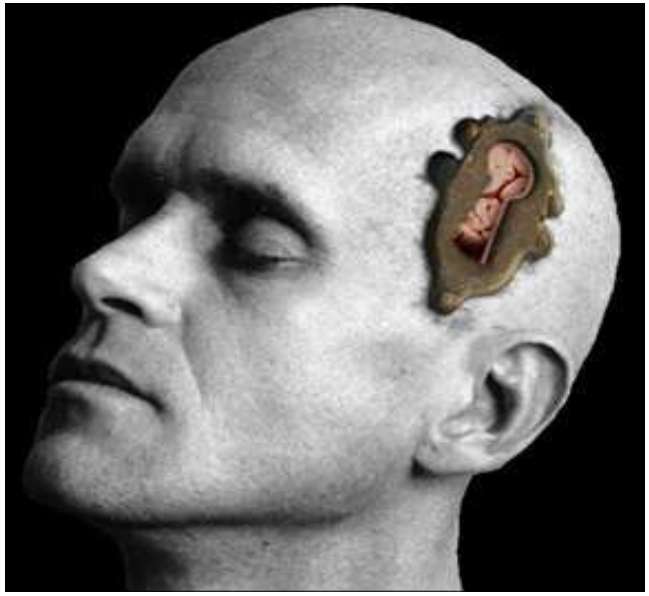
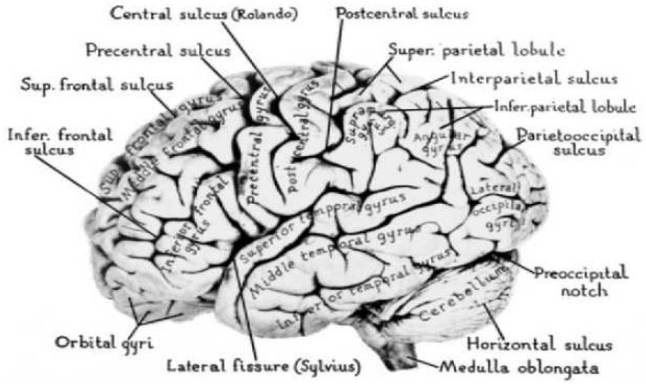
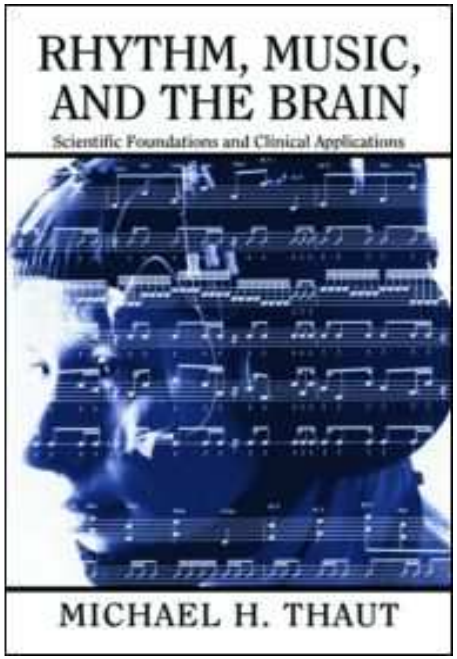
NEUROLOGIA & MUSICA



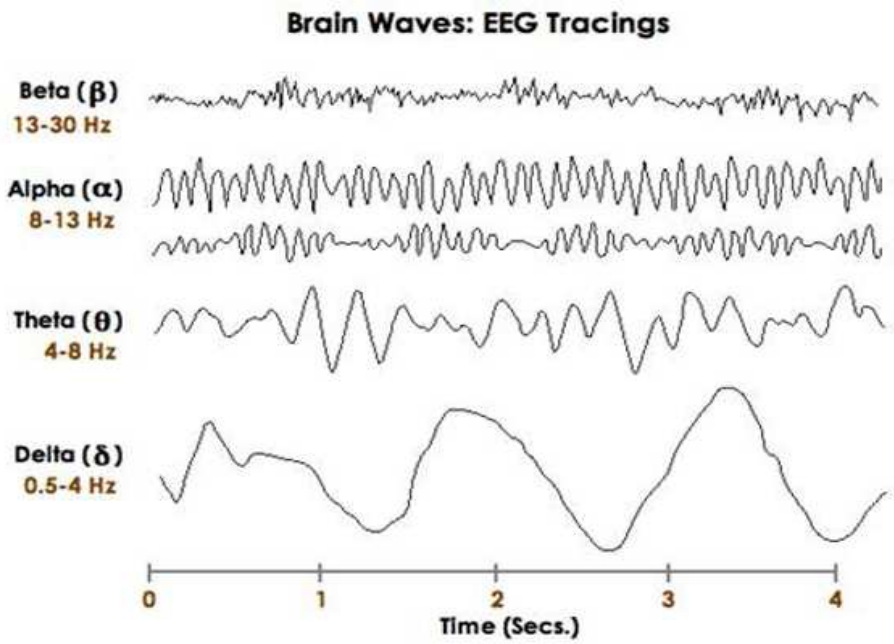


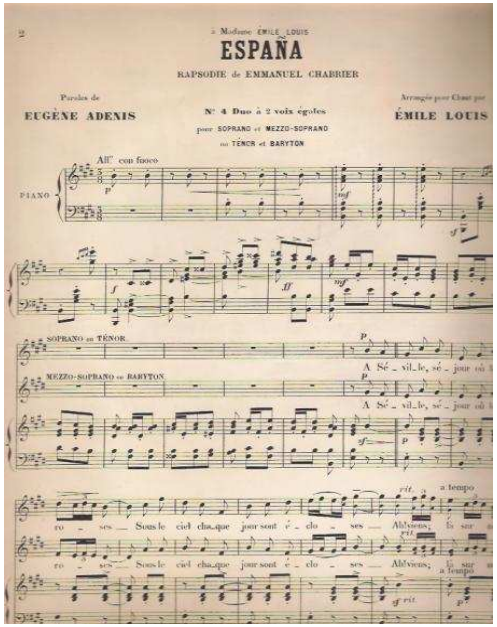
Dott. Patrik Fazio 26 Maggio 2012. Società Medico Chirurgica di Ferrara.

Musica, cervello e neurologia



The Rhythmic Brain

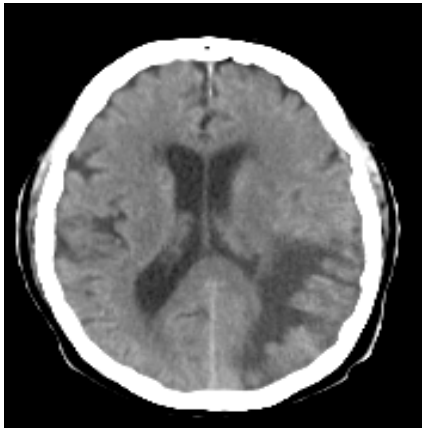




*"La stessa struttura della "musica" (**in termini di composizione temporale e di frequenza**) è apparentemente direttamente correlata alle dinamiche di sincronizzazione e funzionamento di decodifica neurale".*

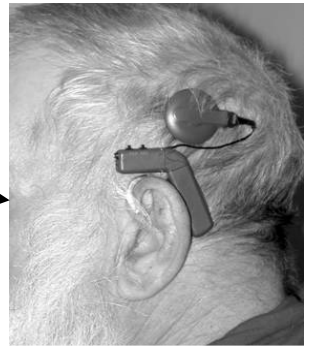
NEUROLOGIA & MUSICA

Danno cerebrale focale acquisito:
Vascolare, tumore,
traumi, forme di demenza



Anomalie congenite:
Amusia congenita,
Sindrome di Williams

Ipoacusie, anacusie:
(sordità): impianti cocleari.



Le patologie neurologiche possono determinare sia fenomeni positivi che fenomeni negativi

Fenomenologie positive

Epilessia musicogenica, crisi epilettiche parziali uditive, allucinazioni musicali

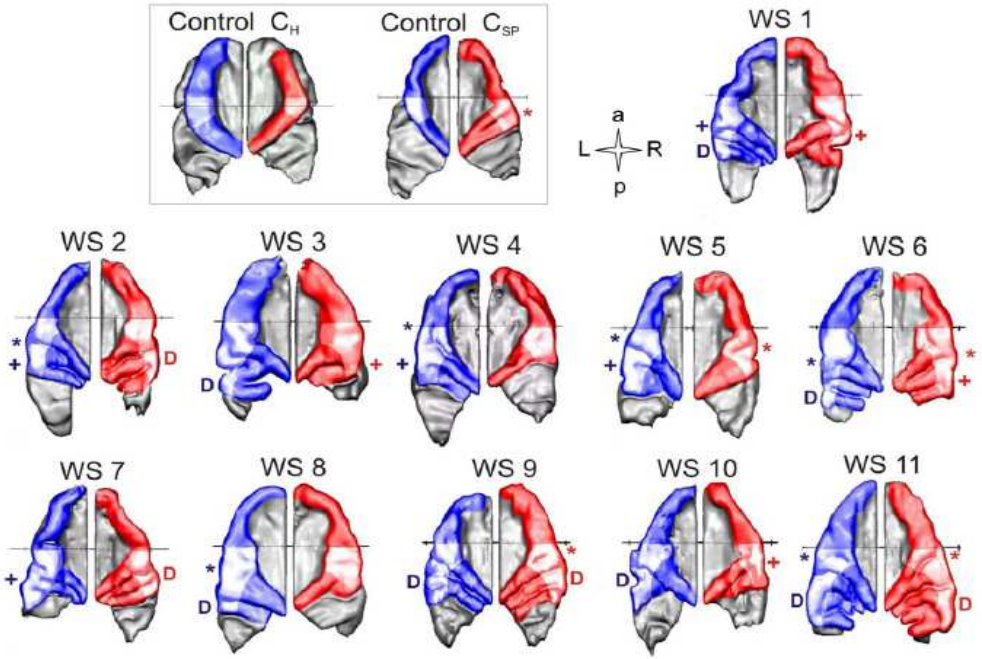
Fenomenologie negative Le Amusie

Disordini del Movimento

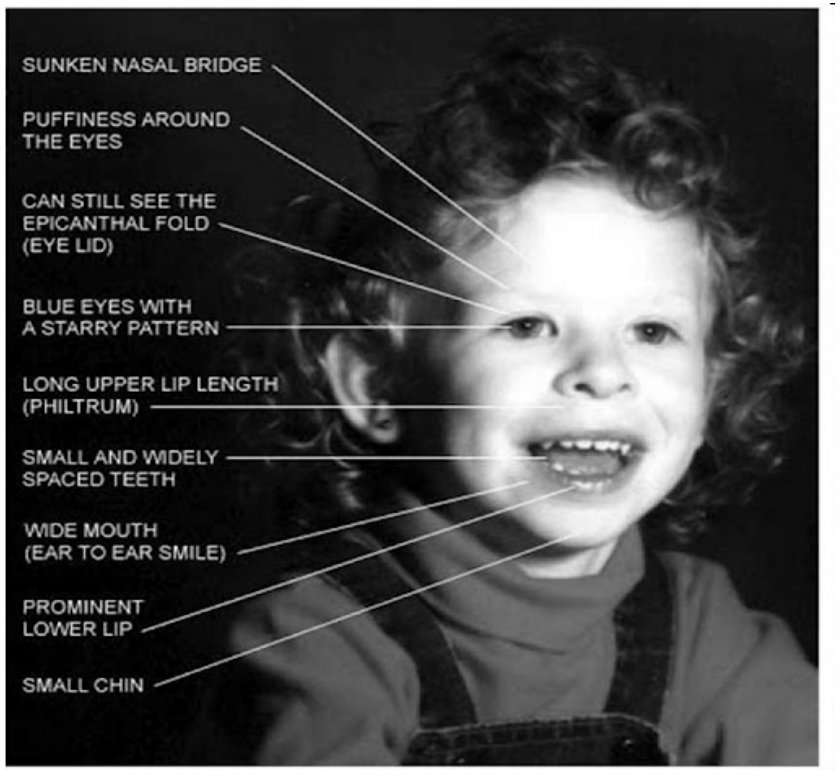
Sindrome di Williams

“ Good pitch, a sense of rhythm, singing, playing instruments, improvising and even composing “ (***Levitin DJ 2005***).

Processamento dei volti, socialità, linguaggio e musica.



Voxel based Morphometry. Increased gyrification of the auditory cortex in WS. *Wengenroth M. 2010. PLOS ONE.*



Brams
International Laboratory for
Brain, Music, and Sound Research

Le Amusie Pure

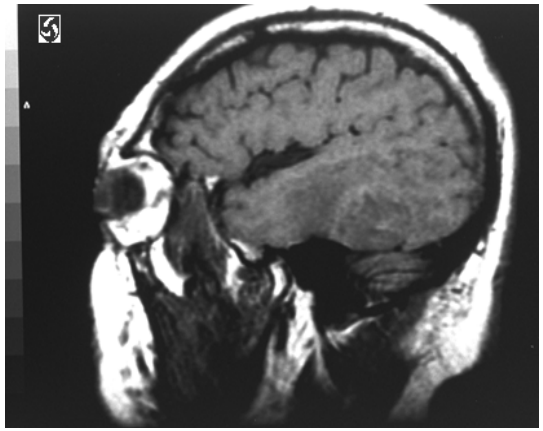
Reports	Domain		
	speech	music	environmental sounds
Metz-Lutz and Dahl (1984)	–	+	+
Yaqub et al. (1988)	–	+	+
Takahashi et al. (1992)	–	+	+
Spreen et al. (1965)	+	–	–
Habib et al. (1995)	+	–	–
Laignel-Lavastine and Alajouanine (1921)	–	+	–
Godefroy et al. (1995)	–	+	–
Peretz et al. (1994), CN and GL	+	–	+
Peretz et al. (1997), IR	+	–	+
Griffith et al. (1997)	+	–	+
Tanaka et al. (1987)	–	–	+
Eustache et al. (1990) case I	–	–	+
Mendez and Geehan (1988), case II	–	–	+
Motomura et al. (1986)	+	+	–

Ernesto Che Guevara fù uno dei più celebri amusici.

Amusia Acquisita e Congenita

L'**amusia** (dal greco *a-musía*, mancanza di armonia) è l'incapacità biologica di comprendere, eseguire ed apprezzare la musica.

L’ "amusico" non è in grado di comprendere l'altezza delle note né di distinguere una melodia da un'altra.
Difficoltà nel seguire un ritmo, sentire, udire sia la voce che la musica come monotonali.
Nei casi più gravi, gli amusici non sono capaci di sentire la musica o la trovano irritante e sgradevole.



Amusia o Agnosia Musicale

***Capacità Motorio/Espressive**:*

- Cantare
- Mimare uno strumento (Hum) o fischiare (**Amusie espressive**)
- Suonare uno strumento (**Aprassia musicale o strumentale**)
- Scrivere musica (**Agrafia Musicale**)

***Dominio recettivo** :*

- Discriminazione tonale
- Identificazione di brani familiari (**Amusia recettiva**)
- Leggere musica (**Alessia Musicale**)

Montreal Battery of Evaluation of Amusia (MBEA)

(Peretz et al. 2003)

Comprensione e ricezione della musica :

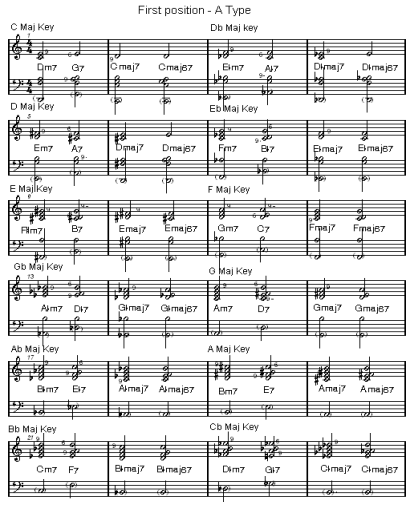
Elementi tonali: tonalità, armonia, melodia, e il timbro.

Elementi temporali: ritmo e metrica.

Componenti emozionali:

Soggettiva risposta alla musica.

Memoria e capacità di **immaginazione** musicale.



Espressione musicale

Elementi tonali: tonalità, produzione di melodie.

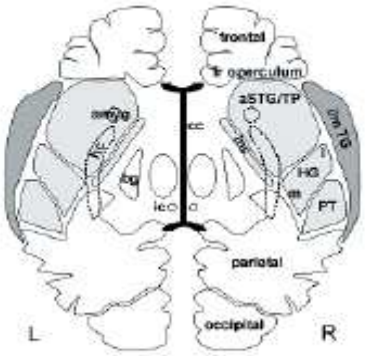
Elementi temporali: ritmo.Elementi emozionali.

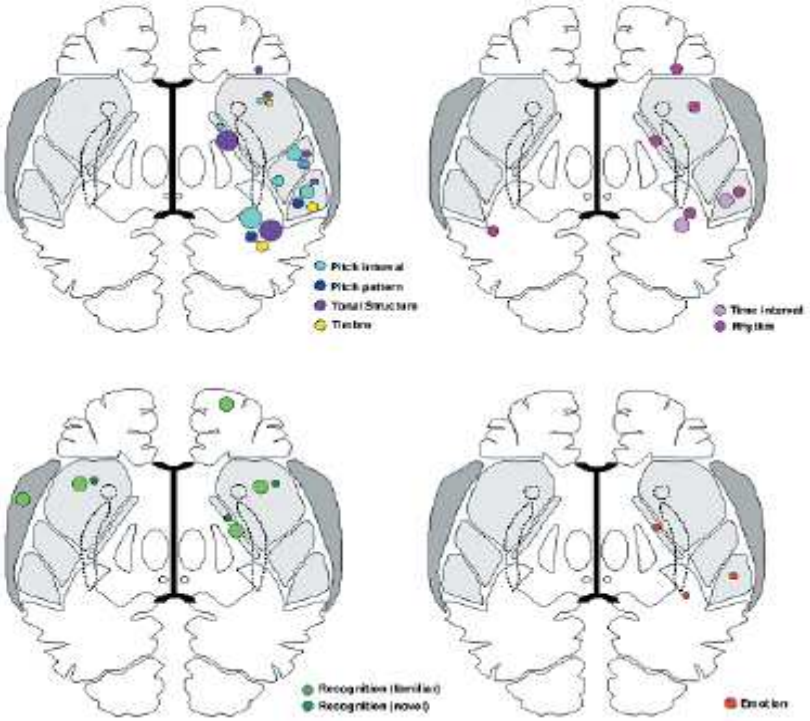
http://www.delosis.com/listening/measure1.htm

REVIEW ARTICLE

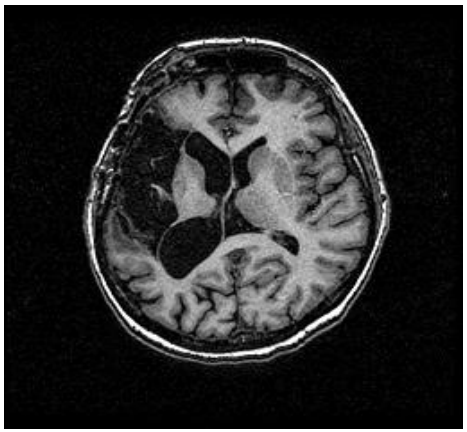
Music and the brain: disorders of musical listening

Lauren Stewart,[1,2,3] Katharina von Kriegstein,[1,3] Jason D. Warren[4] and Timothy D. Griffiths[1,3]

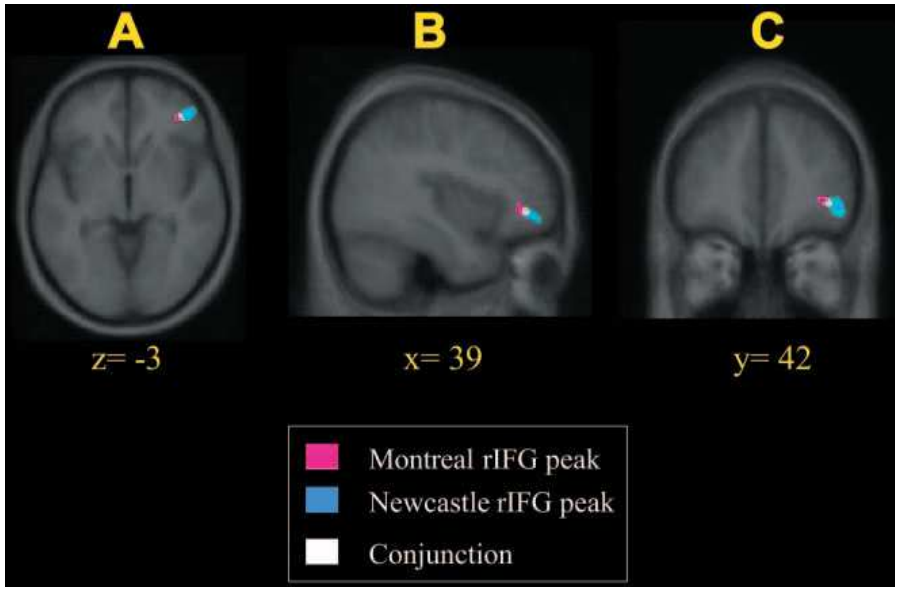




The corpus callosum. Superior-temporal plane. Middle/inferior temporal gyri.

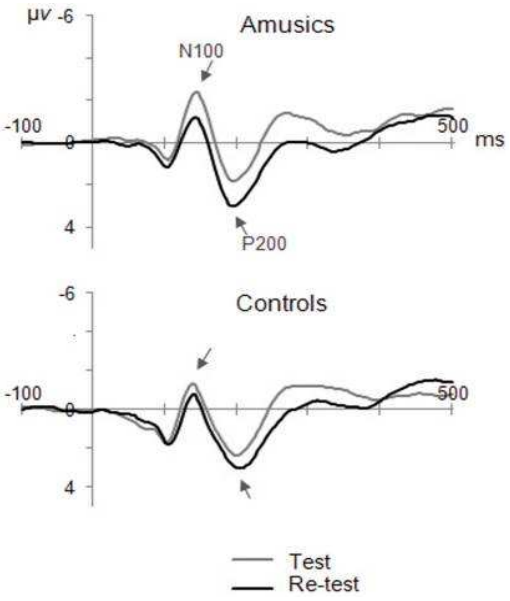


Amusia Congenita:recenti acquisizioni.



Hyde 2006

"Differenze morfometriche a carico della **Corteccia Frontale Inferiore** e nelle aree sopra il **Giro Temporale Superiore** bilateralmente".



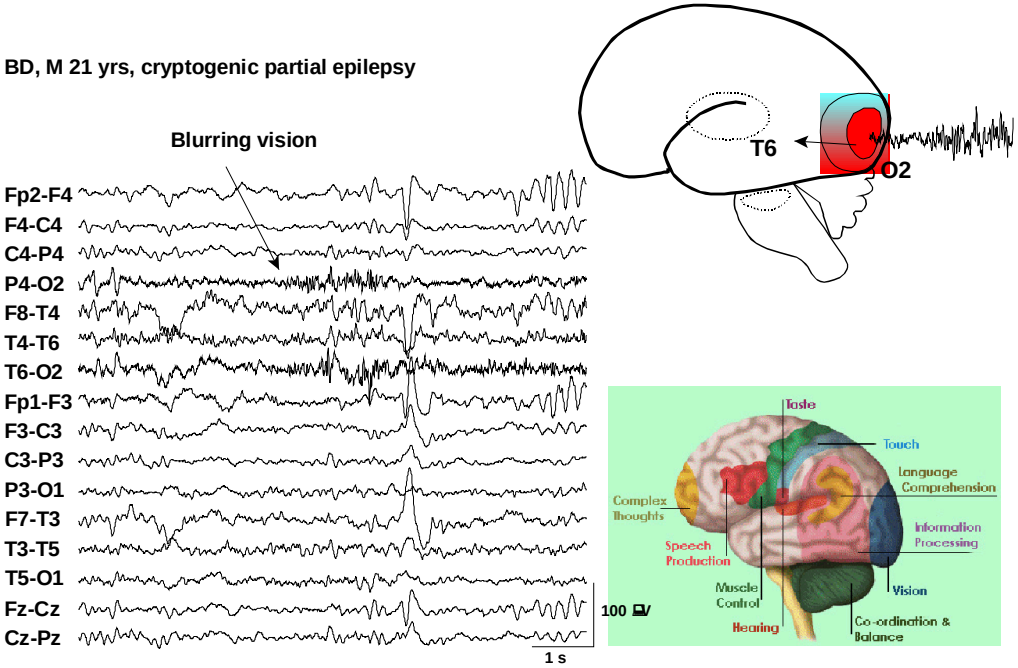
Early ERP in the amusic. Peretz 2012

Fallimento di ritenzione mnesica delle informazioni circa le differenze e I cambi di tono. (Peretz 2012).

La percezione musicale, per se, dipende dall'integrazione di eventi racchiusi nel dominio del tempo.

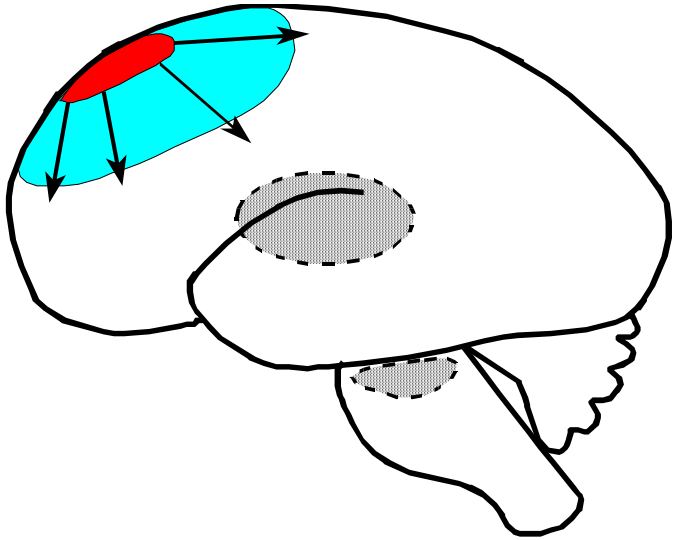
Epilessia Musicogenica

Crisi epilettiche indotte dai suoni (di solito prolungato) in combinazione melodica e/o armonica.
Circa 110 (dal1884 al 2007) casi riportati dalla letteratura scientifica.

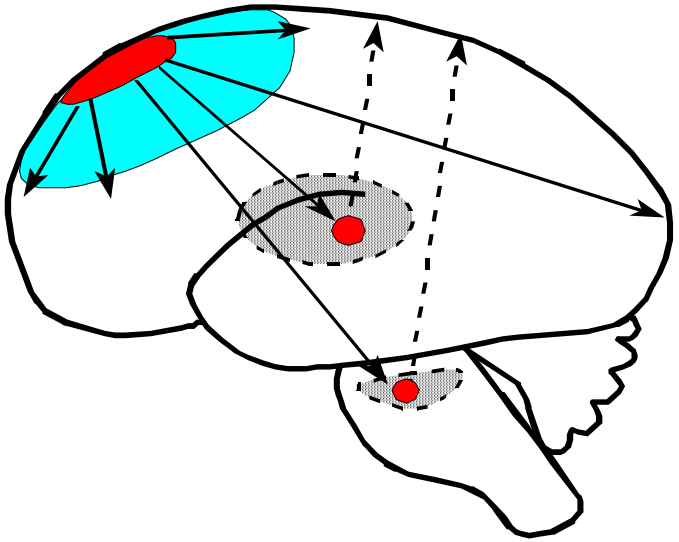


Zifkin and Zatorre 1998, Avanzini 2001, Pittau 2011.

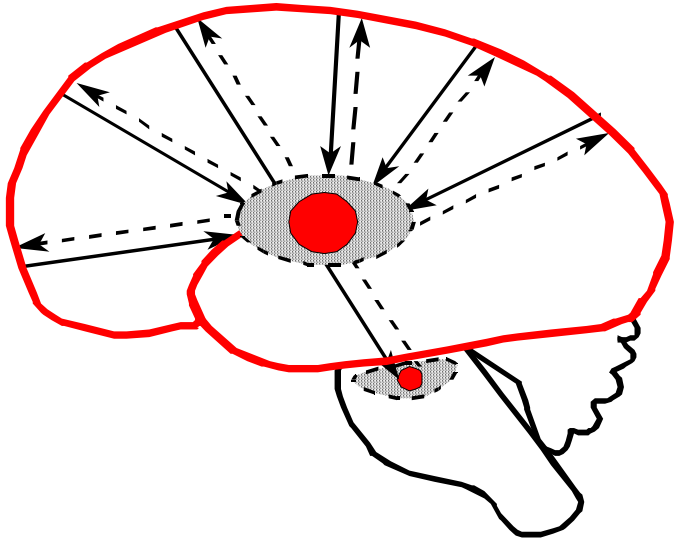
FOCAL



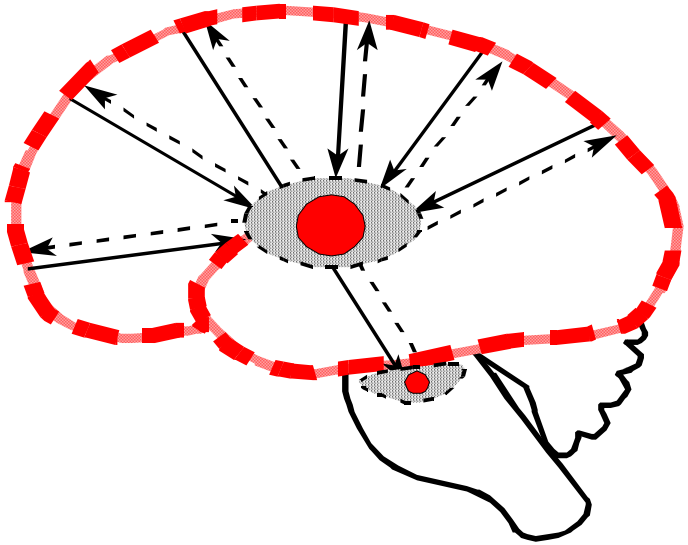
FOCAL, SECONDARELY GENERALIZED



GENERALIZED IDIOPATICHE



"GENERALIZED" SYMPTOMATIC

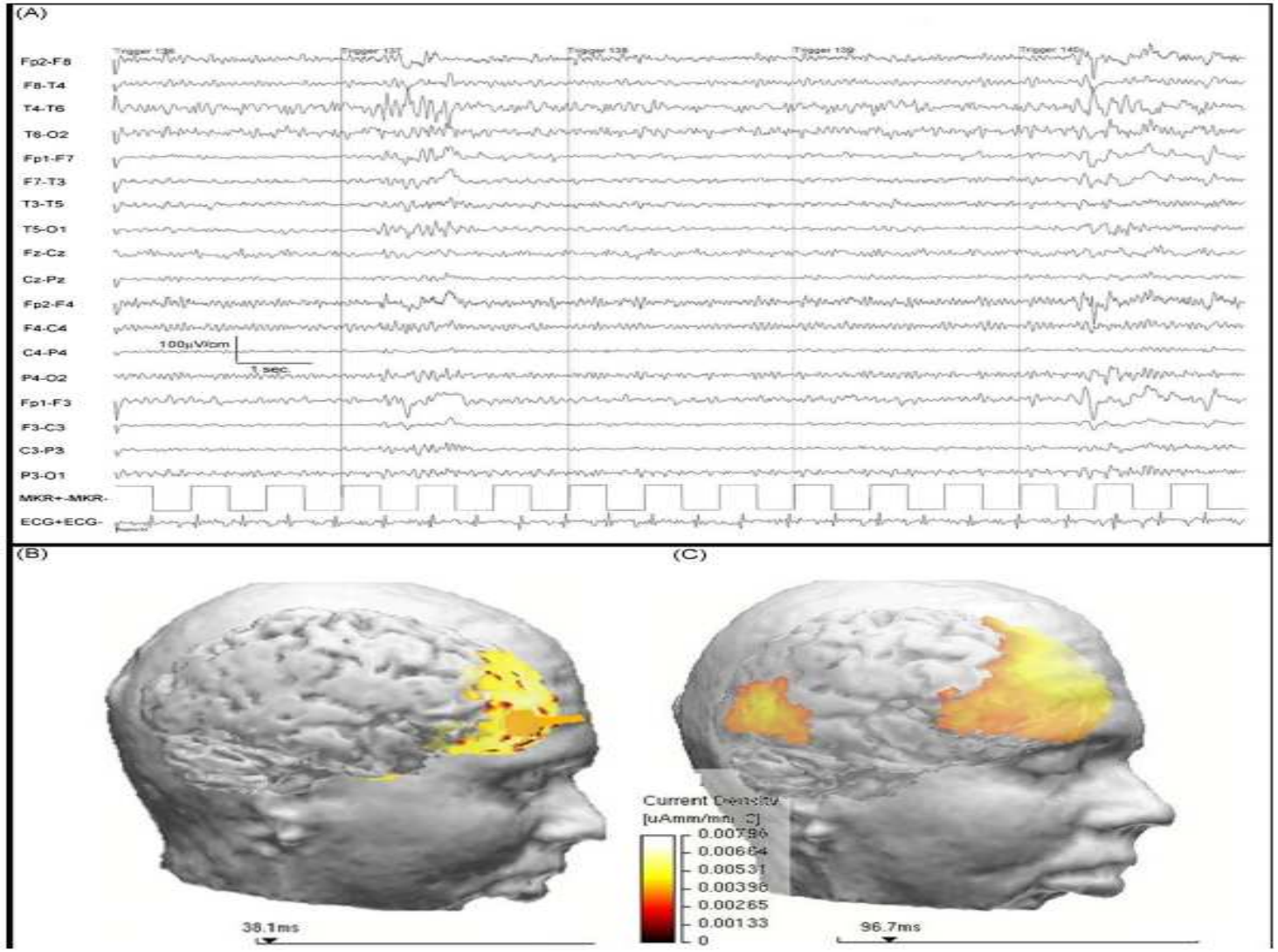


Musiche e Strumenti

80	44/M/–	Classical music	RT, interictal	–	–	–	–	Vanelle, 1982 [59]
81	33/M/–	Popular repetitive music	LT	–	–	–	LT	–
82	53/F/–	Singers' voices	Generalized	–	–	–	–	Brien and Murray, 1984 [60]
83	–/M/–	Music with high emotional charge[b]	LT, interictal	–	–	–	–	Jallon et al., 1988 [61]
84	77/M/–	Music of which he was fond	LT	–	–	–	LT	–
85	40/F/–	Popular Korean song	LT	–	–	–	LT	Byun et al., 1989 [62]
86	66/M/–	Music he enjoyed	–	–	–	–	–	Ackerman and Banks, 1995 [63]
87	40/F/–	All kinds of music[b]	RT	–	–	–	RT	Smeijsters and van den Berk, 1995 [64]
88	32/F/–	Her favorite Italian song	RT	Normal	–	RT	RT	Wieser et al., 1997 [9]
89	31/F/–	Pop music[b]	RT	Normal	–	Normal, interictal	RT	Nakano et al., 1998 [65]
90	43/M/R	"The X-Files" theme song	RT gyrus (SEEG)	RT cortex thickening	–	–	RT superior gyrus	Trevathan et al., 1999 [66]
91	48/F/R	"Arabesque"[b]	RT	Normal	–	RT	RT	Genç et al., 2001 [24]
92	48/F/R	Whitney Houston and Boyz II Men	LT	Normal	–	LT	LT	Mórocz et al., 2003 [30]
93	6 m/M/–	Loud music, especially the Beatles	LT	Normal	–	LT	LT	Lin et al., 2003 [27]
94	39/F/R	Various types of music	RT	Normal	–	R lateral	RT	Gelisse et al., 2003 [25]
95	–/F/–	Unspecified music	RT	–	–	–	BiT	Wieser et al., 2004 [67][c]
96	–/–/–	–	–		–	–	–	–
97	–/–/–	–	–	—	–	–	–	–
98	–/–/–	–	–	–	–	–	–	–
99	–/–/–	–	–	–	–	–	–	–
100	–/–/–	–	–	–	–	–	–	–
101	20/F/R	Popular music rhythms	RT anterior (SEEG)	RO lesion	Normal	–	RT	Tayah et al., 2006 [15]
102	24/F/R	Shania Twain's ballad	RT mesial (SEEG)	Normal	RT, interictal	Normal, interictal	RT	–
103	19/F/R	Novel church hymns	BiT mesial (SEEG)	Normal	Normal, interictal	RT lateral, interictal	–	–
104	49/M/R	His favorite music	RT gyrus (DTM)	Normal	–	Normal, interictal	RT	Shibata et al., 2006 [68]
105	48/F/R	Sorrowful lyrics[b]	LT	LFT astrocytoma	–	LT, interictal	LT	Anneken, 2006 [28]
106	–/M/–	Music, loud sounds[b]	–	–	–	–	–	Sacks, 2006 [69]
107	–/F/–	Neapolitan songs	–	–	–	–	–	–
108	46/F/–	Unspecified music	RT (MEG)	Normal	Normal	–	RT	Stern et al., 2006 [70]
109	34/F/R	All types of music	RT	Normal	–	RT (SISCOM)	RT	Cho et al., 2007 [26]
110	62/F/A	Slow, melancholic music[b]	RFT	–	–	–	RFT	Claassen et al., 2007 [71]

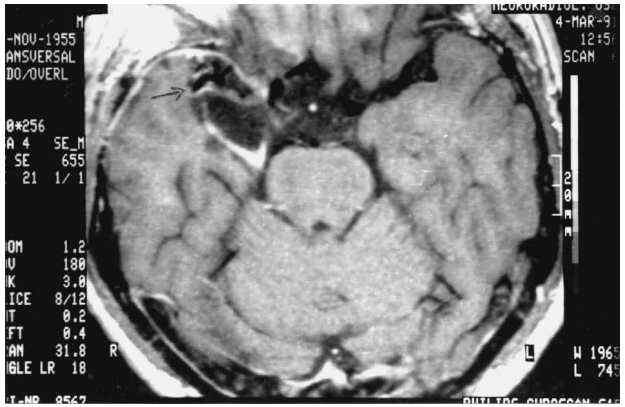
Combined EEG/fMRI recording in musicogenic epilepsy

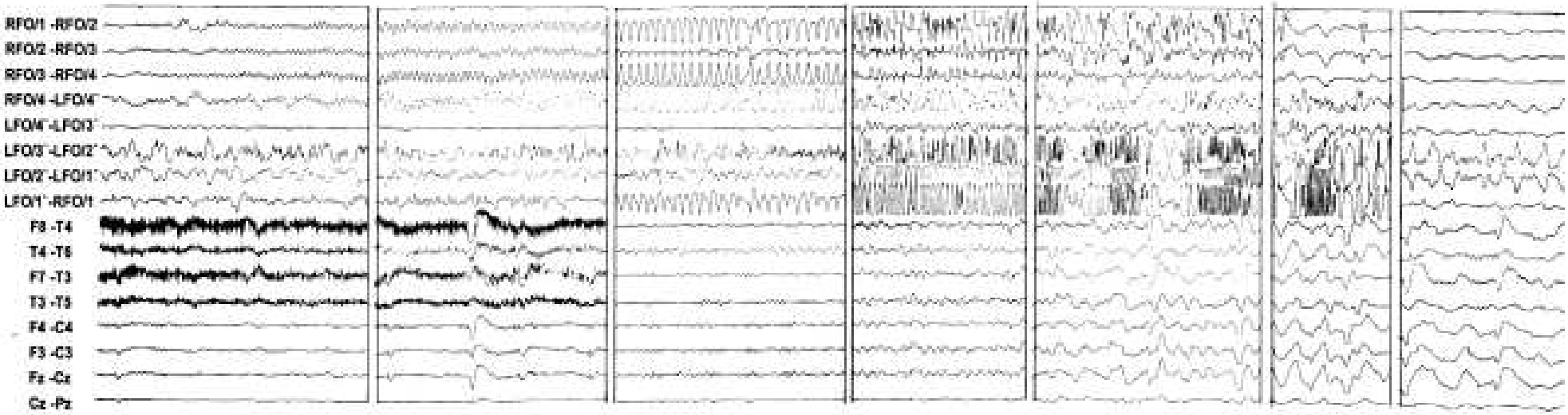
Francesco Marrosu[a,*], Luigi Barberini[a], Monica Puligheddu[a], Marco Bortolato[a], Marcello Mascia[a], Antonella Tuveri[a], Antonella Muroni[a], Giorgio Mallarini[b], Giuliano Avanzini[c]



Untroubled musical judgement of a performing organist during early epileptic seizure of the right temporal lobe*

HEINZ GREGOR WIESER† and ROLAND WALTER





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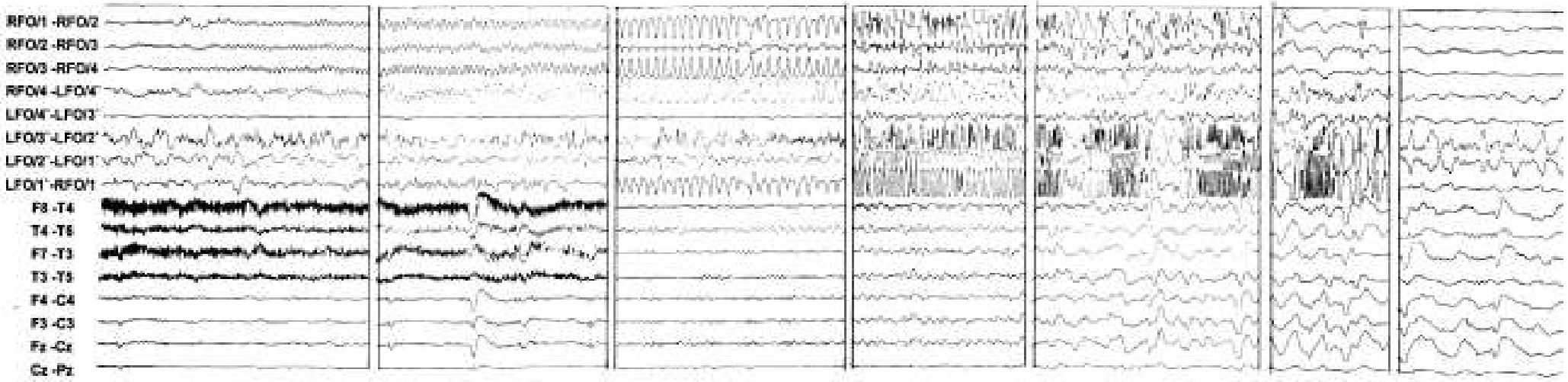
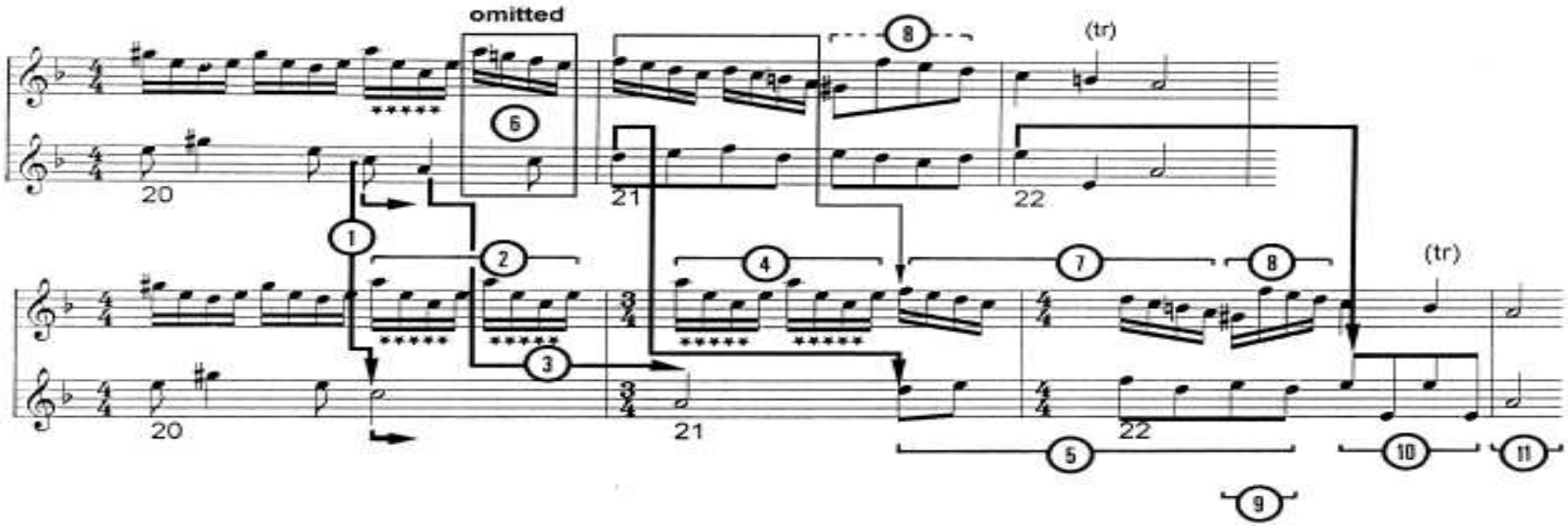
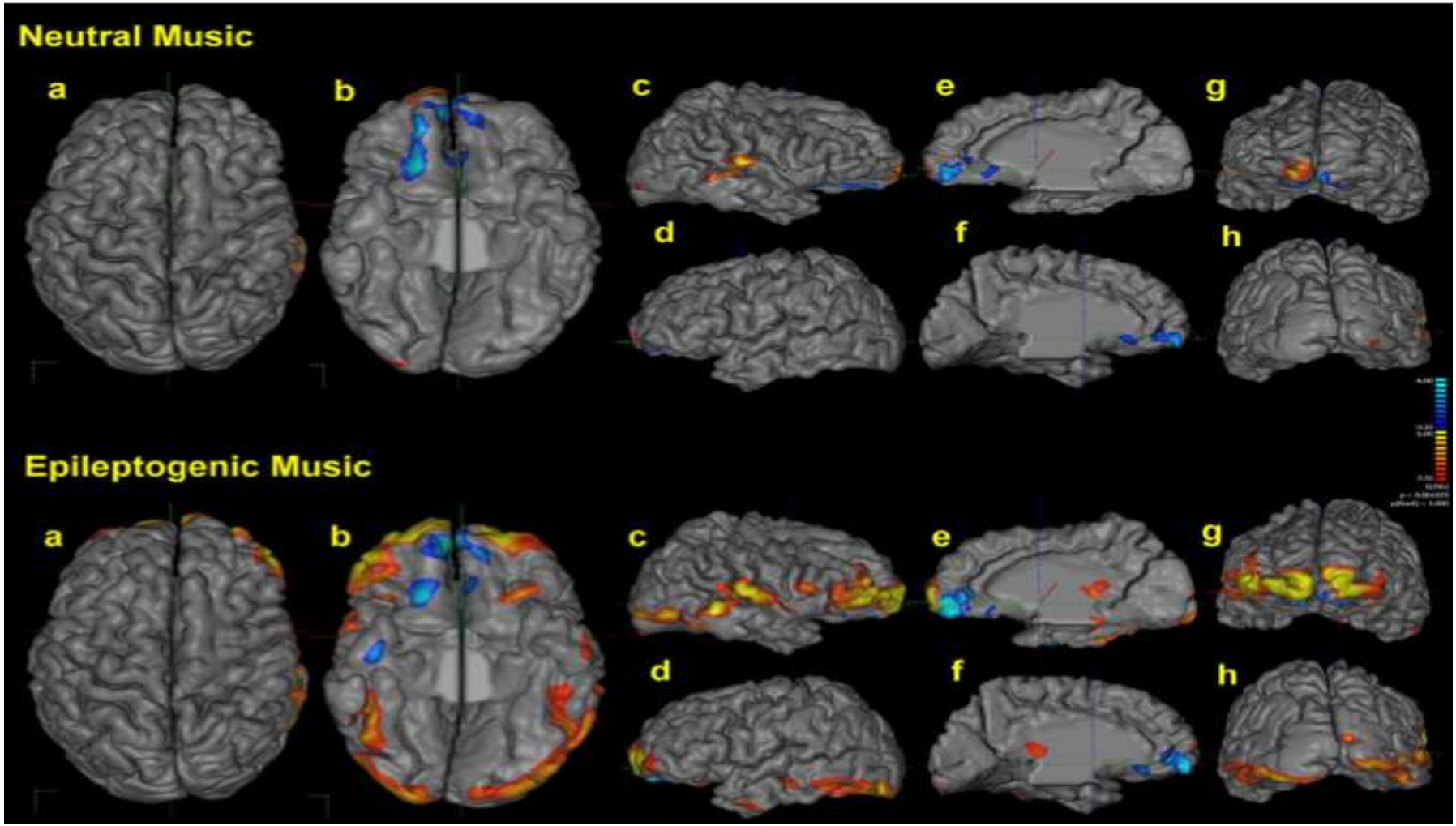




Musiche Epilettogene ?



Videopolygraphic and functional MRI study of musicogenic epilepsy. A case report and literature review

Francesca Pittau [a], Paolo Tinuper [a,*], Francesca Bisulli [a], Ilaria Naldi [a], Pietro Cortelli [a], Antonietta Bisulli [a], Carlotta Stipa [a], Daniela Cevolani [b], Raffaele Agati [b], Marco Leonardi [b], Agostino Baruzzi [a]

Allucinazioni musicali

L'**allucinazione** è una falsa percezione in assenza di uno stimolo esterno reale. Le allucinazioni sono usualmente persistenti e non confortevoli sebbene possono essere percepite raramente come piacevoli.

Table 3 Musical hallucination reports

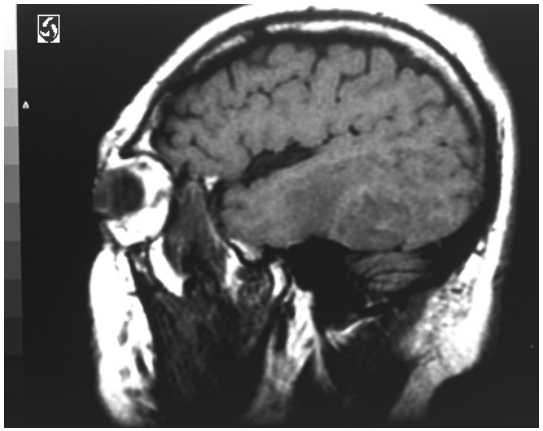
Agrawal and Sherman (2004)	Fisman (1991)	Nagaratnam *et al.* (1996)
Aizenberg *et al.* (1986)	Fukunishi *et al.* (1998a)	Nevins (1991)
Aizenberg *et al.* (1991)	Fukunishi *et al.* (1998b)	Paquier *et al.* (1992)
Ali (2002)	Fukunishi *et al.* (1999)	Patel *et al.* (1987)
Allen (1985)	Gertz *et al.* (1996)	Raghuram *et al.* (1980)
Baba *et al.* (2003)	Gilbert (1993)	Roberts *et al.* (2001)
Berrios (1990)	Gilchrist and Kalucy (1983)	Ross *et al.* (1975)
Cascino and Adams (1986)	Griffiths (2000)	Rozanski and Rosen (1952)
Cerrato *et al.* (2001)	Hammeke *et al.* (1983)	Saba and Keshavan (1997)
Clark (1998)	Hecaen and Ropert (1959)	Schielke *et al.* (2000)
Cole *et al.* (2002)	Hermesh *et al.* (2004)	Schiffter and Straschill (1977)
Couper (1994)	Inzelberg *et al.* (1993)	Steinberg *et al.* (1998)
Curtin and Redmund (2002)	Izumi *et al.* (2002)	Stricker and Winger (2003)
Douen and Bourque (1997)	Kasai *et al.* (1999)	Tanriverdi *et al.* (2001)
Erkwoh *et al.* (1993)	Keshavan *et al.* (1988)	Tenao (1995)
Evers *et al.* (2002)	Lennox (1988)	Tenao and Tani (1998)
Fenelon *et al.* (1993)	Miller and Crosby (1979)	Vallada and Gentil (1991)
Fenton and McRae (1989)	Moore (2003)	Warner and Aziz (2005)
Fernandez *et al.* (1998)	Mori *et al.* (2006)	Warren and Schott (2006)
Fischer *et al.* (2004)	Murata *et al.* (1994)	

Allucinazioni Musicali

- **Ipoacusie:** più frequente, patologia legata ad un'accentuazione del mental imagery (Griffiths 200)

- **Patologia Psichiatrica** : depressione, schizophrenia, obsessive-compulsive disorder e alcolismo. (Berrios 1991).

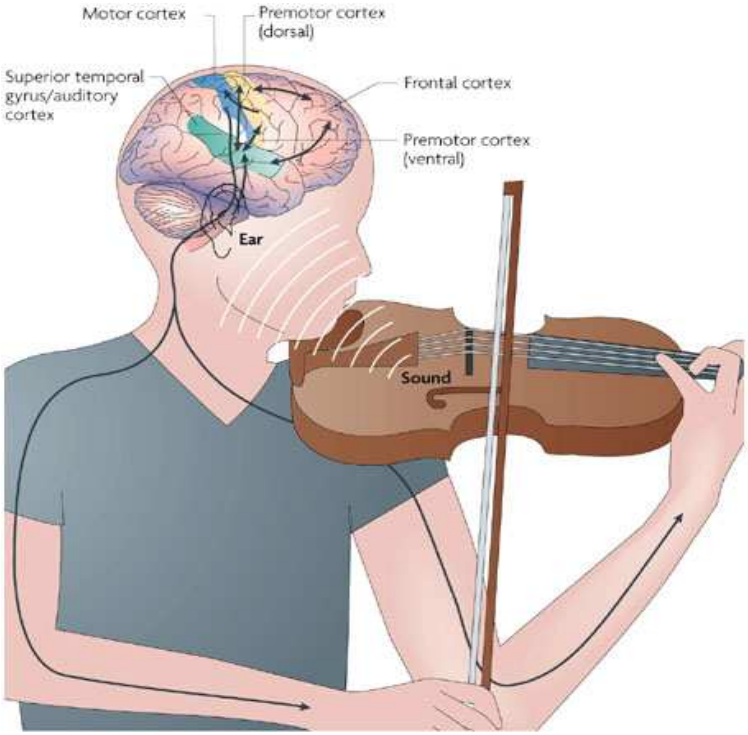
- **Patologia Neurologica:**
  Patologia a focolaio emisfriche destre, casi singoli in malattie degenerative (Berrios 1990, Mori 2006).



- **Iatrogena** : alcol, amfetamine, quinine, imipramina, fenotiazine, carbamazepina, fenitoina, procaine, propranololo e altri. (Fernandez; Gordon 1998; Roberts et al).

Distonie Focali Compito-Specifiche

Un disordine del movimento di natura involontaria caratterizzato da Co-Contrazioni muscolari degli agonisti e antagonisti, con diffusione a muscoli non coinvolti, assunzione di posture anomale in torsione (Fahn 1987).



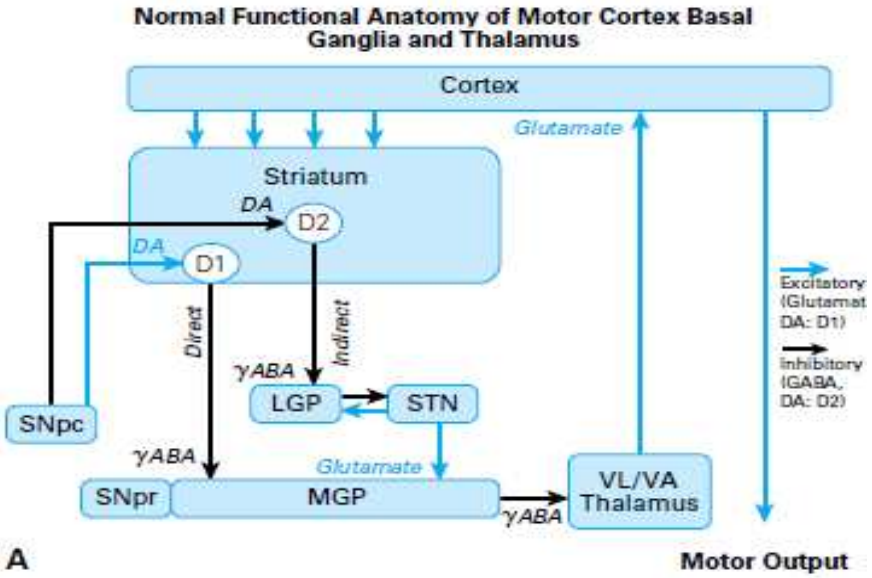
Pianoforte, Contrabbasso, Chitarra, Clarinetto.

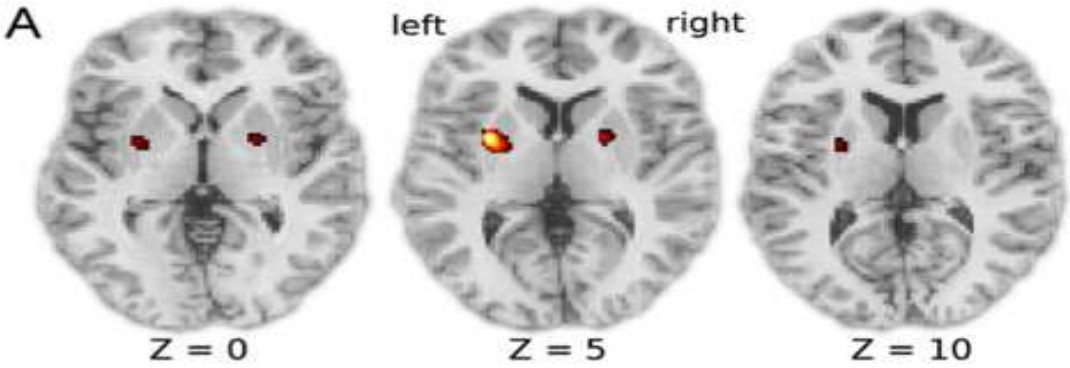
Distonie Focali Compito-Specifiche

Sensorimotor skills and focal dystonia are linked to putaminal grey-matter volume in pianists

Oliver Granert,[1] Martin Peller,[1,2] Hans-Christian Jabusch,[3,4] Eckart Altenmüller,[4] Hartwig Roman Siebner[1,2,5]

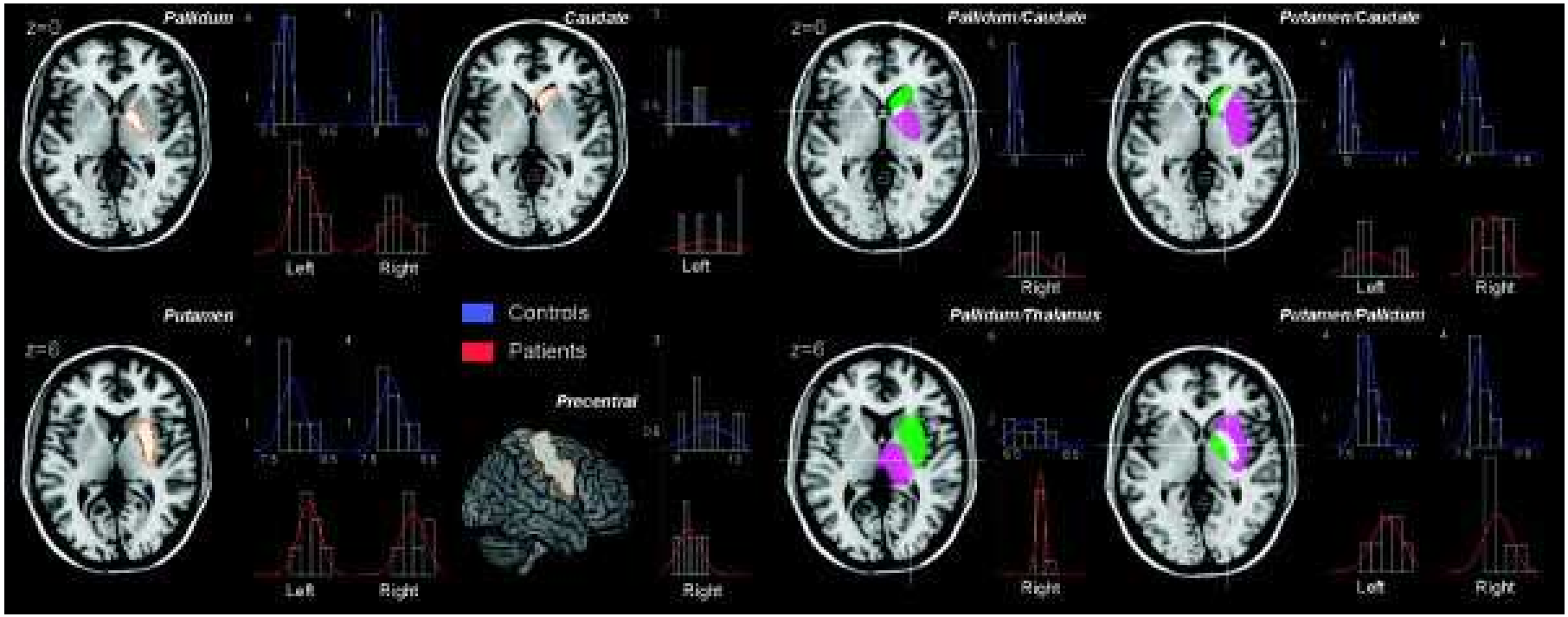
- **Diminuzione delle normali inibizioni corticali sui sistemi sottocorticali e spinali.**
- **Plasticità (maladattativa) patologica dovuta all' uso ripetitivo.**
- **Integrazione sensorimotoria disordinata**





Morfometria della sostanza Grigia.

- **PET**: iperattività delle proiezioni fronto striatali.(metabolismo del glucosio aumentato in Putamen, Globus Pallidus, cervelletto e SMA).
- **Manual MRI morphometria**: abnormi dimensioni del putamen.
- **Voxel-based morphometry**: cambiamenti della sostanza grigia nei circuiti sensori-motori e nel cervelletto.
- **Diffusion tensor imaging (DTI)**: connettività alterata con interruzione del flusso di informazioni.



Focal dystonia in musicians: phenomenology, pathophysiology and triggering factors

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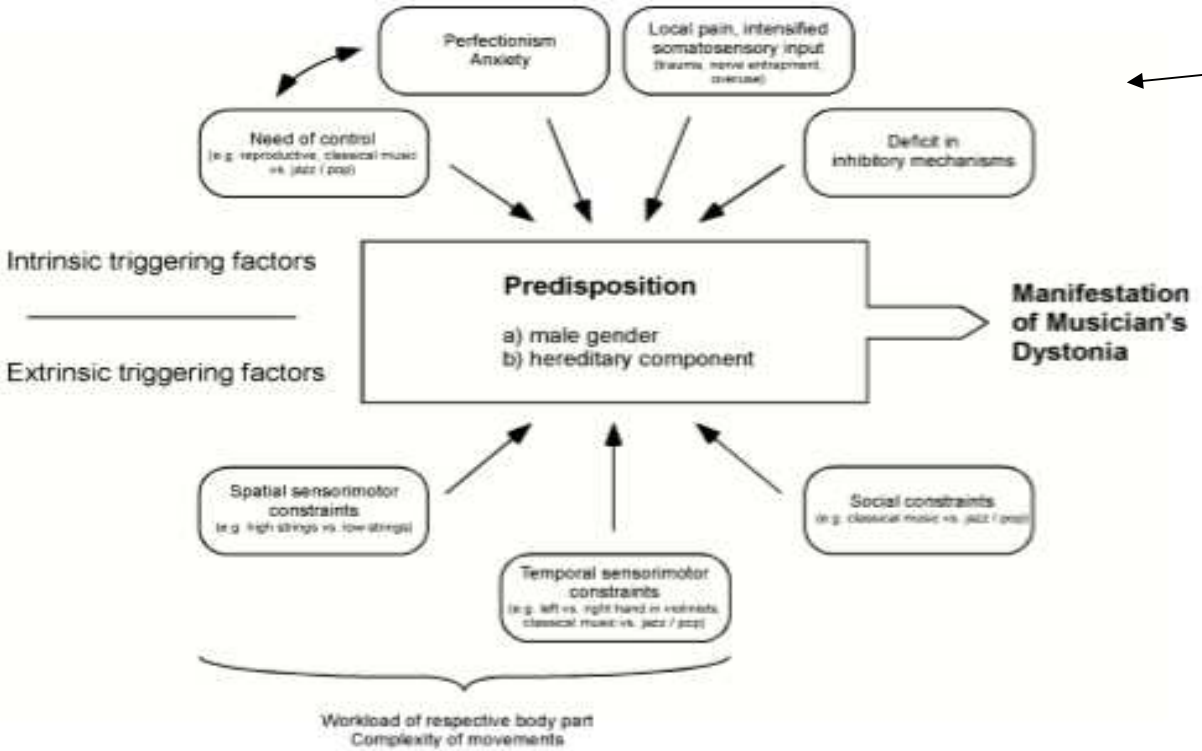

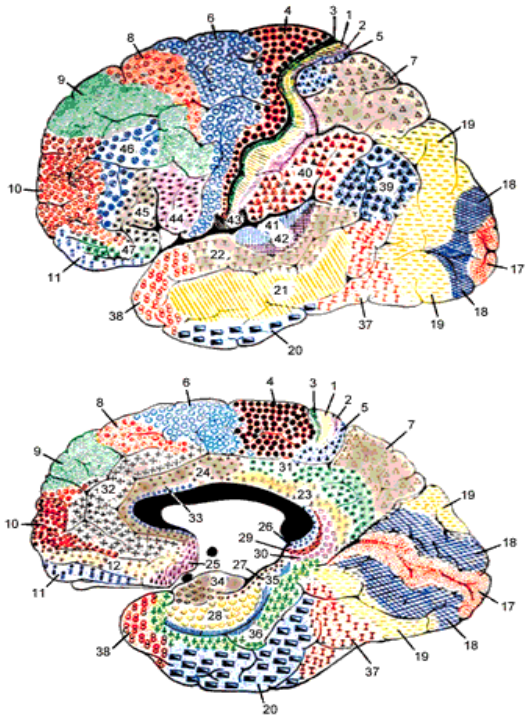

THE END…

Grazie dell’
Attenzione…