8ª Giornata dello Specializzando in Neurologia
Catania, 11 giugno 2019

Visual cortical excitability in patients with fibromyalgia

A study with sound induced flash illusions

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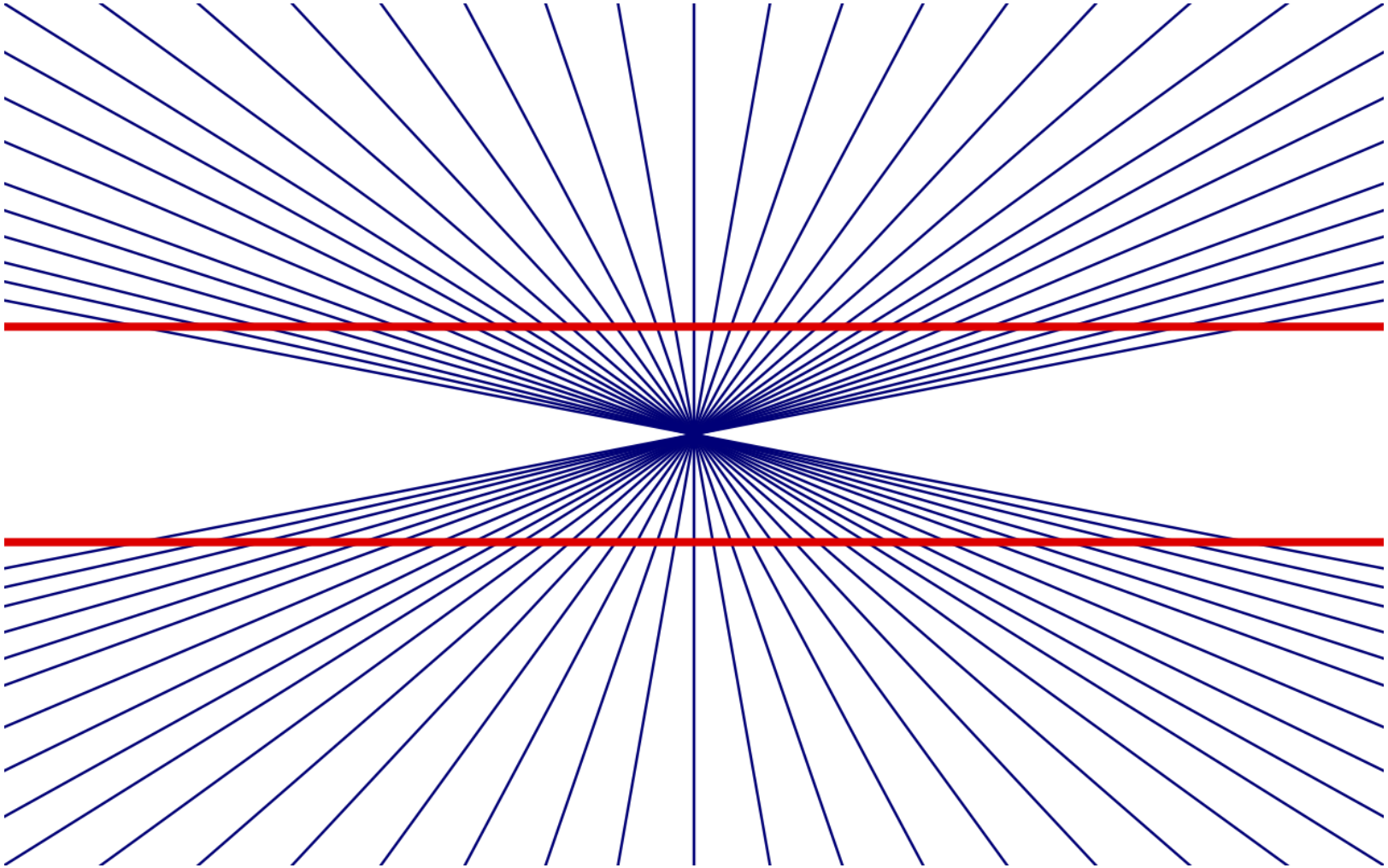
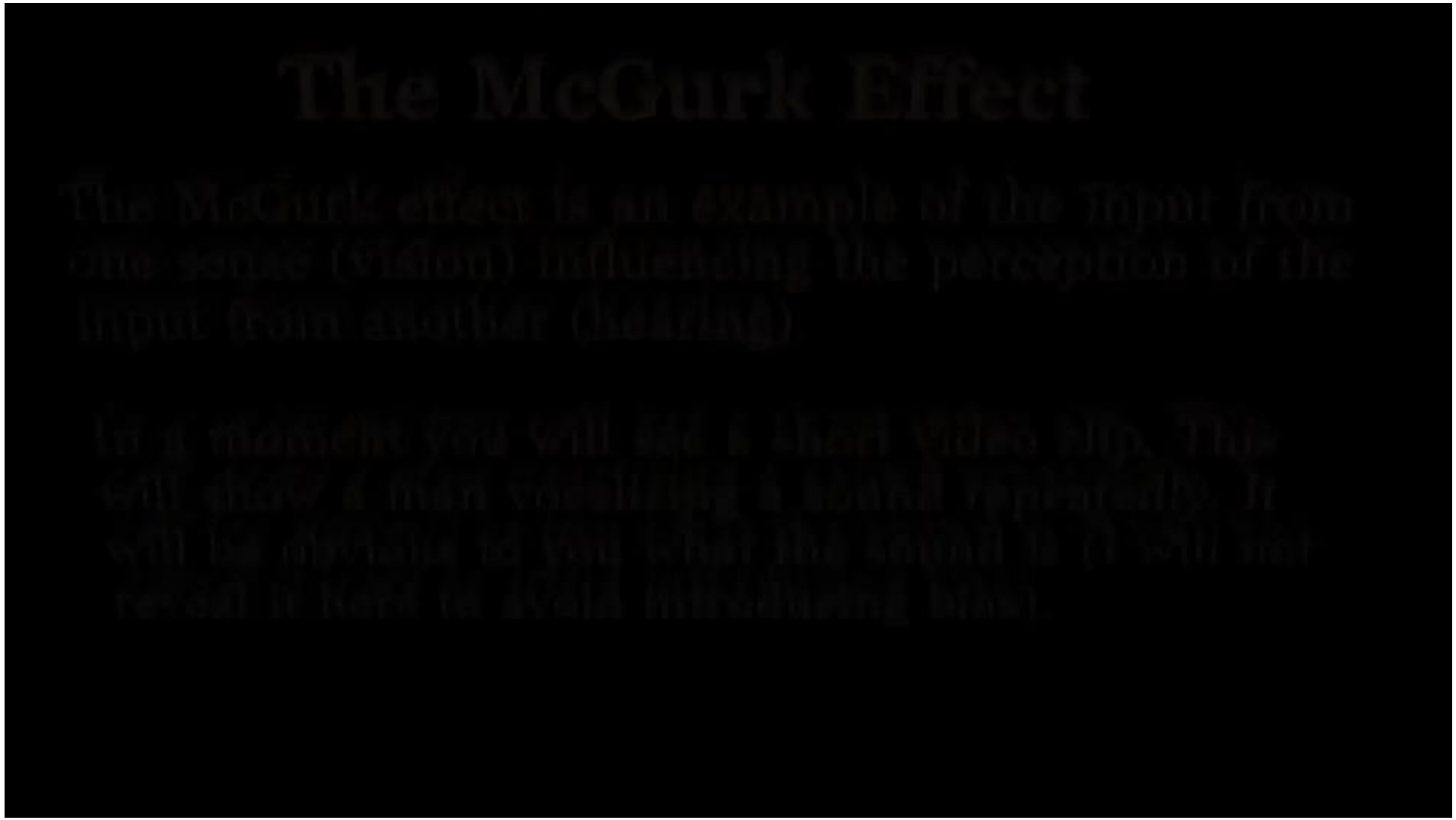
The Hering illusion



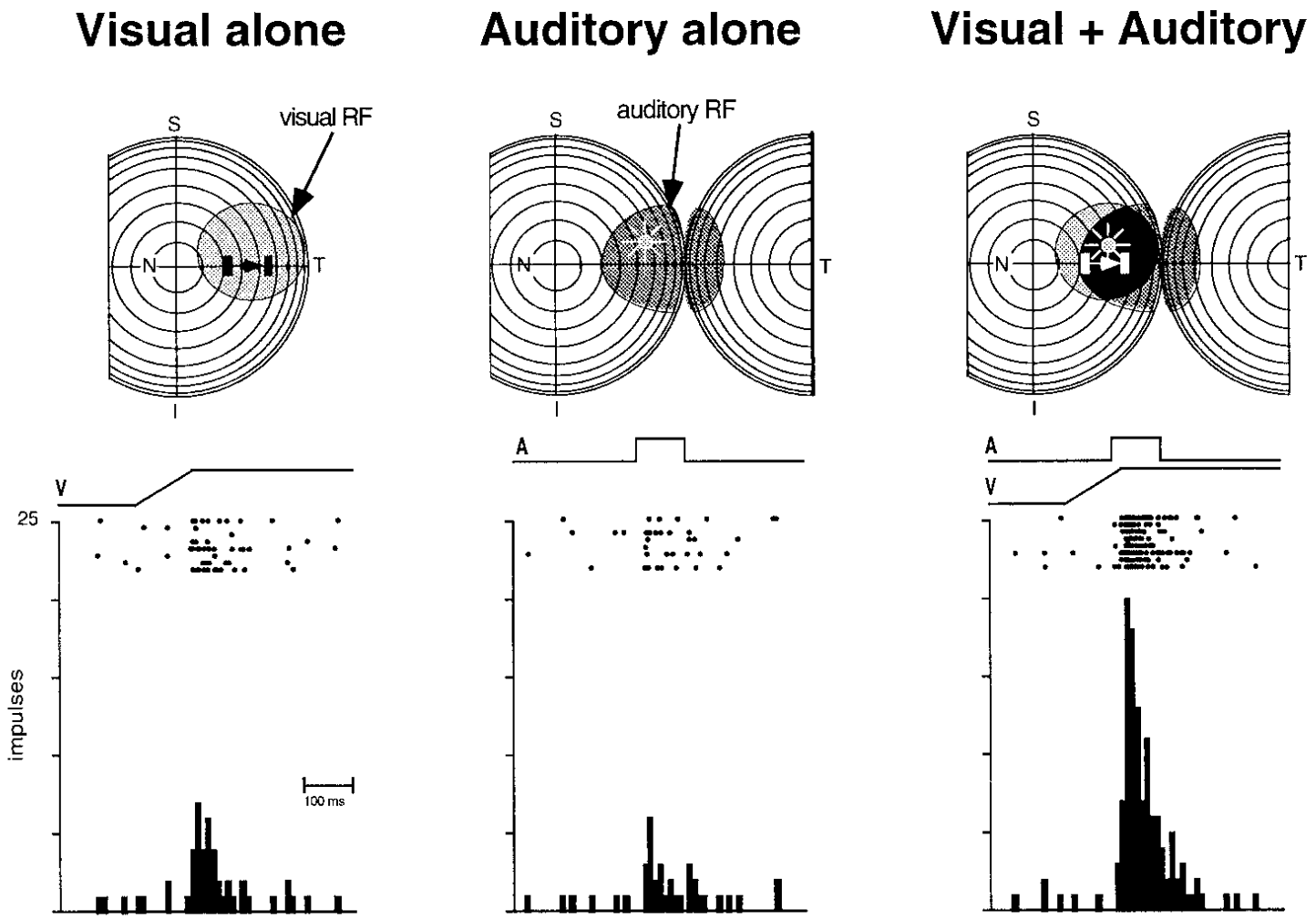
McGurk effect



McGurk effect

Multisensory enhancement

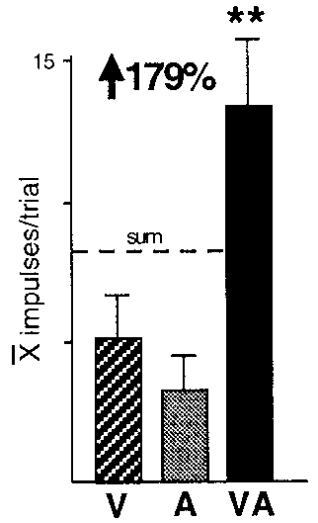
MONKEY



SUPERIOR COLLICULUS

(**=P`0.01).

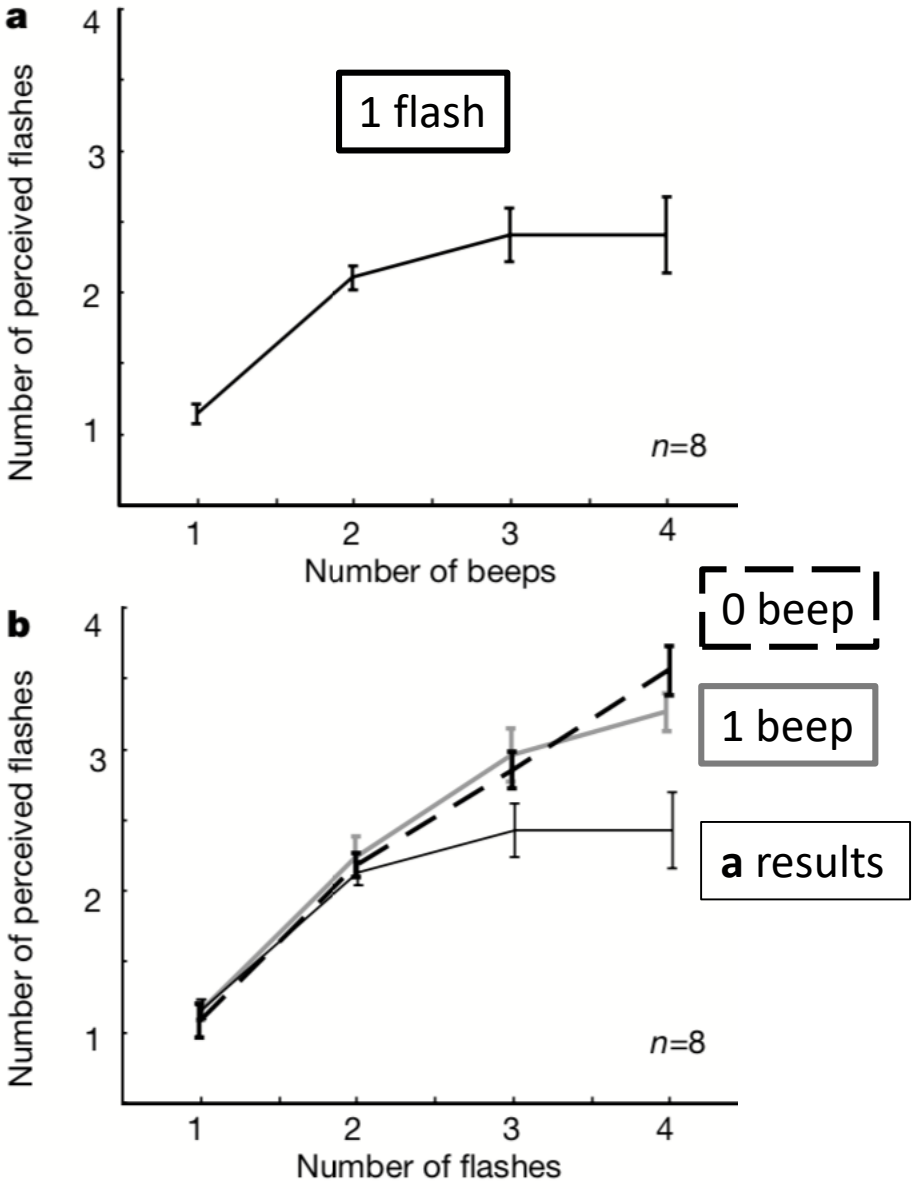
Reprinted from Wallace and Stein (1996a)



Fission illusions

Illusions

What you see is what you hear



Flashes presented with a time interval of 50 ms

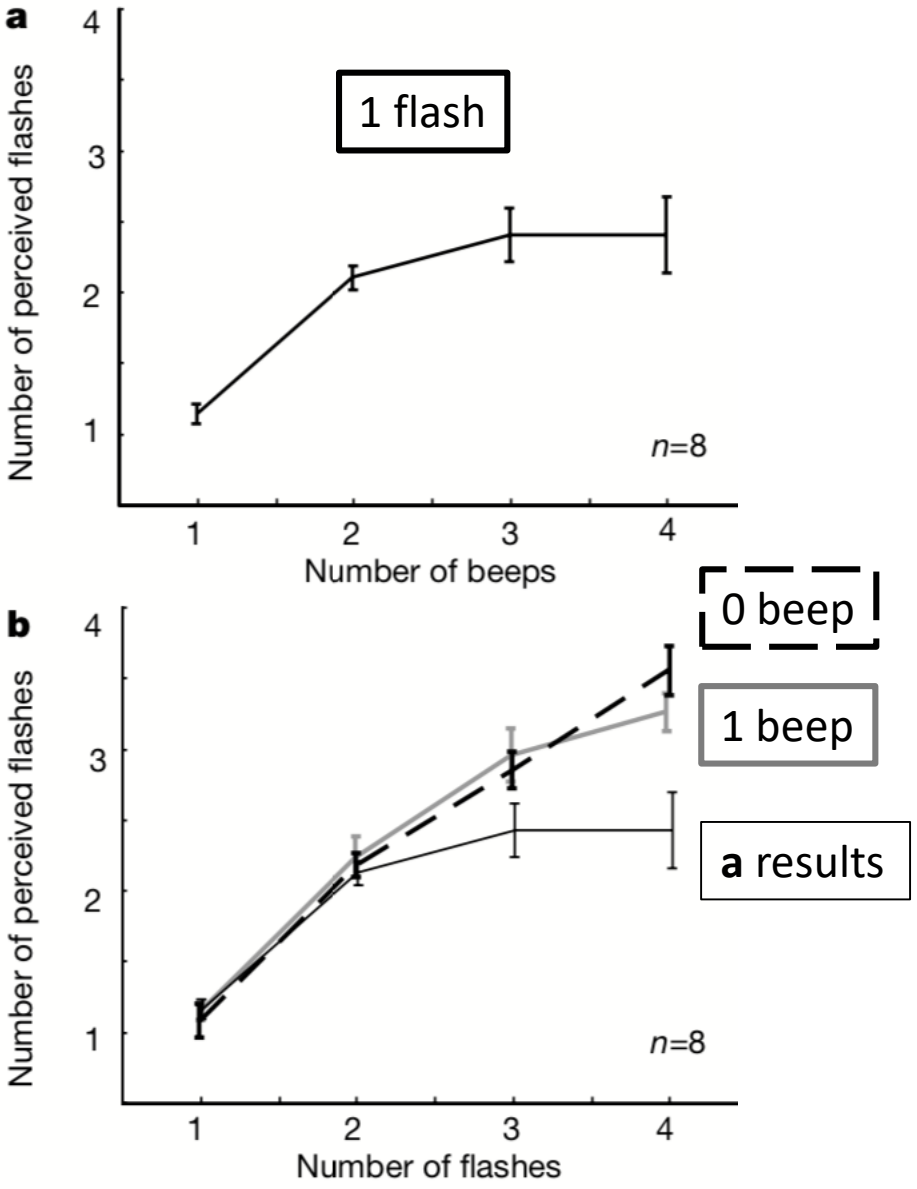
Beeps presented with a time interval of 57 ms

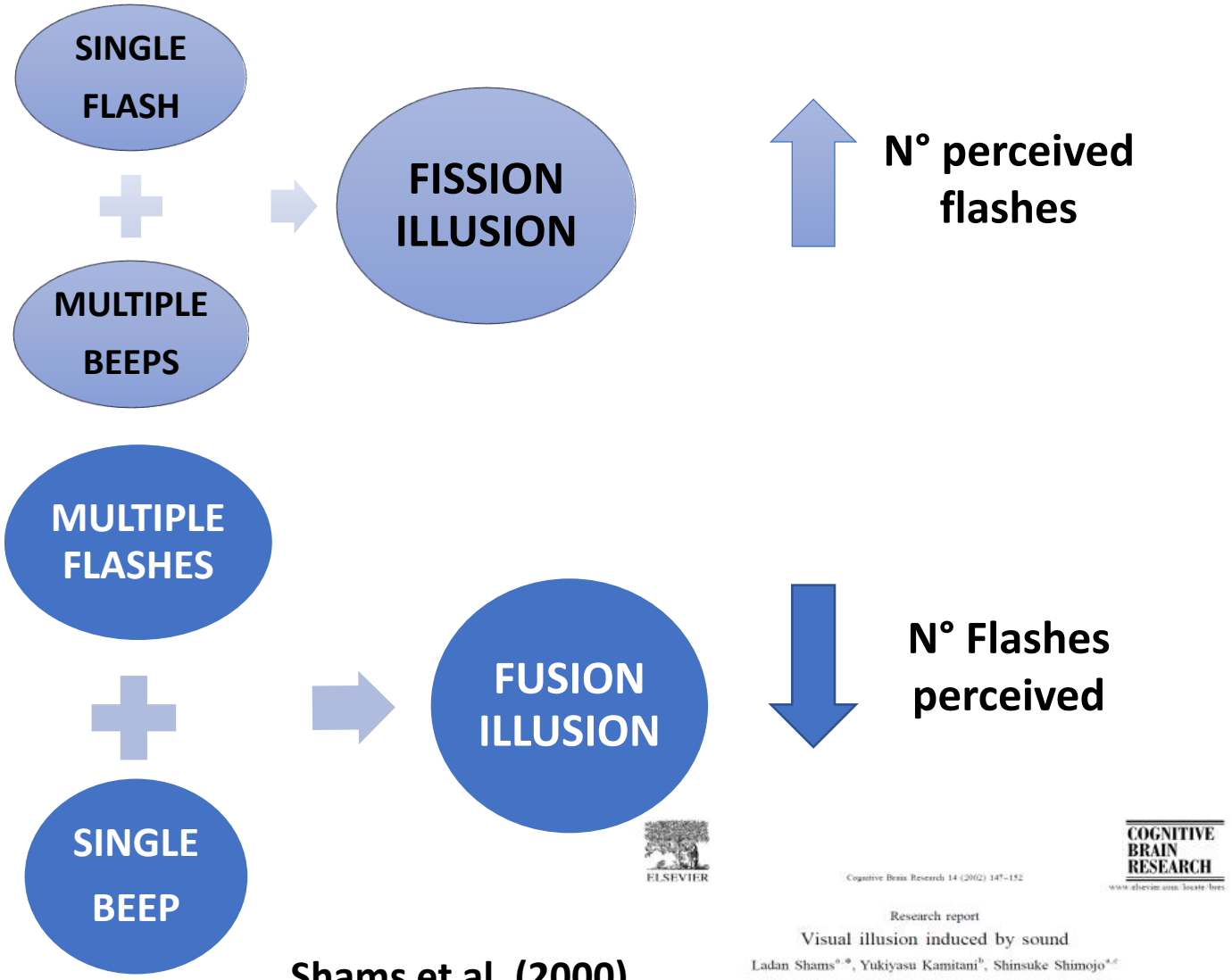
Illusory flashing occurred as long as the beep and flash were within approximately **100 milliseconds** of each other, (consistent with the integration time of polysensory neurons in the brain).

Shams L, Kamitani Y, Shimoyo S. Illusions: what you see is what you hear. Nature 2000;408:788.

Illusions

What you see is what you hear



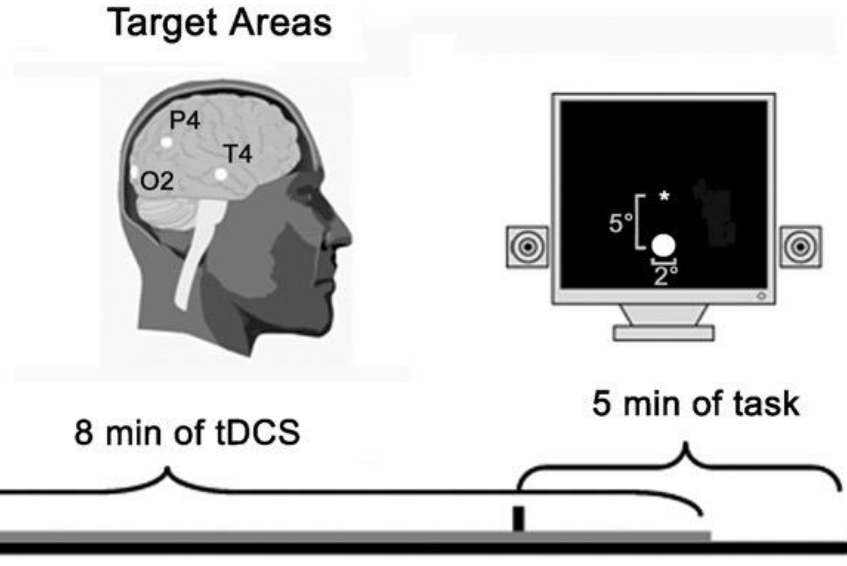


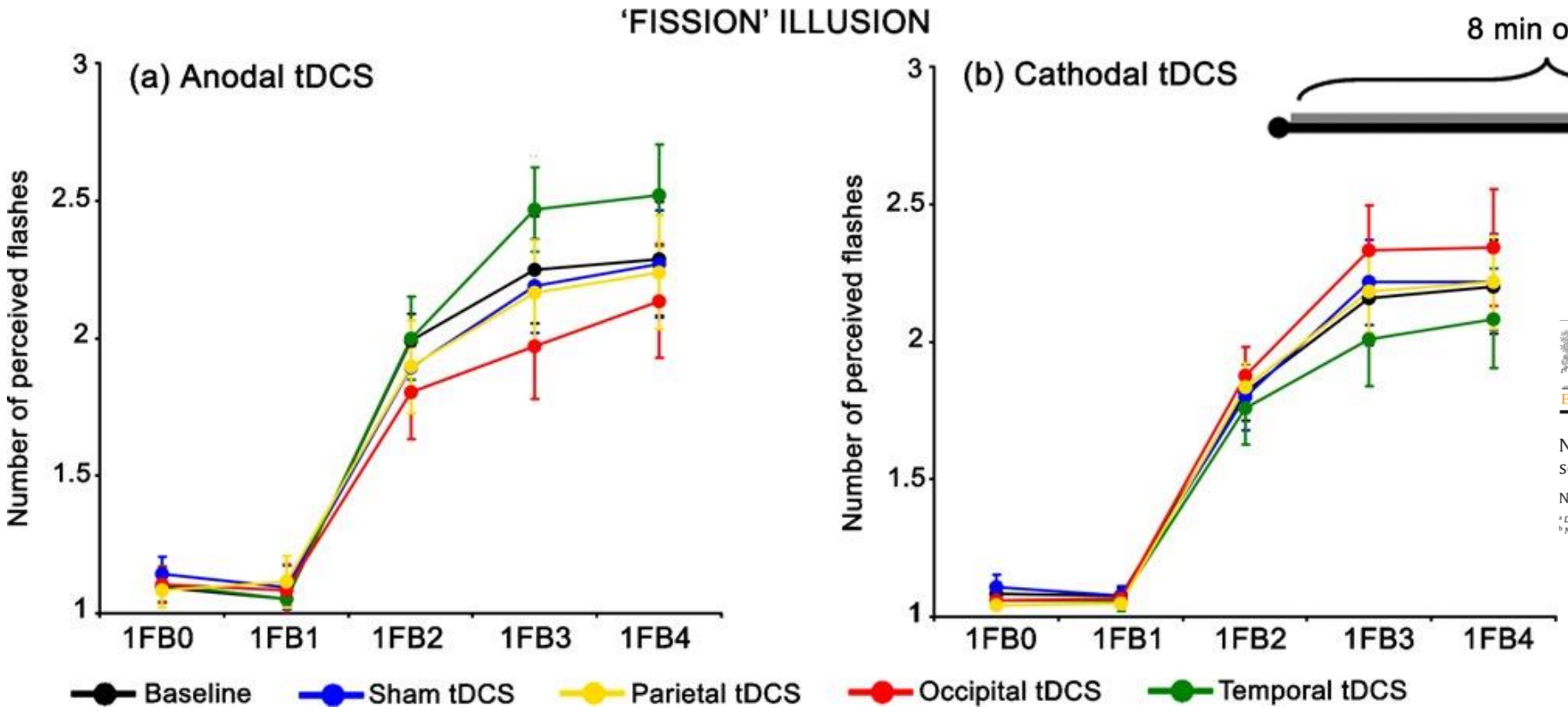
Shams et al. (2000)

SOUND-INDUCED FLASH ILLUSIONS AND CORTICAL EXCITABILITY

tDCS (transcranial current direct stimulation)

EXCITABILITY OF THE PRIMARY VISUAL CORTEX AND PRIMARY AUDITORY CORTEX





Bolognini et al. (2011),
Neuropsychologia, 49 (2011) 231–

Contents lists available at ScienceDirect
Neuropsychologia
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Neuromodulation of multisensory perception: A tDCS study of the sound-induced flash illusion

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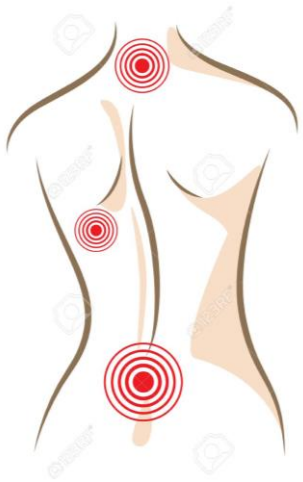
[b] Neuropsychological Laboratory, IRCCS Italian Auxological Institute, Milan, Italy

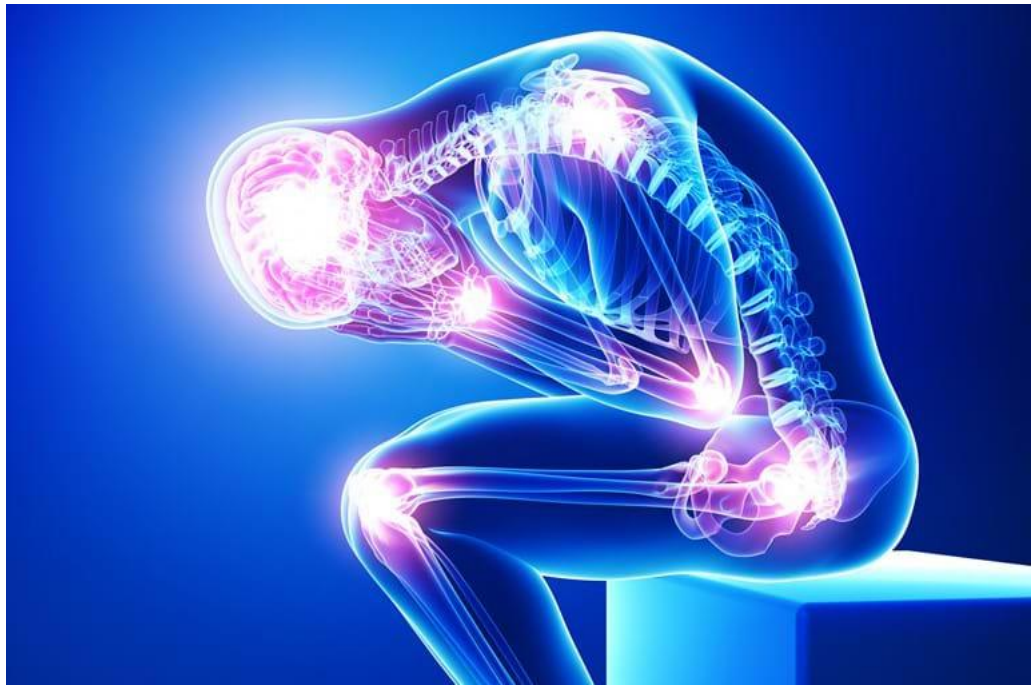
Fibromyalgia



- affects **2 - 4 % of people**, > women
- **not** an **autoimmune** or inflammation based illness,
  - research suggests the **nervous system** is involved.
- diagnosis based on all the **patient's relevant symptoms** (**what you feel**).
- no test to detect this disease.
- Though there is no cure, medications can reduce symptoms in some patients.

https://www.rheumatology.org/I-Am-A/Patient-Caregiver/Diseases-Conditions/Fibromyalgia

Fibromyalgia



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Seminars in Arthritis and Rheumatism

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

2016 Revisions to the 2010/2011 fibromyalgia diagnostic criteria

Frederick Wolfe, MD[a,b,*], Daniel J. Clauw, MD[c], Mary-Ann Fitzcharles, MD[d], Don L. Goldenberg, MD[e,f], Winfried Häuser, MD[g,h], Robert L. Katz, MD[i], Philip J. Mease, MD[j,k], Anthony S. Russell, MD[l], Irwin Jon Russell, MD, PhD[m], Brian Walitt, MD, MPH[n]

Diagnosis can be made when all of the following criteria are met:

1. Generalized **pain**, defined as pain in **at least 4 of 5 regions**, is present.
2. Symptoms have been present at a similar level for **at least 3 months.**
3. Widespread pain index (**WPI**) ≥ 7 and symptom severity scale (**SSS**) score ≥ 5 OR WPI of 4–6 and SSS score ≥ 9.

A **diagnosis of fibromyalgia is valid irrespective of other diagnoses**.

Ascertainment

(1) WPI: note the number of areas in which the patient has had pain over the last week. In how many areas has the patient had pain? Score will be between 0 and 19

Left upper region (Region 1)	*Right upper region (Region 2)*	*Axial region (Region 5)*
Jaw, left[a]	Jaw, right[a]	Neck
Shoulder girdle, left	Shoulder girdle, right	Upper back
Upper arm, left	Upper arm, right	Lower back
Lower arm, left	Lower arm, right	Chest[a]
		Abdomen[a]
Left lower region (region 3)	*Right lower region (Region 4)*	
Hip (buttock, trochanter), left	Hip (buttock, trochanter), right	
Upper leg, left	Upper leg, right	
Lower leg, left	Lower leg, right	

(2) Symptom severity scale (SSS) score

Fatigue
Waking unrefreshed
Cognitive symptoms

For the each of the 3 symptoms above, indicate the level of severity over the past week using the following scale:

0 = No problem
1 = Slight or mild problems, generally mild or intermittent
2 = Moderate, considerable problems, often present and/or at a moderate level
3 = Severe: pervasive, continuous, life-disturbing problems

The symptom severity scale (SSS) score: is the sum of the severity scores of the 3 symptoms (fatigue, waking unrefreshed, and cognitive symptoms) (0–9) plus the sum (0–3) of the number of the following symptoms the patient has been bothered by that occurred during the previous 6 months:

(1) Headaches (0–1)
(2) Pain or cramps in lower abdomen (0–1)
(3) And depression (0–1)

The final symptom severity score is between 0 and 12

The fibromyalgia severity (FS) scale is the sum of the WPI and SSS

The FS scale is also known as the polysymptomatic distress (PSD) scale.

[a] Not included in generalized pain definition.

Key points

- Symptoms:
  - **chronic widespread pain**
  - **unrefreshing sleep**
  - **tiredness**
- **Not a diagnosis of exclusion**
- No clear pathophysiological mechanism
  - evidence suggests that there is an **abnormality in central pain processing**
- The diagnosis allow the patient's polysymptomatic distress to be explained, thereby reducing fear and doubt
- **No cure**, but a range of drug and non-drug treatments can reduce symptoms and their impact on the patient's life
- Trial evidence for all forms of **treatment** in fibromyalgia generally shows only **small to moderate average effects**

BMJ

BMJ 2014;348:g1224 doi: 10.1136/bmj.g1224 (Published 24 February 2014) Page 1 of 12

CLINICAL REVIEW

Fibromyalgia

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Fibromyalgia and cortical excitability

PAIN® 149 (2010) 495–500

PAIN®

www.elsevier.com/locate/pain

Alteration of cortical excitability in patients with fibromyalgia

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[b] *Department of Neurology, Hospital das Clinicas, University of São Paulo, Brazil*
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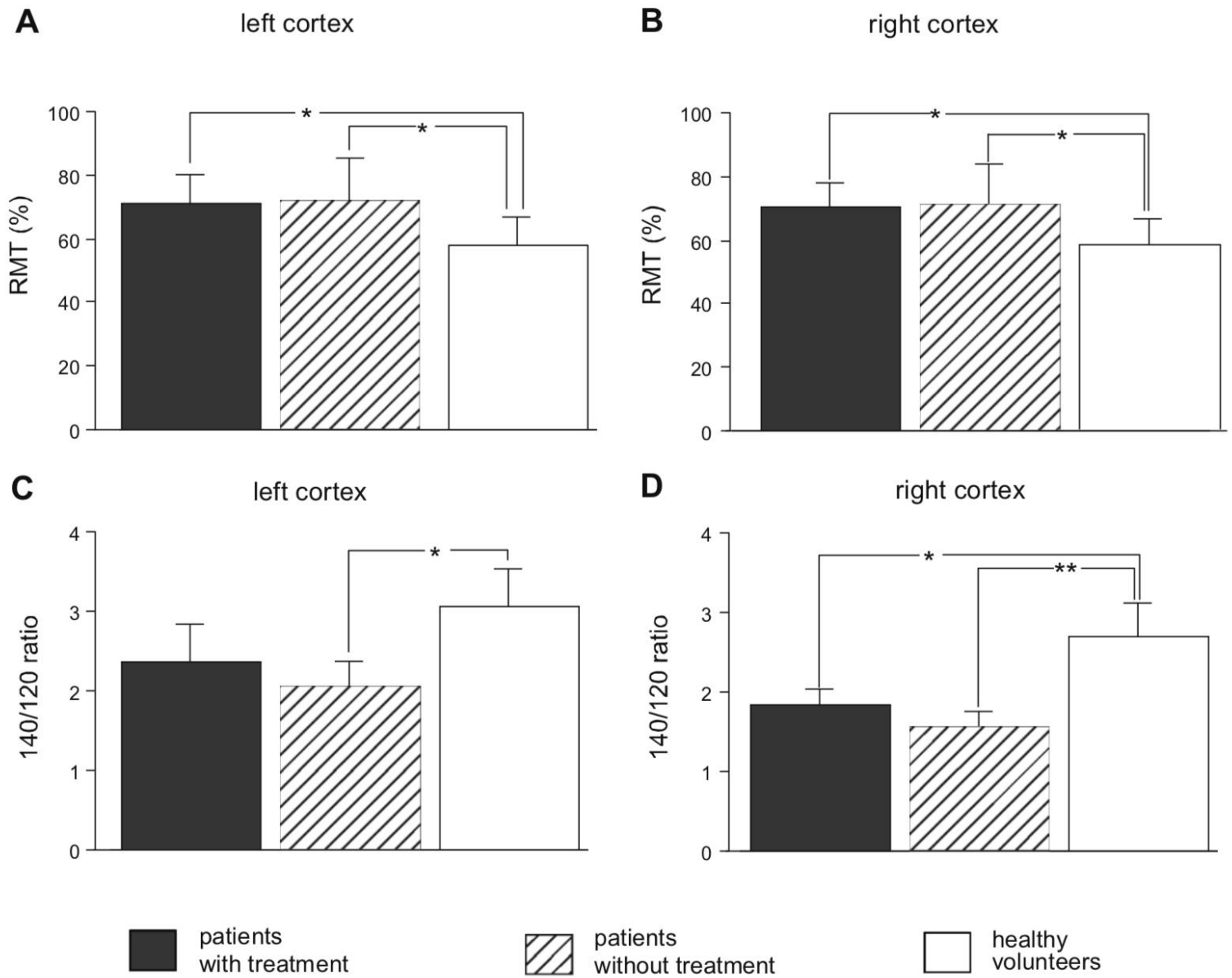
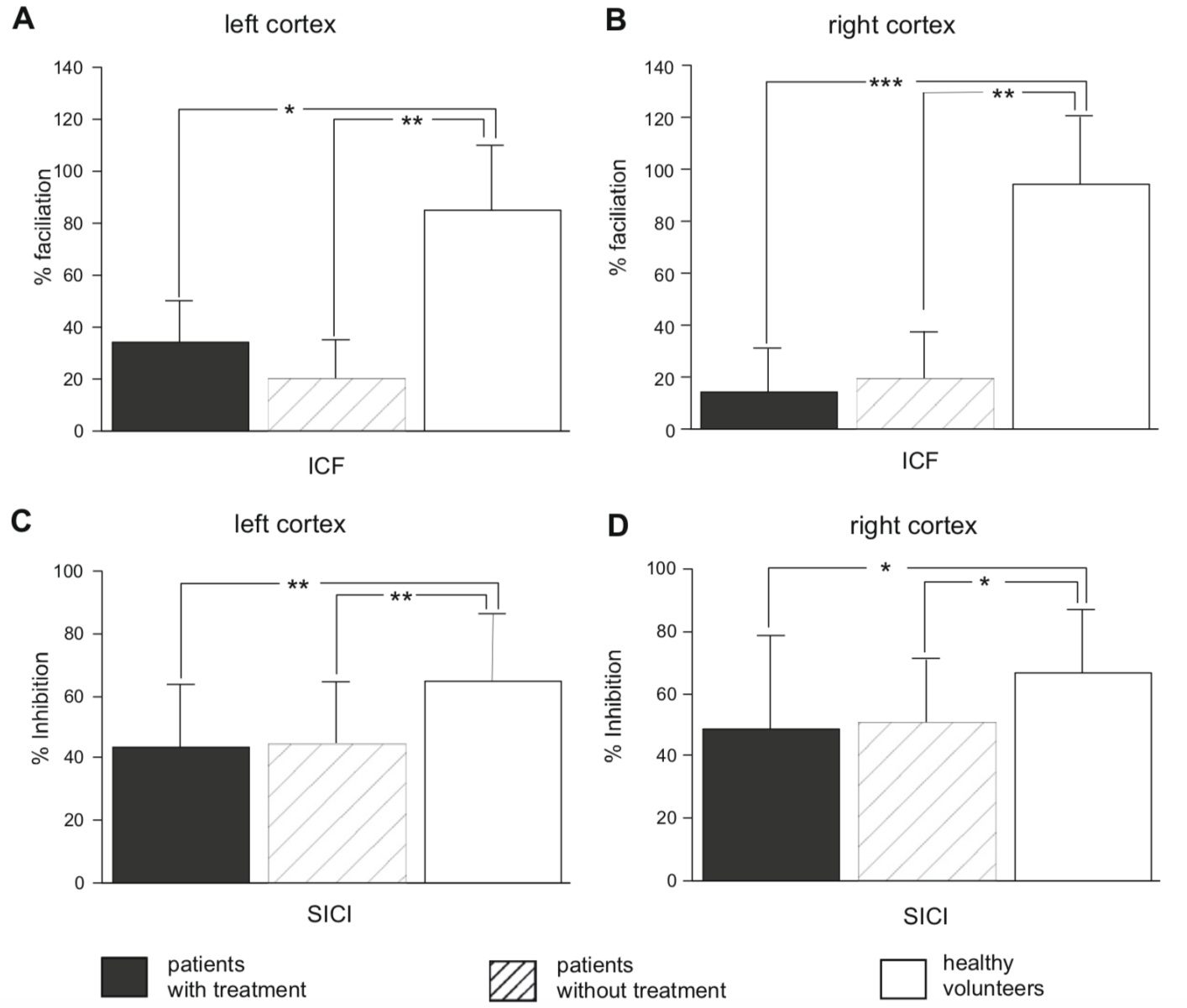
[d] *Université Paris Descartes, F-75005 Paris, France*


A
left cortex
B
right cortex
RMT (%)
100
80
60
40
20
0
*
*
C
left cortex
D
right cortex
140/120 ratio
4
3
2
1
0
*
**
patients
with treatment
patients
without treatment
healthy
volunteers


A
left cortex
% facilitation
140
120
100
80
60
40
20
0
*
**
ICF
B
right cortex
% facilitation
***
**
ICF
C
left cortex
% Inhibition
**
**
SICI
D
right cortex
% Inhibition
*
*
SICI
patients with treatment
patients without treatment
healthy volunteers

Our study

Objective

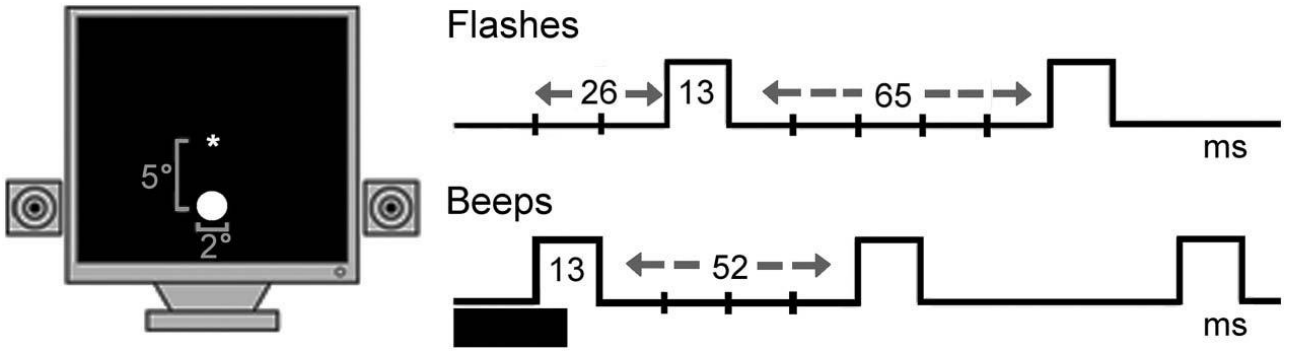
to explore whether fibromyalgic patients show a general sensorial activation, instead of one strictly related to pain processing areas.

using Sound-Induced Flash Illusions (SIFI)

we evaluated excitability of the visual cortex, an area not directly involved in pain processing.

Materials

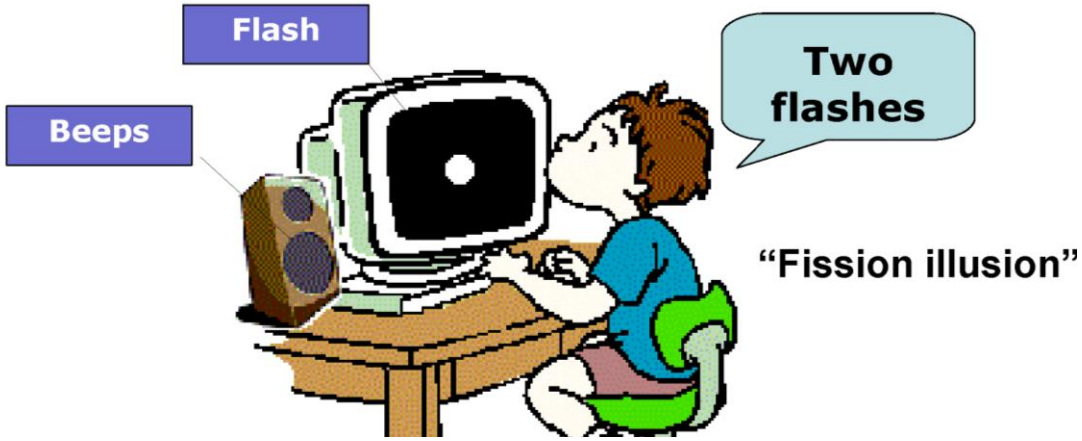
- **28 FM patients** (mean age 45yo ±8.53; 26F)
- **24 healthy controls** (HC – mean age 44yo ±9.68; 22F)
- dimly illuminated room
- participants sat ~57 cm in front of a CRT computer monitor (resolution 1024×768, refresh rate 75 Hz)



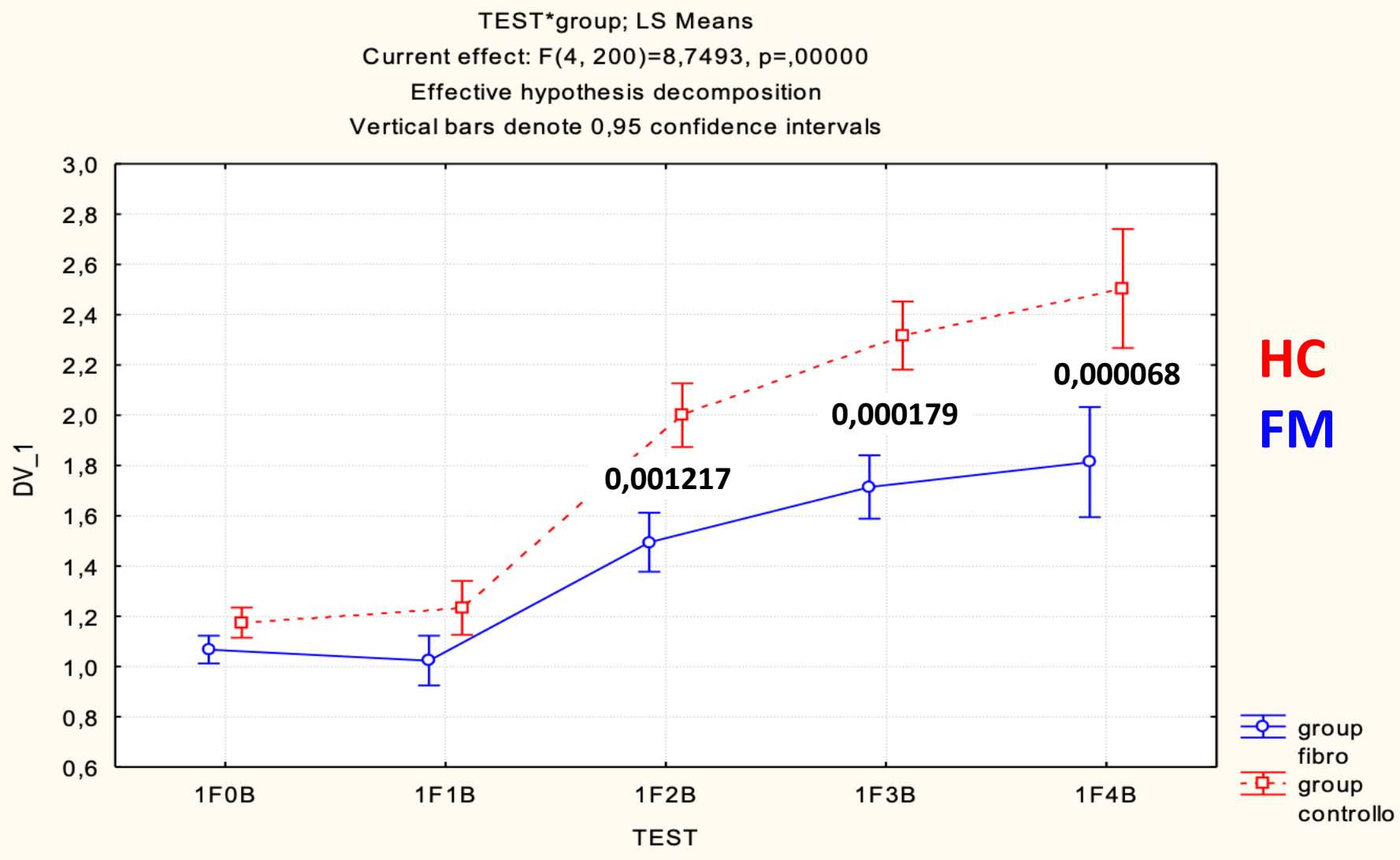
Duration and latency among flashes and beeps

Methods

- Single **flash** and concurrent **beeps** trials.
- **Task**: to count aloud flashes seen each time (total duration ~5 minutes)
- 5 trials randomly presented 9 times:
  - 1FxB, where *x* goes from 0 to 4; F=flash, B=beep).
- We compared FM patients scores to HC ones using a rmANOVA, then we performed a post-hoc Duncan's analysis.



Results


TEST*group; LS Means
Current effect: F(4, 200)=8,7493, p=,00000
Effective hypothesis decomposition
Vertical bars denote 0,95 confidence intervals
DV_1
3,0
2,8
2,6
2,4
2,2
2,0
1,8
1,6
1,4
1,2
1,0
0,8
0,6
1F0B
1F1B
1F2B
1F3B
1F4B
TEST
0,001217
0,000179
0,000068
HC
FM
group fibro
group controllo

Conclusion

SIFI study

- cheap
- very well tolerated
- effective tool

to explore

- cross-modal audio-visual perception and,
- indirectly, visual cortical excitability,
- even in FM patients.

The increased visual excitability showed by such patients

- could favor the hypothesis of a general sensorial activation,
- not strictly linked to pain.

This could shed more light on the disease pathophysiological mechanisms, as well as provide new ways for treatments research.

Thanks for your attention

Questions?