El efecto Mozart y la clasificación de los estudiantes según hemisferios cerebrales

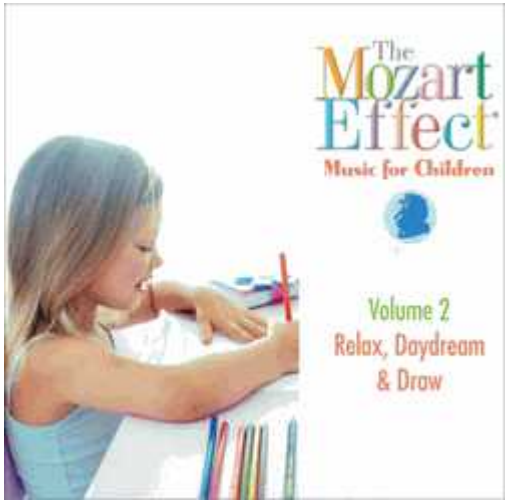
Pedro Maldonado, Ph.D.

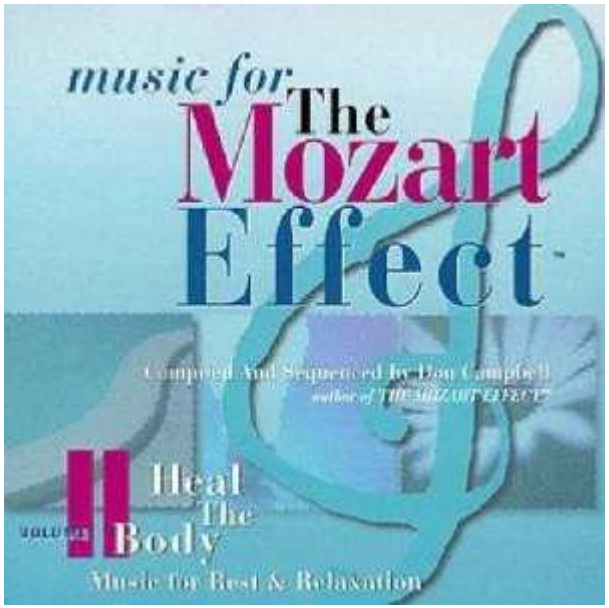
Profesor Titular, Universidad de Chile
Instituto de Ciencias Biomédicas, ICBM
Biomedical Neuroscience Institute, BNI

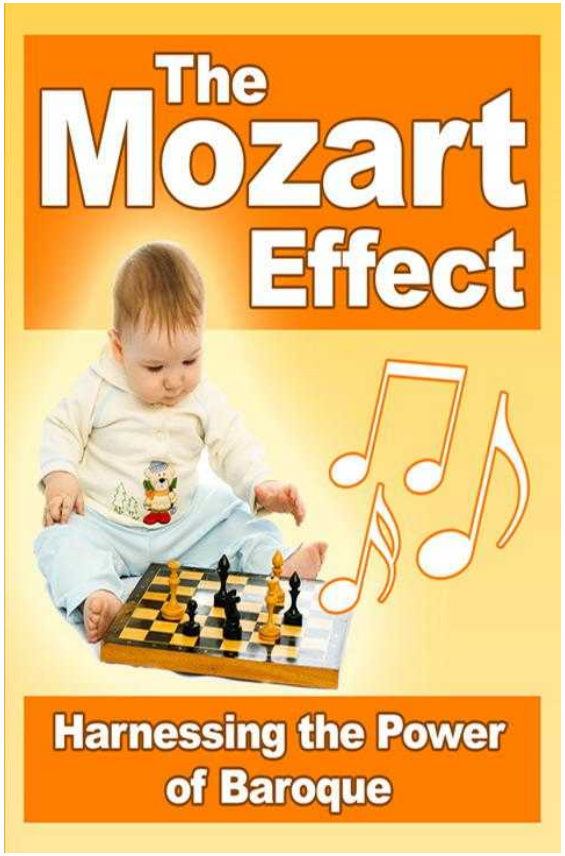
FACULTAD DE MEDICINA
UNIVERSIDAD DE CHILE

BIOMEDICAL NEUROSCIENCE INSTITUTE
CHILE

El Efecto Mozart







En 1992 Alfred Tomatis, un otorrinolaringólogo frances, creia que escuchar música (usaba Mozart) presentada en diferentes frecuencias ayudaba a entrenar el oído, promovía la curación y el desarrollo del cerebro.

Frances Rauscher, Gordon Shaw & Katherine Ky, Nature. 1993

Music and spatial task performance

SIR — There are correlational[1], historical[2] and anecdotal[3] relationships between music cognition and other 'higher brain functions', but no causal relationship has been demonstrated between music cognition and cognitions pertaining to abstract operations such as mathematical or spatial reasoning. We performed an experiment in which students were each given three sets of standard IQ spatial reasoning tasks; each task was preceded by 10 minutes of (1) listening to Mozart's sonata for two pianos in D major, (2) listening to a relaxation tape; or (3) silence. Performance was improved for those tasks immediately following the first condition compared to the second two.

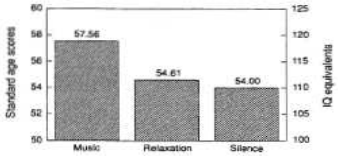
Thirty-six college students participated in all three listening conditions. Immediately following each listening condition, the student's spatial reasoning skills were tested using the Stanford–Binet intelligence scale[4]. The mean standard age scores (SAS) for the three listening conditions are shown in the figure. The music condition yielded a mean SAS of 57.56; the mean SAS for the relaxation condition was 54.61 and the mean score for the silent condition was 54.00. To assess the impact of these scores, we 'translated' them to spatial IQ scores of 119, 111 and 110, respectively. Thus, the IQs of subjects participating in the music condition were 8–9 points above their IQ scores in the other two conditions. A one-factor (listening condition) repeated measures analysis of variance (ANOVA) performed on SAS revealed that subjects performed better on the abstract/spatial reasoning tests after listening to Mozart than after listening to either the relaxation tape or to nothing ($F_{2,35} = 7.08$; $P = 0.002$). The music condition differed significantly from both the relaxation and the silence conditions (Scheffe's $t = 3.41$, $P = 0.002$; $t = 3.67$, $P = 0.0008$, two-tailed, respectively). The relaxation and silence conditions did not differ ($t = 0.795$; $P = 0.432$, two-tailed). Pulse rates were taken before and after each listening condition. A two-factor (listening condition and time of pulse measure) repeated measures ANOVA revealed no interaction or main effects for pulse, thereby excluding arousal as an obvious cause. We found no order effects for either condition presentation or task, nor any experimenter effect.

The enhancing effect of the music condition is temporal, and does not extend beyond the 10–15-minute period during which subjects were engaged in each spatial task. Inclusion of a delay period (as a variable) between the music listening condition and the testing period would allow us quantitatively to determine the presence of a decay constant. It would also be interesting to vary the listening time to optimize the enhancing effect, and to examine whether other measures of general intelligence (verbal reasoning, quantitative reasoning and short-term memory) would be similarly facilitated. Because we used only one musical sample of one composer, various other compositions and musical styles should also be examined. We predict that music lacking complexity or which is repetitive may interfere with, rather than enhance, abstract reasoning. Also, as musicians may process music in a different way from non-musicians, it would be interesting to compare these two groups.

Frances H. Rauscher
Gordon L. Shaw*
Katherine N. Ky
Center for the Neurobiology of Learning and Memory, University of California, Irvine, California 92717, USA

* Also at Department of Physics.

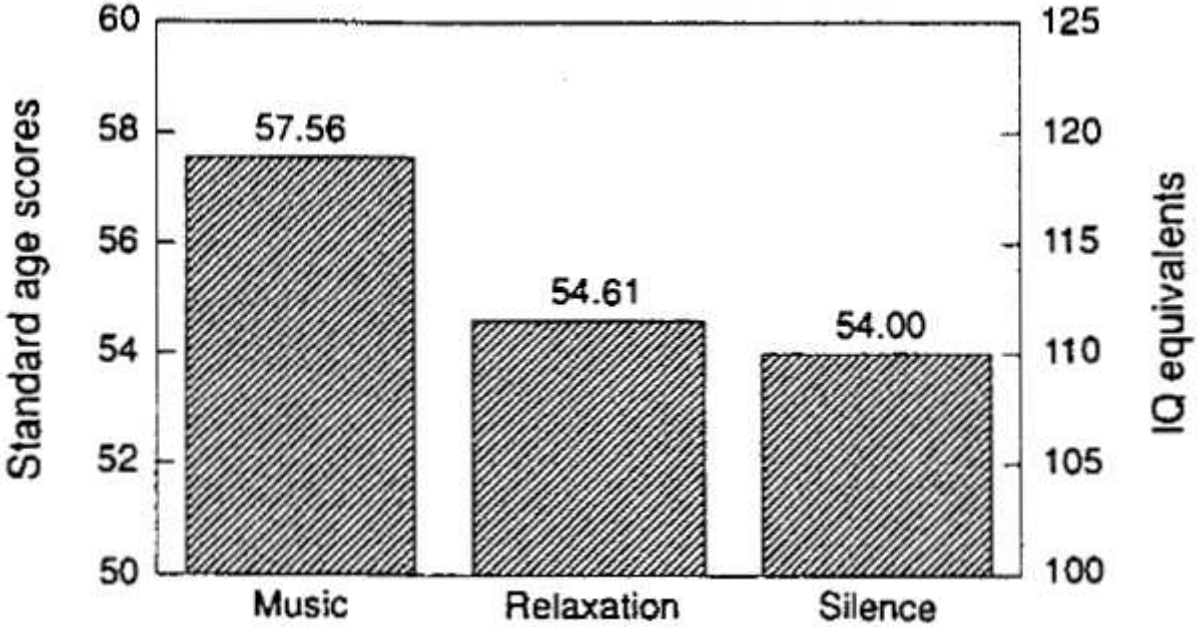
1. Hassler, M., Birbaumer, N. & Feil, A. *Psychol. Music* **13**, 99–113 (1985).
2. Allman, G. J. *Greek Geometry from Thales to Euclid*, p. 23 (Arno, New York, 1976).
3. Cranberg, L. D. & Albert, M. L. in *The Exceptional Brain* (eds Obler, L. K. & Fein, D.) 156 (Guilford, New York, 1988).
4. Thorndike, R. L., Hagen, E. P. & Sattler, J. M. *The Stanford–Binet Scale of Intelligence* (Riverside, Chicago, 1986).



Standard age scores for each of the three listening conditions.

Testing procedure. In the music condition, the subject listened to 10 min of the Mozart piece. The relaxation condition required the subject to listen to 10 min of relaxation instructions designed to lower blood pressure. The silence condition required the subject to sit in silence for 10 min. One of three abstract reasoning tests taken from the Stanford–Binet intelligence scale* was given after each of the listening conditions. The abstract/spatial reasoning tasks consisted of a pattern analysis test, a multiple-choice matrices test and a multiple-choice paper-folding and cutting test. For our sample, these three tasks correlated at the 0.01 level of significance. We were thus able to treat them as equal measures of abstract reasoning ability.

Scoring. Raw scores were calculated by subtracting the number of items failed from the highest item number administered. These were then converted to SAS using the Stanford–Binet's SAS conversion table of normalized standard scores with a mean set at 50 and a standard deviation of 8. IQ equivalents were calculated by first multiplying each SAS by 3 (the number of subtests required by the Stanford–Binet for calculating IQs). We then used their area score conversion table, designed to have a mean of 100 and a standard deviation of 16, to obtain SAS IQ equivalents.



Music and Spatial Task Performance: A Causal Relationship

Frances H. Rauscher, Gordon L. Shaw, Linda J. Levine, Katherine N. Ky

University of California, Irvine

Eric L Wright

Irvine Conservatory of Music

Presented at the American Psychological Association 102nd Annual Convention in Los Angeles, CA
August 12–16, 1994

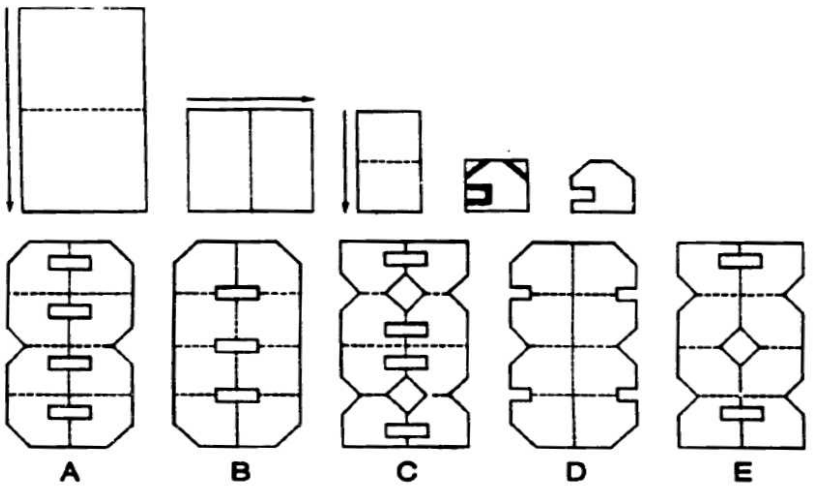
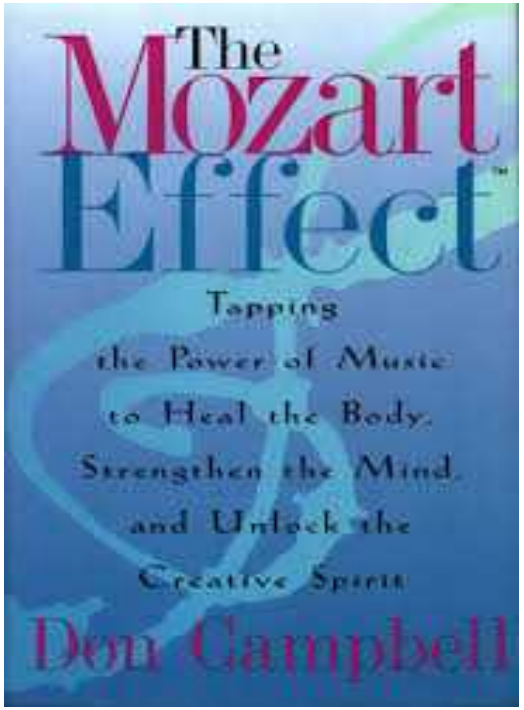
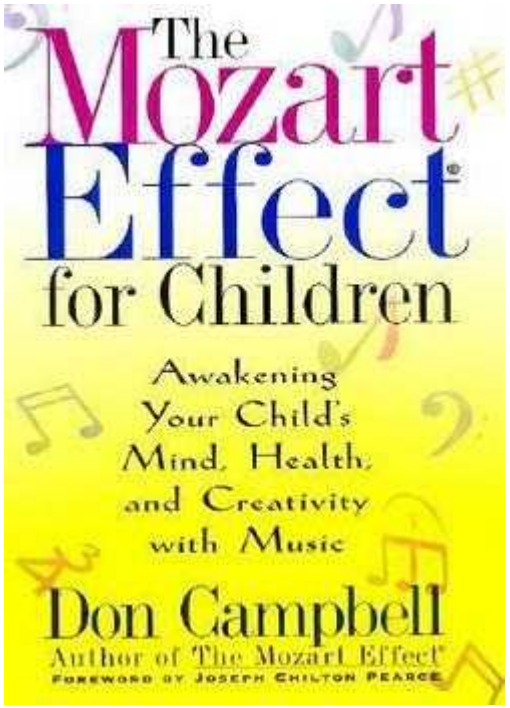


Figure 1. Example of the Paper Folding and Cutting task. Students were presented with a picture of a paper before it was folded and cut (top left figure). The dotted lines and arrows represent where and in what direction the paper would be folded; the solid lines show where the paper would be cut. This paper, for example, would be folded in eighths and then cut in three places. The student was instructed to visualize the folds and cuts and then choose the alternative which shows how the paper would look if it were unfolded.

The New York Times
Expect the World®

Alex Ross, el 28 de agosto de 2004, publico en el New York Times que:
“Investigadores del Centro para la Neurobiología del Aprendizaje y la Memoria en la Universidad de California, Irvine, han determinado que escuchar a Mozart en realidad te hace más inteligente.”





El musico Don Campbell recomienda tocar música clásica especialmente para bebés, con la expectativa de que beneficiará su desarrollo mental . Después de El Efecto Mozart, Campbell recomienda aprovechar el efecto Mozart para "profundo descanso y rejuvenecimiento” , "la inteligencia y el aprendizaje", y "la creatividad y la imaginación".

El gobernador de Georgia Zell Miller emitió un proyecto de ley en 1998, asegurando que cada madre de un recién nacido recibiría un CD de música clásica de cortesía. En el mismo año, el gobierno estatal de Florida aprobó una ley, que requieria guarderías financiadas por el estado de tocar al menos una hora de música clásica al día.

Rhyme and Reason Early Learning
Topics in Parenting and Early Childhood Education

El efecto Mozart

El efecto Mozart se refiere a un conjunto de estudios que en realidad estaban buscando una cosa muy específica - que escuchar la Sonata de Mozart mejora la percepción espacial . En los últimos años la gente ha interpretado " El Efecto Mozart " en el sentido de que la reproducción de música clásica para bebés en el útero va a aumentar su coeficiente intelectual . Eso no es una idea exacta. Sin embargo - porque nuestro sentido auditivo se desarrolla muy temprano (Dentro de los primeros veinte semanas de vida) podemos escuchar los ritmos del cuerpo como los latidos del corazón y la respiración antes del nacimiento , lo que significa que la música en realidad es muy beneficioso para los niños en el UTERO.

1999 PSYCHOLOGICAL SCIENCE

Research Report

THE MYSTERY OF THE MOZART EFFECT: Failure to Replicate

Kenneth M. Steele, Karen E. Bass, and Melissa D. Crook

Appalachian State University

OPEN ACCESS Freely available online

2001

PLoS one

Pervasiveness of the IQ Rise: A Cross-Temporal Meta-Analysis

Jakob Pietschnig*, Martin Voracek, Anton K. Formann†

Department of Basic Psychological Research, School of Psychology, University of Vienna, Vienna, Austria

Evidence-Based Complementary and Alternative Medicine

IMPACT FACTOR 1.93

Evid Based Complement Alternat Med. 2012; 2012: 607517.
Published online 2012 Dec 5. doi: 10.1155/2012/607517

PMCID: PMC3523174

Mozart K.545 Mimics Mozart K.448 in Reducing Epileptiform Discharges in Epileptic Children

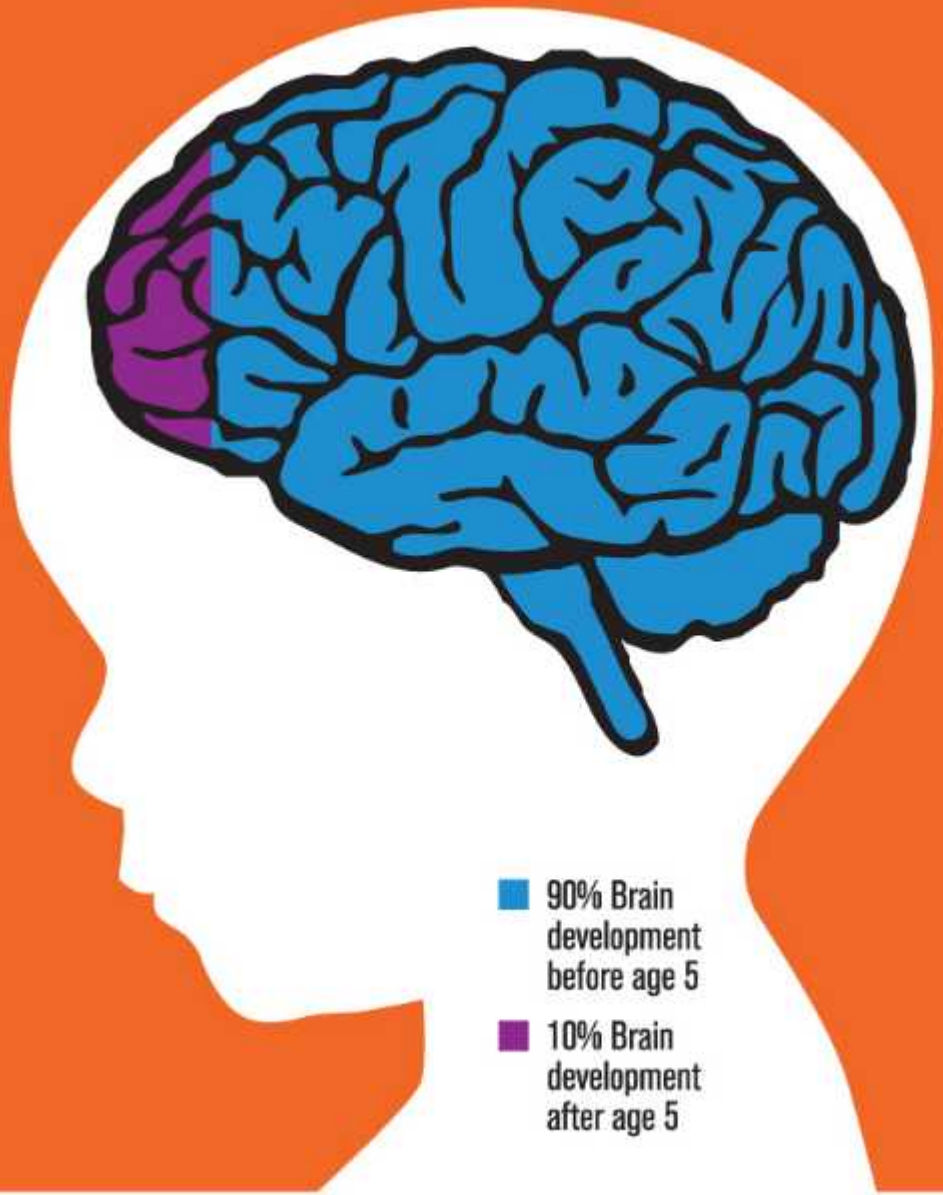
Lung-Chang Lin,[1,2] Mei-Wen Lee,[3] Ruey-Chang Wei,[4] Hin-Kiu Mok,[5] Hui-Chuan Wu,[2] Chin-Lin Tsai,[6] and Rei-Cheng Yang[2,*]

Author information ► Article notes ► Copyright and License information ►

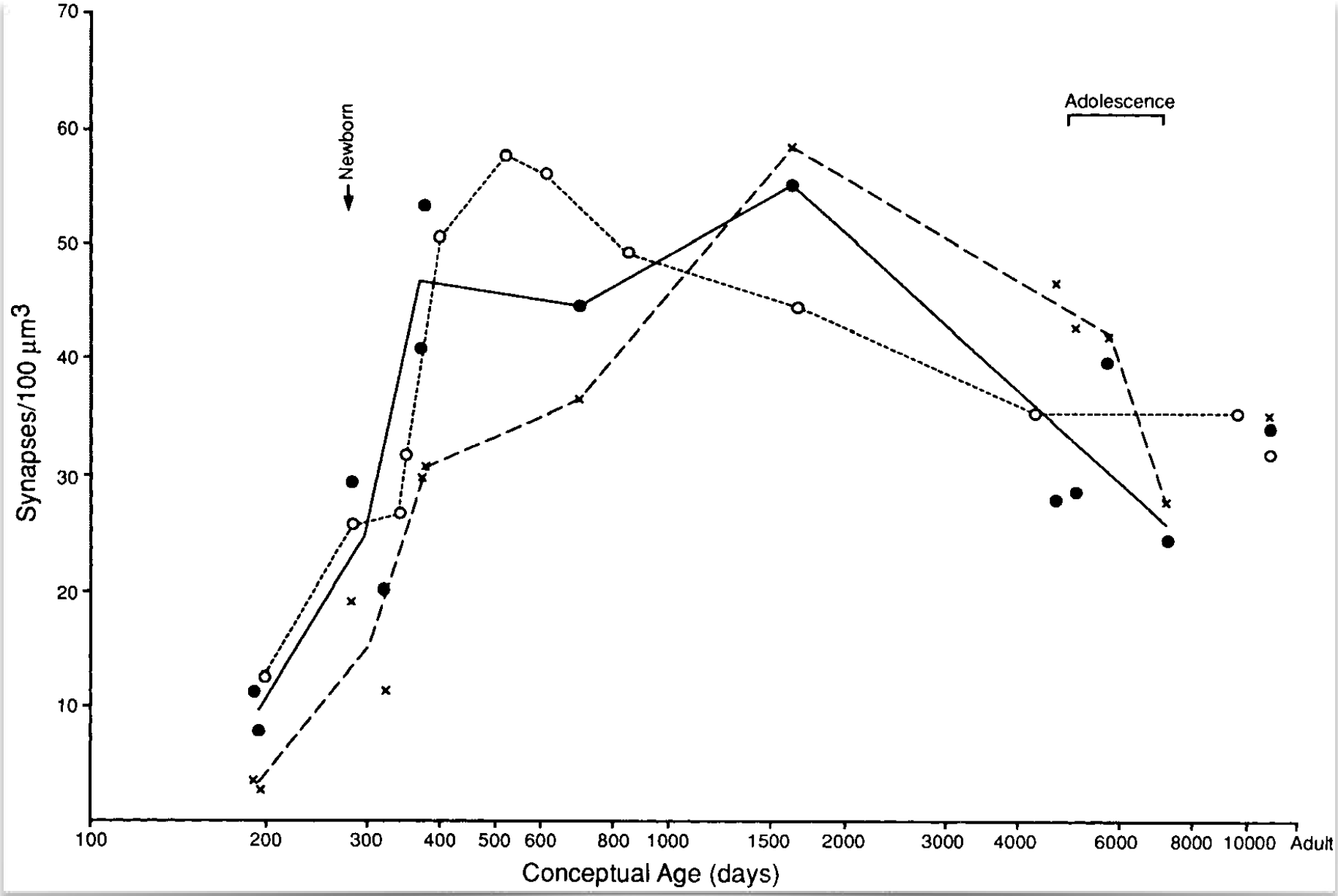
Rauscher , uno de los investigadores originales escribió en 1999 que “jamás hemos hecho la afirmación que escuchar a Mozart aumenta la inteligencia.”

90%

of a child's brain development happens before age 5



Source: Harvard Center for the Developing Child

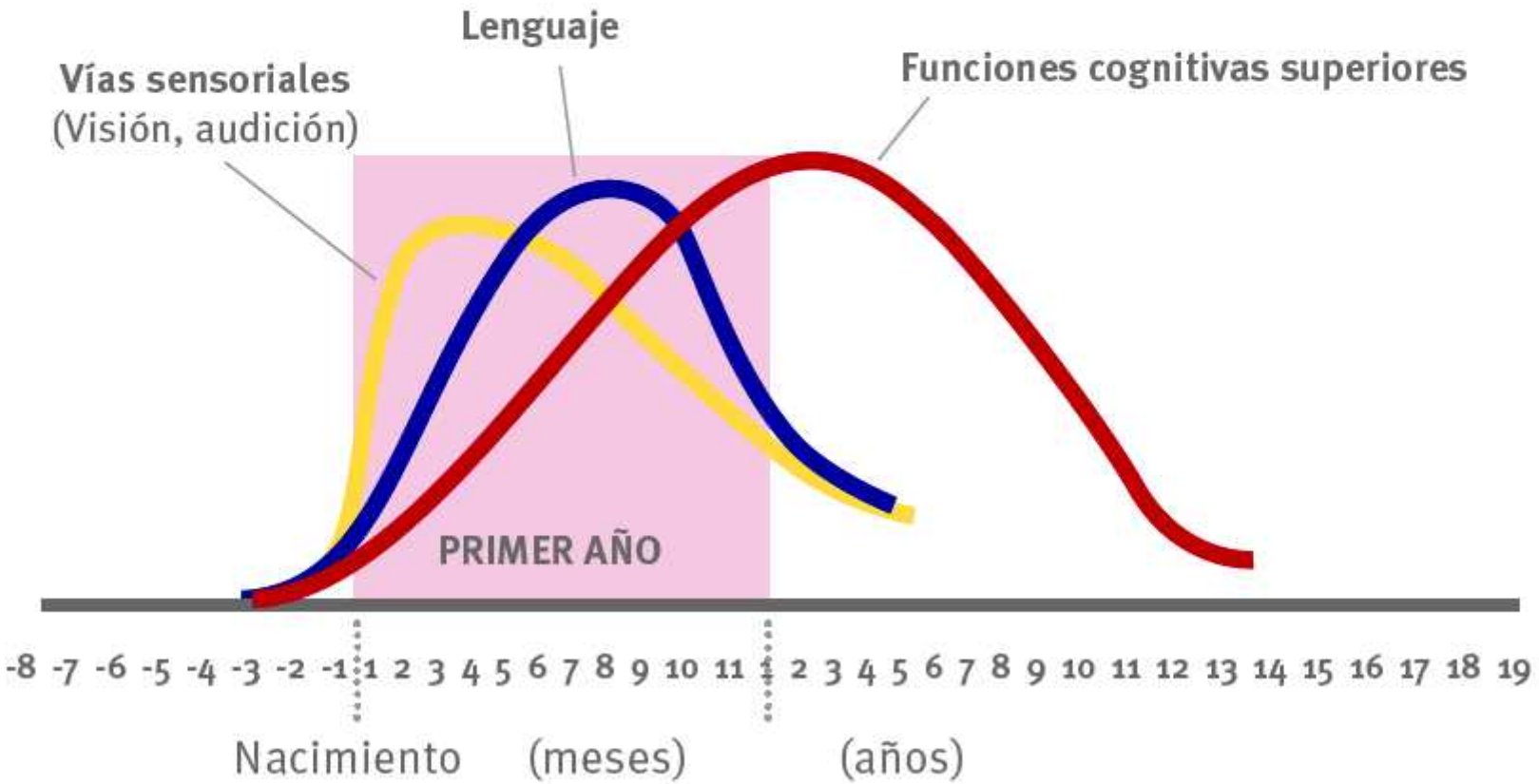


Huttenlocher & Dabholkar, 1997

Center on the Developing Child
HARVARD UNIVERSITY

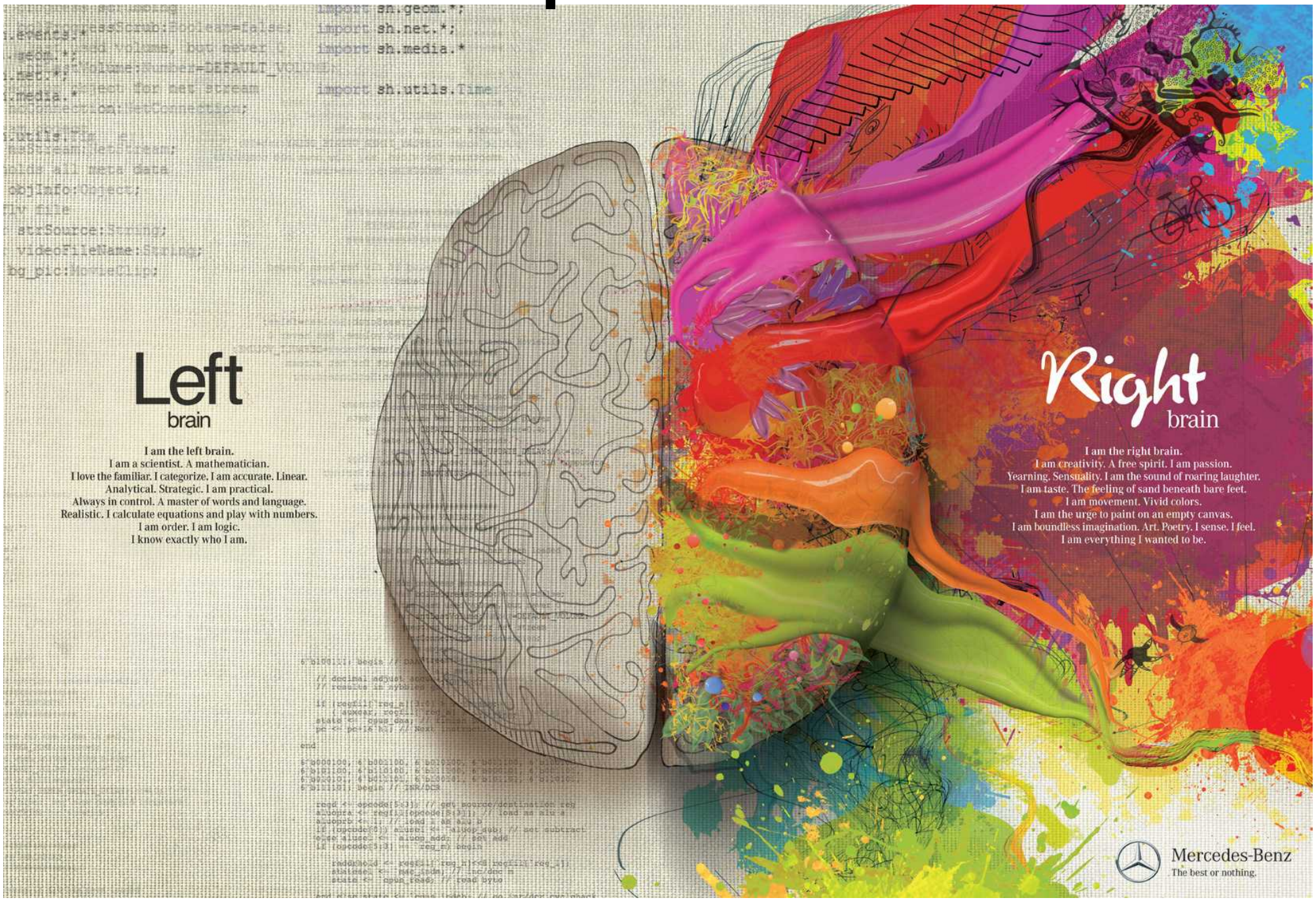
Desarrollo del cerebro humano

Las conexiones neuronales para las diferentes funciones se desarrollan secuencialmente



Fuente: C.A. Nelson (2000)

El cerebro izquierdo v/s el derecho



LEFT VS. RIGHT BRAIN

If you've ever wondered why you act the way you do, the answer may lie in which side of your brain you tend to use more. Although they're generalizations, popular theories suggest that right-brain people have different skills and preferences than those who are left-brain people. How do these differences impact you? Find out:

OVERVIEW

As similar as the brain's hemispheres look, they actually manage very different functions, which are attributed to different characteristics and abilities such as:

LEFT SIDE

Often goal-orientated and well organized, left brainers are critical thinkers and rarely absent minded.

Planner

Reads sitting up

RIGHT SIDE

Slightly disorganized, unpredictable and emotional, right brainers are often good with people and philosophical.

Reads lying down

Impulsive

Research is well-documented and likes to read directions.

Realistic

Prefers to read realistic stories and to write non-fiction.

Music critic

Prefers classical music.

Dog lovers

Cat lovers

Solves problems intuitively and doesn't like reading directions

Psychic

Interested in "the unexplained" and mystery stories.

Sound

Prefers rock music and can study with music or television.

Left-brain teachers

Teachers with left-brain strengths generally prefer to teach using lecture and discussion. They give problems to the students to solve independently. They assign more research and writing. A clean, quiet, structured classroom is preferred.

Right- brain teachers

Teachers with right-brain strengths prefer to use hands-on activities. They incorporate art, visuals, and music into their lessons.
They assign more group projects and prefer a busy, active, noisy classroom environment.

Left-brain students

These students prefer to work alone in a quiet classroom. They like to read independently and incorporate research into their papers.

Right- brain students

These students prefer to work in groups with interaction and activity. These students like to do art projects and choose industrial art electives.

DIFFERENT LEARNING STYLES

The side of the brain we tend to use more may determine our learning styles, not to mention instructors' teaching methods:

LEFT SIDE

Linear
Processes information by taking pieces, lining them up, and arranging them in a logical order to draw conclusions.

Sequence
Processes information in order. This makes for easy daily planning and accomplishing tasks.

Reality-based
Deals with reality the way it is. When affected by the environment, adjustment can be easily made.

$$f(x) = \frac{x}{3} + 5$$

Symbolic
Processing symbols is no problem such as letters, words, and mathematical notation.

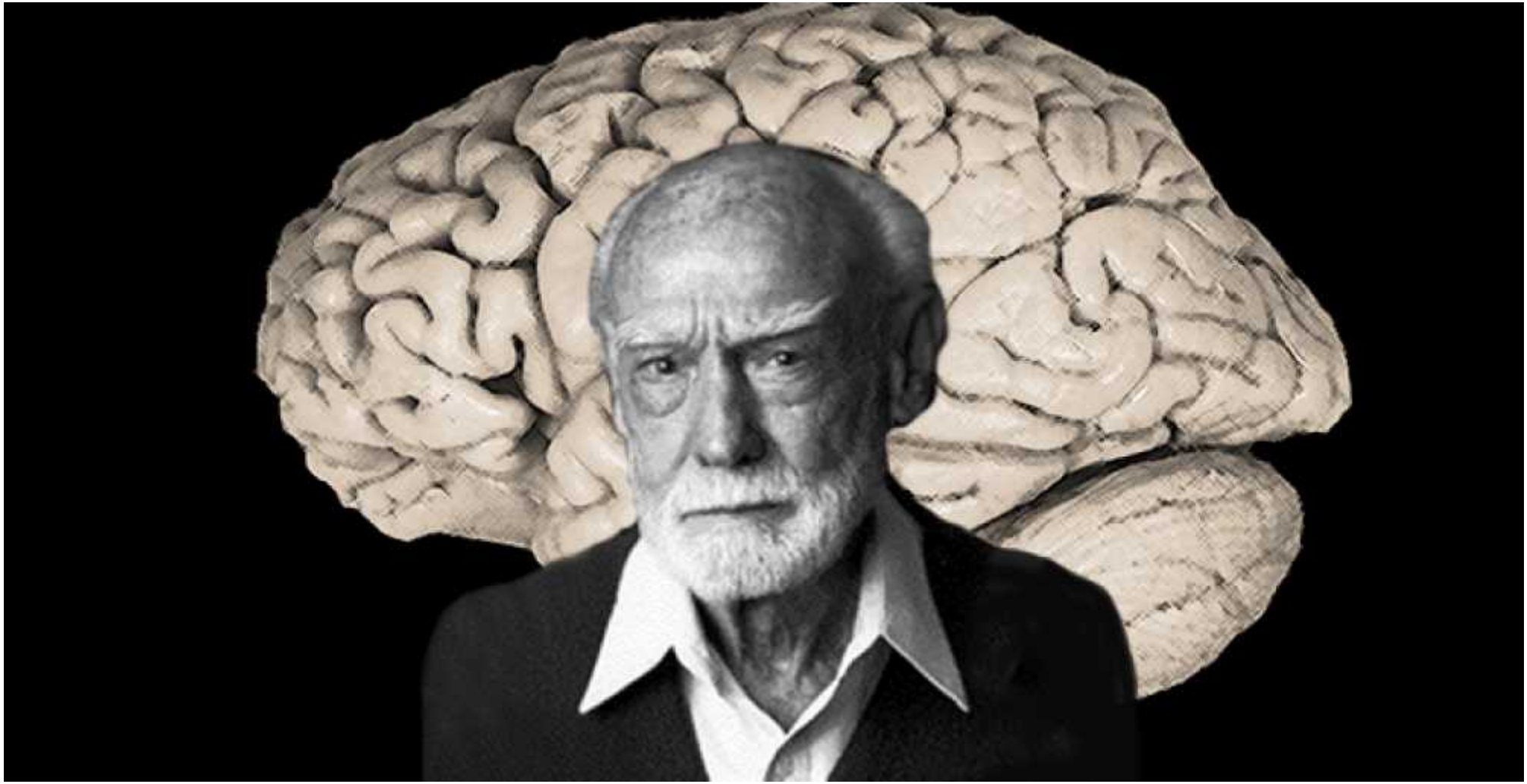
RIGHT SIDE

Holistic
Processes information by starting with the answer. It sees the big picture first, not the details.

Random
Processes information through random processing. Tasks are done randomly and in parts.

Fantasy-oriented
Processes information based on what they think the answer is. Often they find the answer intuitively.

Concrete
Processing requires things to be concrete such as feeling, seeing, or touching the real object.



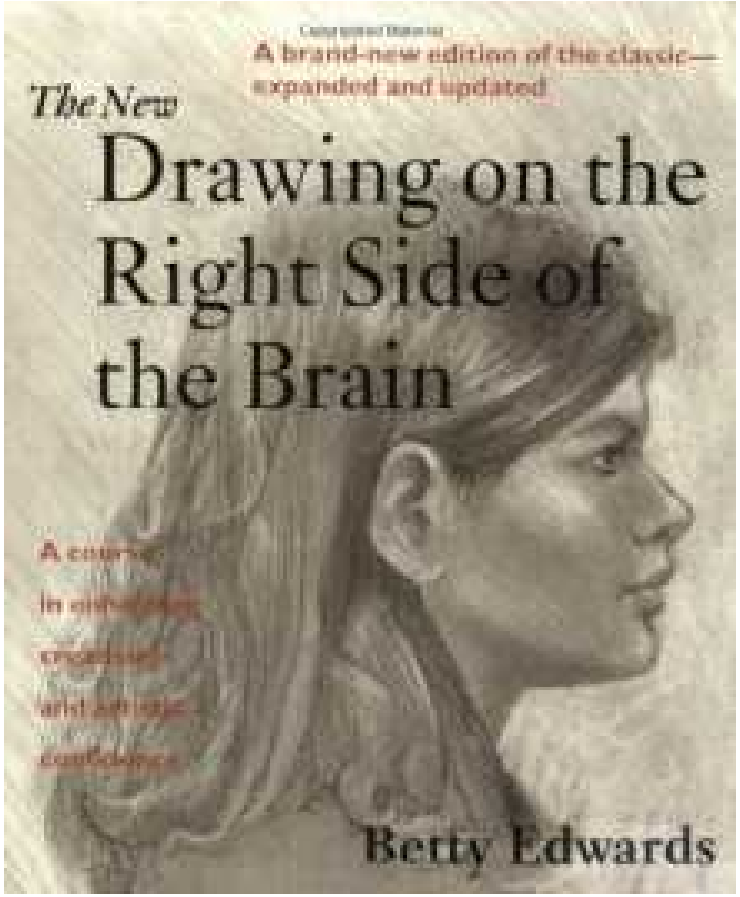
Roger Sperry 1913 –1994

Ned Herrmann

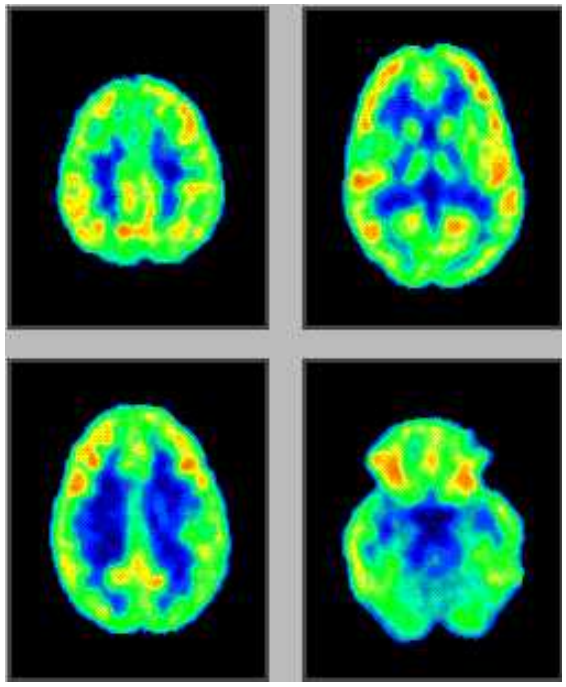
La teoría de los cuadrantes

	Racional lógico	Imaginativo
A	•Lógica •Análisis •Cuantificación •Crítica •Racionalidad •Realismo	•Conceptualización •Intuición •Integración •Síntesis •Visualización •Experimentación D
	Metódico formal	**Emotivo social**
B	•Previsión •Precaución •Organización •Planificación •Administración	•Relación humana •Instrucción •Sentimiento •Emoción •Expresión C

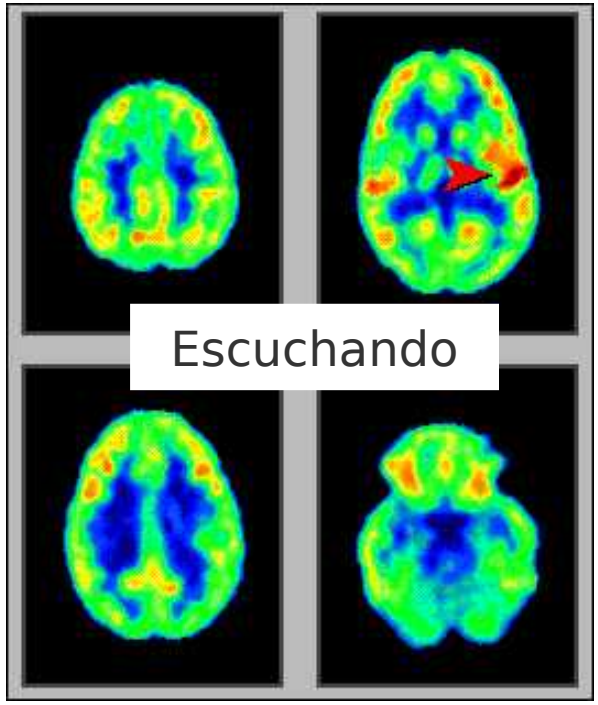
Betty Edwards

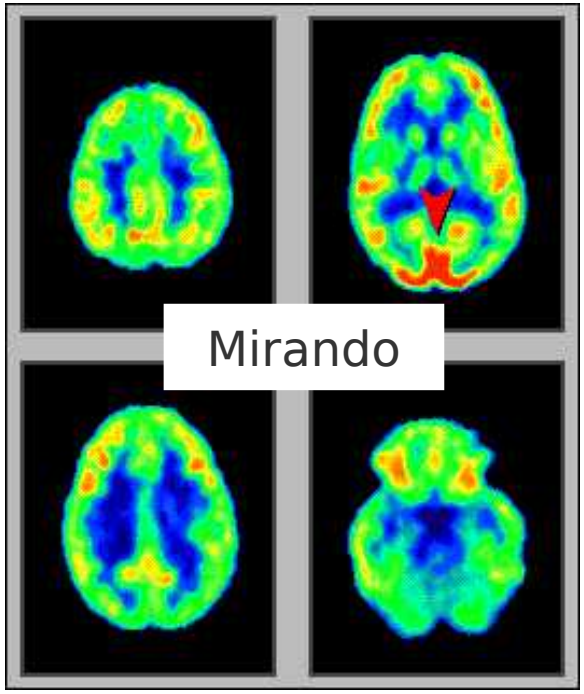


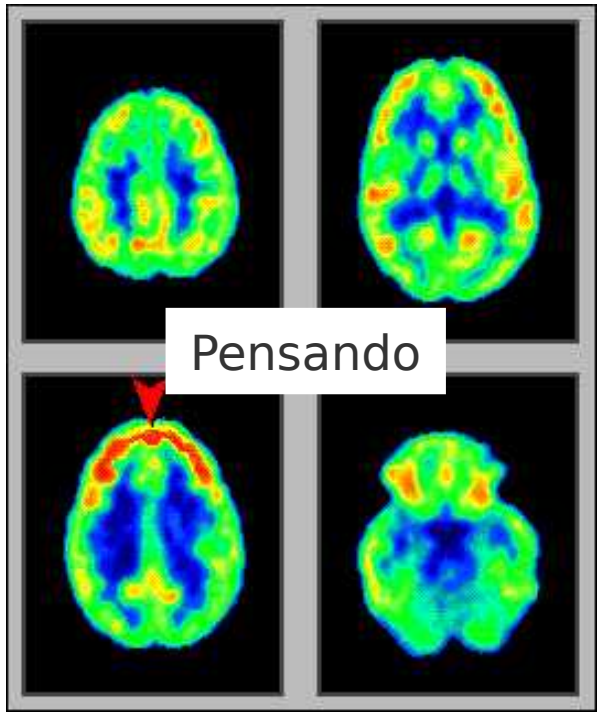
IMAGENES: Tomografía de Emision de Positrones (PET)

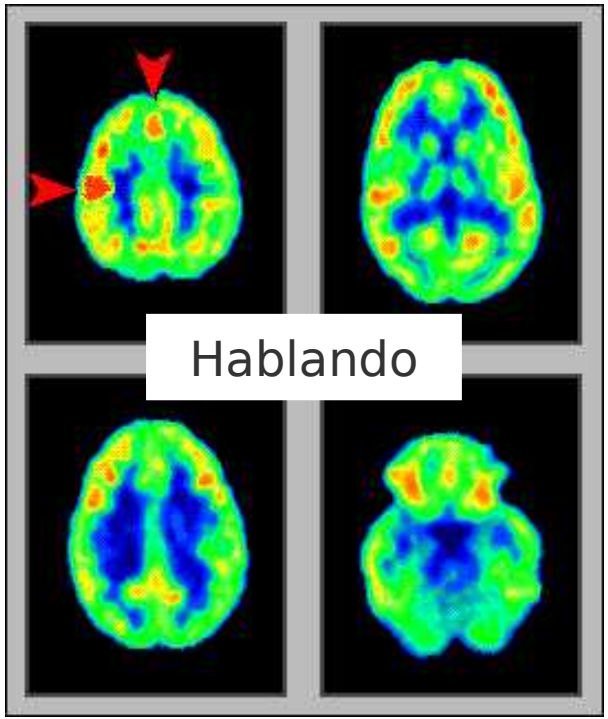


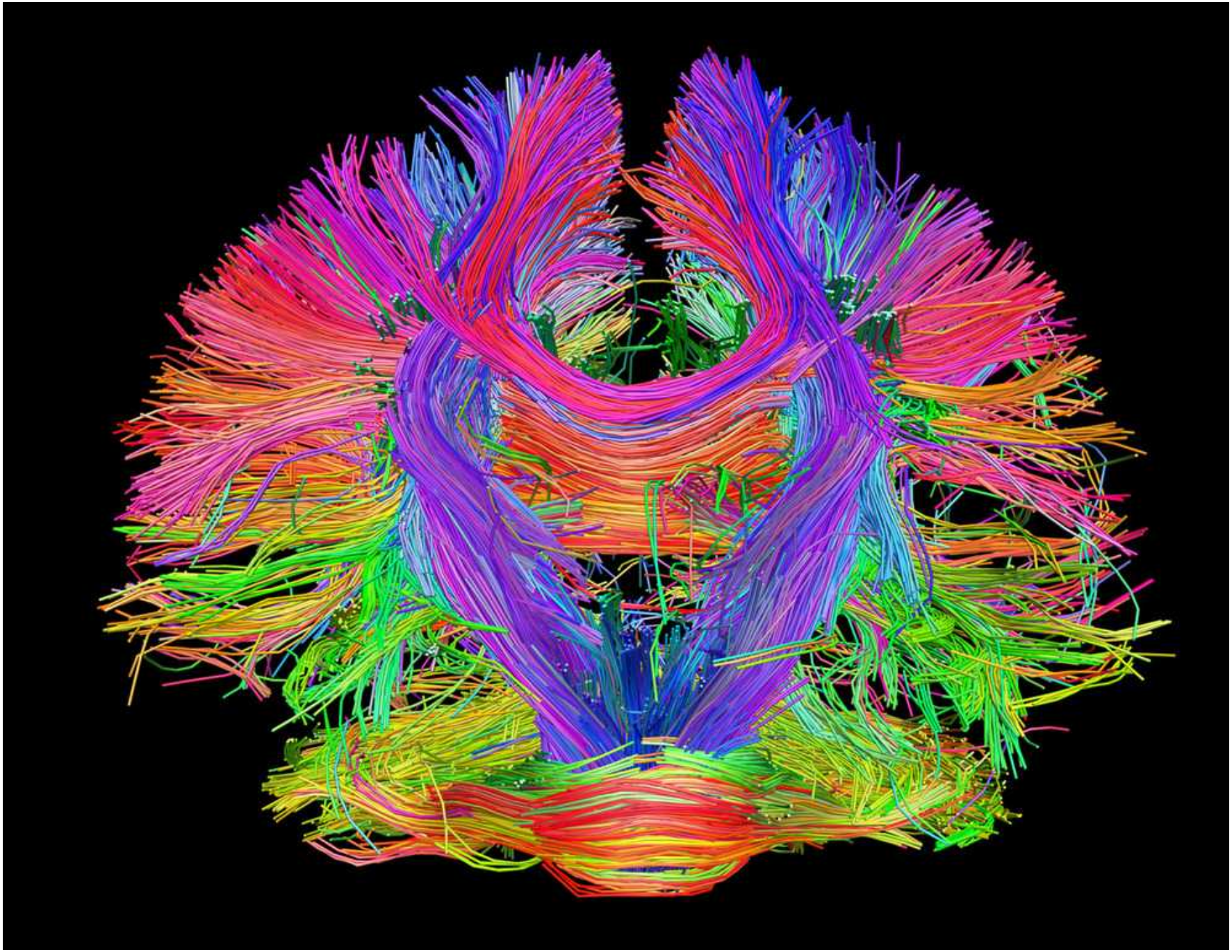
Descansando



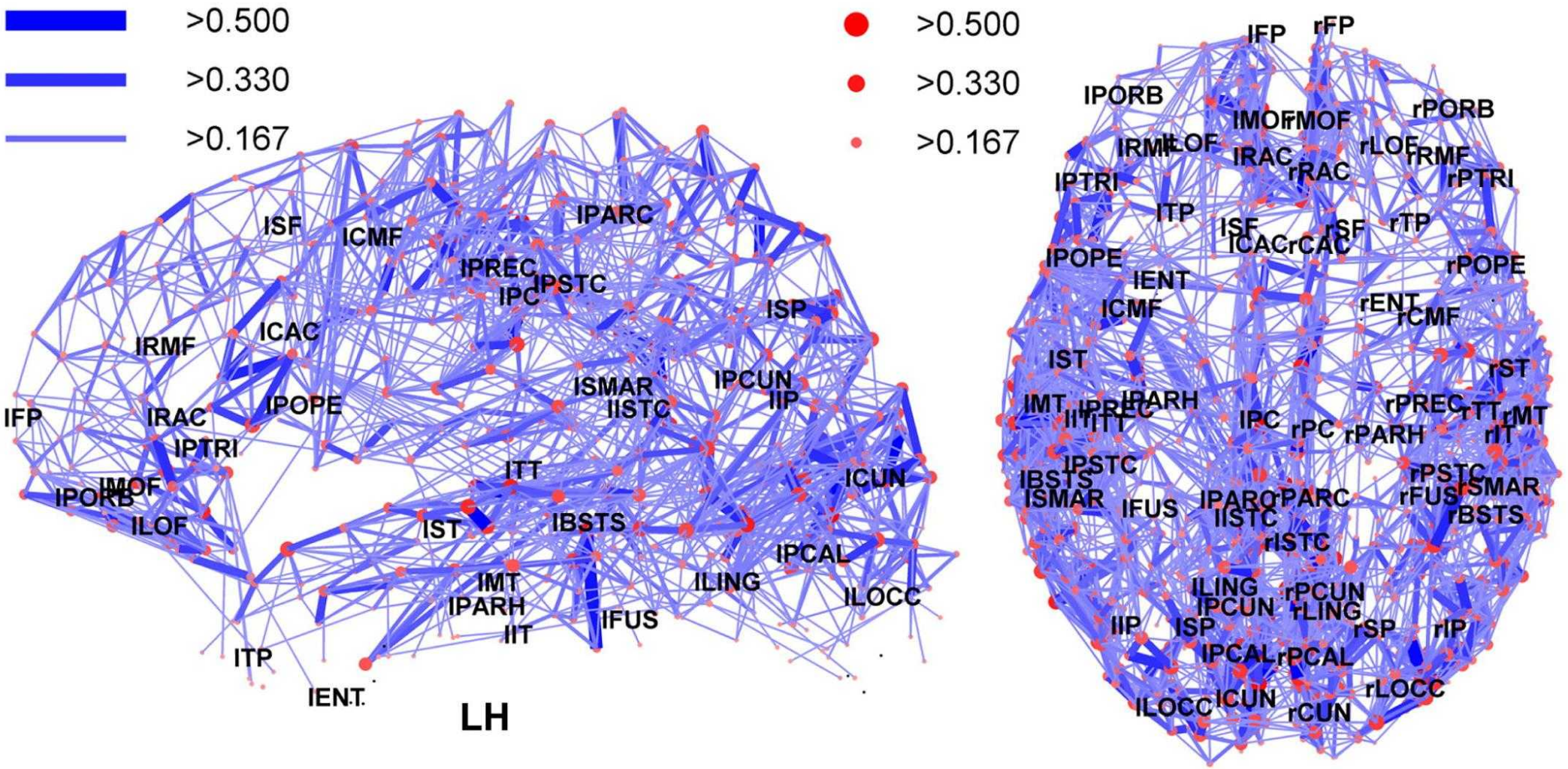








Brain conectome


>0.500
>0.330
>0.167
>0.500
>0.330
>0.167
ISF
ICMF
IPARC
IPREC
IPSTC
IPC
ISP
IRMF
ICAC
IPOPE
ISMAR
IPCUN
IISTC
IIP
IFP
IRAC
IPTRI
IMOF
IPORB
ILOF
ITT
ICUN
IST
IBSTS
IPCAL
IMT
ILING
IPARH
ILOCC
IFUS
IIT
ITP
IENT
LH
IFP
rFP
IPORB
IMOF
rMOF
rPORB
IRMF
ILOF
IRAC
rLOF
rRMF
rRAC
IPTRI
rPTRI
ITP
ISF
rSF
rTP
ICAC
rCAC
IPOPE
rPOPE
IENT
rENT
ICMF
rCMF
IST
rST
IMT
IPARH
rPREC
rTT
rMT
IIT
ITT
IPC
rPC
rPARH
rIT
IPSTC
rPSTC
IBSTS
ISMAR
IFUS
IPARC
rPARC
rFUS
rISMAR
IISTC
rBSTS
rISTC
ILING
rPCUN
IPCUN
rLING
IIP
ISP
rSP
rIP
IPCAL
rPCAL
rLOCC
ILOCC
ICUN
rCUN

NEUROCIENCIA

Conducta /organismo

SNC

Sistemas

Neuronas

Genes

EDUCACIÓN

País

Sociedad

Ambiente familiar /escuela

Relación con el medio físico

Conducta /organismo

País

Sociedad

Ambiente familiar /escuela

Relación con el medio físico

Conducta /organismo

SNC

Sistemas

Neuronas

Genes

Cualquier colaboración va a tener más éxito cuando cada socio tiene expectativas realistas sobre el otro.

Los educadores deben esperar que la neurociencia:

(1) no es prescriptiva.

(2) no entrega sugerencias o mecanismos acerca de los objetivos educativos en niveles de análisis que van más allá del individuo.

(3) entrega evidencia sobre mecanismos finos de conducta individual, tales como cómo entender cómo la gente lee, aprende, o atiende, pero estos datos sólo serán útil en el contexto de teorías de educativas bien desarrolladas.

Willingham, 2009

GRACIAS!

FACULTAD DE MEDICINA
UNIVERSIDAD DE CHILE

BIOMEDICAL
NEUROSCIENCE
INSTITUTE
CHILE