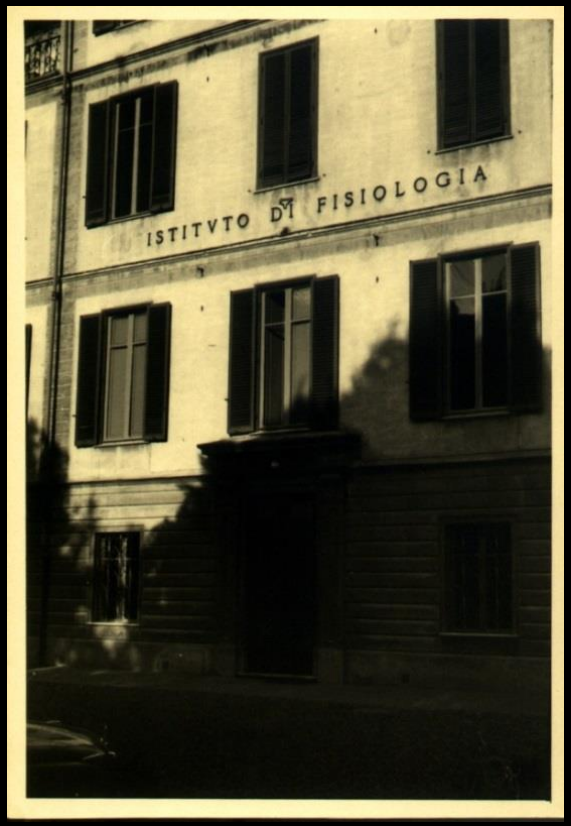


# Hypnotizability and the cerebellum: facts and hypotheses

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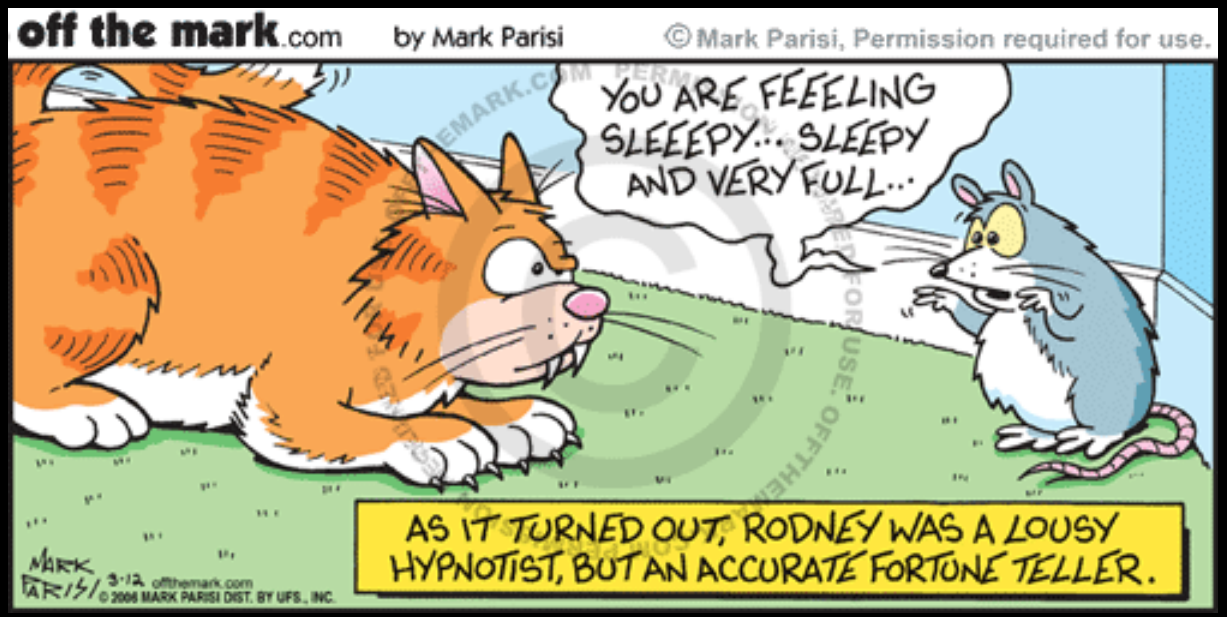
University of Pisa

Palermo, SIPF 30 settembre 2021




# hypnotizability

a cognitive trait predicting
the proneness to experience alteration of perception, memory and behavior
according to specific suggestions

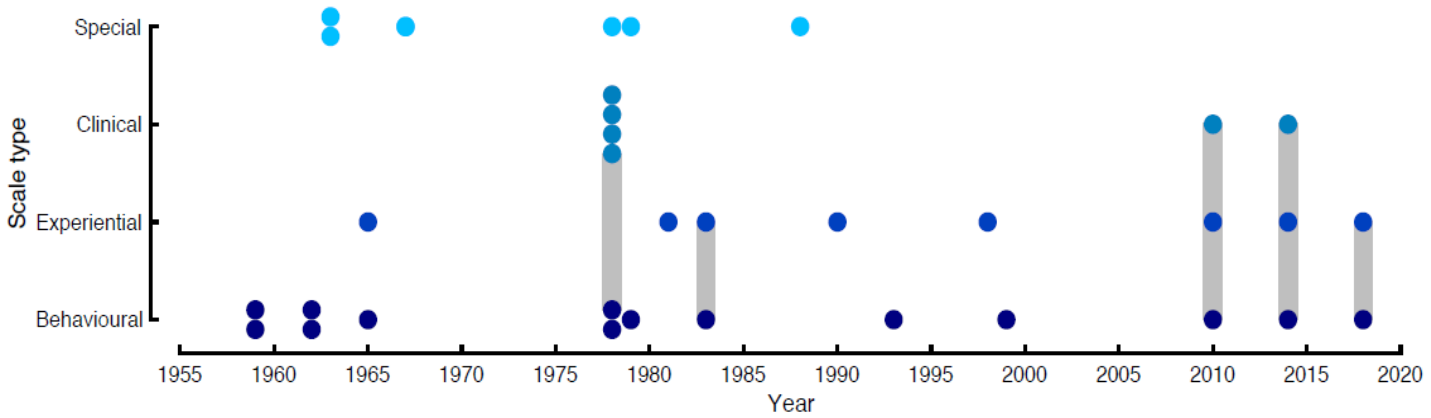



**Figure 1**. A timeline of standardized measures of hypnotic suggestibility. Scales are distinguished on the basis of whether they were introduced primarily as behavioural, experiential, clinical, or special-population scales with corresponding different colours. Connecting lines denote scales that fall into multiple categories. *Stanford Hypnotic Susceptibility Scale: Form A* (SHSS:A; Weitzenhoffer & Hilgard (1959)); *Stanford Hypnotic Susceptibility Scale: Form B* (SHSS:B; Weitzenhoffer & Hilgard (1959)); *Harvard Group Scale of Hypnotic Susceptibility: Form A* (HGSHS:A; Shor & Orne (1962)); *Stanford Hypnotic Susceptibility Scale: Form C* (SHSS:C; Weitzenhoffer & Hilgard (1962)); *Children's Hypnotic Susceptibility Scale* (CHSS; (London, 1963)); *Stanford Profile Scales of Hypnotic Susceptibility* (SPS; Weitzenhoffer & Hilgard (1963)); *Barber Suggestibility Scale* (BSS; (Barber, 1965)); *Inventory Scale of Hypnotic Depth* (ISHD; (Field, 1965a)); *Revised Stanford Profile Scales of Hypnotic Susceptibility* (RSPS; Weitzenhoffer & Hilgard (1967)); *Diagnostic Rating Scale* (DRS; Weitzenhoffer & Hilgard (1967)); *Hypnotic Induction Profile* (HIP; (Spiegel & Spiegel, 1978)); *Stanford Hypnotic Clinical Scale for Adults* (SHCS:A; (Morgan & Hilgard, 1978/1979)); *Stanford Hypnotic Clinical Scale for Children* (SHCS:C; Morgan & Hilgard, 1978/1979b)); *Creative Imagination Scale* (CIS; (Barber & Wilson, 1978)); *Stanford Hypnotic Arm Levitation* (SHALIT; (Hilgard, Crawford, & Wert, 1979)); *Tailored Stanford Hypnotic Susceptibility Scale: Form C* (TSHSS:C; Hilgard et al. (1979)); *Bowers Involuntariness Scale* (BIS; (K. S. Bowers, 1981a)); *Carleton University Responsiveness to Suggestion Scale* (CURSS; (N. P. Spanos, Radtke, Hodgins, Stam, & Bertrand, 1983)); *Children's Hypnotic Susceptibility Scale* (CHSS; (London, 1988)); *HGSHS:A Subjective Scale* (HGSHS:A-S; Kirsch et al. (1990a)); *Waterloo Stanford Group Scale of Hypnotic Susceptibility: Form C* (WSGC; (K. S. Bowers, 1993)); *WSGC Subjective Scale* (WSGC-S; Kirsch et al. (1998)); *Group Scale of Hypnotic Ability* (GSHA; Hawkins & Wenzel, 1999); *PCI Hypnotic Assessment Procedure* (PCI-HAP; (Pekala et al., 2010b)); *Elkins Hypnotizability Scale* (EHS; (G. Elkins, 2014)); *Sussex-Waterloo Scale of Hypnotizability* (SWASH; (Lush, Moga, McLatchie, & Dienes, 2018).

**highs mediums lows**

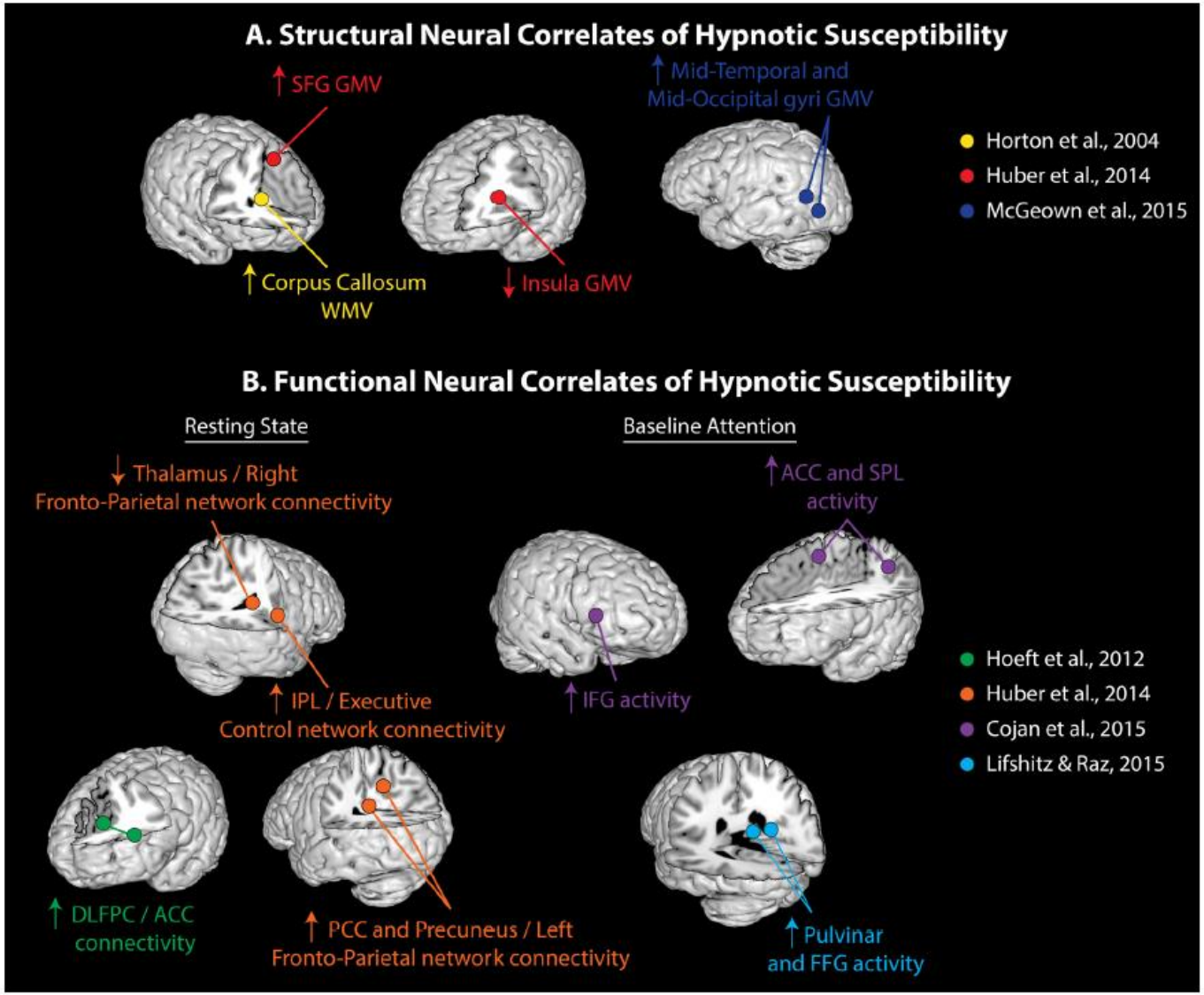



**Fig. 3.** A. Structural correlates of hypnotic susceptibility. Change in gray matter volume (GMV) and white matter volume (WMV) as a function of hypnotic susceptibility. B. Functional correlates of hypnotic susceptibility. Increased activity and functional connectivity patterns in experiments contrasting high and low susceptibility individuals in resting state (i.e., no task or stimuli) and baseline attention (i.e., using an attention task). The colors indicate the different studies (see online version of the article). ACC = Anterior Cingulate Cortex. DLPFC = Dorsolateral Prefrontal Cortex. FFG = Fusiform Gyrus. IFG = Inferior Frontal Gyrus. IPL = Inferior Parietal Lobule. SFG = Superior Frontal Gyrus. SPL = Superior Parietal Lobule. PCC = Posterior Cingulate Cortex.

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DOI: 10.1080/00207144.2016.1171093

Routledge
Taylor & Francis Group

# Complementing the Latest APA Definition of Hypnosis: Sensory-Motor and Vascular Peculiarities Involved in Hypnotizability

ENRICA L. SANTARCANGELO AND ELIANA SCATTINA

*University of Pisa, Italy*

a **physiological** trait

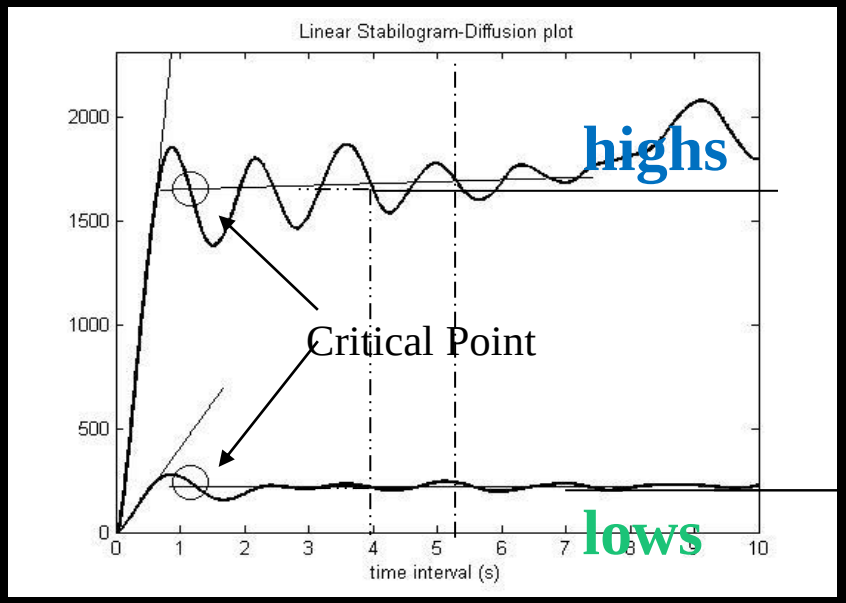
- with specific sensorimotor and cardiovascular characteristics observable in the absence of suggestions and in ordinary state of consciousness
- associated with the ability to alter
  . the subjective experience and
  . most of its physiological correlates according to suggestions' contents

In **highs**

- larger and faster body sway during vision suppression and leg proprioceptive alteration
- absence of learning across trials

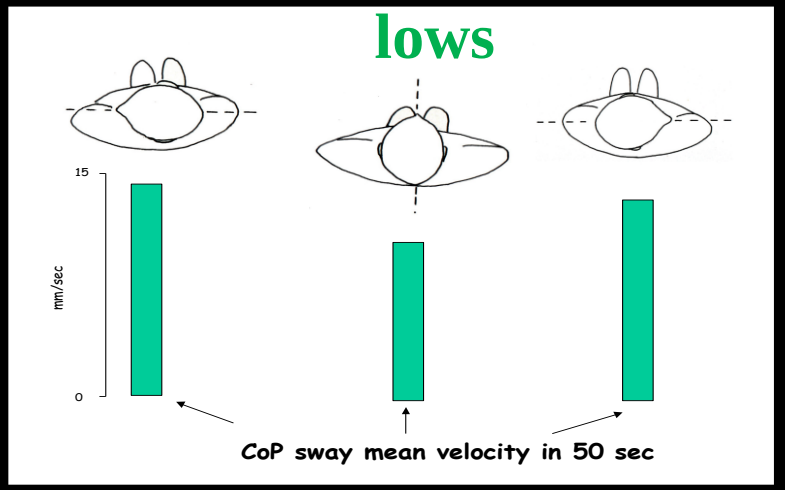
*Santarcangelo et al., Exp Brain Res, 2008*

both sagittal and frontal plane



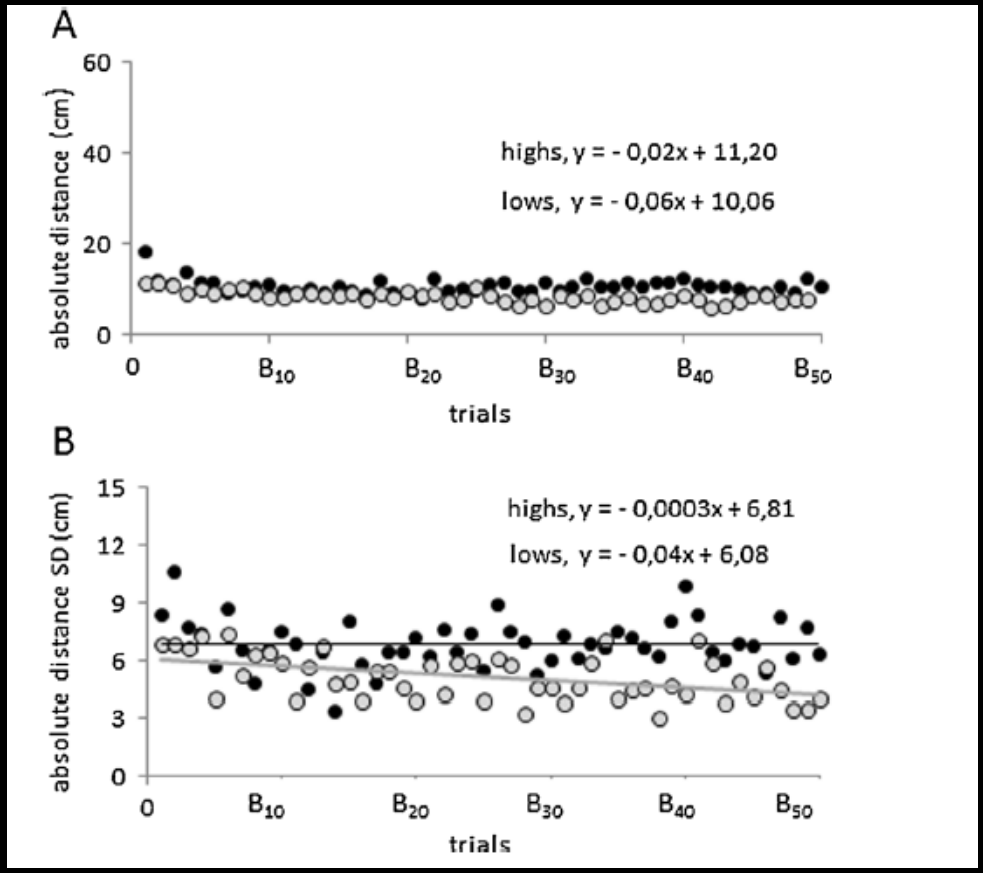

- no effect of head rotation on body sway

*Santarcangelo et al., Int J Clin Exp Hypn, 2008*



In **highs**

- lower throwing accuracy
- larger variability
- absence of learning across trials



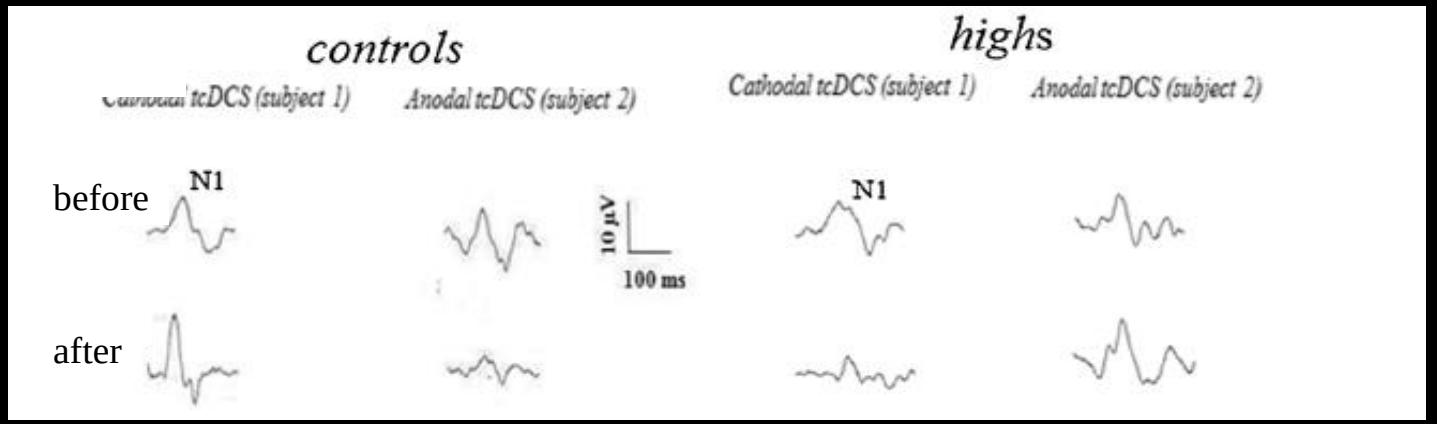

*Menzocchi et al., Cerebellum 2014*

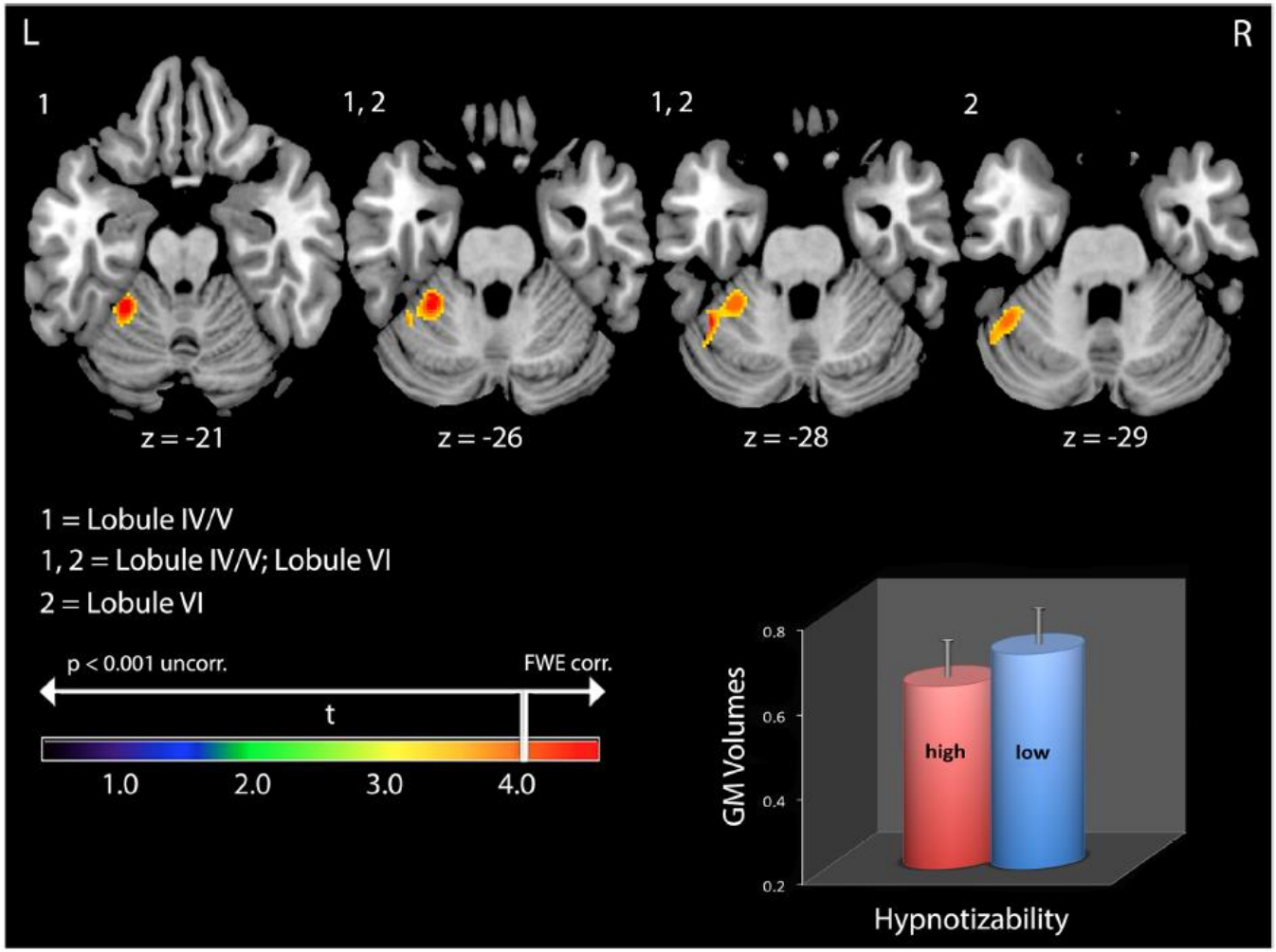
Cerebellum
DOI 10.1007/s12311-016-0764-2

ORIGINAL PAPER

# High Hypnotizability Impairs the Cerebellar Control of Pain

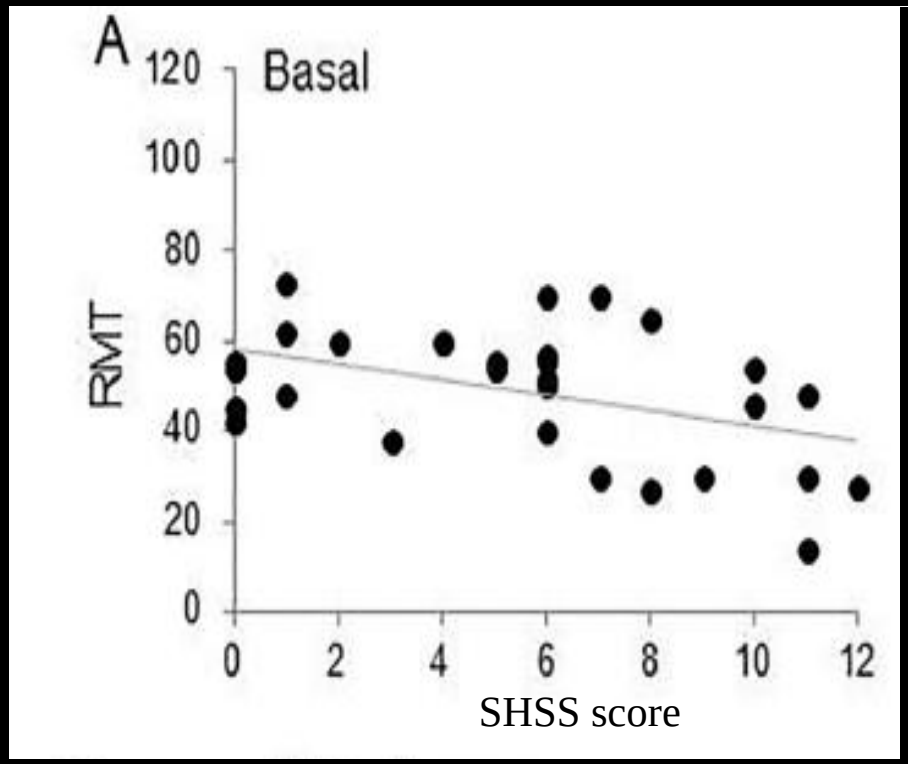
Tommaso Bocci[1] · Davide Barloscio[1] · Laura Parenti[1] · Ferdinando Sartucci[1] · Giancarlo Carli[2] · Enrica L. Santarcangelo[3]






*Picerni et al., Cerebellum 2019*

*motor cortex excitability*

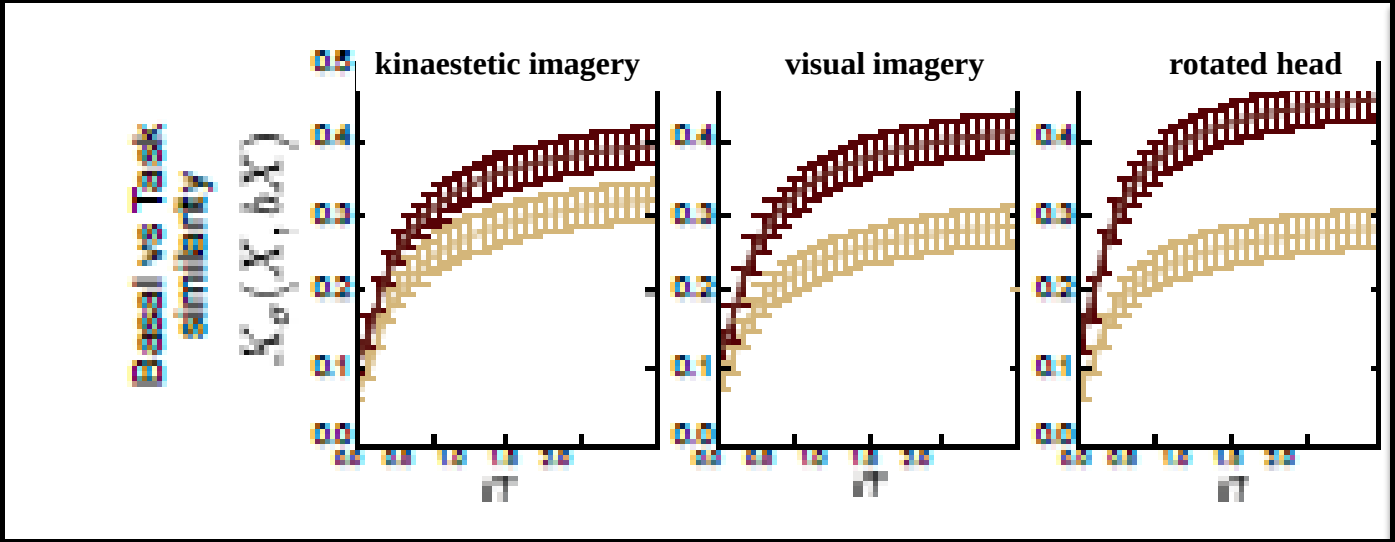



*Spina et al., Neuroscience 2020*

*or higher dopaminergic tone?*

a few physiological correlates of hypnotizability
may account for
the highs' response to suggestions

Topological analysis of EEG:
stronger functional equivalence between imagery and perception in highs




The highs' better simulation of physically induced perception/action may facilitate the response to sensori-motor suggestions and possibly account for their greater proneness to ideomotor behavior

*Ibanez-Marcelo et al ., NeuroImage 2019*


9 3/4
HOGWARTS EXPRESS
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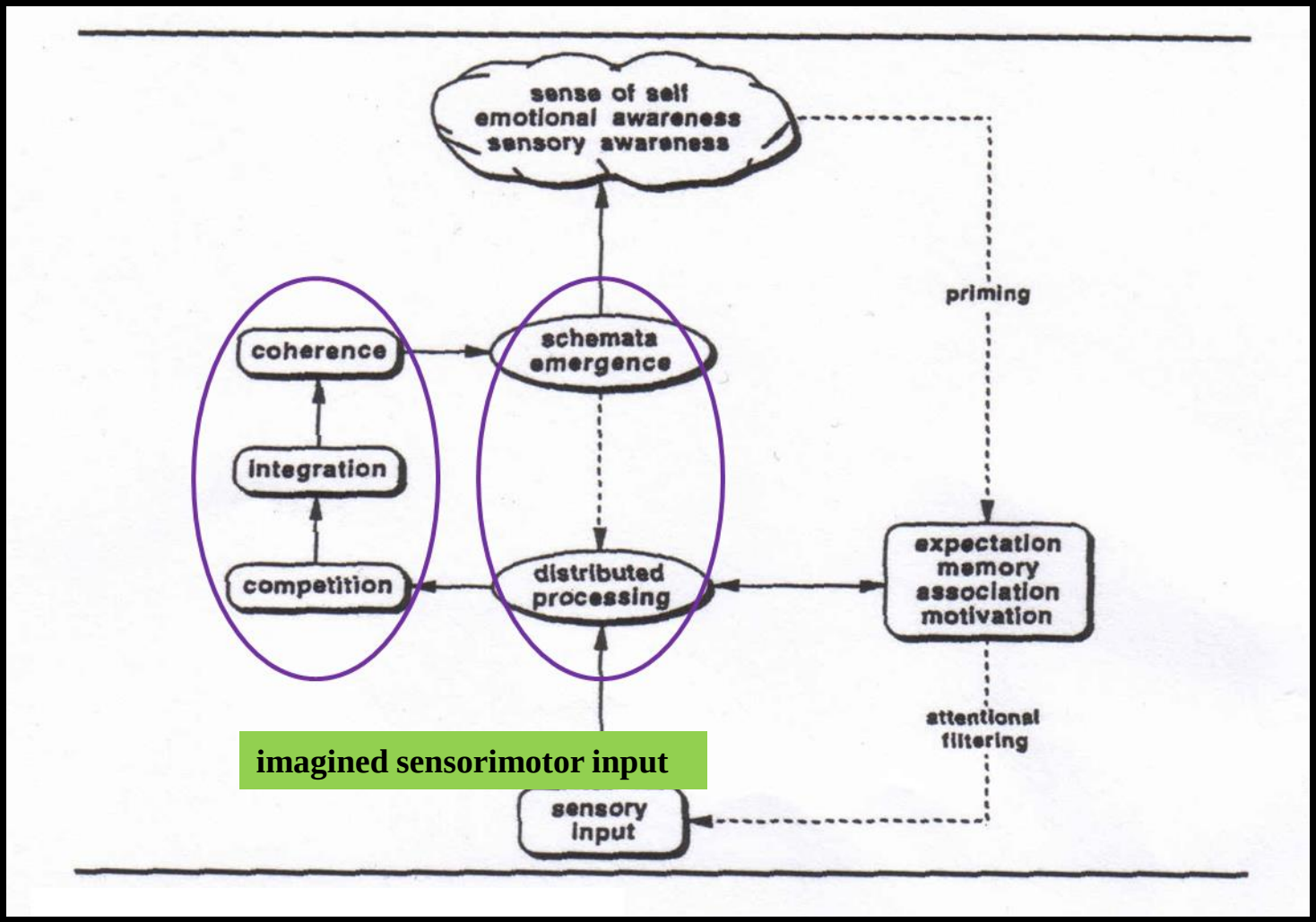

sense of self
emotional awareness
sensory awareness
priming
coherence
schemata
emergence
integration
competition
distributed
processing
expectation
memory
association
motivation
attentional
filtering
imagined sensorimotor input
sensory
input

## In highs

- greater attentional stability/absorption in highs

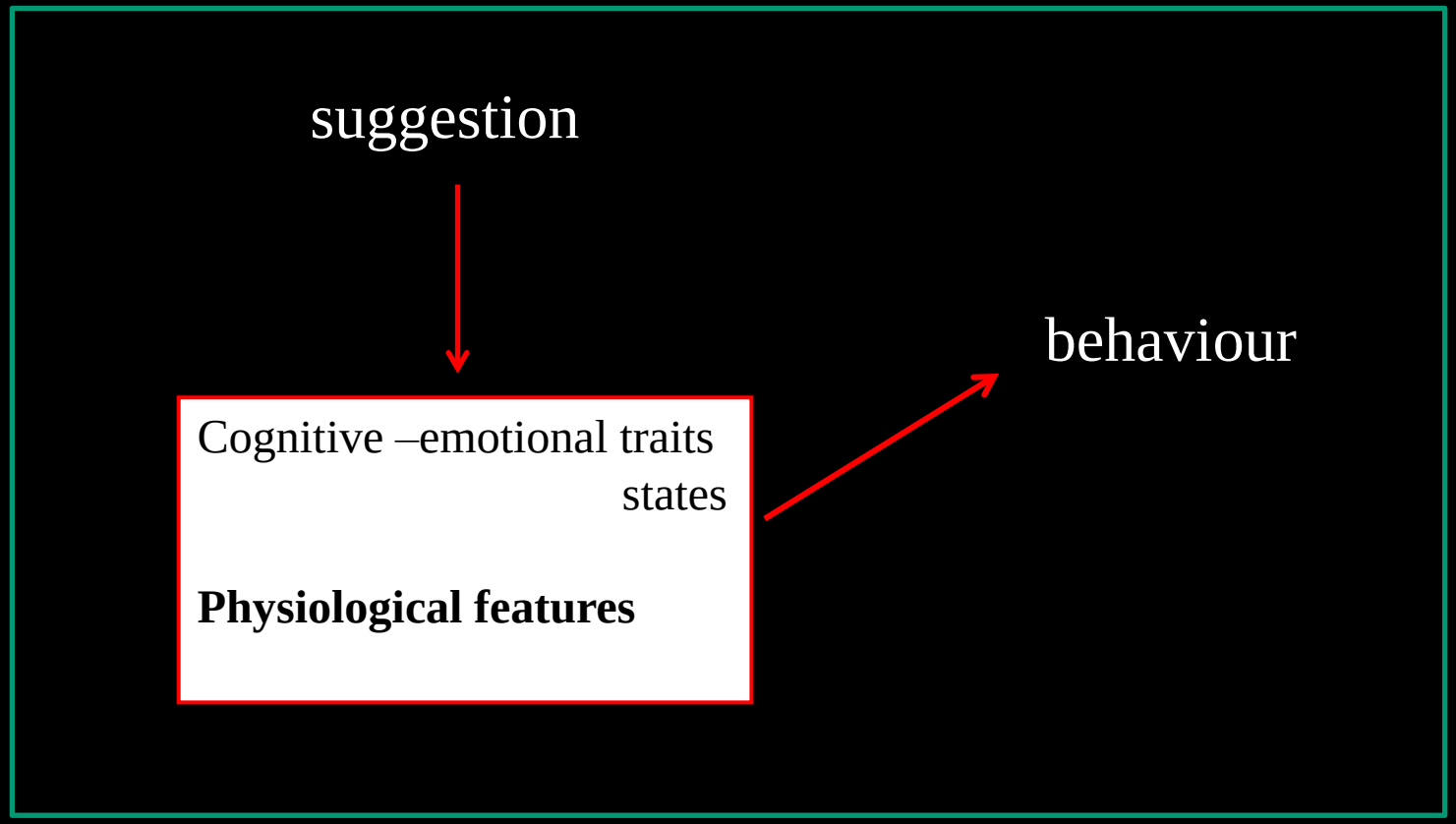
  *Tellegen and Atkinson, 1974; Raz, Int J Clin Exp Hypn,2005*

- higher blink rate

  *Di Gruttola et al., Exp Brain Res 2014*

*or higher dopaminergic tone?*

## socio-cognitive theories



# neo-dissociative theories

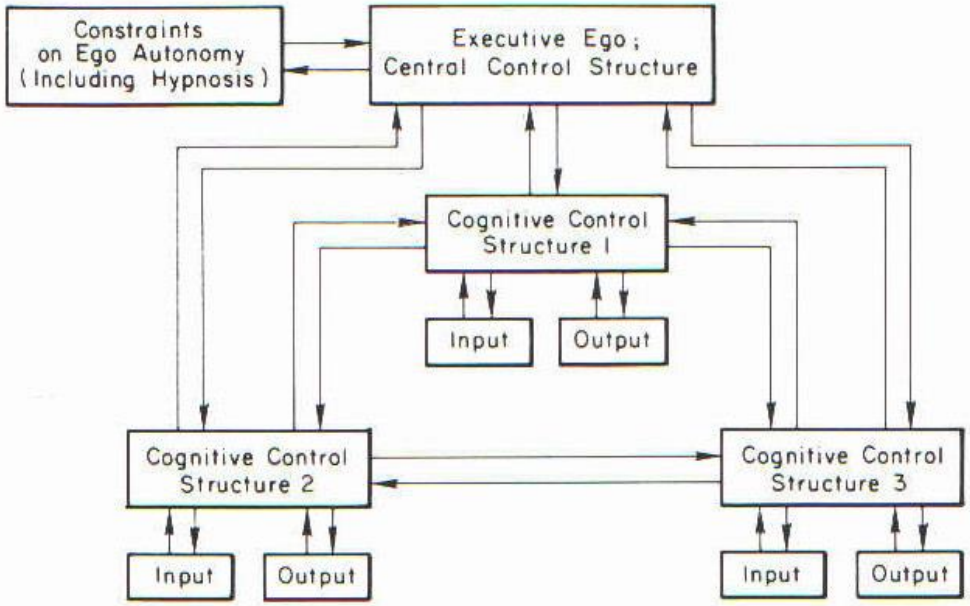
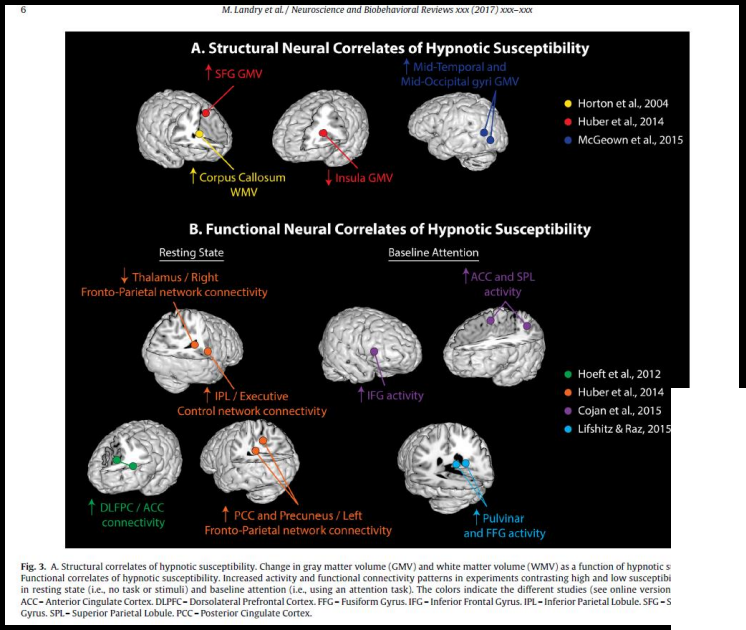
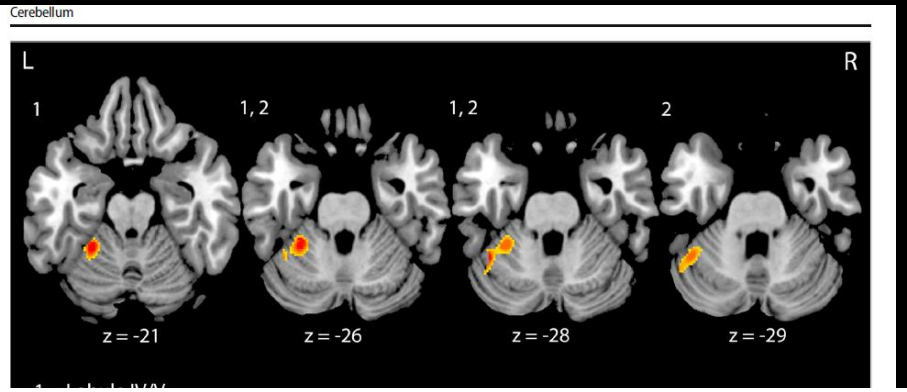



**FIGURE** 3.2. Subordinate cognitive control structures in a hierarchical order. Hierarchical positions are subject to change under control of the executive ego. From "Neodissociation Interpretation of Pain Reduction in Hypnosis" (p. 405) by E. R. Hilgard, 1973, *Psychological Review*, *80*, 396–411. Reprinted by permission of American Psychological Association.

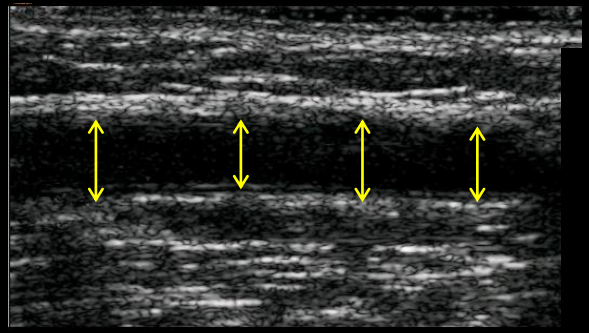


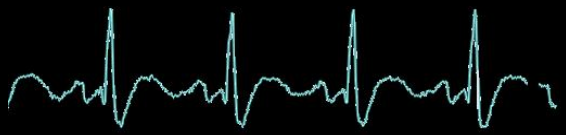




| | Suggestibility score |
|---|---|
| Suggestibility score | 1 |
| Hypnotic depth rating | 0.524** |
| Relaxation rating | 0.378* |
| Age | −0.447* |
| Education | −0.463* |
| Total intracranial volume | −0.528** |
| Grey matter | −0.380* |
| White matter | −0.507** |

hypnotic suggestibility is negatively correlated with GM, WM, total brain volume

*McGeown et al., 2014*

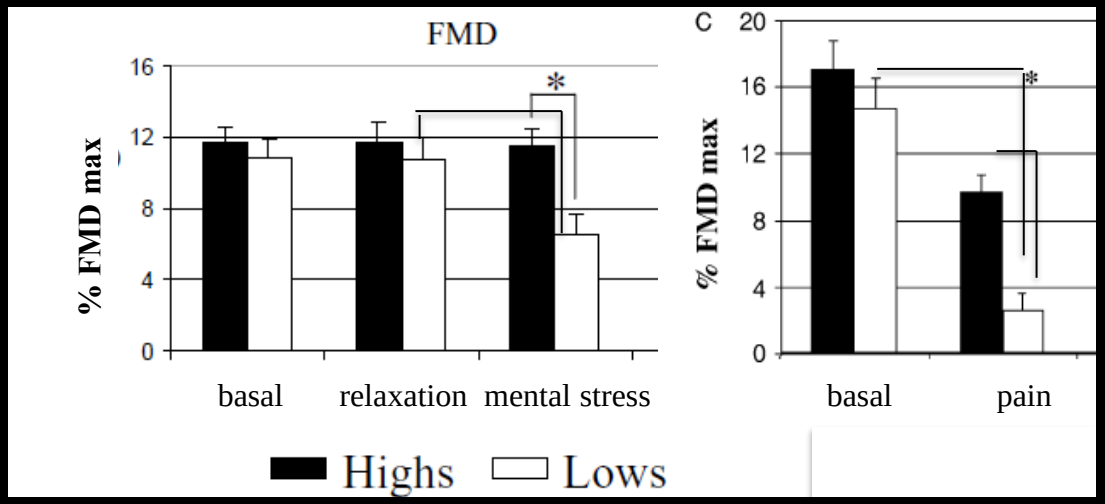




## Post occlusion flow- mediated endothelial dilation

$$FMD_{\text{mean or max}}$$

$$\frac{(\text{mean or max post ischemic diameter} - \text{basal diameter}) * 100}{\text{basal diameter}}$$




*(Jambrik et al., Brain Res Bull 2004; Int J Psychophysiol 2005;Pain 2005)*

*work in progress…*

# Limitations

Mediums not included
Samples size

D. Manzoni
L. Sebastiani
C. Chisari
S. Presciuttini
University of Pisa

G. Carli

C. Mocenni
University of Siena

E. Picano , R. Balocchi, M Varanini
National Council of Research, Pisa

G. Petri
ISI Foundation, Turin

**Why should Nature have selected highs for survival ?**

In **highs**

- better vascular endothelial function (flow mediated dilation) in stressful conditions *Jambrik et al 2004, 2005,*
- higher parasympathetic tone in resting conditions *Santarcangelo et al., 2012*

**better cardiovascular prognosis**

- **better response of the immune system to relaxation** *(Gruzelier et al., 2004)*

**In highs**

high frequency of A118G polimorphism of OPMR1 gene (μ1 receptors)

↓

low responsiveness to endogenous opiates

*(science fiction)*

*survival made possible by development of non opioid mechanisms for pain control* ?

# Ipnosi

*stato di coscienza* consistente in

- focalizzazione dell' attenzione
- riduzione del contatto con l'ambiente
- aumentata capacità di accettare suggestioni

American Psychological Association (*Elkins et al., Int J Clin Exp Hypn, 63(1):1-9, 2015)*