Musicoterapia in ambito neurologico

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NECESSITA' DI DEFINIRE LA MUSICOTERAPIA...

Dr. Alfredo Raglio A.A. 2012-2103

9 th WORLD CONGRESS OF MUSIC THERAPY:

Music Therapy: a global mosaic many voices, one song

WASHINGTON, D.C., 1999

“*La Musicoterapia è ...l'uso della* ***musica*** *e/o dei suoi* ***elementi*** *(suono, ritmo, melodia e armonia) per opera di un* ***musicoterapeuta qualificato****, in un rapporto individuale o di gruppo, all'interno di un* ***processo*** *definito, per facilitare e promuovere la* ***comunicazione****, le* ***relazioni****, l'***apprendimento****, la* ***mobilizzazione*** *, l'****espressione*** *l'****organizzazione*** *ed altri obiettivi terapeutici degni di rilievo, nella prospettiva di assolvere i* ***bisogni fisici, emotivi, mentali, sociali e cognitivi****.*

La Musicoterapia si pone come scopi di ***sviluppare potenziali e/o riabilitare funzioni*** *dell'individuo in modo che egli possa ottenere una migliore* ***integrazione sul piano intrapersonale e/o interpersonale*** *e, conseguentemente, una migliore* ***qualità della vita*** *attraverso la* ***prevenzione****, la* ***riabilitazione*** *o la* ***terapia***”.

(8 th WORLD CONGRESS OF MUSIC THERAPY, AMBURGO, 1996)

World Federation of Music Therapy
Federación Mundial de Musicoterapia

What is music therapy?

Music therapy is the professional use of music and its elements as an intervention in medical, educational, and everyday environments with individuals, groups, families, or communities who seek to optimize their quality of life and improve their physical, social, communicative, emotional, intellectual, and spiritual health and wellbeing. Research, practice, education, and clinical training in music therapy are based on professional standards according to cultural, social, and political contexts. WFMT, 2011

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www.wfmt.info

Clinical Psychology Review 29 (2009) 193–207

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Clinical Psychology Review

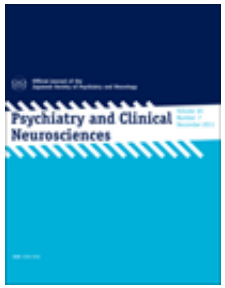
Dose–response relationship in music therapy for people with serious mental disorders: Systematic review and meta-analysis

Christian Gold [a,*], Hans Petter Solli [b,c], Viggo Krüger [b], Stein Atle Lie [a]

"...Music therapy is a special type of psychotherapy where forms of musical interaction and communication are used alongside verbal communication. It has been defined as "a systematic process of intervention wherein the therapist helps the client to promote health, using music experiences and the relationships developing through them as dynamic forces of change" (Bruscia, 1998). The types of 'music experiences' used in music therapy can include free and structured improvisation, other types of active music-making by patients, and listening to music. Improvisation is perhaps the most prominent form of musical interaction in music therapy. It has been described as central in many music therapy models. Client(s) and therapist improvise on musical instruments they have chosen, playing together freely or with a given structure or a musical or non-musical theme. Music therapists are specifically trained to intervene therapeutically within the medium, for example to support by providing rhythmical or tonal grounding, to clarify, to confront or to challenge the client's expression in the music (Bruscia, 1987; Wigram, 2004). Other modes of music experiences in music therapy include playing composed music on instruments, singing and writing or improvising songs (Baker & Wigram, 2005), and listening to music (Grocke & Wigram, 2006). Songs may be used by clients as a
safe, structuring and socially acceptable form in which they can express feelings which otherwise might be too overwhelming to express. Music listening may be helpful to bring up and make available therapeutically relevant issues (emotions, associations, memories, identity issues).
All these different modes of 'music experiences' become therapeutic by being used in the context of a therapeutic relationship. Verbal discussions, reflections, or interpretations connected to the music are important to help clients explore the potential meaning of an experience, and to relate a new experience within therapy to situations in the client's life. The degree to which the music experience itself, versus the verbal reflection connected to it, is seen as the active agent of change may vary between models of music therapy (Garred, 2004), as well as between clients. However, treatments that rely solely on the direct effects of music alone, which do not "involve or depend upon a process of intervention and change within a client–therapist relationship" ("auxiliary level", Bruscia, 1998, p. 195), are not music therapy. The term 'music medicine' is sometimes used to distinguish such treatments from music therapy."

When music becomes music therapy

Psychiatry and Clinical Neurosciences 2011; **65**: 679–683



SCIENTIFIC LITERATURE PROVIDES evidence of the unquestionable effects of music both in pathological contexts and upon individuals generally speaking.[1] Also on the physiological, neurophysiological, biological and neurochemical levels, confirmation of such effects has been forthcoming.[2]

Empirically, all individuals can experience well-being and positive emotions when listening to music that has some particular significance for them, or can derive pleasure from socializing a musical experience (making or listening to music together with others), but all the above, while emphasizing the potentialities of music, usually refers to momentary effects that elude therapeutic logic.

I personally see that music embodies therapeutic potentialities as suggestive – but not scientifically proven.

For example, 'Mozart's music' is an insufficient concept: which Mozart? The Requiem or an aria from Don Giovanni? Why Mozart and not the Beatles or B. McFerrin? And addressing whom? Producing what? How?

With these queries in mind, the international music-therapeutic community has introduced – as an essential component of therapy by music – the concept of 'relationship'.[3,4]

The above thoughts can help re-model music-therapeutic practices by introducing the following aspects (Evidence Based Music Therapy and Evidence Based Practice):[5,6] musical and relational training of music therapists, presence of a therapeutic setting, a theoretical/methodological background, aims oriented to the achievement of stable and long- lasting improvements (according to type and gravity of pathologies considered), content (active and/or receptive techniques) facilitating intra- and inter-personal relationships with the patient/client and rigorous assessment criteria.

I believe that neither music nor the sonorous-musical element can fail to keep these concepts in due consideration if they are to assume a potential therapeutic value. In therapeutic applications it is of essential importance that the individual's musicality and musical potential should emerge: this can only happen through the relationship between the music therapist and the patient/client mediated by the power of music. This is what defines the therapeutic specificity of music and contextualizes the various possible interventions through music. Music can be the source of deep pleasure, it can stimulate relationships and attentive and cognitive functions, but it becomes therapeutic practice only in the presence of the essential components mentioned above.

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Differences between "music" and "music therapy" interventions in dementia. (Raglio & Gianelli, Current Alzheimer Research, 2009, 6, 293-301).

MUSIC	MUSIC THERAPY
Presence of a professional of the music area	Presence of a professional of the music-therapeutic area with specific relational and musical competences
Absence of a specific therapeutic setting	Presence of a structured therapeutic setting
Absence of a specific intervenion model	Presence of a music-therapeutic referential model grounded on theoretical and methodological criteria
Aims: temporary well-being, improving mood, promoting socialization, memories and stimulation of frames of mind, relaxation, etc.	Aims (aspiring to become stable and long-lasting over time): attenuation of behavioral and psychiatric symptoms and prevention/ stabilization of complications; increase in communication and relationship skills
Contents: structured musical initiatives (rhythmic use of instruments, singing, movement associated to music, etc.) and listening to music (classical music, favourite music, etc.)	Contents: sonorous-musical improvisation; listening activities that involve verbal and elaborative competences (preferably at initial stages of dementia)

Altri interventi con la musica in ambito clinico...

- ATTIVITA' DI PRODUZIONE MUSICALE
- ASCOLTO MUSICALE INDIVIDUALIZZATO
- BACKGROUND MUSIC
- MUSICA E MOVIMENTO
- ...

QUALI OBIETTIVI? IN QUALE AMBITO CLINICO?
QUALI CONTENUTI? QUALI PROFESSIONISTI?
QUALI MODALITA' DI VERIFICA?...

MUSIC THERAPY MODELS

(WORLD FEDERATION OF MUSIC THERAPY, 1999)

- CREATIVE MUSIC THERAPY (NORDOFF-ROBBINS)
- ANALITICAL MUSIC THERAPY (PRIESTLEY)
- BEHAVIORAL APPROACH (MADSEN)
- GUIDED IMAGERY AND MUSIC (BONNY)
- BENENZON MUSIC THERAPY (BENENZON)

IN SINTESI...

ORIENTAMENTO

UMANISTICO

↓

VALENZA ESPRESSIVA

(enfasi sulla **componente estetica**)

↓

LA LIBERTA' ESPRESSIVA FACILITA IL FLUSSO EMOTIVO EVITANDO IL BLOCCO DEL PENSIERO E DELLA CREATIVITA'

ORIENTAMENTO

PSICODINAMICO

↓

VALENZA INTROSPETTIVA

(enfasi sulla **componente relazionale**)

↓

L'ASTENSIONE DALL'AZIONE CONTATTA LE VERE EMOZIONI E SVILUPPA IL PENSIERO

Quale musicoterapia?

- Musicoterapia
- musicoTerapia
- MusicoTerapia

Altri modelli...

- L'approccio neuroscientifico (ambito neurologico)

Le principali tecniche...

- TECNICHE IMPROVVISATIVE

- TECNICHE RECETTIVE

Gli ambiti applicativi...

- PSICHIATRICO
- NEUROPSICHIATRICO INFANTILE
- NEUROLOGICO
- GERIATRICO
- ONCOLOGICO/CURE PALLIATIVE
- ...

LA LETTERATURA SCIENTIFICA...

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LA RICERCA PUO' ESSERE INTESA COME SISTEMATIZZAZIONE E VALUTAZIONE DELL'INTERVENTO TERAPEUTICO

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Necessità di definire i contenuti degli interventi (M o MT)e di utilizzare metodologie di ricerca adeguate

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EVIDENCE BASED MEDICINE

EVIDENCE BASED MUSIC THERAPY

(Edwards, 2002; 2004; Vink & Bruinsma, 2003; Rolvsjord et al., 2005; Abrams, 2010)

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"Evidence Based Music Therapy is a method in which the music therapist, in each decision he or she makes, tries to integrate best available scientific evidence with his or her own experience, combined with the values, expectations and wishes of his or her patient. Evidence Based Music Therapy is based on the principles of Evidence Based Medicine".

(Vink & Bruinsma, 2003)

LEVEL OF EVIDENCE

- Systematic review that is based on RCT's
- RCT or CCT studies

- Patient-series with or without controls
- Case studies
- Expert opinions
- Qualitative research

LA RICERCA IN MUSICOTERAPIA

...

LETTERATURA SCIENTIFICA

...

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Musicoterapia e...

- Depressione (Maratos et al., 2009)
- Cure di fine vita (Bradt & Dileo, 2010)
- Danno cerebrale acquisito (Bradt et al., 2010)
- Autismo (Gold et al., 2010)
- Demenza (Vink et al., 2011)
- Schizofrenia (Mössler et al., 2011)

Esempi di RCTs in musicoterapia

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Efficacy Of Music Therapy In The Treatment Of Behavioral And Psychiatric Symptoms Of Dementia

Raglio A, Bellelli G, Traficante D, Ubezio MC, Gianotti M, Villani D, Trabucchi M,

Alzheimer Dis Assoc Disor, 2008; 22:158-162

Fondazione Sospiro (CR)
Gruppo Ricerca Geriatrica (BS)
Unità Valutazione Alzheimer, Ancelle della Carità (CR)
RSA Salò (BS)
Fondazione Piccinelli (BG)

Efficacy of music therapy treatment based on cycles of sessions: a randomized controlled trial.

Raglio A, Bellelli G, Traficante D, Gianotti M, Ubezio MC, Gentile S, Villani D, Trabucchi M

Aging and Mental Health, 2010, 14, 900-904

Fondazione Sospiro (CR)
Gruppo Ricerca Geriatrica (BS)
Unità Valutazione Alzheimer, Ancelle della Carità (CR)
RSA Salò (BS)
Fondazione Piccinelli (BG)
Fondazione S. Chiara (BG)
IRCCS Don Gnocchi (MI)

Background: Music therapy has been proposed as a valid approach for behavioral and psychological symptoms (BPSD) of dementia.

Objective: to assess MT effectiveness in reducing BPSD in persons with dementia.

Methods:

- Sixty persons with moderate-severe dementia (CDR 2-4)
- Experimental group (n=30): 30-36 MT sessions (30 min/ session)
- Control group (n=30): educational support or entertainment activities.
- Subjects were randomly assigned to experimental or control group
- multidimensional assessment (MMSE, Barthel Index and NPI)
- Improvisational/intersubjective MT approach
- Music therapists: 5-year training focused on the relational MT approach applied in particular on persons with dementia
- MT evaluation: items taken from MTCS (Raglio et al., 2006)

Main difference between the two studies:

- The first study was based on a continuous treatment: 30 biweekly sessions (16 weeks)

-The second study was based on 3 cycles of 12 sessions each, 3 times a week (36 sessions) and each cycle of treatment was followed by 1 month of wash-out

MAIN RESULTS (first study)

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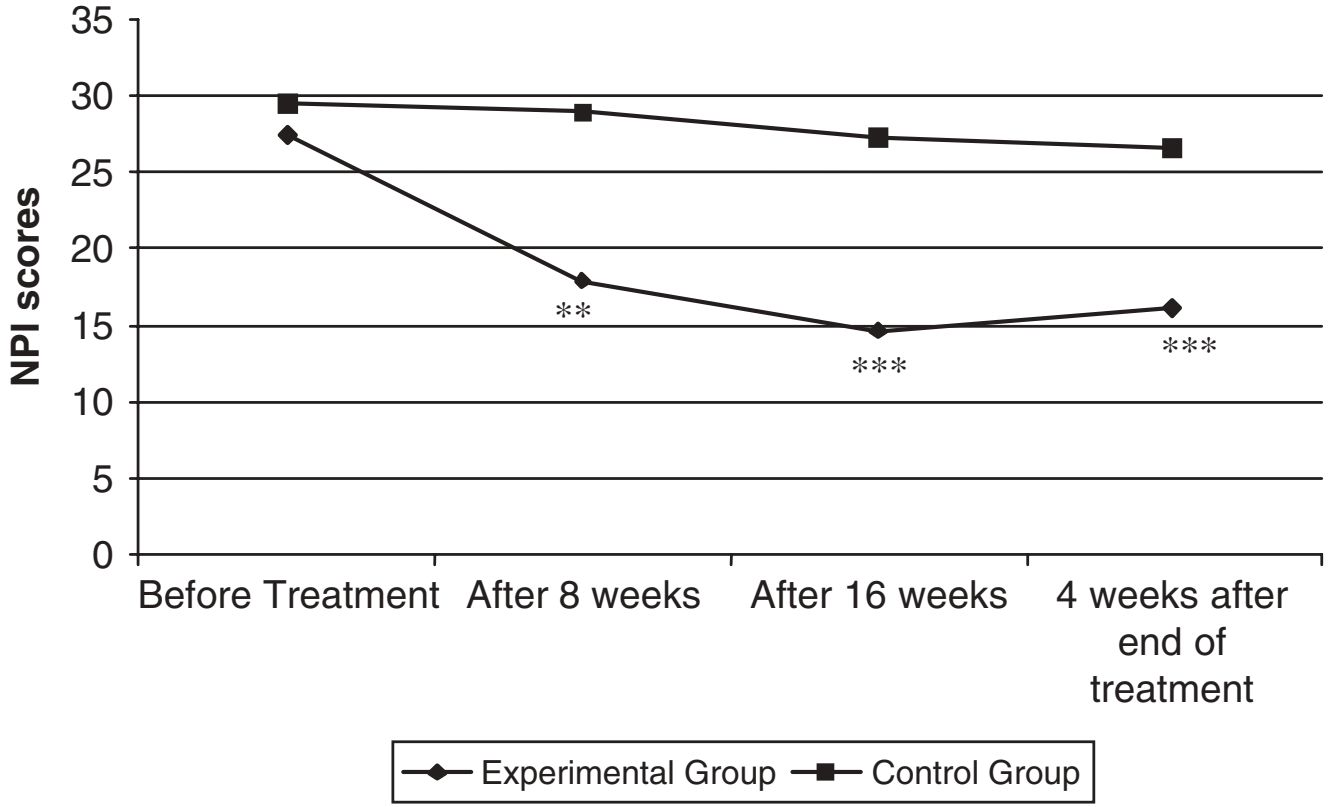


FIGURE 1. Average NPI global scores in the experimental and control groups $^{**}P<0.01$; $^{***}P<0.001$ at *t* test comparison between groups.

TABLE 2. Changes in NPI Items Score

NPI Test	Before Treatment	After 8 wk	After 16 wk	4 wk After End of Trial	Test di Friedmann (χ^2)
Experimental group					
Hallucinations	0.28	0.21	0.18	0.07	2.08
Delusions	3.48	2.62	2.93	2.68	9.70*
Depression	2.07	1.07	1.21	1.57	6.48
Agitation	2.90	2.38	1.25	1.39	17.03***
Euphoria	0.24	0.10	0.04	0.00	5.67
Anxiety	3.00	1.28	1.21	1.50	20.69***
Apathy	1.97	1.21	0.61	1.75	8.10*
Disinhibition	0.38	0.38	0.18	0.46	0.83
Irritability	3.66	2.79	2.18	1.61	10.88**
Aberrant motor activity	5.59	4.17	3.71	3.86	19.60***
Appetite and eating	0.66	0.66	0.07	0.57	2.54
Nighttime behavior disturbances	3.21	1.14	1.07	0.64	16.59***
Control group					
Hallucinations	0.10	0.34	0.14	0.14	1.00
Delusions	3.72	3.69	3.72	3.31	2.94
Depression	2.69	2.93	2.34	2.28	2.72
Agitation	4.93	4.34	3.90	3.48	14.56**
Euphoria	0.31	0.24	0.24	0.31	1.70
Anxiety	3.34	2.93	2.93	3.10	0.86
Apathy	2.03	2.69	1.90	2.28	4.05
Disinhibition	0.59	0.66	0.62	0.48	0.84
Irritability	4.24	4.55	4.24	4.55	1.29
Aberrant motor activity	4.93	5.14	5.00	5.07	1.44
Appetite and eating	0.76	0.48	0.79	0.69	0.69
Nighttime behavior disturbances	1.72	1.10	1.38	1.10	12.88*

Friedmann test average and score (statistical significance: *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$).

TABLE 3. Changes in Patient's Behaviors During the 3 Cycles of MT Treatment

	First Cycle of MT Sessions†		Second Cycle of MT Sessions‡		Third Cycle of MT Sessions§			
Observed Behavior	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	***F***	**Cohen *d***
EB	0.30	0.29	0.33	0.27	0.49	0.33	10.37***	0.61
n-EB	0.72	0.31	0.70	0.32	0.59	0.28	5.55**	1.8
Smiles	0.15	0.13	0.15	0.12	0.25	0.23	8.14***	0.53
Synchronic body movement	0.11	0.18	0.13	0.17	0.29	0.37	12.41***	0.62
Singing	0.02	0.04	0.04	0.08	0.07	0.10	6.98***	0.62

Mean and ratings of the *F* test (**$P < 0.01$; ***$P < 0.001$) on repeated measures (effect inside the subjects) and effect size (Cohen *d*).
†The first 10 MT sessions.
‡11th-20th MT sessions.
§21st-30th MT sessions.

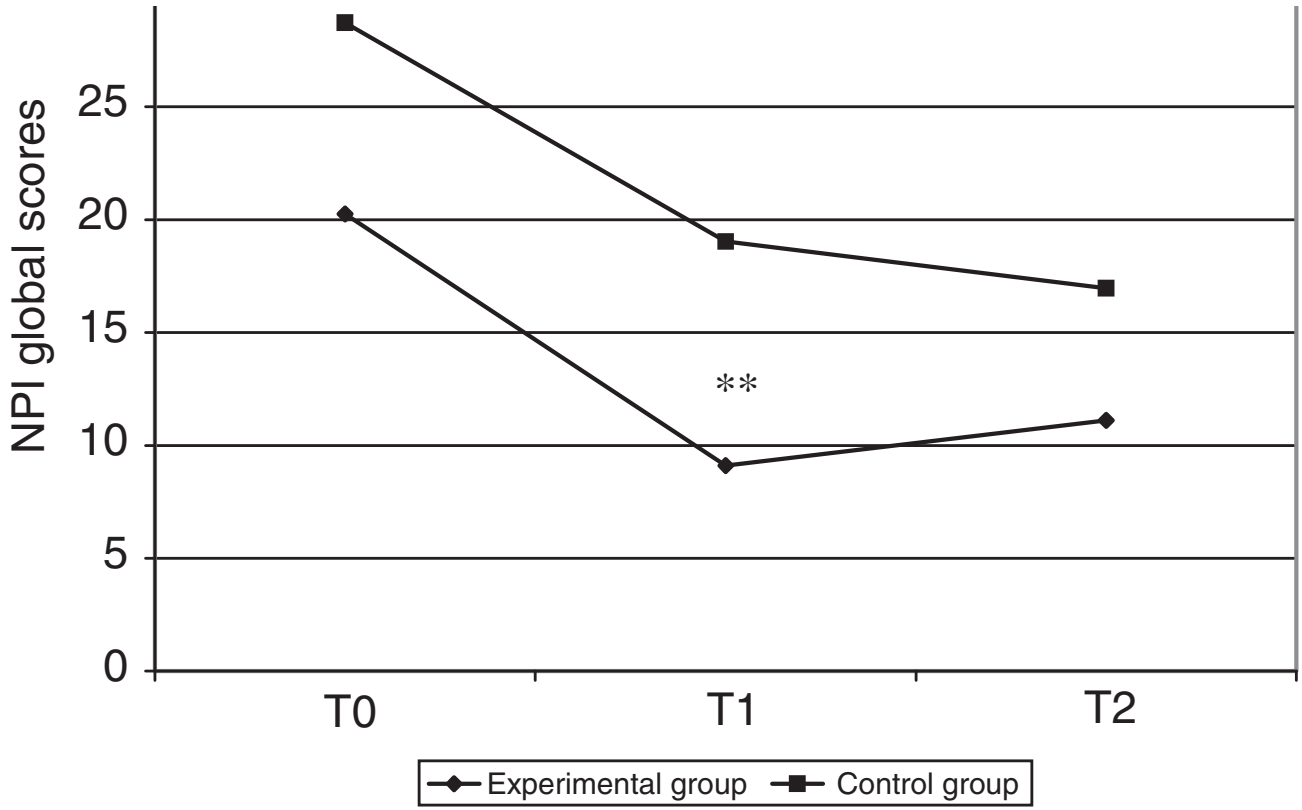
MAIN RESULTS (second study)

Dr. Alfredo Raglio A.A. 2012-2103

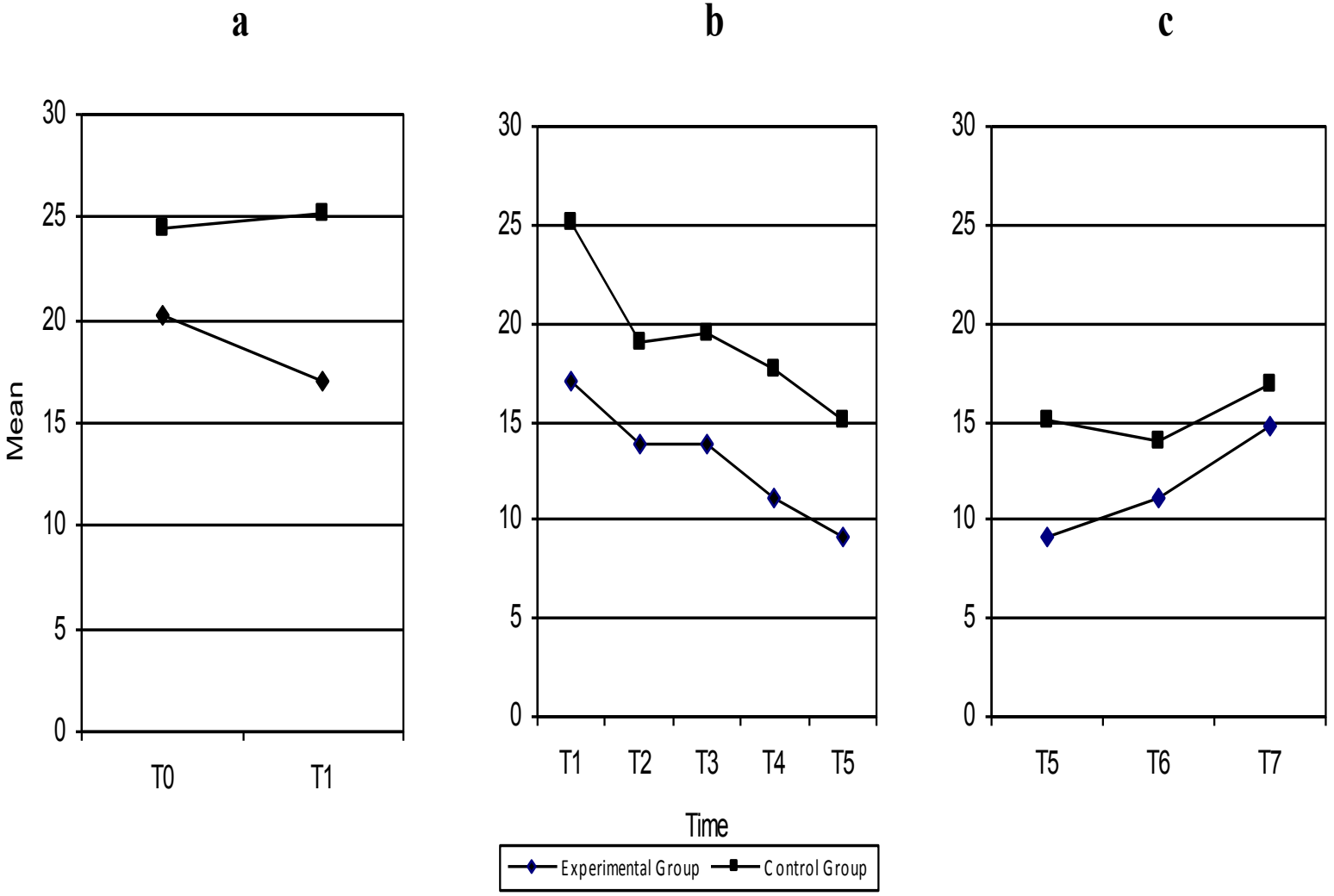
Aging & Mental Health
Vol. 14, No. 8, November 2010, 900–904

Efficacy of music therapy treatment based on cycles of sessions: A randomised controlled trial

A. Raglio[a,b]*, G. Bellelli[c,d], D. Traficante[e], M. Gianotti[a], M.C. Ubezio[a], S. Gentile[a], D. Villani[a] and M. Trabucchi[d,f]



Comparisons of the average NPI global scores in the experimental and control group over time



STRENGTH OF THESE STUDIES:

- the general plan of the studies (RCTs)

- the number of persons enrolled in the treatments

- the duration of the treatments

- the description of MT approach

- the use of standardized criteria (i.e., blinded raters, clinical scales, fixed camcorder, and MTCS) to assess the clinical outcomes and the MT process

THE FUTURE...

- Other RCTs are needed
- Specific and more sensitive tools of assessment are needed
- It is important to define the contents of the music/music therapy interventions
- On which BPSD and in which stages and kinds of dementia is MT more effective?
- Can music and music therapy produce any effect also on cognitive functions?
- Is there a difference between music and music therapy approaches and their effectiveness in the field of dementia?
- It is important to delve into the relationship dose/effect and cost/effectiveness

Esempio di Case Report

Dr. Alfredo Raglio A.A. 2012-2103

Raglio A, Bellandi D, Baiardi P, Gianotti M, Ubezio MC, Granieri E.

Music therapy in frontal temporal dementia: a case report.

J Am Geriatr Soc. 2012 Aug;60(8):1578-9.

Introduction

Music therapy (MT) is a widespread non-pharmacological approach in the treatment of Behavioral and Psychological Symptoms of Dementia (BPSD) in dementia. Active MT approach is an important way to communicate with person with dementia also in severe stages of disease. MT has psychological and neuroscientific bases. The sonorous-music relationship allows the person to express and modulate/regulate his emotions and behaviors. The frontotemporal dementia (FTD) generally presents several behavioral disturbances (agitation, irritability, depression, disinhibition, etc.) but also difficulties in the emotional perception and regulation, due to the brain lesions. Nevertheless, the person with FTD shows creative aspects and sensibility to the musical patterns.

Aim

To verify the efficacy of active music therapy approach on behavioural disturbances in a patient with Fronto Temporal Dementia

Case Description

Mrs. M. is 58 years old and has a diagnosis of FTD (Clinical Dementia Rating=3). An encephalic magnetic resonance imaging scan showed prevalent cortical–subcortical atrophy in the temporal areas, bilaterally; in particular the damage is located in the left frontal region and the temporal pole. The neuropsychological assessment highlighted severe memory and language disturbances (total aphasia). Cognitive evaluation was not possible because Mrs. M. was not able to answer the questions Mini Mental State Examination= n.a.). A behavioral assessment indicted significant disturbances at baseline (Neuropsychiatric Inventory (NPI)=26, Cohen Mansfield Agitation Inventory (CMAI)=40, Cornell Scale for Depression in Dementia (CSDD)=2). In particular, formal caregivers reported agitation, depression, purposeless movements, wandering, and persistent vocalizations.

METHODS

The MT approach is mainly based on sonorous music relationship between patient and music therapist . They interact using musical instruments but also voice (singing and vocal improvisation). This approach is based on intersubjective psychological theories. Mrs. M. participated in 50 individual MT sessions (30 minutes each) conducted by a trained music therapist twice a week over 6 months. The NPI, CMAI, and CSDD were administered at baseline, before treatment, after 25 sessions, at the end of treatment, and at 1-month follow-up after treatment to evaluate BPSD, agitation, and depression. Pharmacological therapy was not modified during treatment. During the study, nursing staff monitored the main behavioral disturbances (persistent vocalizations, crying, wandering, purposeless movements) and filled in a chart three times a week reporting absence, partial presence, or presence of the above-mentioned disturbances. An independent observer analyzed the MT process from a qualitative point of view through videotapes of each session.

Results

Table 1. Results Summary

Result	Baseline	Beginning of Treatment	After 25 Sessions	End of Treatment	1-Month Follow-Up
Neuropsychiatric Inventory total score	26	24	8	10	8
Cohen Mansfield Agitation Inventory total score	40	23	10	10	7
Cornell Scale for Depression in Dementia total score	2	3	1	0	0
Observations of nursing staff, mean ± standard deviation, median (interquartile range)[a]					
Persistent vocalizations		1.20 ± 1.01, 2 (2)	0.93 ± 0.91, 1 (2)	0.39 ± 0.52, 0 (1)	0.08 ± 0.28, 0 (0)
Crying		0.5 ± 0.83, 0 (1)	0.44 ± 0.73, 0 (1)	0.13 ± 0.37, 0 (0)	0, 0 (0)
Wandering		1.80 ± 0.62, 2 (0)	1.38 ± 0.62, 1 (1)	0.86 ± 0.38, 1 (0)	0.72 ± 0.45, 1 (1)
Purposeless movements		1.75 ± 0.72, 2 (1)	1.26 ± 0.63, 1 (1)	0.88 ± 0.36, 1 (0)	0.69 ± 0.47, 1 (1)

[a] Weekly evaluations across periods (three assessments per week): 0 = absence, 1 = partial presence, 2 = presence.

Discussion

It is hypothesized that the above reported results are strongly linked to MT. This approach can be an important nonpharmacological resource in the management of BPSD. A possible explanation is the psychological effects and the effect of MT on the brain. In particular, MT showed its effects on areas involved in emotional processing and regulation, such as the limbic (e.g., amygdala and hippocampus) and paralimbic structures (e.g., orbitofrontal cortex, parahippocampal gyrus, and temporal poles). Music and MT also play an important role in the activation of social cognition areas and in the mirror neurons system.

Conclusion

These psychological and neuroscientific implications could be part of the underlying mechanisms of MT efficacy on behavioral problems in dementia and in particular in FTD, indicating that MT can be an effective intervention for improving symptoms and quality of life and supporting caregivers in the management of dementia.

La ricerca musicoterapeutica in Italia...

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Punti critici...

- non riconoscimento della disciplina (a livello formativo e applicativo)
- parziale diffusione della disciplina sul piano istituzionale
- scarsa presenza e continuità delle esperienze applicative
- scarsa formalizzazione/strutturazione degli interventi
- scarsa sensibilità scientifica dell'ambito musicoterapeutico
- scarsità di pubblicazioni scientifiche

IL CONTRIBUTO DELLE NEUROSCIENZE...

- Quali gli effetti prodotti dal suono e dalla musica nel nostro cervello?
- Quali possono essere le potenzialità terapeutiche?
- Perché?
- Tematiche considerate: musica/emozioni, musica/apprendimento, localizzazione delle funzioni cerebrali rispetto alla percezione e produzione dell'elemento sonoro, musica/riabilitazione (neurocognitiva, neuromotoria, etc.)
- Tendenzialmente gli studi non si riferiscono a setting terapeutici

Current Advances in the Cognitive Neuroscience of Music

Daniel J. Levitin and Anna K. Tirovolas

Ann. N.Y. Acad. Sci. 1156: 211–231 (2009).

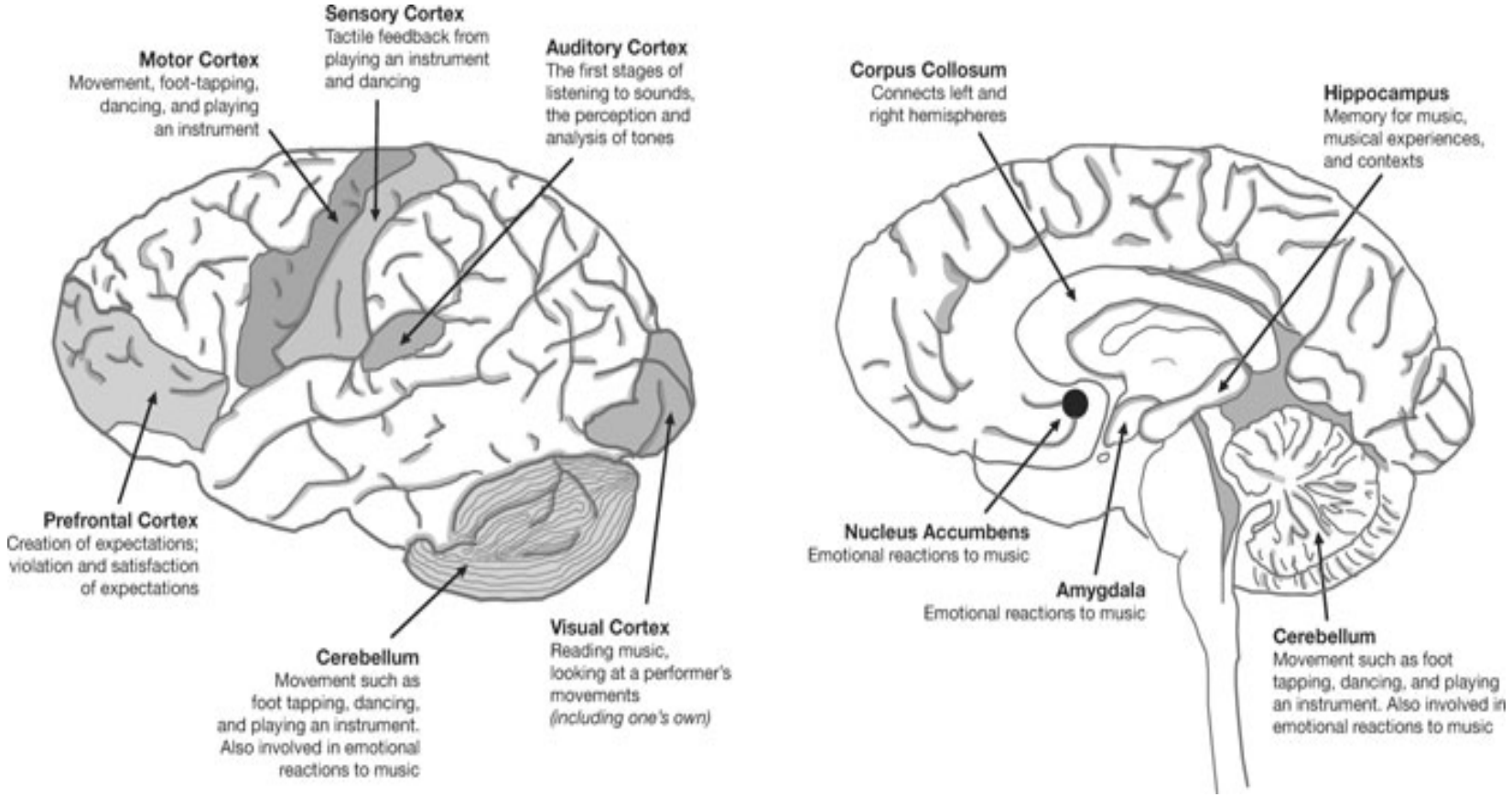
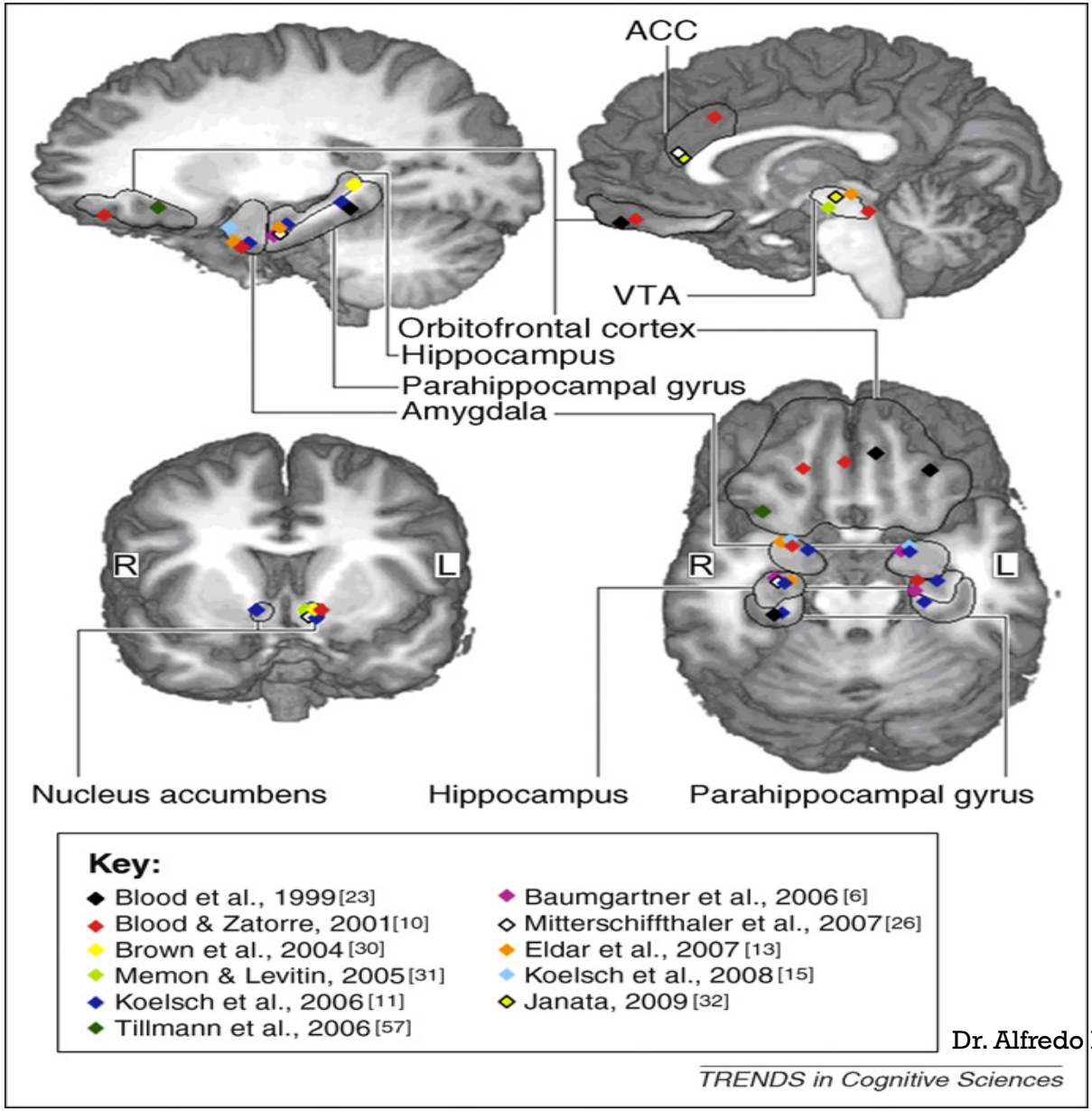
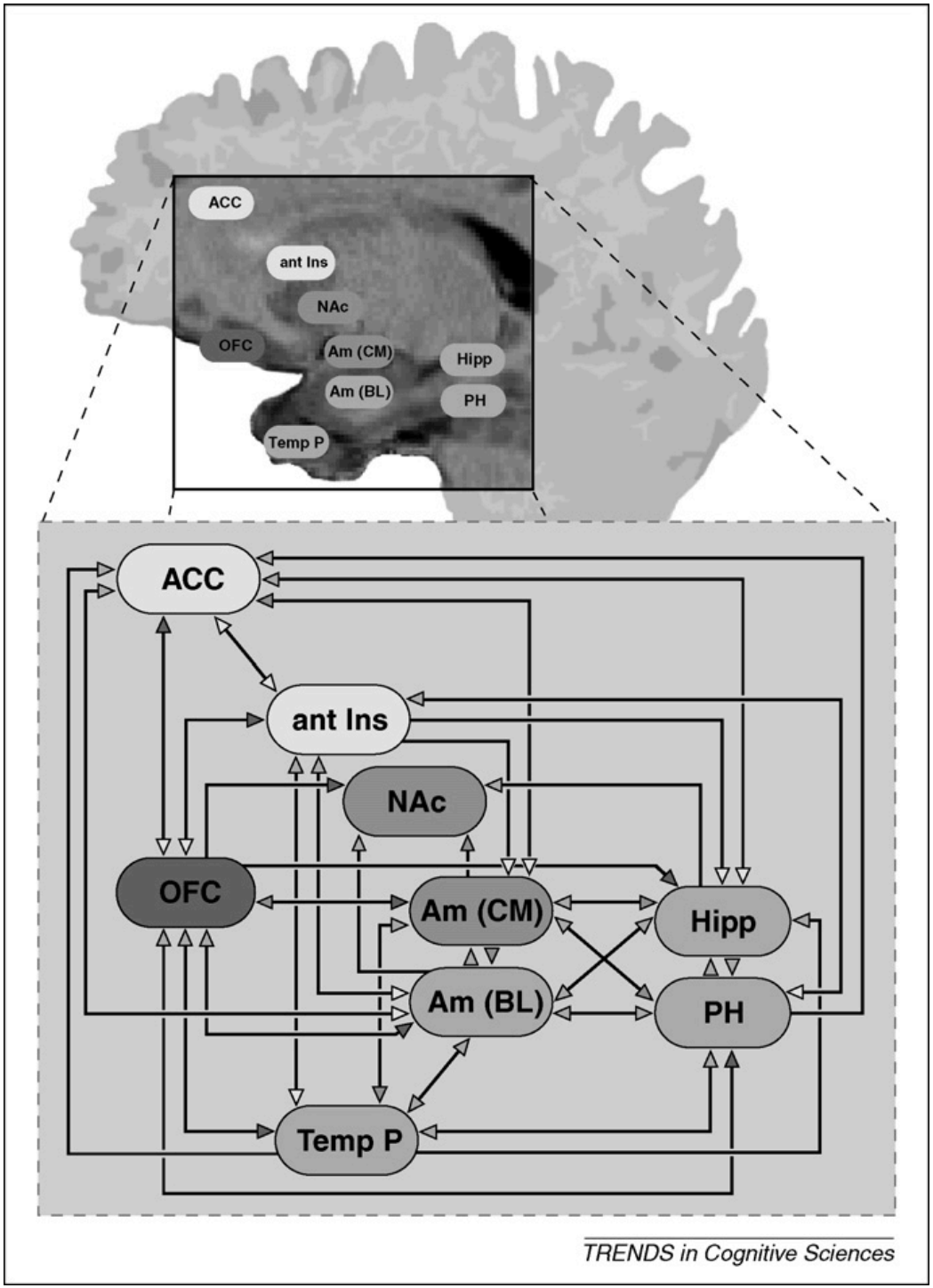


Figure 1. Core brain regions associated with musical activity. Based on Tramo 2001 and updated in 2006 (from Levitin 2006).

Strutture limbiche e paralimbiche correlate alle emozioni evocate dalla musica (Koelsch, 2010)





Koelsch, 2010

Figure 2. Schematic representation of anatomical connections of some limbic and paralimbic structures involved in the emotional processing of music (Figure 1 and main text). ACC: anterior cingulate cortex; ant Ins: anterior insula; Am (BL): basolateral amygdala; Am (CM) corticomedial amygdala (including the central nucleus), Hipp: hippocampal formation; NAc: nucleus accumbens; OFC: orbitofrontal cortex; PH: parahippocampal gyrus; Temp P: temporal pole.
Connectivity is depicted based on Refs. [37,79–81].

I pressuposti neuroscientifici della riabilitazione neuromotoria con la musica e la musicoterapia

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Scientific Perspectives on Music Therapy

THOMAS HILLECKE, ANNE NICKEL, AND HANS VOLKER BOLAY

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The fourth factor is called *behavior modulation* or *motoric behavioral factor*: The basic assumption is that music represents a useful possibility to evoke and condition behavior, such as movement patterns, without the necessity of conscious will. The association of music and dance is well known. Marching songs are common, and the military offers a great variety of military marches. Neuroscientists, like the team of Michael Thaut, point out that rhythmic stimulation influences timing processes in the frontal brain and associated neural structures (neurologic music therapy, NMT). This factor is used therapeutically in gait rehabilitation of stroke patients and in the treatment of movement problems, for example, in Parkinson patients.[42,43] Music and auditive stimulation—known since the time of Pavlov—is a useful tool in behavioral conditioning in general. The analysis of the behavioral component of patients' performing music is of central interest in active music therapy and important in facilitating the learning of new behaviors. It is used as a theoretical framework in behavioral music therapy.[44,45]

La musica agisce sulle aree frontali del cervello...

Neural Reorganization Underlies Improvement in Stroke-induced Motor Dysfunction by Music-supported Therapy

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Fare musica favorisce cambiamenti plastici del sistema motorio... migliora la connettività corticale e stimola la corteccia motoria ...

Stretto rapporto tra ritmo e movimento (attivazione aree motorie – corteccia premotoria, aree motoria supplementare, cervelletto, gangli della base – sincronizzazione, modulazione...)

Halsband et al., 1993; Janata et al., 2003; Peretz & Zatorre, 2005; Zatorre et al., 2007; Chenn et al., 2008; 2009; Grahn & Brett, 2007; 2009; Schwartze et al., 2011

Part VI Introduction

Listening to and Making Music Facilitates Brain Recovery Processes

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La musica è uno stimolo multimodale che attiva varie aree e funzioni facilitando le connessioni... provoca il movimento e stimola l'interazione...

L'ascoltare e il fare musica attivano anche le aree del sistema dei Mirror Neurons

(Kohler et al., 2002; Keysers et al., 2003; Lahav et al., 2007; Overy & Molnar-Szakacs, 2006; 2009; D'Ausilio, 2009; Koelsch, 2009; 2010; Wan et al., 2010)

The Shared Affective Motion Experience model (SAME)

(Overy & Molnar-Szakacs, 2006;2009)

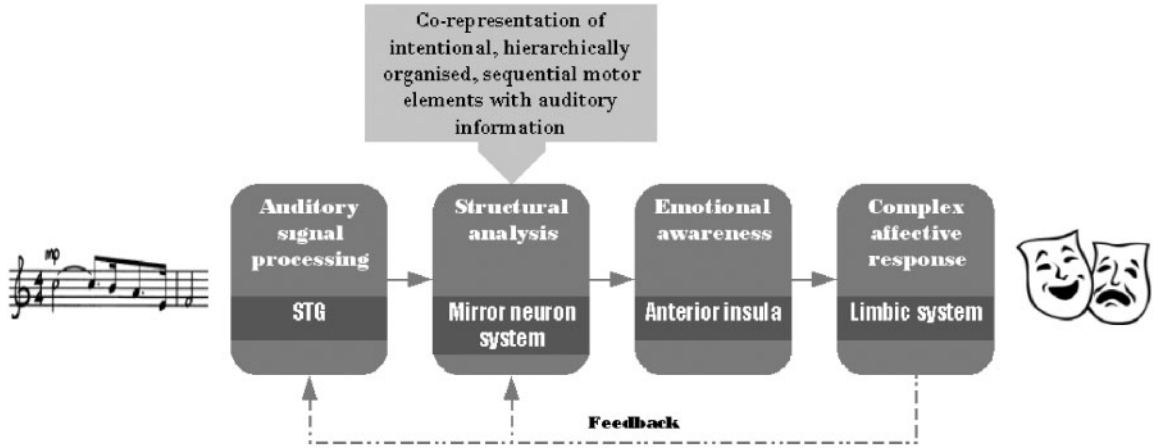

Fig. 1 Model of the possible involvement of the human mirror neuron system in representing meaning and affective responses to music. One aspect of the experience of music involves the perception of intentional, hierarchically organized sequences of motor acts with temporally synchronous auditory information. Auditory features of the musical signal are processed primarily in the superior temporal gyrus (STG) and combined with synchronous structural features of the 'motion' information conveyed by the musical signal in the posterior inferior frontal gyrus (BA 44) and adjacent premotor cortex. The anterior insula forms a neural conduit between the mirror neuron system and the limbic system, allowing this information to be evaluated in relation to one's own autonomic and emotional state contributing to a complex affective response mediated by the limbic system. Possible feedback mechanisms may influence the subsequent processing of the musical signal at the immediate and more long-term timescales. The shared recruitment of this neural mechanism in both the sender and the perceiver of the musical message allows for co-representation and sharing of the musical experience. Music notes from 'The Lady Sings the Blues' by Billie Holiday and Herbie Nichols.

…The **Shared Affective Motion Experience** model suggests that musical sound is perceived **not only in terms of the auditory signal**, **but also in terms of the intentional, organized sequences of expressive motor acts that are behind the signal.** So this model can suggest that properties of the human Mirror Neuron System allow us to consider social communication, and more specifically **musical communication, in a new light—less in terms of pitch/timbre/rhythmic patterns—and more in terms of action sequencing, goals/intentions, prediction, and shared representations**. In particular I think that this model can be connected to the active music therapy model in which the movements and the gestures behind the sound play an important role.

Tutte le funzioni del sistema dei Mirror Neurons sono collegate alla “social cognition” (interazione sociale, comunicazione, empatia,…) (Overy & Molnar-Szakacs, 2009)

Ascoltare e fare musica attiva funzioni sociali (Koelsch, 2010)

- Contact
- Social cognition (Steinbeis & Koelsch, 2009; Koelsch, 2009)
- Co-pathy
- Communication (Trehub, 2003; Fitch, 2006)
- Coordination (Overy & Molnar-Szakacs, 2009; Patel, 2009; Kirschner & Tomasello, 2009)
- Cooperation (Rilling et al., 2002; Tomasello, 2005)
- Social cohesion (Baumeister &Leary, 1995; Cross & Morley, 2008)

La musica attiva meccanismi gratificanti legati al piacere e alla gratificazione... (Hillecke et al., 2005; Schlaug, 2009; Koelsch 2009; 2010)

The neurochemistry of music

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Music is used to regulate mood and arousal in everyday life and to promote physical and psychological health and well-being in clinical settings. However, scientific inquiry into the neurochemical effects of music is still in its infancy. In this review, we evaluate the evidence that music improves health and well-being through the engagement of neurochemical systems for (i) reward, motivation, and pleasure; (ii) stress and arousal; (iii) immunity; and (iv) social affiliation. We discuss the limitations of these studies and outline novel approaches for integration of conceptual and technological advances from the fields of music cognition and social neuroscience into studies of the neurochemistry of music.

Box 2. Relevance for therapy (Koelsch, 2010)

Music therapy (MT) can have effects that improve the psychological and physiological health of individuals. A heuristic working factor model for music therapy [72] assumes five factors which contribute to the effects of MT. These factors refer to the modulation of emotion, attention, cognition, behavior and communication. Given that music can change activity in brain structures that function abnormally in patients with depression (such as amygdala, hippocampus and nucleus accumbens; see main text), it seems plausible that music can be used to stimulate and regulate activity in these structures (either by listening to or by making music), and thus ameliorate symptoms of depression. However, so far the scientific evidence for effectiveness of MT on depression is surprisingly weak, because of the lack of high-quality studies, and the small number of studies with randomized, controlled trials [73]. Studies on neurological applications of MT have so far mainly dealt with the therapy of stroke patients. Recent evidence suggests that playing melodies either with the hand on a piano, or with the arm on electronic drum pads that emit piano tones, helps stroke patients to train fine as well as gross motor skills with regard to speed, precision and smoothness of movements [74]; it seems likely that an emotional component contributes at least partly to these effects, because this treatment was more effective than a standard rehabilitation. Electrophysiological data suggest that these effects are due to enhanced cortical connectivity and stronger activation of the motor cortex as a result of music-supported movement training [75]. Other studies showed that isometric musical stimuli have the capability of regulating gait and arm control in patients with stroke and Parkinson's disease, presumably as a result of music-evoked arousal and priming of the motor system via auditory stimulation, as well as a result of entrainment of the motor system to the beat of the music [75,76]. Moreover, positive emotions elicited by preferred music can decrease visual neglect (possibly by increasing attentional resources) [77], and listening to self-selected music after stroke appears to improve recovery in the domains of verbal memory and focused attention (along with less depressed and confused mood) [78]. The neural mechanisms for such effects, however, remain to be specified.

INTERVENTIONS WITH MUSIC IN THE NEUROLOGICAL CLINICAL SETTING

RELATIONAL MUSIC THERAPY	REHABILITATIVE MUSIC THERAPY	MUSIC–SUPPORTED MOTOR ACTIVITIES
•Trained music therapist •Therapeutic Setting •Psychological models •Relationship as the core of intervention •Specific active or receptive techniques •Aims (aspiring to become stable and long-lasting over time): attenuation of behavioral and psychiatric symptoms and prevention/stabilization of complications; increase in communication and relationship skills (sometimes improvement of cognitive and motor functions)	• Trained professional/music therapist • Rehabilitative setting • Neuroscientific and neurocognitive models • Motor and cognitive exercises using sonorous-musical elements (in particular rhythm) • Specific techniques • Aims (aspiring to become stable and long-lasting over time): cognitive and motor changes (sometimes psychological changes)	• Absence of a Professional of the music field • Absence of a specific therapeutic setting • Absence of a specific intervention model • Using music to support motor activities • Aims: well-being, improving mood and motivation, promoting socialization, motor and cognitive stimulation

Neurologic Music Therapy

A Research-Based System of Standardized Clinical Techniques

- Colorado State University
  - Center for Biomedical Research in Music and Neurologic Rehabilitation
    - Michael Thaut, Ph.D Neuroscience/Music Therapy
    - Gerald McIntosh, M.D. Neurologist
    - Ruth Rice, MS PT PT, Neurologic Rehabilitation
    - Gary Kenyon, MS Biomechanics, Mathematics
    - Corene Thaut, MM MT, Neurologic Rehabilitation

Thaut, M.H. (1999). Training Manual for Neurologic Music Therapy

Neurologic Music Therapy
Basic Definitions

- NMT is defined as the therapeutic application of music to cognitive, sensory, and motor dysfunctions due to neurologic disease of the human nervous system.

Thaut, M.H. (1999). Training Manual for Neurologic Music Therapy

Neurologic Music Therapy
Rhythmic Auditory Stimulation

- **RAS - (**Rhythmic Auditory Stimulation**)**
  - **RAS** is a specific technique to facilitate rehabilitation of movements that intrinsically are biologically rhythmical. One of the most important of these rhythmical movements is gait. Therefore, the most prominent application of RAS is to gait disorders, e.g. in stroke patients, Parkinson's patients, and traumatically brain injured patients.

Th[illegible], M.H. (1999). Training Manual for Neurologic Music Therapy

Table 1.
Randomized Controlled and Clinical Controlled Trials (RCT, CCT) about clinical interventions with music in some of the main neurological pathologies found in PubMed (English language) from 2003 to 2012 using the following terms: "music", "rhythmic auditory stimulation" and "dementia", "stroke", "Parkinson", "multiple sclerosis", "brain injury".

Pathology	*Music Intervention*	*Number of Studies*	*RCT/CCT*	*Outcomes*
Dementia[a]	Music therapy techniques; rehabilitative music exercises; use of percussion instruments with familiar music; making music; singing; preferred music listening; Rhythmic Auditory Stimulation; group music with movement	19	15 RCT/4 CCT	Improvement in: behavioral and psychological symptoms (agitation, anxiety, delusions, apathy, depression; irritability, aberrant motor activity, night-time disturbances, aggressiveness); self-esteem; cognitive functions (general cognitive functioning, attention, prose memory skills, language); physiological parameters (heart rate variability, systolic blood pressure, reduction of salivary Chromogranin A); motor functions (gait)
Stroke[b]	Music therapy techniques; listening to music; music-supported training; Rhythmic Auditory Stimulation; Musical Motor Feedback	8	7 RCT/1 CCT	Improvement in: psychological symptoms (anxiety, depression, mood, frequency and quality of interpersonal relationships); cognitive functions (verbal memory, focused attention); fine and global motor skills (speed, precision and fluency, wider range of motion and flexibility, motor control in everyday activities, gait)
Parkinson's Disease[c]	Rhythmic Auditory Stimulation; Music relaxation; Rhythmic sound cues; Listening to drumming music	4	1 RCT/3 CCT	Improvement in: motor functions (functional gait and balance, gait timing, arm and finger movements); tremor; psychological symptoms (mood and anxiety); quality of life
Multiple Sclerosis[d]	Rhythmic Auditory Stimulation; rehabilitative music exercises; improvisational music therapy approach	3	2 RCT/1 CCT	Improvement in: motor functions (gait parameters); cognitive functions (memory learning); psychological symptoms (depression and anxiety); self-esteem
Brain Injury[e]	Neurological Music Therapy	1	1 CCT	Improvement in: cognitive functions (executive function) and psychological symptoms (depression and anxiety)

[a] Vink et al., 2012; Ceccato et al., 2012; Sung et al., 2012; 2010; 2006; Lin et al., 2011; Raglio et al., 2010a; 2010b; 2008; Cooke et al., 2010a; 2010b; Guétin et al., 2009; Choi et al., 2009; Bruer et al., 2007; Takahashi et al., 2006; Clair et al., 2006; Svansdottir et al., 2006; de Winckel et al., 2004; Suzuki et al., 2004.
[b] Kim et al., 2011; Särkämö et al., 2010; 2008; Altenmüller et al., 2009; Jeong et al., 2007; Schneider et al., 2007; Thaut et al., 2007; Schauer et al., 2003.
[c] Kadivar et al., 2011; Craig et al., 2006; del Olmo et al., 2005; Bernatzky et al., 2004.
[d] Conklyn et al., 2010; Moore et al., 2008; Schmid et al., 2004.
[e] Thaut et al., 2009.

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