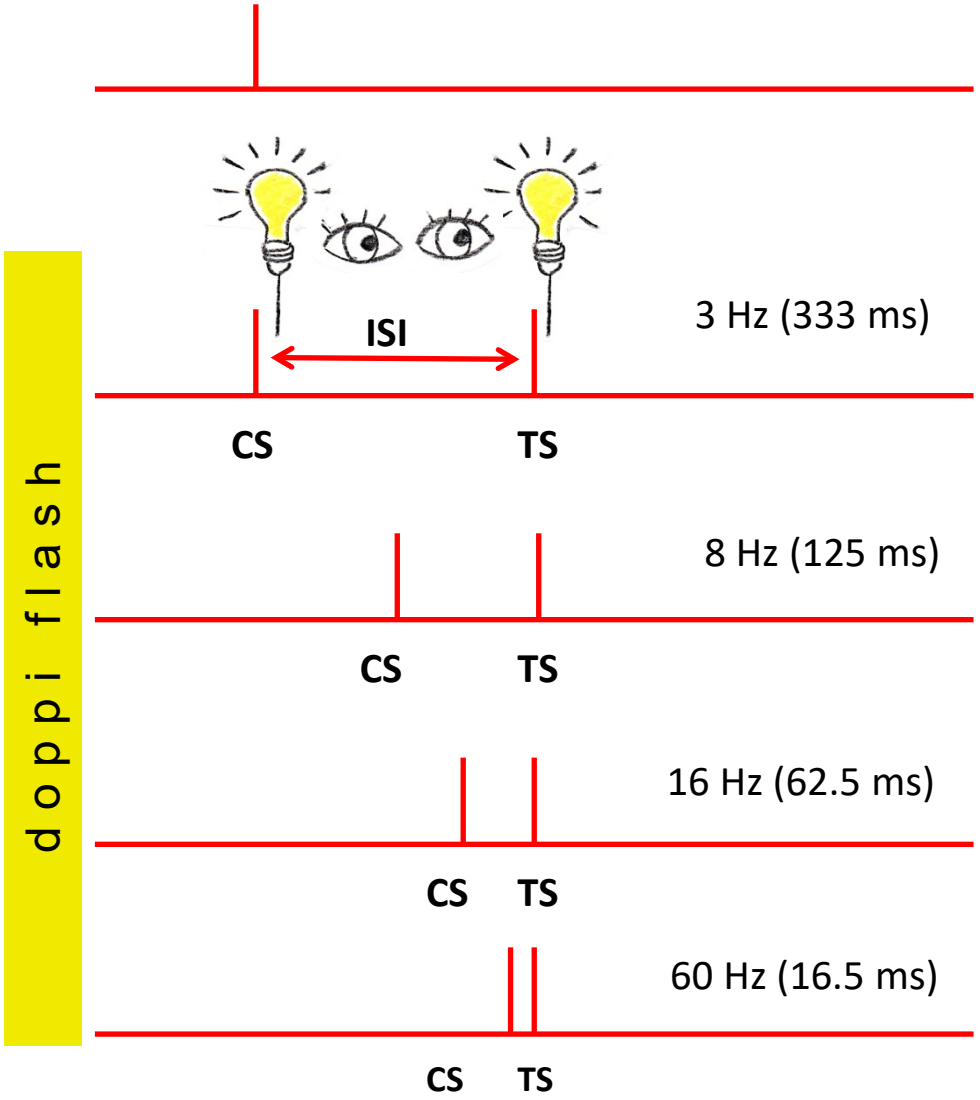
POTENZIALI EVOCATI VISIVI DA SINGOLO FLASH (F-PEV)



PEV da doppio flash



Flash di luce bianca (0.64 Joules), singoli o doppi, ripetuti 100 volte per ogni condizione



Cantello et al. 2011

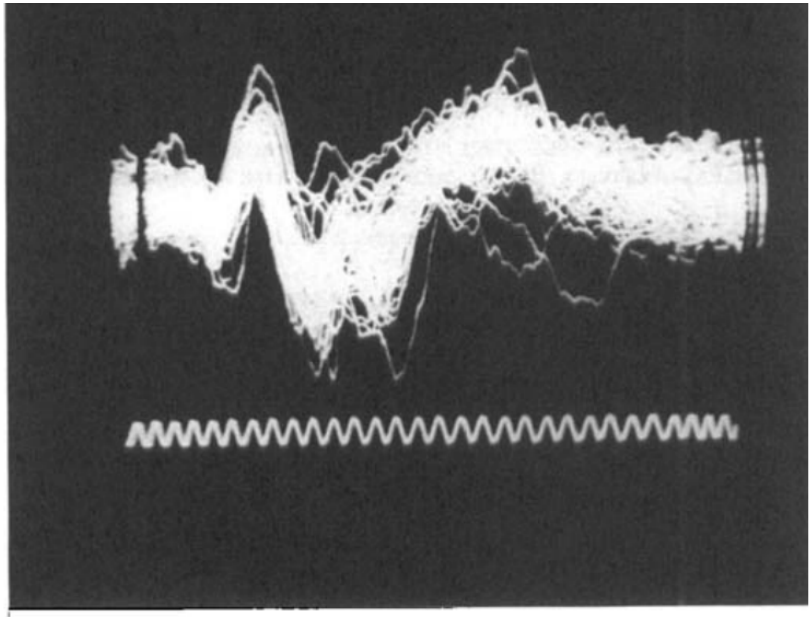
Ann N Y Acad Sci 1964

EXCITABILITY CYCLE OF THE VISUAL CORTEX IN MAN

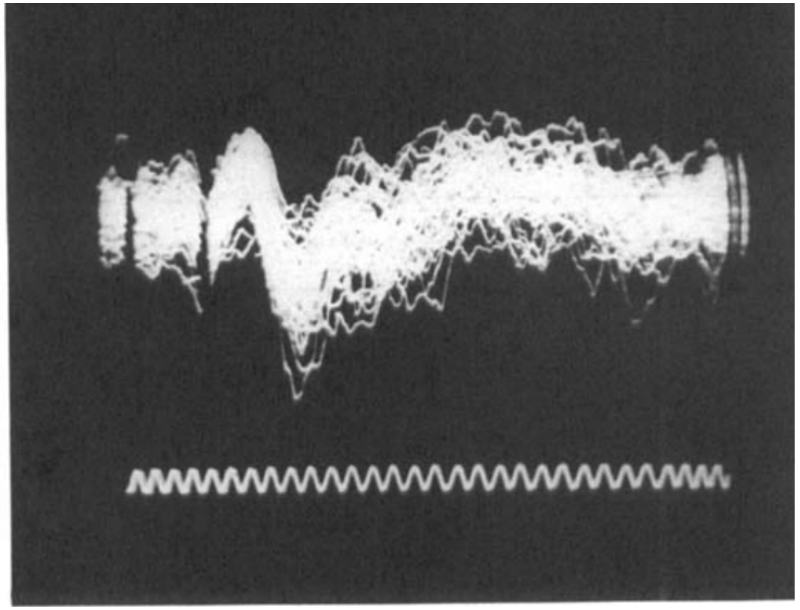
L. Cigánek

Department of Clinical Electrophysiology, Institute of Experimental Medicine of the Slovak Academy of Sciences, Bratislava, Czechoslovakia.

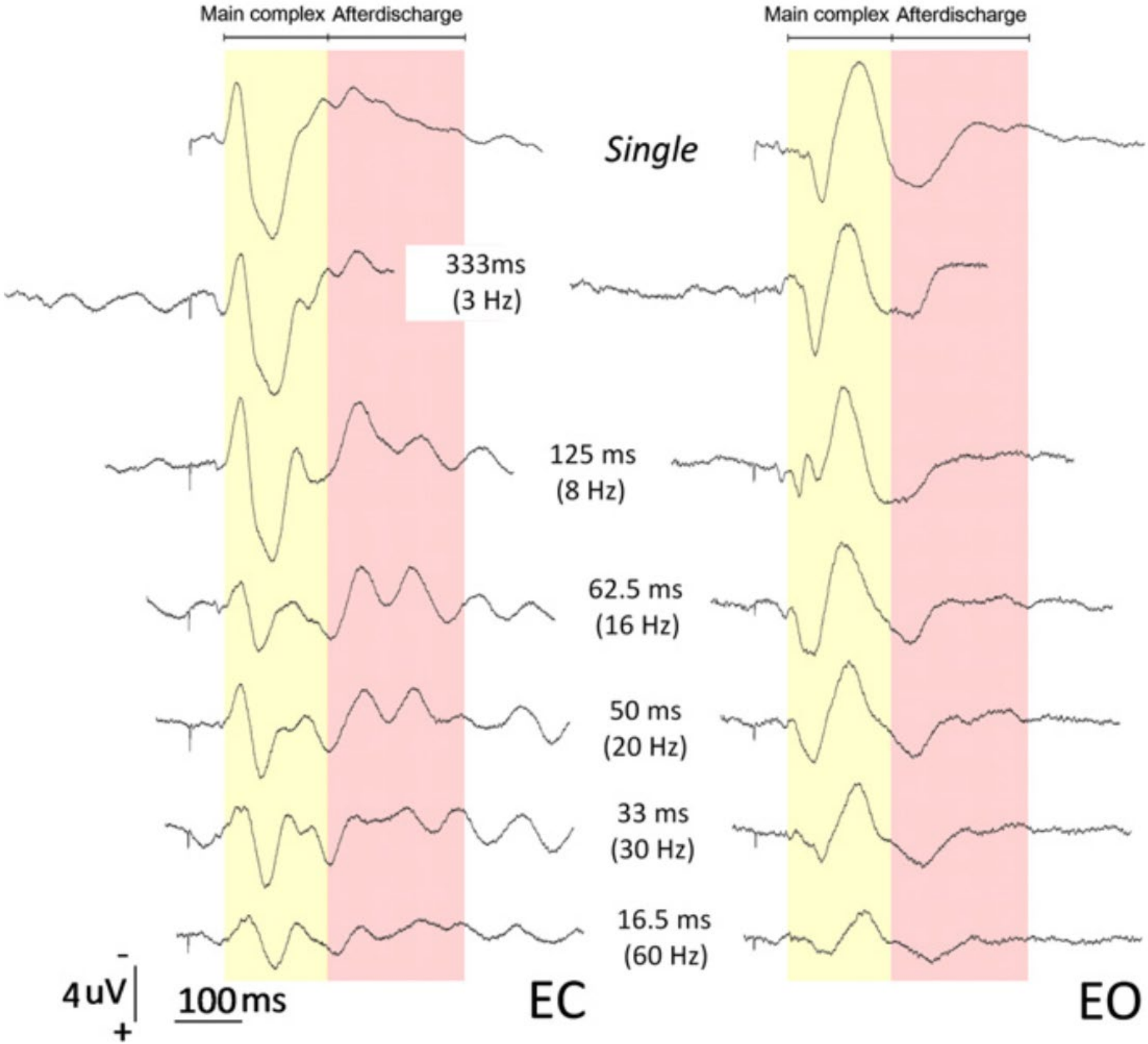
This paper deals with the excitability cycle of human visual cortex. For this purpose the responses (evoked potentials) to paired "conditioning" and "test" flashes, separated by varying intervals, were compared.



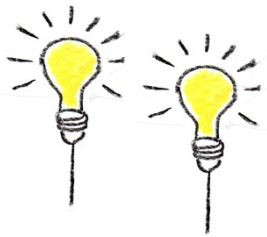
PEV da singolo flash

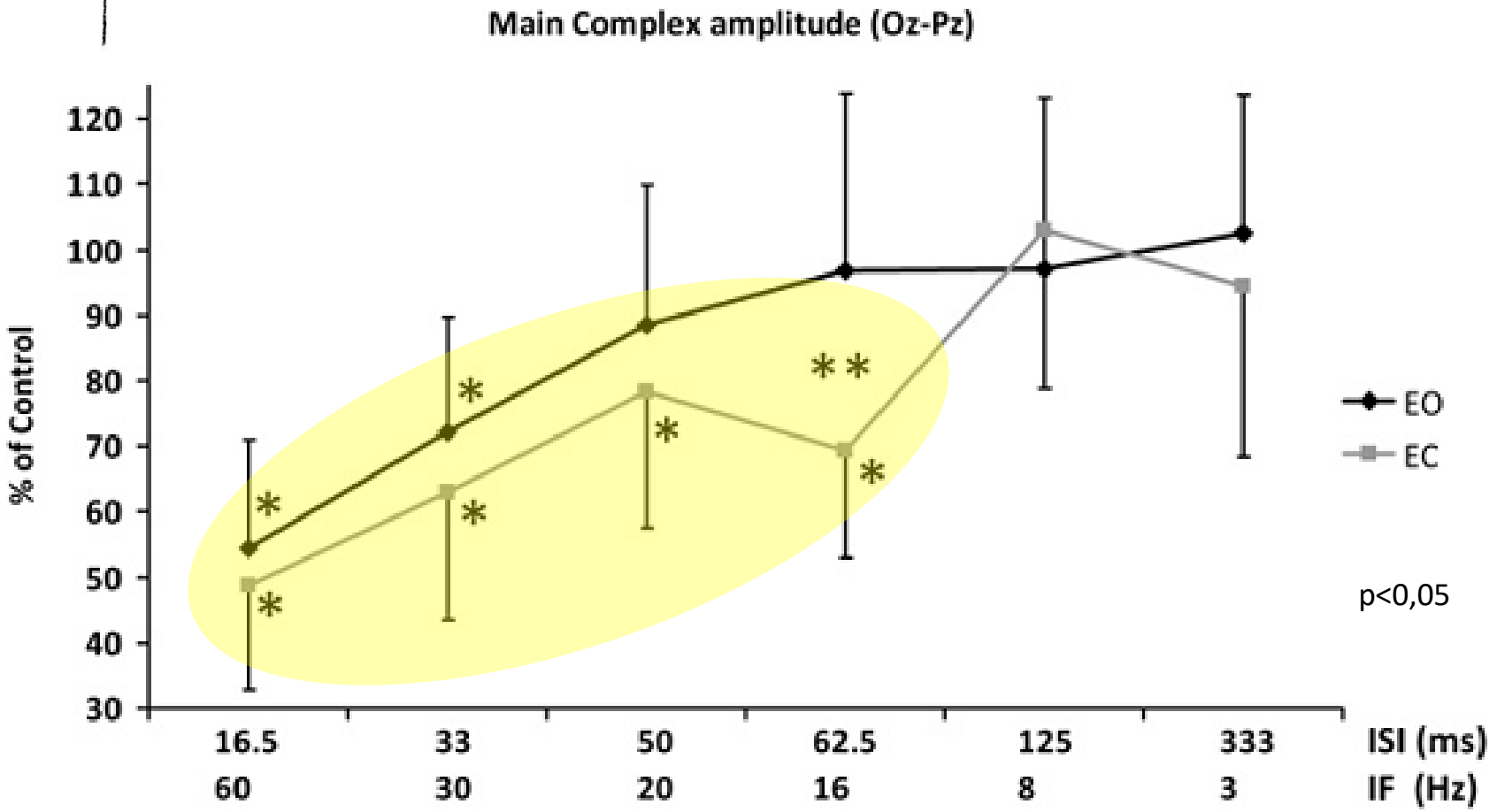


PEV da doppio flash (ISI 40 ms)


Main complex
Afterdischarge
Main complex
Afterdischarge
Single
333ms
(3 Hz)
125 ms
(8 Hz)
62.5 ms
(16 Hz)
50 ms
(20 Hz)
33 ms
(30 Hz)
16.5 ms
(60 Hz)
4uV
100ms
EC
EO

PEV da doppio flash

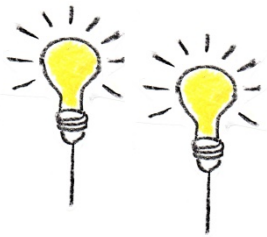


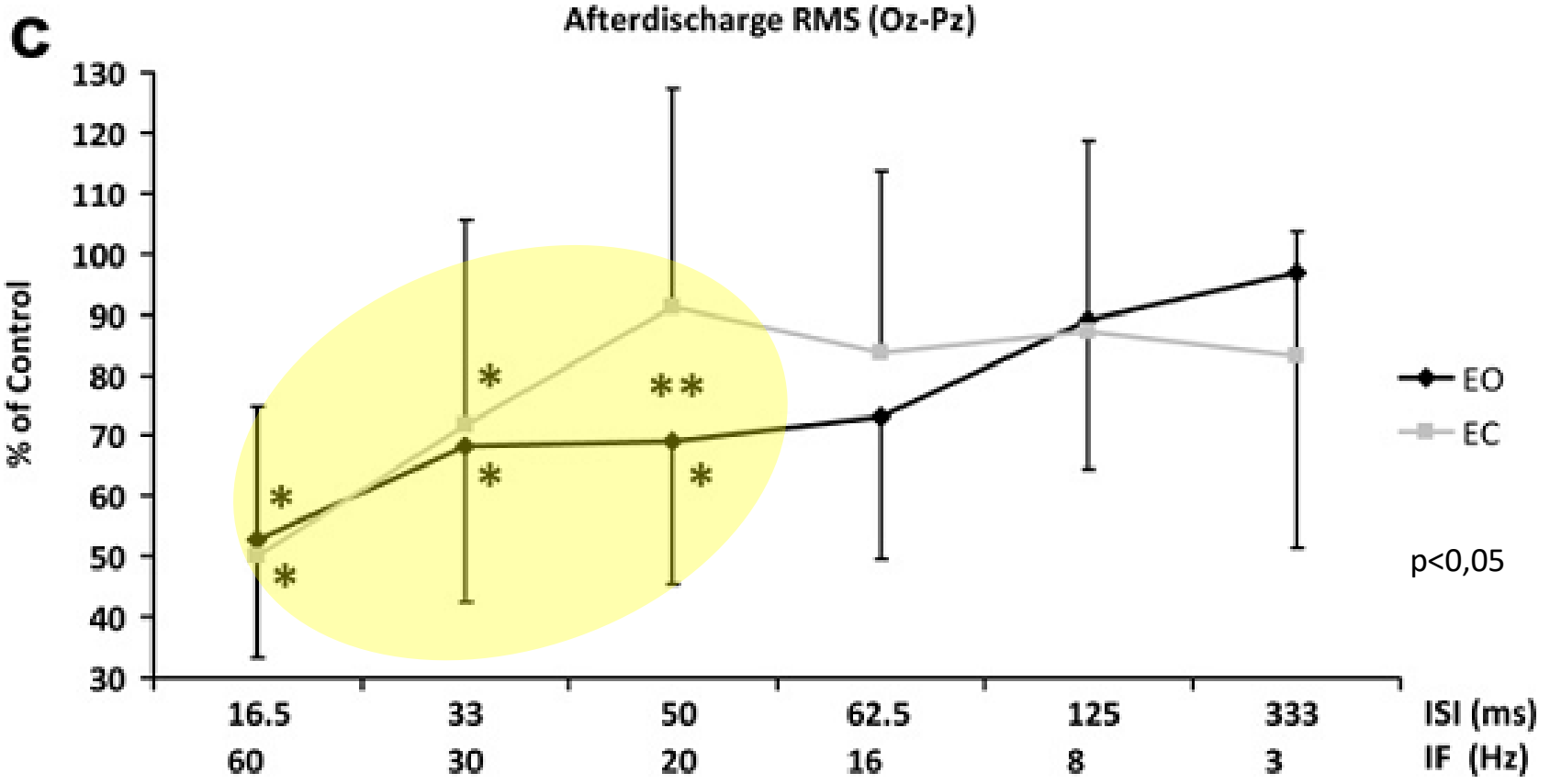


Effetti inibitori dipendono:

- intervallo interstimolo (ISI)
- stato degli occhi

PEV da doppio flash





PEV da doppio flash

Epilepsia, 53(4):695–704, 2012
doi: 10.1111/j.1528-1167.2012.03411.x

Epilepsia
Official Journal of the International League Against Epilepsy

FULL-LENGTH ORIGINAL RESEARCH

Defective visual inhibition in photosensitive idiopathic generalized epilepsy

Gionata Strigaro, Paolo Prandi, Claudia Varrasi, [1]Francesco Monaco, and Roberto Cantello

Department of Clinical and Experimental Medicine, Section of Neurology, University of Piedmont East, "A. Avogadro," Novara, Italy

- 19 pazienti con EGI e fotosensibilità
  (16 donne, età media 27.7; SD 7.4)
- 22 volontari sani
  (17 donne, età media 23.3; SD 2.1)

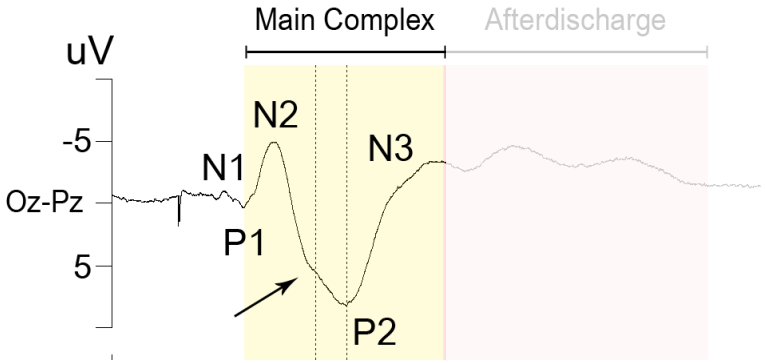
Table 1. Main features of the patients

Patient no.	Age	Sex	Age at onset	Syndromic diagnosis	Reported seizure frequency	Current treatment (mg/die)
1	20	F	18	JME	Free	LEV 1000
2	18	F	16	JME	Free	VPA 800
3	29	F	15	JME	2/year	VPA 1000
4	45	F	17	JME	2/year	VPA 1300 LEV 1000
5	25	F	18	JME	Free	VPA 1000
6	21	F	12	JME	Free	LTG 250
7	32	M	12	JME	2–4/month (myoclonus)	VPA 1000
8	24	F	19	JME	Free	LEV 1000
9	28	M	15	JME	2–4/week (myoclonus)	VPA 1000 LEV 1000
10	35	F	13	JME	Free (since 1998)	VPA 600
11	28	M	12	JME	Free	VPA 1000
12	16	F	16	Photosensitive IGE	1/year	Refused
13	34	F	8	Photosensitive IGE	Free	PB 150
14	33	F	22	Photosensitive IGE	Free	VPA 1000
15	23	F	7	CAE	Free	None
16	25	F	25	Photosensitive IGE	1/year	VPA 1000
17	40	F	12	EMA	Persistent eyelid myoclonia on eye closure	PB 125
18	26	F	14	JAE	Free	VPA 900
19	24	F	7	Photosensitive IGE	Free	TPM 200

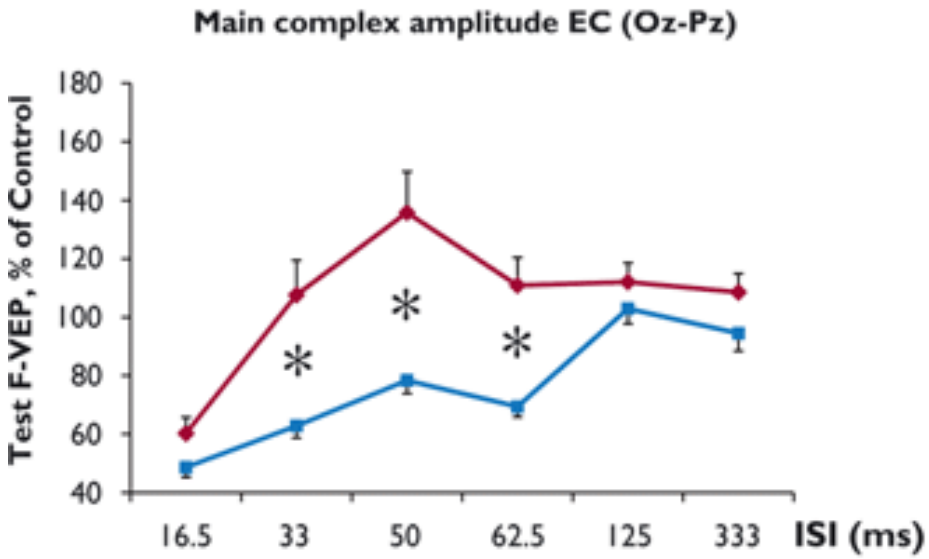
CAE, childhood absence epilepsy; EMA, eyelid myoclonia with absences; JAE, juvenile absence epilepsy; IGE, idiopathic generalized epilepsy; JME, juvenile myoclonic epilepsy; LEV, levetiracetam; VPA, sodium valproate; LTG, lamotrigine; PB, phenobarbital; TPM, topiramate.

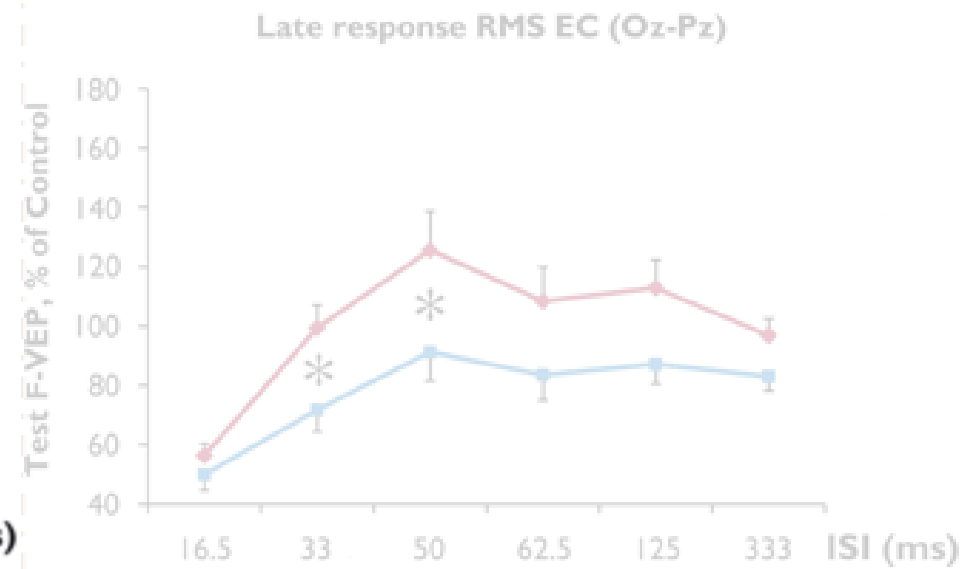
Occhi chiusi
pazienti vs controlli

Oz



Pazienti
Controlli





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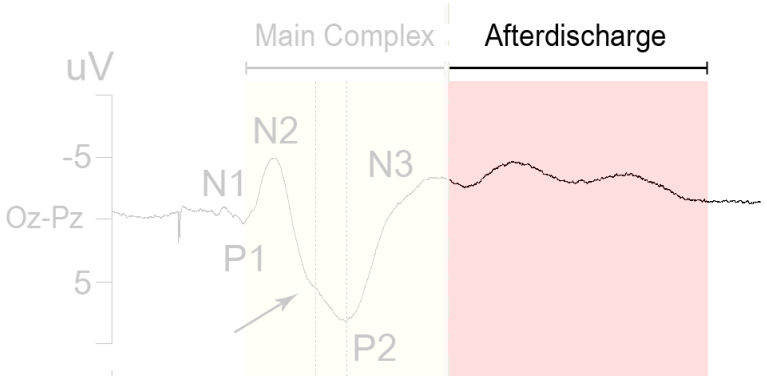
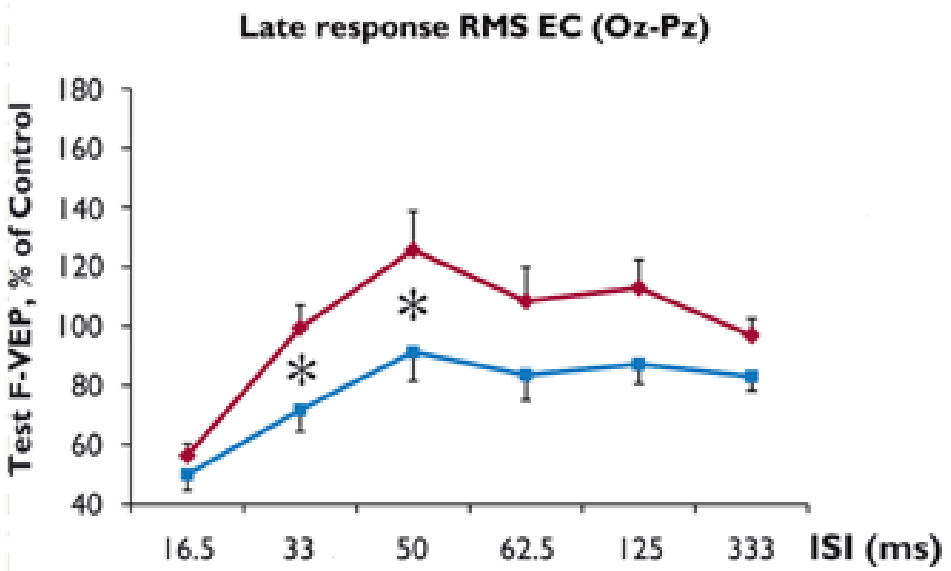
Occhi chiusi
pazienti vs controlli

Oz



Pazienti
Controlli



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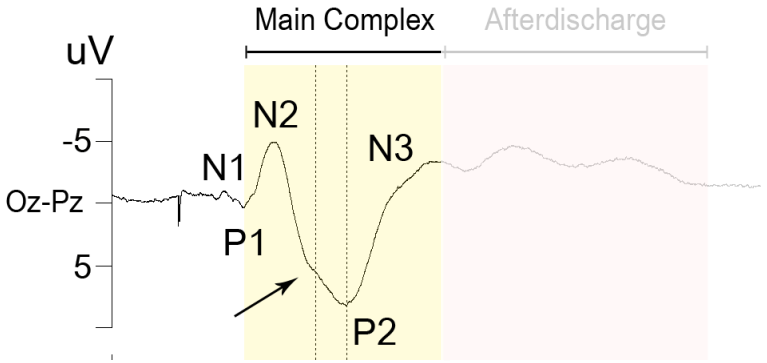
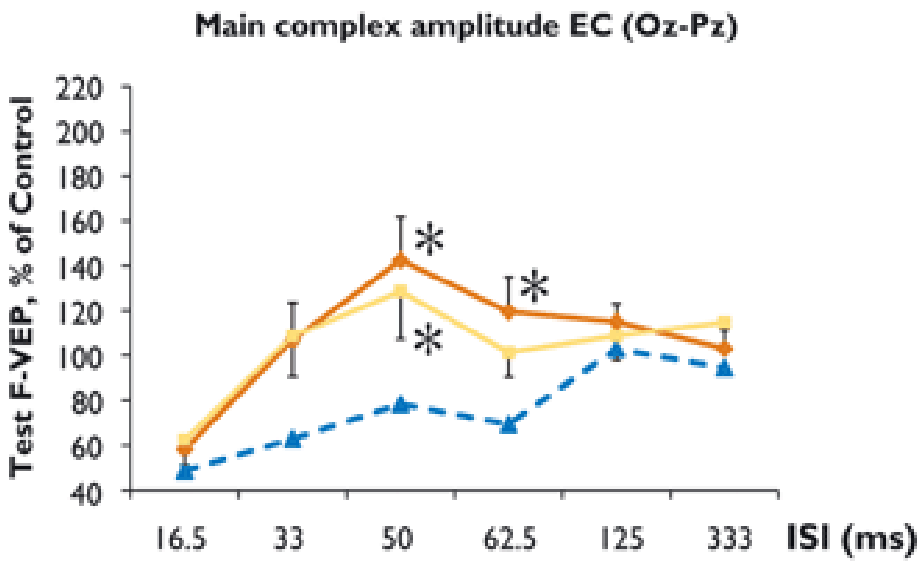
Occhi chiusi in funzione del tipo di RFP

Oz

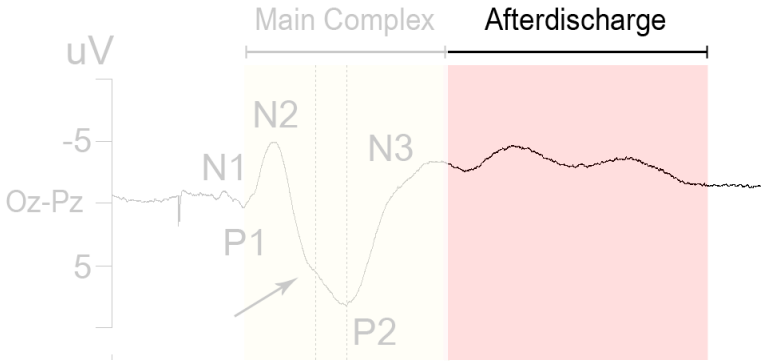


Tipo III-IV
Tipo II
Controlli

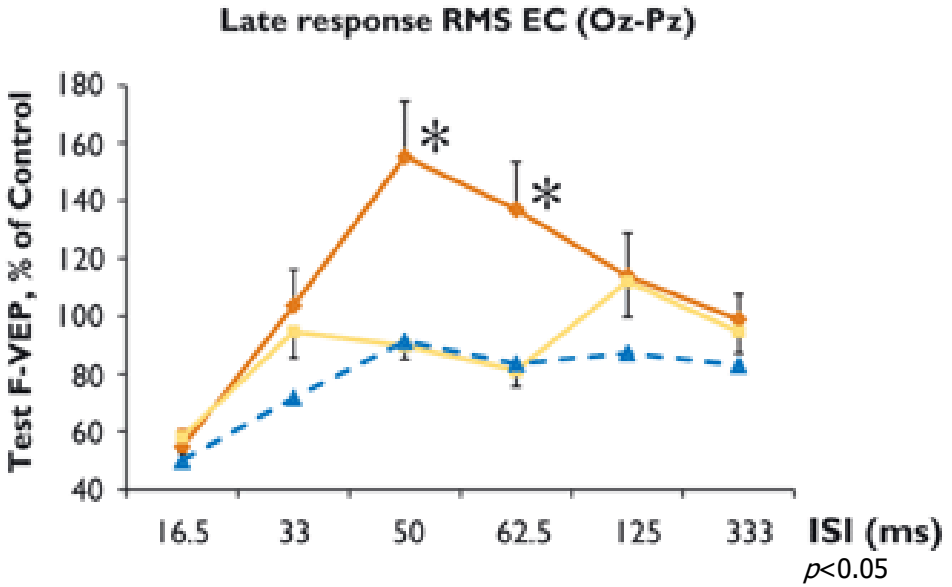


Occhi chiusi in funzione del tipo di RFP

Oz



Tipo III-IV
Tipo II
Controlli



$p<0.05$

Risposta fotoparossistica implica

<u>Deficit di inibizione nel sistema visivo</u>

- occhi chiusi
- 16 e 20 Hz
  = condizioni in cui la SLI è particolarmente attivante
- più grave in RFP diffusa

I PEV sono nati con l'EEG

E bisogna volergli bene

Chiedeteli

Interpretateli

Non vi deluderanno!