Istituti Clinici Scientifici Maugeri IRCCS
FONDAZIONE SALVATORE MAUGERI

GIORNALE ITALIANO DI MEDICINA DEL LAVORO ED ERGONOMIA

VOLUME XLIII - N. 4 OTTOBRE-DICEMBRE 2021

Medicina del Lavoro

E. Vitale, V. Galatola, R. Mea
Anxiety and Depression symptoms in Italian nurses during the Covid-19 pandemic

F. Napolano, M. Corfiati, A. Vaira, G. Giangaspero, M. D'Onghia, G. Di Leone, G. Trani, F. Longo, P. Marcuccio
Piano di vigilanza sul rispetto degli obblighi in materia di protezione dagli agenti cancerogeni dei lavoratori addetti alla distribuzione carburanti

S. Sernia, K. Prokopenko, L. Lia, V. D'Egidio, L. Strippoli, T. Antoniozzi, S. del Buono, A. Mannoccix, G. La Torre
Associazione fra fattori socio-demografici e le patologie oculari dei dipendenti di un Ateneo italiano sottoposti a sorveglianza sanitaria: uno studio osservazionale

A.M. Angelone, A. D'Apice, A. Mattei
Modalità di lavoro e valutazione dello stress percepito durante la pandemia di Covid-19

R.S. Calabrò
Il mobbing sul lavoro in Italia: un fenomeno crescente in cerca di legislazione

Medicina Riabilitativa Occupazionale

G. La Torre, S. Paoletti, F. Petronzi, C. Sestili
L'uso del Disability Management in contesti internazionali: revisione sistematica di revisioni

A. Brusini
Low back pain among nurses in Italy: a review

L. Donisi, E.M. Capodaglio, F. Amitrano, G. Cesarelli, G. Pagano, G. D'Addio
A multiple linear regression approach to extimate lifted load from features extracted from inertial data

Music Therapy Corner

A. Raglio, M. Castelli, L. Manzoni, F. Vico
What happens if algorithmic music meets medicine

Necrologio

Pietro Alberto Bertazzi (1945-2021)

Editor
Marcello Imbriani

GIMLE FREE
GIORNALE ITALIANO DI MEDICINA DEL LAVORO Full text

TIPOGRAFIA pime EDITRICE Srl
PAVIA - 2021

L'Istituto di Medicina del Lavoro dell'Università degli Studi e dell'Azienda Ospedaliera di Perugia dalle origini ai nostri giorni

a cura di
Giuseppe Abbritti

con la collaborazione di
Giacomo Muzi, Adolfo Puxeddu
Maria Patrizia Accattoli, Andrea Bellucci, Michele Bini, Marco dell'Omo
Sandrina Mearelli, Alessandro Monaco, Laura Morettoni, Piero Morucci
Nicola Murgia, Pina Pompei, Andrea Siracusa, Chiara Tinozzi

CULTURA E SALUTE EDITORE PERUGIA

"Memoria minuitur nisi exerceatur" e bene ha fatto Giuseppe Abbritti ad esercitare la sua memoria e quella dei suoi Collaboratori in veste scritta per ricordare la nascita e la vita matura, tuttora rigogliosa, della Medicina del Lavoro a Perugia. E l'ha fatto con sagacia ed intelligenza, non confidando soltanto nella memoria dei singoli individui, ma, con metodo scientifico accurato, riproponendo documenti illustrativi e coinvolgendo un po' tutti coloro che hanno contribuito alla fondazione e alle tappe successive della cattedra e della disciplina della nostra Università. Il quadro risultante è così ad un tempo completo e piacevole perché ogni persona coinvolta ha portato la sua visione e l'aspetto, piccolo o grande, che ha contribuito a creare.

dalla prefazione del Prof. Fausto Grignani

www.edizioniculturasalute.com

Volume XLIII, N. 4

GIMLE FREE GIORNALE ITALIANO DI MEDICINA DEL LAVORO Full text

Ottobre-Dicembre 2021

Issn 1592-7830

GIORNALE ITALIANO DI MEDICINA DEL LAVORO ED ERGONOMIA

Rivista di **Medicina del Lavoro** (Medicina Occupazionale e Ambientale, Igiene del Lavoro, Tossicologia Occupazionale) ed **Ergonomia** (Rapporto Uomo/Lavoro, Riabilitazione Occupazionale, Terapia Occupazionale, Psicologia del Lavoro, Ergonomia)

Rivista indicizzata da: Index Medicus, Excerpta Medica, Scopus

Editor

MARCELLO IMBRIANI

Università degli Studi di Pavia

Istituti clinici scientifici Maugeri, IRCCS

MEDICINA DEL LAVORO

COMITATO SCIENTIFICO

Giuseppe ABBRITTI, Pietro APOSTOLI, Giulio ARCANGELI, Enrico BERGAMASCHI, Ennio CADUM, Stefano M. CANDURA, Domenico CAVALLO, Massimo CORRADI, Alfonso CRISTAUDO, Mario DI GIOACCHINO, Paolo DURANDO, Concettina FENGA, Marco FERRARIO, Fabrizio M. GOBBA, Ivo IAVICOLI, Sergio IAVICOLI, Piero MAESTRELLI, Andrea MAGRINI, Cristina MONTOMOLI, Antonio MUTTI, Giacomo MUZI, Anna ODONE, Gabriele PELISSERO, Enrico PIRA, Stefano PORRU, Walter RICCIARDI, Lory SANTARELLI, Pietro SARTORELLI, Giovanna SPATARI, Mario TAVANI

MEDICINA DEL LAVORO

COMITATO DI REDAZIONE

Alberto BATTAGLIA, Rossana BORCHINI, Angela CARTA, Nicoletta CORNAGGIA, Chiara COSTA, Paolo CROSIGNANI, Marco DELL'OMO, Francesco FRIGERIO, Francesco GARDINALI, Giuseppe LA TORRE, Sara NEGRI, Enrico ODDONE, Roberta PERNETTI, Benedetta PERSECHINO, Giuseppe TAINO

MEDICINA RIABILITATIVA OCCUPAZIONALE

COMITATO SCIENTIFICO

Edoardo ALESSE, Michelangelo BUONOCORE, Carlo CALTAGIRONE, Luca CHIOVATO, Anna GIARDINI, Giuseppe LAGANGA SENZIO, Mario MELAZZINI, Antonio NARDONE, Fabrizio PAVONE, Pierluigi POLITI, Alfredo RAGLIO, Egidio TRAVERSI, Livia VISAI, Michele VITACCA

MEDICINA RIABILITATIVA OCCUPAZIONALE

COMITATO DI REDAZIONE

Tommaso CAMEROTA, Edda CAPODAGLIO, Gianni D'ADDIO, Marina MANERA, Monica PANIGAZZI, Giandomenico PINNA, Gianfranco SPALLETTA

Segreteria scientifica: **Enrico Oddone - E-mail enrico.oddone@unipv.it - Fax 0382-593796**

Redazione: Giornale Italiano di Medicina del Lavoro ed Ergonomia - Istituti Clinici Scientifici Maugeri Spa SB IRCCS Maugeri Pavia - Sezione di Medicina del Lavoro "Salvatore Maugeri" - Via Severino Boezio, 24 - 27100 PAVIA

Editore: PI-ME Editrice - Via Vigentina 136[A] - Tel. 0382-572169 - 27100 PAVIA
E-mail tipografia@pime-editrice.it

Pubblicazione trimestrale - *Direttore Responsabile:* : Prof. Marcello Imbriani - Autorizzazione del Tribunale di Pavia n. 229 del 16 Maggio 1978 - ROC 5756

Associato all'USPI, Unione Stampa Periodica Italiana

INDEXED IN EMERGING SOURCES CITATION INDEX THOMSON REUTERS

GIORNALE ITALIANO DI MEDICINA DEL LAVORO ED ERGONOMIA

Volume XLIII - N. 4 Ottobre-Dicembre 2021

INDICE

Medicina del Lavoro

E. Vitale, V. Galatola, R. Mea	321	Anxiety and Depression symptoms in Italian nurses during the Covid-19 pandemic
F. Napolano, M. Corfiati, A. Vaira, G. Giangaspero, M. D'Onghia, G. Di Leone, G. Trani, F. Longo, P. Marcuccio	328	Piano di vigilanza sul rispetto degli obblighi in materia di protezione dagli agenti cancerogeni dei lavoratori addetti alla distribuzione carburanti
S. Sernia, K. Prokopenko, L. Lia, V. D'Egidio, L. Strippoli, T. Antoniozzi, S. del Buono, A. Mannoccix, G. La Torre	334	Associazione fra fattori socio-demografici e le patologie oculari dei dipendenti di un Ateneo italiano sottoposti a sorveglianza sanitaria: uno studio osservazionale
A.M. Angelone, A. D'Apice, A. Mattei	341	Modalità di lavoro e valutazione dello stress percepito durante la pandemia di Covid-19
R.S. Calabrò	352	Il mobbing sul lavoro in Italia: un fenomeno crescente in cerca di legislazione

Medicina Riabilitativa Occupazionale

G. La Torre, S. Paoletti, F. Petronzi, C. Sestili	357	L'uso del Disability Management in contesti internazionali: revisione sistematica di revisioni
A. Brusini	369	Low back pain among nurses in Italy: a review
L. Donisi, E.M. Capodaglio, F. Amitrano, G. Cesarelli, G. Pagano, G. D'Addio	373	A multiple linear regression approach to extimate lifted load from features extracted from inertial data

Music Therapy Corner

A. Raglio, M. Castelli, L. Manzoni, F. Vico	379	What happens if algorithmic music meets medicine
Necrologio	381	Pietro Alberto Bertazzi (1945-2021)

G Ital Med Lav Erg 2021; 43:4, 379-381
ISSN 1592-7830

© PI-ME, Pavia 2021

Alfredo Raglio[1], Mauro Castelli[2], Luca Manzoni[3], Francisco Vico[4]

What happens if algorithmic music meets medicine

[1] Istituti Clinici Scientifici Maugeri IRCCS, Music Therapy Research Laboratory, Pavia, Italy
[2] NOVA Information Management School (NOVA IMS), Universidade Nova de Lisboa, Portugal
[3] Dipartimento di Matematica e Geoscienze, Università degli Studi di Trieste, Trieste, Italy
[4] ETSI Informatica, Andalucia Tech, University of Malaga, Malaga, Spain

ABSTRACT. Since ancient times there has been recognition of music's therapeutic powers, inherent in the properties of sound and its effects on human beings at a psychophysical level. Literature showed the development of therapeutic applications of music in numerous clinical settings. Music-listening itself can qualify as an effective therapeutic means within clinical contexts. Numerous studies document the potentialities of this practice. Whilst, it appears to be difficult to study the phenomenon of music from a scientific point of view, it may be possible to attempt moving music closer to science. Algorithms are of help in this process. Only recently has algorithmic music been used within the context of composing music with therapeutic aims helping to create songs for precise therapeutic aims: music characteristics can be altered and re-modelled and, above all, simplified. It was exactly this intent that recently brought into being an algorithm, Melomics-Health, which composes music with a "therapeutic" logic. Melomics-Health allows us to study the effect of specific musical parameters and structures on individuals (including neuro-scientific aspects) with the possibility to correlate effectiveness and efficiency to those precise musical aspects and to re-model the latter based on these findings. The use of algorithms applied to music as therapy constitutes a new starting point, an attempt to bring art and science closer together, to increase awareness and effectiveness in the use of music in therapeutic contexts; a new perspective integrating art, science and technology in the service of medicine, in clinical work and research.

Key words: *algorithmic music, music therapy, music medicine, music listening, evidence-based approaches.*

RIASSUNTO. Fin dall'antichità sono stati riconosciuti i poteri terapeutici della musica, riguardati le proprietà del suono e i suoi effetti sugli esseri umani a livello psicofisico. La letteratura ha mostrato lo sviluppo di applicazioni terapeutiche della musica in numerosi contesti clinici. Lo stesso ascolto musicale può qualificarsi come un mezzo terapeutico efficace in contesti clinici. Numerosi studi documentano le potenzialità di questa pratica. Anche se sembra difficile studiare il fenomeno della musica da un punto di vista scientifico, è possibile tentare di avvicinare la musica alla scienza. Gli algoritmi possono supportare questo intento. Solo recentemente la musica algoritmica è stata utilizzata nell'ambito della composizione di musica con scopi terapeutici aiutando a creare brani con precisi scopi terapeutici: le caratteristiche della musica possono essere variate e modellate e, soprattutto, semplificate. È stato proprio questo l'intento che ha portato recentemente alla nascita di un algoritmo, Melomics-Health, che compone musica con una logica "terapeutica". Melomics-Health permette di studiare l'effetto di specifici parametri e strutture musicali sugli individui (anche a livello neuroscientifico) con la possibilità di

What happens if algorithmic music meets medicine

Since ancient times there has been recognition of music's therapeutic powers, inherent in the properties of sound and its effects on human beings at a psychophysical level (Thaut, 2015; Lippi et al., 2010). Ancient peoples and modern sciences have been concerned with, and continue to investigate, the therapeutic effects of music, which, in more recent times, has given rise to music therapy. This discipline has moved through diverse phases, from an almost magical employment of music to contemporary studies which have benefitted from the contributions, first of the biomedical sciences and subsequently of the neurosciences. A mere review of literature in databases such as PubMed suffices to illustrate the development of therapeutic applications of music in numerous clinical settings (Aalbers et al., 2017; Garza-Villarreal et al., 2017; Geretsegger et al., 2017; Sihvonen et al., 2017; Bradt et al., 2016; Hole et al., 2015; Geretsegger et al., 2014). Music's therapeutic applications bring to our attention, with ever-increasing urgency, the need to conciliate science's rigor with music's implicit evanescence and subjectivity.

The latter is as complex a phenomenon as it is powerful, difficult to study and to define in relation to possible therapeutic outcomes. Literature offers a wide panorama of potential interventions with music (Raglio et al., 2015): In the first instance, music therapy's traditions and culture highlighted how music, to have therapeutic efficacy, must be implemented in a relational context (Raglio, 2011). The dual term sound-relation constituted an essential prerequisite for the consideration of the intervention as being potentially therapeutic. More recently, however, the idea has emerged that even music-listening itself can qualify as an effective therapeutic means within clinical contexts. Numerous studies document the potentialities of this practice (Hole et al., 2015; Sarkamo et al., 2008; Gerdner, 2000). Apart from issues regarding methodology and approach, the aspect of the proposed contents of music-listening proves particularly significant. This has inspired researchers to investigate this element, resulting in the conclusion that it is individualized listening that produces the best therapeutic results, in other words, listening which is attributable to the patient's subjective experience, to his/her personal tastes, and to music which pleases.

documentare la loro efficacia con la possibilità di modellarli sulla base dei risultati ottenuti. L'uso di algoritmi applicati alla musica come terapia costituisce un nuovo punto di partenza, un tentativo di avvicinare arte e scienza, al fine di aumentare la consapevolezza e l'efficacia nell'uso della musica in contesti terapeutici; una nuova prospettiva che integra arte, scienza e tecnologia al servizio della medicina, nel lavoro clinico e nella ricerca.

Parole chiave: musica algoritmica, musicoterapia, music medicine, ascolto musicale, approcci evidence-based.

It is undeniable that such music produces effects at a general level and important changes at a physical and biochemical level (Chanda et al., 2013). The prolonging of these effects can determine psycho-behavioral changes in individuals and can also reduce transitory symptoms (such as anxiety or stress due to a particular event, for example before an operation or in relation to pain).

In other approaches based on music-listening, it is the researchers who select the music to propose; in this case, complications arise in the effort to identify music repertoire corresponding to therapeutic aims. One of the crucial questions is therefore the extent to which the subjective factor of the suggested repertoire should be considered, or, rather, the extent to which the musical parameters and structures are responsible for any therapeutic effects. This article is concerned with precisely this investigation.

Whilst it appears to be difficult to study the phenomenon of music from a scientific point of view, it may be possible to attempt moving music closer to science. Algorithms are of help in this process. Experiences leading to the creation of music using artificial intelligence are not new to us (Ball, 2012; Cope, 2005). The numerous examples available of works composed by artificial intelligence indicate diverse musical genres, indeed introducing stylistic innovations and original works, each with its own aesthetic quality and identity. One important example is the recording made by the London Symphony Orchestra, which has immortalized a repertoire of contemporary music created entirely by an artificial intelligence named Iamus (CD Melomics Records, S.L., 2012) (Ball, 2012). However, only recently has algorithmic music been used within the context of composing music with therapeutic aims, offering interesting advantages and prospects (Raglio et al., 2017). In traditional musical works, in most cases, we are faced with complexities which we cannot fragment or change without altering the sense of the composition itself. Concerning this aspect, artificial intelligence can come to our assistance, in helping to create music for precise therapeutic aims, with characteristics which can be altered and re-modelled and, above all, in allowing us to simplify the musical structure using the precise elements and parameters which have proved significant for the therapeutic project. Therefore, music is founded not on aesthetic principles, but on healing aims; music is created to reduce symptoms or to modify a clinical condition. A further advantage lies in the possibility of knowing the substance of which the music is made, permitting the comparison between musical structures and parameters and therapeutic results, with the possibility to intervene in these aspects to improve the efficacy of the proposed listening material. It was exactly this intent that recently brought into being an algorithm, Melomics-Health, which composes music with a "therapeutic" logic (Raglio et al., 2017). Melodies are composed which present specific parameters in terms of timbre, tonal environment, tempo, intervals, pitches, dynamics and density, and which characterize listening according to the therapeutic aim. Knowledge from bio-medicine, neurosciences, music psychology, and clinical practice inform and support these choices, based on which Melomics-Health composes the musical works (Spotify offers an example of this type of music composition created for relaxing or pain reduction, Melomics-Health playlist: For Relaxation op.1 ad op. 2; For Pain Relief op.1 and op. 2). A recent study (Raglio et al., 2021) involving subjects with and without musical training compared conventional music with algorithmic music with respect to perception ad short-term effects. The study concluded that there aren't significant differences between the two types of music both in perception and in relaxing effects considered in the research. The musical product is hardly distinguishable from a melody created

Figure 1a.

Figure 1b.

Figure 1. ***a. The Andalusia Technology Park (University of Malaga, Spain): the room where the Melomics-Health algorithm was created - b. The Istituti Clinici Scientifici Maugeri SpA (Pavia, Italy): the site where Melomics-Health studies are taking place***

by a composer following similar indications for the musical structure and parameters. Algorithmic songs are works that have never been heard before, written with musical "aesthetics" but, above all, for the purpose of therapy. Melomics-Health allows us therefore to study the effect of specific musical parameters and structures on individuals (including neuro-scientific aspects) with the possibility to correlate effectiveness and efficiency to those precise musical aspects and to re-model the latter based on these findings. Through randomized controlled trials focusing on the algorithm, traditional music, and the absence of music, studies are now taking place to measure the effects of these approaches within the contexts of ongoing pain and stress, and in oncology. The use of algorithms applied to music as therapy constitutes a starting point, not an arrival. It is an attempt to bring art and science closer together, to increase awareness and effectiveness in the use of music in therapeutic contexts; a new perspective integrating art, science, and technology in the service of medicine, in clinical work and research.

Declaration of Interest

I declare no competing interests.

Role of funding source

None.

References

1) Thaut MH. Music as therapy in early history. Prog Brain Res 2015; 217:143-58.
2) Lippi D, Roberti di Sarsina P, D'Elios JP. Music and medicine. J Multidiscip Healthc 2010; 3:137-41.
3) Aalbers S, Fusar-Poli L, Freeman RE, et al. Music therapy for depression. Cochrane Database Syst Rev 2017; 11:CD004517.
4) Garza-Villarreal EA, Pando V, Vuust P, Parsons C. Music-Induced Analgesia in Chronic Pain Conditions: A Systematic Review and Meta-Analysis. Pain Physician 2017; 20(7):597-610.
5) Geretsegger M, Mössler KA, Bieleninik Ł, Chen XJ, Heldal TO, Gold C. Music therapy for people with schizophrenia and schizophrenia-like disorders. Cochrane Database Syst Rev 2017; 5:CD004025.
6) Sihvonen AJ, Särkämö T, Leo V, Tervaniemi M, Altenmüller E, Soinila S. Music-based interventions in neurological rehabilitation. Lancet Neurol 2017; 16(8):648-660.
7) Bradt J, Dileo C, Magill L, Teague A. Music interventions for improving psychological and physical outcomes in cancer patients. Cochrane Database Syst Rev 2016; 8:CD006911.
8) Hole J, Hirsch M, Ball E, Meads C. Music as an aid for postoperative recovery in adults: a systematic review and meta-analysis. Lancet 2015; 386(10004):1659-71.
9) Geretsegger M, Elefant C, Mössler KA, Gold C. Music therapy for people with autism spectrum disorder. Cochrane Database Syst Rev 2014; 6:CD004381.
10) Raglio A, Oasi O. Music and health: what interventions for what results? Front Psychol 2015; 6:230.
11) Raglio A. When music becomes music therapy. Psychiatry Clin Neurosci 2011; 65(7):682-3.
12) Särkämö T, Tervaniemi M, Laitinen S, et al. Music listening enhances cognitive recovery and mood after middle cerebral artery stroke. Brain 2008; 131:866-76.
13) Gerdner LA. Effects of individualized versus classical "relaxation" music on the frequency of agitation in elderly persons with Alzheimer's disease and related disorders. Int Psychogeriatr 2000; 12(1):49-65.
14) Chanda ML, Levitin DJ. The neurochemistry of music. Trends Cogn Sci 2013; 17(4):179-93.
15) Ball P. Computer science: Algorithmic rapture. Nature 2012; 488(7412):458-458.
16) Cope D. Computer models of musical creativity. Cambridge, MA: MIT Press, 2005.
17) Raglio A, Vico F. Music and Technology: The Curative Algorithm. Front Psychol. 2017; 8:2055.
18) Raglio A, Baiardi P, Vizzari G, Imbriani M, Castelli M, Manzoni S, Vico F, Manzoni L. Algorithmic Music for Therapy: Effectiveness and Perspectives. Appl. Sci. 2021; 11:8833.

Correspondence: *Dr. Raglio Alfredo, Ph.D., Istituti Clinici Scientifici Maugeri IRCCS, Music Therapy Research Laboratory, Scientific Institute of Pavia, Via Muageri, 27100Pavia, Italy, Phone/Fax: +390382593797, alfredo.raglio@icsmaugeri.it*

ISSN 1592-7830

PI-ME PRESS - PAVIA