Global Brain Consortium

Executive Summary: 2nd Annual Meeting

Meeting date: February 27-March 1, 2020

Report date: April 15, 2020

Venue: Melia International Hotel, Varadero, Cuba

PIs: Dr Alan Evans & Dr Pedro Valdés-Sosa

Attendees: Sixty-eigth (68) meeting attendees in total, forty-eight (48) in person at the venue and twenty (20) online participants, including several from China who were not able to travel due to the COVID-19 epidemic. The list of attendees is added at the end of this document.

Contents

1. ALAN'S GLOBAL SUMMARY

Dear GBC members,

I got back from the GBC meeting on Monday and would like to give you a brief report. Much more information will be loaded on to the GBC website over the next week or so as the local organizers (Pedro Valdes-Sosa and colleagues) and our team (Jorge Bosch Bayard, Derek Lo) gather Powerpoints, Working Group discussion summaries and miscellaneous materials (e.g. photos) to record the event. This information is accessible at https://globalbrainconsortium.org/event-cuba-2020.html.

In short, the meeting was a success. Despite the inevitable glitches with live streaming the event and the lack of Chinese representation due to coronavirus, the sessions were energetic and focused. The decision to hold the event in Cuba was entirely justified in the sense that Cuba is an ideal bridge between advanced technologies in developed countries and large populations of under-served people in Low- and Middle-Income Countries (LMIC's). Cuba has public brain health challenges that affect many LMIC's but, uniquely, has a strong scientific and technical class that can translate advanced technologies into LMIC settings. Many of these people were presenters at the meeting.

The meeting had considerable input in the areas of consciousness (e.g. Claudio Babiloni, Italy), EEG technology (e.g. Scott Makeig, USA; James Desjardins, Canada) precision medicine/customized intervention (e.g. Yasser Iturria Medina, Canada/Cuba) and public brain health (e.g. WHO and UNESCO). Progress reports from the Working Groups on their activities in the 10 months since the first GBC meeting were presented. Details will appear on the website.

Numerous collaborative initiatives were launched at the meeting that will take advantage of GBC platforms, to be described on the GBC website in due course) but perhaps the most important one involves Dr. Tarun Dua, WHO lead for global brain health. Tarun spent considerable time with Pedro and me at the Cuban Neuroscience Centre prior to the GBC meeting. We had a productive videoconference with the National Science Foundation of China (NSFC) regarding global brain health initiatives. This fed into the subsequent GBC conference discussions and has seeded a plan of action. Tarun will develop a position paper, with ammunition provided by Pedro and myself, that will be proposed to major philanthropic agencies in support of a major brain

health initiative. Specifically, Tarun is interested in a large multi-national effort to study ~10,000 adolescents in LMIC's. We know that adolescence is a period in brain development when many psychiatric disorders manifest themselves. This initiative will be a world first to investigate this phenomenon specifically in LMIC's, with the hope that it will provide a better understanding of the specific mechanisms that break down to give rise to psychiatric disorders. My sense is that, with WHO taking a leading role, we have a better chance of getting the attention and support from these funding agencies than if we approached them as regular scientists. The next months will see this process take shape and we will keep you informed on its progress.

Pedro and I would like to thank Irving and Freema Ludmer for their continued support of the GBC. It is no small feat to bring together world leaders in brain research and engage them in a global initiative. We would also like to thank the extended team at the Cuban Neuroscience Centre for the huge amount of work that they undertook to handle the local logistics, document preparation, travel, hotel booking etc. This was especially tricky when the coronavirus issues influenced many peoples' travel plans at short notice.

2. GBC Rationale

It is of primary importance for the GBC to starts drafting guidelines for the recording, processing and storage of EEG data. These guidelines should represent a minimum set necessary to have valid data that can be used by other researchers. They should also be the result of a comparison with other societies that have already developed similar guidelines. Having a consensus from multiple scientific societies would strengthen the discipline and image of the GBC. In addition, the GBC should start producing systematic reviews of the clinical use of QEEG in various neurological and psychiatric diseases. Subsequently, these systematic reviews should be brought to the attention of the numerous international boards that deal with the development of guidelines for various neuropsychiatric disorders (autism, learning disabilities, ADHD, depression, PTSD, etc.). Of equal important is the aspect of how to make the normative databases being built available for clinical use. In fact, not all clinical centers have competent IT resources and knowledge at their disposal.

GBC must further develop contacts with the world of education by offering all the necessary support that Neuroscience can offer today. In particular, the available experimental paradigms to investigate the learning process and evaluate its outcomes accordingly. This knowledge is easily accessible and transmissible to the world of pedagogists.

The primary goal of the GBC is to attract the neuroscience societies of the low- and middle-income countries (LMIC's), where the EEG is the most frequent technique for the clinical and research study of the brain activity. The GBC will focus its activity in attracting international resources to provide the neuroscience societies of the LMIC's with the necessary technical and technological capacities which make them able to do higher quality science in their countries. At the same time, making information, and training and learning courses accessible to them.

3. Background

The Global Brain Consortium (GBC) was formed in 2018 through funding from the Ludmer Centre for Neuroinformatics & Mental Health to translate neuroscience discovery to global health. It was embedded in the Canadian Open Neuroscience Platform (CONP) to link its membership with the global research community, by building collaborative and dynamic relationships among globally oriented data scientists and health researchers; both domestically and internationally. In doing so, it seeks to bridge existing collaborations, networks and organizations rather than establish competing parallel structures.

The GBC kick-off meeting, held in May 2019 in Montreal Canada, brought together over 65 neuroscientists, data scientists, researchers, clinicians and international actors committed to advancing global research towards a greater understanding the human brain and the identification of early detection biomarkers using cost-effective technologies for consciousness-related pathophysiology, neurodegenerative disorders, and mental illness.

GBC participants recognized that although modern neuroscience comprises a considerable arsenal of theoretical, modelling and neuroimaging technologies, many of these are not readily accessible to lower- and middle-Income countries (LMICs). Fortunately, a growing array of digital and neuro-technologies now enable the bridging of this critical divide, opening opportunities for collaborations with neuroscientists and clinicians in LMICs. This further builds on the 2016 Geneva meeting on International Brain Projects, led by the World Health Organization (WHO), on improving healthcare delivery to underserved populations around the world. The GBC Steering Committee and its membership now seek to level the playing field by creating an ecosystem where all nations can work collaboratively and learn from each other.

As agreed in the 2019 meeting, GBC members elected to begin this venture with EEG, a technique that allows us to study dynamic brain states in consciousness, sleep, anesthesia, and across multiple brain disorders. EEG has exquisite temporal resolution in quantifying brain states, is cost-effective and broadly used internationally. GBC members believe it is an excellent use-case that will lay the groundwork for a global neuroscience collaborative ecosystem - tackling complex issues of international best practices and data-sharing, fostering global precision mental health and reducing the global burden of brain disorders.

Nine Working Groups were established at the 2019 meeting to advance EEG collaboration, research, knowledge mobilization, data sharing, tool development and sustainability. The 2020 meeting reviewed progress by the Steering Committee and Working Groups on developing tools for a global EEG platform, applications in global brain health and funding opportunities.

4. Meeting Outcomes

Building Collective Impact and Delivering Unique Value

The success of an implementation strategy is most often measured through improvements in outcomes such as implementation acceptability, adoption, appropriateness, cost, feasibility, fidelity, penetration, and sustainability targeting a given evidence-based intervention. Importantly, the community, health and educational impacts, and overall value of EEG standards and technologies developed by the GBC will be determined most by those who use these digital tools. Cuba has public brain health challenges similar to those in many LMICs but, uniquely, has

a strong scientific and technical class that can translate advanced technologies into other LMIC settings. Many of these people were presenters at the meeting.

The GBC will support the adoption of technical guidelines for the recording, processing and storage of EEG data, in addition to emerging standards for annotation and data sharing. The Babiloni 2019 whitepaper published by the Internal Federation of Clinical Neurophysiologists (IFCN) was adopted as a model for best practices in clinical and research data collection.

These IFCN-led guidelines will represent the minimum requirements necessary to collect valid spatiotemporal data that can be independently reproduced and used by researchers. These guidelines will also integrate the key findings of other organizations that have developed similar best practices. In parallel, the GBC will prepare a series of systematic reviews of the clinical use of quantitative EEG in various neurological and psychiatric diseases. These systematic reviews will be brought to the attention of the numerous international boards involved in the development of guidelines for various neuropsychiatric disorders (autism, learning disabilities, ADHD, depression, PTSD, etc.). Achieving a consensus across multiple scientific stakeholders will strengthen the influence and image of the GBC.

Of equal importance is the aspect of how to make the normative databases being built by the GBC available for clinical use in LMICs. For example, many clinical centers lack the IT resources and technical knowledge required to implement technology solutions. To address this issue, the GBC will engage with neuroscience societies in LMICs, where EEG is the most frequently applied technique for clinical and research study of brain activity. The GBC will focus its activity in attracting international resources to provide neuroscience collectives in LMICs with technical and technological training and capacities that enable high quality science. The GBC must therefore build contacts throughout the education sector by offering all the necessary support that neuroscience can offer today. In particular, the availability of experimental paradigms to investigate the learning process and evaluate its outcomes accordingly. This information is readily accessible and transmissible to universities, medical centers and other academic institutions.

Social and Financial Sustainability

The high attendance at this meeting is indicative of each member's commitment to GBC goals. However, the collective efforts of GBC members to advance the GBC agenda are largely supported by individual funding resources and pre-existing collaborative engagements.

Funding Challenges:

Learning journeys, such as the GBC, enable the accumulation of deep contextual knowledge to justify their investments. Since this slow approach may not deliver “results” in the short run and thereby risks losing support from staff, funders, and the communities that organizations work with, members recognised the GBC must find ways to sustain its momentum. This is particularly important for consortia operating in a volatile and uncertain global environment. For example, the current COVID-19 pandemic has unexpectedly resulted in widespread reductions in global resources, services, employment and scientific funding. Collectively, these changes have culminated in greater inequality, anxiety and stress in all countries, including high-income countries, bringing to the forefront some of the daily socioeconomic challenges and mental

health issues of those living in LMICs. The GBC is monitoring the unique and growing impact of the COVID-19 pandemic on global mental health.

The LMIC Challenge

There are no magic levers available to change systems. Few interventions have moved beyond the pilot phase of researcher-controlled implementation in LMICs to routine implementation at scale and with quality. Greater investment in pragmatic effectiveness trials is needed to generate the evidence-base for mental health treatment in LMICs. In addition to basic and clinical research, the GBC must test and optimize implementation strategies to promote scale-up of evidence-based depression interventions in routine care. These studies should use high-quality pragmatic designs and focus on later-stage implementation outcomes such as cost, penetration, and sustainability. The GBC was specifically held in Cuba as part of the memberships' commitment to highlighting the challenges, needs, resources and research opportunities of its LMIC membership.

Collaborations

Numerous collaborative initiatives were launched at the meeting that will take advantage of the existing GBC EEG platform developments. These will be proposed to philanthropic agencies in support of a major brain health initiative. Specifically:

- Tarun Dua of the World Health Organization is interested in developing a large multinational study of ~10,000 adolescents in LMICs. Adolescence is a period in brain development when many psychiatric disorders manifest themselves. This initiative will be a world first to investigate this phenomenon specifically in LMICs, with the hope that it will provide a better understanding of the changes in specific mechanisms that give rise to psychiatric disorders. Such a study may also reveal the 'mental health care gap' to be much larger than current estimates, as it would include the biomedical treatment gap, combined with the psychosocial care gap as well as the physical health care gap.
- Dr Alan Evans discussed a Brain Canada Platform Support Grant application, currently under review, that would enable further development of the GBC platform. This pan-Canadian network, EEGNET, includes 30+ scientists across the country, engaged in both technical development and clinical application in pediatric, psychiatric and neurodegenerative conditions.

GBC members were encouraged to move GBC to firmer footing through joint grant applications and collaborative international projects that included funding to advance EEG tools, notably but not exclusively, within LORIS, an open source data platform supported by Evans' MCIN lab.

Shared EEG Resources, Summary

EEG Platform

GBC has initiated the construction, within the framework of the Canadian Open Neuroscience Platform (CONP), of an accessible neuroinformatics platform that not only includes EEG but also fosters engagement by stakeholders globally, regardless of their economic setting. As reported at the meeting (notably WG 1), current efforts in advancing tools that will underpin the development of an EEG platform are based on, and considerably expand, the activities of the Cuba-Canada-China (CCC) axis. The CCC (see companion document) is a research project

developed by the Cuban Neuroscience Center (Valdes-Sosa), the Montreal Neurological Institute (Evans), and the University of Electronic Science and Technology of China (UESTC) (Yao and Valdes-Sosa) that have joined forces to develop pipelines for CBRAIN with the most advanced methods in EEG research. For example, new CBRAIN/LORIS EEG tools and functionalities: LORIS was expanded to include EEG, and new pipelines have been added to CBRAIN for quantitative EEG (qEEGt) toolboxes, quantitative MEG, and multimodal (EEG-fMRI) fusion analysis pipelines. New modules, pipelines and format interoperability (BIDS-EEG) have been added to the LORIS data platform.

EEG Data

Cuban Brain Mapping Project (CHBMP) database of EEG/MRI was anonymized and uploaded to LORIS in BIDS format. Nine of the 11 LORIS-mediated databases being hosted at the CCC-Axis site in UESTC (Chengdu) include EEG or MEG data.

Data-sharing

A number of GBC members reported that they have shared their databases and EEG data. Ongoing data-sharing collaborations include the Cuban Human Brain Mapping project, the Child Mind Institute, and the PREVENT-AD (via CONP) database, among others.

5. Working Group Summary Discussions

The GBC Working Groups provided overviews of recent scientific research that should guide the direction of the EEG platform development and provide a forum for researchers to discuss their research, exchange ideas and form collaborations. Highlights are provided below.

Working Group 1—EEG Standards, Best Practices, and Integrated Technologies

Chair: Jorge Bosch, Christine Rogers and Scott Makeig

Members noted that EEG, as a robust and globally accessible technology, presents special challenges as a mature field for scientific collaboration. Common standards, tools and platforms need accelerated attention and further development to enable reproducible research and data provenance, sharing and reuse.

They also highlighted the need to develop openly available standard pipelines and data storage repositories where researchers can share their data and results in standard formats. Although data sharing is becoming increasingly easier, EEG data presents some unique challenges; such as, storing raw EEG data is limited in usefulness as many aspects of the data are not interpretable without annotations or data cleaning.

Building on consensus established at the 2019 GBC meeting, this working group discussed movement towards emerging standards as well as possible funding routes to establish technical platforms that could drive community access and input towards common sample datasets. Important scientific advancements were presented in the understanding and analysis of EEG with broad implications for its clinical utility across contexts.

It was noted that significant effort is currently directed towards creating standard tools in order to guarantee results are reproducible and readily available to the greater community of EEG clinicians and scientists. However, making more data available and more usable by non-imaging

experts, requires the development of derivatives: processed data and metadata annotation layers that can be used together with phenotypic and clinical data to improve diagnosis and prognosis.

Outcome:

GBC members committed to sharing their data and clinical expertise to create such an open collection of derivative-level data as a common resource.

Worked examples of open standards in EEG datasets will be piloted through the Canadian-led EEGNet platform based on LORIS, as part of the Canadian Open Neuroscience Platform.

Specific actions (consolidated also with suggestions from other Workgroups):

1. Use the Lossless pipeline developed by James Desjardin group being integrated into CBRAIN as the basis for automatic EEG evaluation. This is based on EEGLab effort led by Scott Makeig.
2. Integrate the standardized report of the IFCN for EEG as part using the HED and Ctagg plugins with Scott Makeig, and the CCC team.
3. Create an international repository of EEG data and its annotation by worldwide EEG experts.
4. Carry out a competition with the annotated EEG data to develop and evaluate automatic methods for EEG analysis to be used in many countries
5. INCF pledged seed funding for this project that will allow application to larger grants.to larger grants.to larger grants.

Working Group 2: Global Public Health

Chair: Tarun Dua & Luis Velazquez

The GBC drew representation from China, Europe, Australia, North America and Latin America, as well as the **World Health Organization** (WHO), **UNESCO,** and the **International Neuroinformatics and Coordinating Facility** (INCF). In 2019 it established links with the **International Brain Initiative** (IBI). Via the CCC, the GBC also has established strong government-level engagement in China, Cuba and Canada (Quebec government).

Discussion included emphasis on the need to focus on clinical priorities arising from Low- and Middle-Income Countries (LMIC) contexts. The proposed EEGNet platform and tools spearheaded by the Evans group were conceived to specifically support the scale-out of affordable health technologies to LMICs. The World Health Organization (WHO) and UNESCO attendees indicated that GBC could potentially underpin a multinational effort on adolescent brain health targeting LMICs; they will follow up with Dr Evans.

Outcome:

This initiative has been put on hold at WHO until the COVID-19 situation is stabilized. All WHO resources are currently overstretched in dealing with the pandemic.

Subsequent to the GBC meeting, GBC members have been discussing as an emergent problem evaluation of brain disorders in convalescent patients from coronavirus, one such program having been already launched by the Cuban government and led by the Cuban Neuroscience Center.

Working Group 3: GBC Governance and Operational Model

Chair: Alan Evans

Since only two members of the GBC Steering Committee were able to attend in person, primarily due to the COVID-19 situation, this Working Group meeting was cancelled.

*Status***:** GBC has established an international, 11-member steering committee, 9 Working Groups (WGs) with dedicated WG Chairs and a core membership of neuroscientists and neuroinformatics experts. The Steering Committee shares responsibility in order to guide the mission of the GBC and ensure the overall performance of the Working Groups and members towards successful outcomes.

Working Group 4—Studying Dynamic Brain States with EEG Models

Chair: Pedro Valdes-Sosa & Christoph Michel

Analysis of resting-state activity has become a promising approach to characterize mental and cognitive functions and is promoted as a biomarker for neuropsychiatric diseases and for predictive treatment response. Characterizing resting state with EEG enables researchers to study the temporal dynamics of resting state networks.

A second important aspect of brain dynamics is the connectivity between the nodes of the networks. It is important to undertake connectivity analysis in the source space, keeping in mind that source localization methods can introduce artificial connectivity.

Outcome:

The working group concluded that an expert group should be created that tests and compares different analysis methods in the databases available through the GBC, given that the analysis of brain dynamics needs careful consideration of the three dimensions of the data in pre-processing as well as analysis. Methods for automatic quality control of EEG recordings will be incorporate into the pipelines defined by Workgroup1 and evaluated using the data depository proposed there.

Working Group 5—Neurodevelopment and Educational Neurosciences

Chair: Nancy Estevez and Mmantsetsa Marope

Dr Anne Gallagher presented preliminary results from three studies: the ELAN longitudinal study of brain network connectivity in infants using near infrared spectroscopy, the PREMABrain EEG Study of brain connectivity in 74 infants, and a study on the predictive brain markers of neurodevelopment in children with congenital heart disease.

Dr Thalia Harmony presented an overview of neurodevelopmental risk factors and current research on neurodevelopment and rehabilitation from her group based at the National Autonomous University of Mexico. Her presentation also summarized the impact of hearing loss, vision impairment and blindness on attention, language development and learning.

Dr Mmantsetsa Marope, Director of IBE UNESCO, presented the fundamental problems of education in the world. She stressed the need to work together with the Neurosciences to bring about a radical change in conceptions about school, learning and teaching. Initiatives:

- Open science experience in France, where teachers are trained to do their own experiments in the classroom.
- Non-Verbal Learning Disorder was presented as a separate entity from ADHD.
- Some researchers showed their work with children in the early stages of development
- Cuba's opportunities for the creation of a database of learning disabilities

Outcome:

- Ministers of education and decision makers need to be involved in identifying priority issues.
- Take advantage of open databases, which include information about the brain, behavior and learning to answer questions of interest.
- It is necessary to sign alliances between the institutions that form part of the GBC in order to coordinate actions, determine research problems, standardize data collection protocols, experimental designs, etc.

Working Group 6—EEG Paradigms, Clinical Applications and Validation

Chair: Dirk Smit, Mitchell Valdes and Claudio Babiloni

Clinical paradigms have been defined and outlined in the IFCN EEG research workgroup's recommendations on EEG Applications in clinical research studies (Babiloni 2019).

This group highlighted approaches to biomarker development for monitoring brain diseases, with applications in consciousness, sleep and epilepsy (vigilance); in cognitive development and decline; and AD, HIV and major depression. Members of working group 4 presented a survey that its members developed for EEG practitioners for clinical validation of EEG paradigms. The group is engaged to conduct a parallel survey of patient advocates and international public health stakeholders and the translation of the Cuban experience to other LMIC.

Outcome:

Consensus was established on action items for coordinating training, stakeholder agreement, and validation of practices.

A survey developed by Dr. Stephanie Dyke and GBC colleagues is published on the GBC website (https://globalbrainconsortium.org/gbc2020-survey.html) to invite experts in stakeholder groups to contribute input towards the development of Global Brain Consortium consensus position papers on a roadmap for the introduction of the most promising and novel EEG biomarkers for use in public health systems with an emphasis on underserved populations in all countries, especially in low- and middle-income countries.

Working Group 7: Research Opportunities with Cuba

Chair: Gerardo Guillen and Janina Galler

The main research institutions in Cuba explained their work.

- The Center of Genetic Engineering and Biotechnology, and the Center for Molecular Immunology are development of therapies to slow down or reverse neurodegenerative diseases
- The Center for Medical genetics explained the study of genetic studies and Cuba and the resources available for joint research such as the Twin registry and the national network of Genetics which has hundreds of laboratories in the country.
- The Cuban Neuroscience Center coordinates with the Ministry of Health a national network of clinical neurophysiology.
- Other Medical research organizations with a unified, primary health care orientation based on the family doctor.

Outcome:

- Incorporate into all the research centers the methodology based on Yasser Iturria's disease progression models.
- Use the Cuban National Network for clinical neurophysiology as the testing ground for EEG infrastructure developed by the GBC

Working Group 8: Aging and Neurodegenerative diseases Disease Progression Modeling

Chairs: Yasser Iturria-Medina (MNI), Roberto Rodriguez (CNEURO)
Speakers: Yasser Iturria-Medina, Roberto Rodriguez, Maria A. Bobes, Laura Garcia Pupo, Carlos Tobon (Atioquia University, Colombia)

First, the group discussed the importance of using disease progression models (DP) to track neurodegenerative progression and identify individually-tailored treatments. As discussed, the DP progression models can be empirical or mechanistic. In the first case, the models allow making disease predictions without offering a biological explanation of the underlying disease processes. On the contrary, mechanistic models focus on clarifying pathological factors and their interactions underlying disease development, although in some cases they can also perform predictions.

Different DP applications in the context of Alzheimer's disease were presented by Yasser Iturria Medina, from the Montreal Neurological Institute. In addition, the wide utility of EEG recordings to characterize hereditary Ataxias was discussed by Roberto Rodriguez, from the Cuban Neuroscience Center, who presented the significant advances obtained at the Centre for Research and Rehabilitation of Hereditary Ataxias (CIRAH) in Holguin, Cuba. Similarly, Maria Antonieta Bobes illustrated the importance of analyzing EEG recordings for further understanding disease progression in early-onset Alzheimer's disease. Laura Garcia Pupo presented new molecular tools for characterizing Alzheimer's at the most basic microscopic level.

In general, the group highlighted the crucial need for defining and using robust DP models, informed by the presented molecular, electrophysiological and/or imaging data, as well as discussed, their multiple advantages over the traditional biomarkers search/application. Specific collaborations across the group members were discussed, particularly in the context of multimodal data integration and the corresponding development/application of unified DP models.

Outcome:

Efforts for strengthen collaborations between the members were discussed. Looking for funds to develop collaborative research projects between CNeuro and MNI. In particular, to take advantage of the multimodal databases of pathologies and normal people gathered by the Cuban Neuroscience Center. In this sense, designing new projects of precision medicine would be facilitated by the organization of the Cuban Public Health System to create interdisciplinary programs with a social impact.

Working Group 9—Neuropsychiatric Diseases: Novel and Scalable Treatment Strategies

Chair: Klaus Mathiak and Giuseppe Chiarenza

Discussion topics: Biomarkers and neurotransmitter systems, dysfunction and response to drug therapy, personalized approaches, psychiatric research, patient safety, international ethics.

Psychiatric approaches and psychopharmacological treatment were highlighted in the working group discussion of biomarkers suitable for improving mental health care. Biomarker and brain imaging were applied to clarify mechanisms and enable personalized treatment.

The global perspective of repurposed drugs and personalization of established psychopharmacological principles was emphasized. In particular, EEG can be employed to differentiate dysfunctions in different transmitter domains. Event-related potentials (ERP) in response to complex self-paced paradigms were presented and their relation to pathology and potential treatment targets discussed.

The use of brain imaging to determine long-term effects of drug treatment, thereby showing the potential for differential treatment, was highlighted. It was noted that ERP and fMRI responses and connectivity are employed for classification of groups and enabling personalized treatment depending on transmitter dysfunction in the glutamatergic domain.

The relevance of dimensional diagnostics (e.g. RDoC) was highlighted for personalized drug targets. Several neuro-modulatory approaches were discussed, including a focus on mechanistic fMRI neurofeedback, highlighting the value of existing collaborations between China and Cuba, in the application of less expensive techniques such as fNIRS and EEG.

Outcome: The members suggested that data safety, privacy, ownership, open-access, data sharing and regulatory aspects of medical devices should be considered in a global context, specifically the EU's stringent standards on the rights of individuals and patients. The workgroup expressed interest to establish an action plan with McGill and other shareholders.

6. List of Participants at the 2nd GBC meeting Varadero 2020.

1.	Alan C.	Evans	Co-Chair, Global Brain Consortium, McGill University
2.	Tarun	Dua	World Health Organization
3.	Christine	Rogers	MCIN, McGill University
4.	Claudio	Babiloni	Sapienza University of Rome

5.	Dirk	Smit	University of Amsterdam
6.	Giuseppe	Chiarenza	President International Organization of Psychophysiology
7.	James	Desjardins	Compute Canada
8.	Janina	Galler	Harvard University
9.	Jorge	Bosch-Bayard	MCIN, McGill University
10.	Christoph	Michel	Université de Genève
11.	Mathew	Abrams	INCF
12.	Samir	Das	MCIN, McGill University
13.	Scott	Makeig	University of California, San Diego
14.	Stephanie	Dyke	MCIN, McGill University
15.	Thalia	Harmony	Institute Neurobiology Queretaro, Mexico
16.	Manuel	Hinojosa	Institute Neurobiology Queretaro, Mexico
17.	Yasser	Iturria	Montreal Neurological Institute
18.	Klaus	Mathias	University of Aachen Germany
19.	Zia	Mohades	MCIN, McGill University
20.	Carlos	Tobon	Universidad de Antioquia, Colombia
21.	Lucie	Brechet	University of Geneva
22.	Mmantsetsa	Marope	Director, IBE-UNESCO
23.	Leigh	Macintire	MCIN, McGill University

24.	Maria A.	Bobes	CNeuro, Cuba
25.	Maria L.	Bringas	University of Electronic Science and Techn.of China (UESTC)/ CNeuro Cuba
26.	Ana	Calzada	CNeuro, Cuba
27.	Lidia	Charroo	CNeuro, Cuba
28.	Joel	Gutierrez	INN Cuba
29.	Yissel	Rodriguez	University of Electronic Science and Techn.of China (UESTC)/ University of Oriente Cuba
30.	Arturo	Orellana	University of Electronic Science and Techn.of China (UESTC)/ University of Science Information Cuba
31.	Pedro	Valdes	Co-Chair GBC, CNEURO (Cuba), UESTC (China)
32.	Fernando	Villate	CNeuro, Cuba

33.	Mitchell	Valdes	CCC Co-Chair, Director of CNeuro, Cuba
34.	Rosario	Torres	CNeuro, Cuba
35.	Nancy	Estevez	CNeuro, Cuba
36.	Ricardo	Bringas	CIGB Cuba
37.	Alejandro	Saul	CIDEM Cuba
38.	Hector Raul	Gonzalez	University of Science Information, Cuba
39.	Denis	Buedo	University of Science Information, Cuba
40.	Yaniel	Nuñez	CIDEM Cuba
41.	Gerardo	Guillen	CIGB Cuba
42.	Diana	Garcia	CIGB Cuba
43.	Roberto	Rodriguez	CNeuro, Cuba
44.	Eduardo	Martinez	CNeuro, Cuba
45.	Eduardo	Aubert	CNeuro, Cuba
46.	Iris	Rodriguez	CNeuro, Cuba
47.	Caleb	Leon	CIM Cuba
48.	Laura	Garcia Pupo	CNeuro, Cuba

Remote

49.	Zhen	Yang	Child Mind Institute NY USA
50.	Aina	Puce	Indiana University USA
51.	Jane	Roskams	Global Brain Consortium
52.	Michael	Milham	Child Mind Institute NY USA
53.	Kamil	Udulag	University Health Network, Toronto, Canada
54.	Sergio	Della Sala	Edinburg University UK
55.	Faranak	Farzan	Simon Frazer Canada
56.	Naser	Muja	MCIN Canada
57.	Petra	Ritter	Charite Berlin Germany
58.	Yu-Xuan	Zhang	Beijing Normal University
59.	Yan	Song	Beijing Normal University
60.	Xia	Mingrui	Beijing Normal University
61.	Chen	Jing	NSFC, China

62.	Cao	Heqi	NSFC, China
63.	Chengyu	Li	Shanghai Institute of Neuroscience
64.	Dezhong	Yao	University of Electronic Science and Technology of China
65.	Ben	Becker	University of Electronic Science and Technology of China
66.	Pernet	Cyril	University of Edinburgh, Scotland
67.	Li	Tao	Huaxi Hospital, China
68.	Keith	Kendrick	University of Electronic Science and Technology of China