

# SCIENTIFIC REPORT

ESF Exploratory Workshop on

## **Music and the brain: New perspectives for stimulating cognitive and sensory processes**

Gdansk (Poland), 2-5 July 2009

*<http://leadserv.u-bourgogne.fr/~mandb/>*

Convened by:  
**Emmanuel Bigand, Simone Dalla Bella  
and Barbara Tillmann**

## 1. Executive summary

The ESF Exploratory Workshop was held in the Hotel “Wolne Miasto” in Gdansk (Poland), over 3 days (on July 3-5 2009). Seventeen researchers (coming from seven countries, namely Belgium, France, Germany, England, Italy, Poland, and Canada), including the three conveners (from France and Poland), and, in addition, two local organization assistants (from Poland), participated in the Meeting. The general atmosphere of the meeting was pleasant, friendly, very collaborative, thus allowing spirited discussions and fruitful interactions. This was facilitated by the particularly appropriate and small-scale setting of the meeting, as well as by the excellent local organization (e.g., a well-designed schedule, allowing each participant to present new and exploratory data, leaving sufficient time for discussions). The workshop was structured around long and short presentations as well as discussion rounds and practical demonstration sessions, in keeping with the Workshop program. Participants were invited well in advance to provide questions, statements and hypothesis aimed to stimulate the various sessions and enrich the topics addressed.

The main scientific goal of the Meeting was to create a bridge between basic research and applied research in the neurosciences of music, aiming to study rehabilitating brain functions (e.g., auditory processing, language, and motor processes). Interdisciplinary research involving clinical and cognitive neuroscientists was needed to capitalize on existing knowledge about the brain in order to devise effective rehabilitation programs. This meeting created a privileged setting where participants worked together and brainstormed on the topic of “*Music and the brain: New perspectives for stimulating cognitive and sensory processes*”. The goal of ESF Exploratory Workshops was to create a context in which new ideas/new emerging fields could be discussed.

The workshop brought together scientists with research interests that allowed investigating the positive influences that music might have on general cognitive abilities, including sensory and high-level cognitive processes, from perception to performance. This aim was addressed in sessions promoting discussions on four topics, complemented by an additional session presenting examples of diagnosis tools and new training methods

- 1) *Music in the rehabilitation of auditory processing*
- 2) *Music in the rehabilitation of language disorders and the improvement of linguistic abilities*
- 3) *Improving memory and learning deficiencies with music stimulation*
- 4) *Music in motor rehabilitation of non-musicians and musicians*

The goals were successfully met in the Workshop. Participants presented new, unpublished data and preliminary studies, and have been willing to discuss new, provocative ideas and theories. The main outcome was that all participants agreed that music can be used in different contexts as a tool for rehabilitation of perceptual and cognitive, and motor functions. In particular, the issue of which musical properties (if any) are relevant for this effect was thoroughly discussed, and the different points of view compared. There was particular agreement around the need of a detailed and specified theoretical framework (see point 2), which is clearly still missing in current clinical approaches making use of music (e.g., standard music therapy).

## 2. Scientific content of the event

The scientific community of neurosciences of music starts to discover that music may be used as a tool to stimulate the brain and to potentially remedy to cognitive and motor injury. Oliver Sacks (one among other researchers having particular impact on the large audience) has spread this idea (and this hope) to the general public. The workshop was designed to consider how to evaluate this issue with rigor. The workshop aimed notably to delineate the possible theoretical framework that could account for this possible effect of music on the brain and the rehabilitation of sensory, cognitive and motor disorders.

Each participant was requested to present new provocative finding along this line, and several round tables animated by other prominent researchers in the field were organized after each set of 3 presentations. These were designed to discuss the theoretical frames that were presumably accounting for the presented data. Obviously, our ambition was not to decide which of these theoretical frameworks was the best one; rather, we aimed at specifying which theories could account for the positive effect of music on other mental functions and outlining future research testing the underlying mechanisms.

For each of the four main topic indicated in the program (see enclosed file), we considered the appropriateness of three main theoretical approaches.

1 Music as a stimulating (but non specific) activity. Music is a stimulating activity (as are many others) that taps into and boosts several general processes, some being also involved in other functions, more specific (e.g., language) or more general (e.g., memory). This stimulating effect may be due to the emotional value of music, or to its dynamogenic effect. In this sense, music is a “stimulating stimulus” comparable to many others (movies, reading pleasant stories, drawing, and so on).

2 The shared-resource approach. Music boosts some cognitive functions because music cognition shares resources with these functions. For example, musical training has positive effects on linguistic abilities because both domains tap into the same neural resources.

3 The modular approach. Music is a specific activity that affects the brain in a specific way, notably, auditory perceptual processes, auditory memory, attention and anticipatory processes. These processes intervene in several other behaviors (language, motor skill), which may be boosted by musical activity.

In addition to the question about the underlying mechanisms and the definition of the theoretical frameworks, the discussion of beneficial effects of music for sensory, cognitive and motor rehabilitation led to the question of musical training. Which components of musical training may have a positive effect on non-musical activities and processes? Indeed, saying that “musical experts” are better than others in several, non-musical cognitive domains, is not precise enough. The main question is which components of the training are useful AND whether are these components specific to music?

These lines of questions, among others, were addressed during the workshop, and our challenge was to clarify them. The workshop provided us with a privileged setting to work together and discuss these important questions. We managed to create a context in which new ideas were discussed and developed in each of the four following sessions (Details

about the presented topics by each participants are provided below), each one focusing on one aspect of music and rehabilitation:

Inside each of the four thematic sessions, there were longer presentations of 15 minutes and short “flash” presentations of 5 minutes. On the final day, various tools for training as well as existing batteries of tests were presented. The short presentation of the batteries was followed by a practical demo session. It is noteworthy that the four sessions were not treated as completely separate. Links were made back and forth between the thematic sessions all along the Workshop.

1) *The first session focused on perceptual processes.*

Emmanuel Bigand presented ongoing research aimed at optimizing auditory training programs for hearing impaired children with music.

Sibylle Herholz illustrated the effect of musical training on auditory processing by means of magnetencephalography (MEG) and comparisons of musicians and nonmusicians as well as laboratory piano training.

The two long talks were followed by three « flash » presentation, focusing on Music application for cochlear implant (Marc Leman), the role of musical expertise in improving pitch processing in language (Mireille Besson), and implicit processing of pitch in patients with cochlear implants (Barbara Tillmann).

The session was followed by a long debate addressing the following questions:

- Is it all about attention? Can music improve attention? (modality-specific / domain-specific attentional mechanisms?) and/or is it all about emotion/mood? And/or entrainment?
- Is it possible that the perception/action coupling in training for hearing impaired individuals is the real “motor of learning”?
- What is the role of motor processing in rehabilitating auditory processes?
- What kind of transfer occurs from music to other cognitive and emotional abilities (for example in language processing and production)?
- Which are the processes known to be influenced by musical expertise? What is their time course?
- When examining the effect of musical expertise, it is critical to assess/determine if the difference between musicians/non-musicians is qualitative (i.e., the groups use different mechanisms) or quantitative (musicians are more efficient in using the same mechanism). What is the consequence of sampling musicians / non-musicians?
- How to get the exposure started? Breaking the avoidance of cochlear implant listeners to music and start the training.
- What about the creation of “cochlear music”? (bionic music for a bionic ear).

2) *the second session focused on the benefits of music on language processing*

Mireille Besson presented ongoing research aiming at testing the implications of musical training (using a longitudinal approach) for the remediation of dyslexia.

Sonja Kotz provided evidence regarding the neural substrates of rhythm, timing and language, and their potential relevance in rehabilitation.

Isabelle Peretz focused on speech disorders, and the role of synchronized singing (« choral singing », implying auditory-vocal coupling) in rehabilitation.

The three long talks were followed by three « flash » presentation, focusing on the effect of musical engagement in helping children with language disorders (Katie Overy), on the role of awareness of phonological and musical units in dyslexia (Regine Kolinsky), and on the relevance of evidence-based medicine in rehabilitation with music (Luisa Lopez).

The session was followed by a long debate addressing the following questions

- What is the overlap between music and language processing?
- A rigorous modular account and a single (shared) resource account both encounter difficulties in explaining the possibility of using music to rehabilitate language. How can we define a mixed account (e.g., with partial overlap of music and language functions) that seems to be more appropriate?
- Syntax and semantics. Can music be used to activate semantic concepts? And to boost impaired circuitry in some patient populations with specifically selected musical sounds or excerpts?
- Towards a psychologically and biologically plausible model of language and music functions. No more syntax/semantics: the need to abandon old school terminology.
- Is it just music and language? What about the proposed links to movement and attention/motor entrainment? Or is it all about temporal and structural processing/integration?
- Music appears as being more conducive than speech to coupled motor activity. Is there any reason to explain why speech and music have not the same rhythmic regularity (in terms of isochrony/meter)? How can we describe/explain the different types of meter which characterize music and speech?
- Effect of musical training on language processing: In Western musical tradition, musical training often involves imposing linguistic features/structures on music (as in the case of solfeggio). Is this manipulation/association/processing of linguistic information boosting linguistic abilities in general? Is this effect music-specific?
- Do the methods we use condition the way we think about music in the brain?
- What is so special about music? Why (or, to what extent) is it more effective than training in the target skill? Is this true for any other kind of intervention/therapy/training?
- Relations between perceptual, cognitive and motor processes in music perception and performance
- Is the benefit of music specific to music and musically expert individuals? Can we observe similar benefits in experts for the processing of other auditory materials (e.g., ornithologists)?

3) *the third session focused on the benefits for learning and memory*

Séverine Samson reviewed new data regarding memory disorders in patients with temporal lobe lesion and proposed rehabilitation techniques with music to reduce their cognitive decline.

Hervé Platel showed that memory for music can be spared in patients with severe verbal memory deficits, notably for the case of Alzheimer disease patients.

Stefan Koelsch presented preliminary data underscoring the possible use of music in the therapy of autoimmune diseases such as Crohn's disease, ankylosing spondylitis (Bechterew's disease), multiple sclerosis (MS), and rheumatoid arthritis.

The three long talks were followed by three « flash » presentation, focusing on songs as an aid for language acquisition (Daniele Schoen), emotion and memory processes in music (Elvira Brattico), and the influence of long- and short-term exposure on pitch and time processing (Barbara Tillmann).

An animated discussion followed, focusing on the following questions :

- Does music help or does not help? Do we remember sung music better or not?
- Why should music help? To what extent could emotional engagement with the lyrics affect memories for songs?
- Music therapeutic effects are mediated by emotions, such as arousal and pleasure.
- Is it all about the effect of emotion (arousal) on memory and other cognitive functions (e.g., see the debate starting with the Mozart effect leading us to the Blur effect... ) ? Or music itself has some special power ? How to disentangle the two in the laboratory ?
- Relations between perceptual, cognitive and motor processes in music perception and performance.

4) *and the fourth session focused on benefits for motor rehabilitation*

Eckart Altenmueller presented data about the importance of making music in the rehabilitation of motor disorders, such as stroke and focal dystonia.

Peter Keller presented an articulated set of data on anticipatory imagery and adaptive timing in musical coordination.

Simone Dalla Bella illustrated the case of motor synchronization in Parkinson's disease patients, as eventually a tool for rehabilitation

The three long talks were followed by three « flash » presentation, focusing on the rehabilitation of singing accuracy in adult poor-pitch singers (Magdalena Berkowska), on the use of games for training movements via dance (Marc Leman), and the possibility of stimulating mental motor imagery in musicians as a tool for more efficient learning/rehabilitation (Emmanuel Bigand).

These presentations were followed by a final general discussion summarizing the different topics/questions that emerged during the workshop and addressing the following questions:

- Is movement important in any kind of music intervention?
- Music-specific and general-purpose mechanisms subserving motor rehabilitation?
- Is motor synchronization the key element in motor rehabilitation strategies? What are the underlying mechanisms ? Via transfer of function?
- How the existing models of timing and sensorimotor synchronization can be put at the service of rehabilitation?
- What's the role of mirror neuron theories in music-based rehabilitation?
- Clear-cut evidence for mirror neurons? Control experiments?
- Relations between perceptual, cognitive and motor processes in music perception and performance.

### **3. Assessment of the results, contribution to the future direction of the field**

The main advance made by the workshop was to highlight a new and more powerful theoretical context with the goal of accounting for the effect of music. Music may be unique because it engages the simultaneous working of different brains areas, with a strong contribution of motor and emotional areas. For a long time, the ability of music to concurrently stimulate different aspects of human cognition (e.g., abstract cognition and embodiment) was recognized as a specific feature of music that may have positive effects on other abilities. Current research in the neurosciences tends to provide support and further explanations for this idea, which remained rather speculative during the past. Music is deeply embodied in the cognitive, motor and emotional brain. As such, music may be the ideal stimulus to act on these various domains, in particular in the case of disorders, thereby representing a real therapeutic option. The workshop outlined several new experimental programs to further this possibility.

We also considered how the fruitful discussions and exchanges which characterized the workshop may be prolonged in the future, thus leading to prepare further grant applications, either at a European level (by ESF or the European commission) or at an international level. In the present case, we were delighted to announce that our ESF exploratory workshop will be followed by an Initial Training Network on the topic of music and rehabilitation (EBRAMUS, funded by the European Commission, within the 7<sup>th</sup> Framework Program). This grant will create the opportunity to develop this network further and foster collaborations – notably, for the organization of workshops, summer schools and a conference. These possibilities were discussed during the workshop, as well as the possibility to create other ways of tightening a research network on this topic over the years to come.

# PROGRAMME

## Arrival – July 2, 2009

*Various arrival times: We have organized with a local company (StayPoland.com) the transfer from the airport to the hotel. Participants are grouped depending on the hour of arrival. A detailed schedule will be sent for your information before the Event. Look out for signs at the arrival area and you will be driven to the hotel in the Old Town of Gdańsk. We then meet all together for dinner at the hotel.*

20.30 Reception dinner (Hotel "Wolne Miasto" = Free Town)

## Day 1 – July 3, 2009

- 09.00-09.10 **Welcome by Convenors**  
**Emmanuel Bigand, Simone Dalla Bella, Barbara Tillmann**
- 09.10-09.30 **Presentation of the European Science Foundation (ESF)**  
**Ewa Dahling-Turek** (ESF Standing Committee for Humanities – SCH)
- 09.30-12.30 Morning Session: Music in the rehabilitation of auditory processing, brain plasticity– state of the art: base research, pathology and rehabilitation**
- 09.30-10.45 **Two presentations** (30 min./speaker: 15 min. presentation + 15 min. discussion):
- |                        |   |
|------------------------|---|
| <b>Emmanuel Bigand</b> | <i>Optimization of auditory training procedures for hearing impaired children</i>                     |
| <b>Sibylle Herholz</b> | <i>Long- and short-term multimodal musical training modulates processing in human auditory cortex</i> |
- 10.45-11.15 *Coffee / Tea Break*
- 11.15-11.40 **Three flash presentations** (5 minutes each):
- |                         |   |
|-------------------------|---|
| <b>Marc Leman</b>       | <i>Music application for cochlear implant</i>                           |
| <b>Mireille Besson</b>  | <i>Musical expertise improves pitch processing in language</i>          |
| <b>Barbara Tillmann</b> | <i>Implicit processing of pitch in patients with cochlear implants?</i> |
- 11.40-12.30 **Open discussion** (discussants/coordinators and workshop participants)  
*Discussants/coordinators: Eckart Altenmueller and Elvira Brattico*
- 12.30-14.00 *Lunch*
- 14.00-18.30 Afternoon Session: Music in the rehabilitation of language, dyslexia– state of the art: base research, pathology and rehabilitation**
- 14.00-15.45 **Three presentations** (30 min./speaker: 15 min. presentation + 15 min. discussion):
- |                        |  |
|------------------------|--|
| <b>Mireille Besson</b> | <i>Implications of musical training for language remediation in dyslexia</i> |
| <b>Sonja Kotz</b>      | <i>Neural substrates of rhythm, timing and language</i>                      |
| <b>Isabelle Peretz</b> | <i>Auditory-vocal coupling in aphasia</i>                                    |



15.45-16.15	<i>Coffee / tea break</i>
16.15-17.00	<b>Three flash presentations</b> (5 minutes each):
	<b>Katie Overy</b> <i>Music for language: from rapid temporal processing to shared experience</i>
	<b>Regine Kolinsky</b> <i>Awareness of phonological and musical units in dyslexia</i>
	<b>Luisa Lopez</b> <i>Is evidence-based medicine applicable to rehabilitation with music?</i>
17.00-18.30	<b>Open discussion</b> (discussants/coordinators and workshop participants) <i>Discussants/coordinators: Stefan Koelsch and Daniele Schoen</i>
20.00	<i>Dinner</i>

## Day 2 – July 4, 2009

<b>09.00-12.00</b>	<b>Morning Session: Music in the rehabilitation of memory and learning – state of the art: base research, pathology and rehabilitation</b>
09.00-10.30	<b>Three presentations</b> (30 min./speaker: 15 min. presentation + 15 min. discussion):
	<b>Séverine Samson</b> <i>Memory disorders in patients with temporal lobe lesion</i>
	<b>Hervé Platel</b> <i>Preserved musical familiarity in moderate and severe Alzheimer disease</i>
	<b>Stefan Koelsch</b> <i>Finding the emotional balance: Possible use of music in the therapy of autoimmune disease</i>
10.30-11.00	<i>Coffee / Tea Break</i>
11.00-11.45	<b>Three flash presentations</b> (5 minutes each):
	<b>Daniele Schoen</b> <i>Song as an aid for language acquisition</i>
	<b>Elvira Brattico</b> <i>Emotion and memory processes in music</i>
	<b>Barbara Tillmann</b> <i>Expecting pitch and/or time patterns: Influence of long- and short-term exposure on pitch and time processing</i>
11.45 – 12.30	<b>Open discussion</b> (discussants/coordinators and workshop participants) <i>Discussants/coordinators: Isabelle Peretz and Regine Kolinsky</i>
12.30-14.00	<i>Lunch</i>
<b>14.00-18.30</b>	<b>Afternoon Session: Music in motor rehabilitation of musicians and nonmusicians – state of the art: base research, pathology and rehabilitation</b>
14.00-15.45	<b>Three presentations</b> (30 min./speaker: 15 min. presentation + 15 min. discussion):
	<b>Eckart Altenmueller</b> <i>Making music in the rehabilitation of motor disorders: stroke and focal dystonia: General principles, obstacles and future perspectives</i>
	<b>Peter Keller</b> <i>Anticipatory imagery and adaptive timing in musical coordination</i>
	<b>Simone Dalla Bella</b> <i>Motor synchronization in rehabilitation: The example of Parkinson's disease</i>

15.45-16.15	<i>Coffee / tea break</i>
16.15-17.00	<b>Three flash presentations</b> (5 minutes each): <b>Magdalena Berkowska</b> <i>Is "rehabilitation" of adult poor singers possible?</i> <b>Marc Leman</b> <i>Sync-in-Team game for training movement, using dance</i> <b>Emmanuel Bigand</b> <i>Stimulating mental motor imagery in young double bassists</i>
17.00-18.30	<b>Open discussion</b> (discussants/coordinators and workshop participants) <i>Discussants/coordinators: Sonja Kotz and Katie Overy</i>
20.0	<i>Dinner</i>

## Day 3 – July 5, 2009

<b>08.30-12.30</b>	<b>Morning Session: Test batteries, diagnosis and rehabilitation – state of the art and opening perspectives</b>
08.00-10.00	<b>Short presentations</b> (10-15 minutes each + discussions) <b>Daniele Schoen</b> <i>Musical battery; MLP</i> <b>Isabelle Peretz</b> <i>MBEA for children; internet evaluation</i> <b>Simone Dalla Bella</b> <i>Sung Performance Battery (SPB)</i> <b>Séverine Samson</b> <i>Montreal Affective Voices (Belin et al., 2008) and Emotional Body Language (De Gelder)</i> <b>Marc Leman</b> <i>Klankrups (« sound caterpillar »)</i> <b>Emmanuel Bigand</b> <i>Le son en main (« sounds in hand »)</i> <b>Katie Overy</b> <i>Rhythm Tests and Games for Dyslexic Children</i>
10.00-10.30	<i>Coffee / Tea Break</i>
10.30-11.00	<b>Practical demonstrations of test batteries etc.</b>
11.00 – 12.30	<b>Workshop closing remarks, discussion and future perspectives</b>
12.30-14.00	<i>Lunch</i>  <i>Departure</i> <i>Transfer to the Airport (organized by StayPoland.com local company depending on your departure times)</i>

## **5. Statistical information on participants (age structure, gender repartition, countries of origin, etc.)**

Gender repartition: 10 women; 8 men (excluding ESF Representative and local assistance)

Age structure: Mean age of 43 years (std=8.3) with minimum 26 and maximum 53 years (excluding ESF Representative and local assistance)

Countries of origin:

France: 6, Belgium: 2, Poland: 2, Germany: 4, Italy: 1, UK: 2 and Canada: 1.

## **6. The Final list of participants (full name and affiliation)**

*Note that Elvira Brattico had to cancel the day before the workshop because of a flue and that Emmanuel Bigand participated at the workshop via videoconference because of post-operative complications that did not allow for travel.*

### **Convenors:**

1. **Emmanuel BIGAND**  
LEAD-CNRS 5022  
Université de Bourgogne  
Pôle AAFE  
Esplanade Erasme, BP 26513  
21065 Dijon Cedex  
France  
[bigand@u-bourgogne.fr](mailto:bigand@u-bourgogne.fr)
2. **Simone DALLA BELLA**  
Department of Cognitive Psychology  
University of Finance and Management in  
Warsaw  
Ul. Pawia 55  
01-030 Warsaw  
Poland  
[sdallabella@vizja.pl](mailto:sdallabella@vizja.pl)
3. **Barbara TILLMANN**  
Neurosciences Sensorielles,  
Comportement, Cognition  
CNRS-UMR 5020  
Université Claude Bernard Lyon I  
50 Avenue Tony  
Garnier  
69366 Lyon  
France  
[btillmann@olfac.univ-lyon1.fr](mailto:btillmann@olfac.univ-lyon1.fr)

### **ESF Representative:**

4. **Ewa DAHLIG-TUREK**  
Faculty of Musicology  
Adam Mickiewicz University  
Ul. Słowackiego 20  
60-823 Poznan  
Poland

### **Participants:**

5. **Marc LEMAN**  
Dept. of Art, Music and Theater  
Ghent University  
Blandijnberg 2  
9000 Ghent  
Belgium  
[Marc.Leman@UGent.be](mailto:Marc.Leman@UGent.be)
6. **Regine KOLINSKY**  
Departement of Psychology  
Université Libre de Bruxelles  
Avenue F.D. Roosevelt 50  
1050 Bruxelles  
Belgium  
[rkolins@ulb.ac.be](mailto:rkolins@ulb.ac.be)
7. **Mireille BESSON**  
INCM,UMR 6193  
Université de la Méditerranée  
31, chemin Joseph Aiguier  
13402 Marseille cedex  
France  
[Mireille.Besson@incm.cnrs-mrs.fr](mailto:Mireille.Besson@incm.cnrs-mrs.fr)
8. **Hervé PLATEL**  
INSERM U923  
Université de Caen  
CHU Avenue de la Côte de Nacre  
14033 CAEN Cedex  
France  
[herve.platel@unicaen.fr](mailto:herve.platel@unicaen.fr)
9. **Daniele SCHOEN**  
INCM,UMR 6193  
Université de la Méditerranée  
31, chemin Joseph Aiguier  
13402 Marseille cedex  
France  
[schon@incm.cnrs-mrs.fr](mailto:schon@incm.cnrs-mrs.fr)

10. **Séverine SAMSON**  
JE Neuropsychologie et Cognition Auditive  
UFR de Psychologie BP 60 149  
Université Charles de Gaulle, Lille 3  
59 653 Villeneuve d'Ascq  
France  
[severine.samson@univ-lille3.fr](mailto:severine.samson@univ-lille3.fr)
11. **Eckart ALTENMUELLER**  
Institute of Music Physiology and  
Musicians' Medicine  
Hohenzollernstraße 47  
30175 Hannover  
Germany  
[altenmueller@hmt-hannover.de](mailto:altenmueller@hmt-hannover.de)
12. **Peter KELLER**  
Max-Planck-Institute of Cognitive  
Neurosciences  
Stephanstraße 1A  
04103 Leipzig  
Germany  
[keller@cbs.mpg.de](mailto:keller@cbs.mpg.de)
13. **Sonja KOTZ**  
Max-Planck-Institute of Cognitive  
Neurosciences  
Stephanstraße 1A  
04103 Leipzig  
Germany  
[kotz@cbs.mpg.de](mailto:kotz@cbs.mpg.de)
14. **Sibylle HERHOLZ**  
Institute for Biomagnetism and  
Biosignalanalysis  
University of Muenster  
Malmedyweg 15  
48149 Muenster  
Germany  
[sibylle.herholz@uni-muenster.de](mailto:sibylle.herholz@uni-muenster.de)
15. **Stefan KOELSCH**  
Department of Psychology  
University of Sussex  
Pevensey Building  
Falmer BN1 9QH  
United Kingdom  
<http://www.stefan-koelsch.de>
16. **Katie OVERY**  
Institute for music in human and social  
development  
University of Edinburgh  
12 Nicolson Square  
Edinburgh EH8 9DF  
United Kingdom  
[k.overy@ed.ac.uk](mailto:k.overy@ed.ac.uk)

17. **Luisa LOPEZ**  
Child Neurology Unit  
Center for Developmental Disabilities-  
Eugenio Litta  
University of Rome "Tor Vergata"  
Via Anagnina Nuova 13  
Rome  
Italy  
[lopez@uniroma2.it](mailto:lopez@uniroma2.it)
18. **Magdalena BERKOWSKA**  
Department of Cognitive Psychology  
University of Finance and Management in  
Warsaw  
Ul. Pawia 55  
01-030 Warsaw  
Poland  
[berkowska@vizja.pl](mailto:berkowska@vizja.pl)
19. **Isabelle PERETZ**  
Department of Psychology & BRAMS  
University of Montreal  
C.P. 6128  
Montreal, Quebec H3C 3J7  
Canada  
[Isabelle.Peretz@umontreal.ca](mailto:Isabelle.Peretz@umontreal.ca)
- Local assistance:**
20. **Anita Białuńska**  
Department of Cognitive Psychology  
University of Finance and Management in  
Warsaw  
Ul. Pawia 55  
01-030 Warsaw  
Poland  
[anita.bialunska@vizja.pl](mailto:anita.bialunska@vizja.pl)
21. **Ilona Laskowska**  
Institute of Psychology  
Kazimierz Wielki University  
Ul. Staffa 1  
Bydgoszcz  
Poland  
[ilaskowska@gmail.com](mailto:ilaskowska@gmail.com)

