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Executive summary

Background and purpose of the SEBRA

More than half of the European population are currently living with a brain disorder and translate into an increasingly worrying burden on society. In 2019, neurological and mental disorders both accounted for more than 16 million disability-adjusted life years (DALYs). Stroke accounts for more than 1 million deaths and Alzheimer's disease (and other forms of dementia), and Parkinson's disease complete the top three causes of death due to neurological disorders in Europe. In addition, one out of 10 Europeans live with an anxiety or depressive disorder and almost 85 000 Europeans died due to substance abuse. Due to such a high disease burden, brain health needs to be promoted and recognized as a priority by the European society.

In 2018, the EU Joint Programme on Neurodegenerative Diseases (JPND), the Network of European Funding for Neuroscience Research (ERA-NET NEURON), the Human Brain Project (HBP) and the European Brain Council (EBC) came together under the EU-funded project the European Brain Research Area (EBRA). Through accelerating collaboration and coordination in the brain space, the EBRA Consortium aims to support brain research and health. This Shared European Brain Research Agenda (SEBRA) provides recommendations on future areas for excellent, innovative, and translational research. The EBRA partners urge the European Commission (EC) to come forward with a clear plan to tackle brain health in a collaborative, integrated and forward-looking manner in Europe. EBRA also calls upon the EU Member States and associated countries to implement and create brain research programmes addressing brain health in a systematic and comprehensive way.

Scientific priorities

To improve the lives of persons with a brain disorder and prevent others from being affected, we need to advance the understanding of the healthy and diseased brain, as well as the interaction with the environment. This can only be achieved by following a multidisciplinary approach and involving all the relevant players in the brain area including patients. Particular attention should also be paid to the use of animal models and the field of regenerative medicine. Importantly, the generation and interoperation of big data sets must be supported. Finally, increased attention must be placed on how brain research is communicated to lay audience and policy makers.

Understand the healthy brain To understand the healthy brain, different aspects need to be considered: Its development, maintenance, and function. Especially developmental neuroscience still represents a challenge because abnormal brain development contributes to a wide range of psychiatric and neurological diseases. Understanding the biological processes that underpin healthy brain development is therefore of critical importance. This also includes the understanding of the development of the brain throughout its lifetime. Such understanding will allow to correct or mitigate defects at each stage during brain development and so reduce the burden of brain disorders in society.

- Understand the foetal brain
- Understand the ageing brain
- Harmonize animal studies across species up to complex human findings
- Develop the theoretical including mathematical, and conceptual level of neuroscience

Unravel the interacting brain Future research should consider the impact of the environment (e.g., political, economic, social, technological, cultural and climate factors) on the brain. This should happen

in an integrative manner and in relation to the bodily interactions. In addition, it is also necessary to broaden our approach from studying the neuron and network of neurons to understanding the impact of other cells of the body and, the external environment on the brain. Finally, the translation between basic and clinical neuroscience, and from animal to human research are relevant and ambitious goals requiring multiscale analysis as well.

The following specific priorities have been identified:

- Understand the phenotypic and endophenotypic expression of (molecular) pathologies across scales
- Understand networks between different brain compartments
- Understand the development, maintenance, and function of the brain through interaction with its internal environment
- Understand the role of the brain in complex functions and encourage research in cognitive, affective, and social neuroscience

Fix the diseased brain To understand and cure the diseased brain, there is first of all a clear need to improve the capacity to translate ground-breaking discoveries into basic neuroscience to the clinical settings. Furthermore, a better and complete understanding of disease mechanisms is crucial. The creation of a translational awareness supported and fostered in all research centres where basic and applied/clinical researchers work together and interact with the goal of potential clinical application will be instrumental and should be encouraged. In addition, we need to gain better insights in the development and progression of brain diseases, improve the prediction of brain disorders, identify appropriate treatments, understand the impact of neurorehabilitation, uncover protective and preventive factors (including genetic, epigenetic, environmental, and social factors for brain disorders), as well as compensation mechanisms. To address these disease priorities, investments are particularly fundamental in the field of personalised and precision medicine.

- Development, reappraisal, and validation of brain disease models
- Need for large longitudinal based studies
- Development of research on the nosography of brain disease
- Understanding the blood-brain barrier
- Understanding the effectiveness of treatment strategies
- Performance of effective prevention studies
- Identify and investigate common disease factors
- Understand sensory organ diseases from a brain perspective

Enabling actions

To ensure that the priorities can be addressed by the brain research community, the conditions for carrying out brain research should improve. Implementing the enabling actions listed below allows excellent brain research as well as the exploitation of the research results. Novel tools to advance the understanding of unknown basic brain functions will be developed and the generation of novel therapeutic approaches will result in a reduced burden of brain disorders in Europe and worldwide.

Create a multiscale, including translational, environment on the work floor The brain research landscape consists of silos of basic researchers, clinical researchers, neurologists, psychiatrists, neurosurgeons, Ear Nose and Throat (ENT) specialists, ophthalmologists, etc. Collaboration between all these "silos" is required and a change in "spirit" or culture in the brain research community needs to be implemented. The following actions will pave the way to improvement:

- The creation of dedicated translational structures and teams.
- Interdisciplinary education and training for current and future generations of basic, preclinical, and clinical brain researchers.
- Set up of specific multidisciplinary programs for clinicians and scientists' programs at national and EU level.
- The creation of permanent positions and career tracks for senior clinician scientists / medical scientists / computational (AI) scientists and specialized clinical experts.
- The removal of legal constraints and increased flexibility for inner EU and international education.
- Support for multi-stakeholder associations

Encourage smart data sharing There is a wealth of existing data in brain research. This huge amount of data should be exploited to ensure relevant use, intelligent interpretation, and smart application. Use of existing datasets and sharing of existing and new pre-clinical and clinical data should be a priority. Acquisition and storage of new data should follow standardized rules and best practice examples. They should be available in open access mode.

- Inclusion of real-world data in datasets using wearables and sensors as well as Patient Relevant Outcomes (PRO's)
- Standardisation and harmonisation
- The development of open multiscale infrastructures and platforms
- Sound analysis and interpretation of big data sets

Develop new technologies and innovation Brain research has been characterised by significant progress over the past years. Breakthroughs in the understanding of the brain are imminent, and recent advances offered by enabling tools such as artificial intelligence (AI), biomarkers and big data will further benefit neuroscience and accelerate the discovery of innovative therapeutic solutions for unmet needs.

- Novel technologies to accelerate brain research and the development of new therapies, as well as improve quality of life.
- Assessment of the impact of telemonitoring and telemedicine on the patient
- Assessment of the value of innovation using socio-economic, cost and quality of life data
- Development of funding programmes to get industry back

Overcome regulatory, administrative, and legislative hurdles/limitations Currently, brain research is faced with several regulatory, administrative, and legislative hurdles which slows down discoveries and breakthroughs in the field.

- Enhancement of the engagement between brain researchers and regulators
- The creation of common data rules on the use of complex human and patient data across the member states in Europe, data sharing with industry, Small and Medium Enterprises (SME's) and between different EU and non-EU countries.
- The development of a clear scientific discovery-to-market pathway

1. Background and purpose of SEBRA

More than 1 out of 2 Europeans are currently living with a brain disorder (GBD2019). These numbers showcase the immensity of the challenge posed by brain disorders and translate into an increasingly worrying burden on society (Olesen et al., 2012). In 2019, neurological disorders alone accounted for more than 16 million disability-adjusted life years (DALYs), the loss of the equivalent of one year of full health (GBD2019 data). The most debilitating neurological disorders are stroke, Alzheimer's disease and other forms of dementia, and headache (Deuschl et al., 2017; GBD2019). Stroke accounts for more than 1 million deaths and Alzheimer's disease (and other forms of dementia), and Parkinson's disease complete the top three causes of death due to neurological disorders in Europe (GBD2019). Additionally, the total number of DALYs attributable to mental disorders is comparable, accounting to more than 16 million in Europe with substance use disorders, mood and anxiety disorders and schizophrenia being the leading causes. One out of 10 Europeans live with anxiety or depressive disorder and almost 85 000 Europeans died due to substance abuse (GBD2019).

Due to such a high disease burden, brain health needs to be promoted and recognized as a priority by the European society. Good brain health encompasses both the absence of neurological and psychiatric conditions. It is a life-long state in which every individual can realize and maintain their own abilities and potential; optimize their mental, cognitive, emotional, psychological, behavioural, and motor functioning to cope with life situations; and contribute to their community. It encompasses neural development, plasticity, functioning and recovery across the life course.

In addition, brain health constitutes a critical part of post-COVID-19 recovery planning. The prevalence of neurological or psychiatric disorders accompanying COVID-19 is elevated (one in three). Such disorders occur at any time during the infection (Mahase, 2021) and even protract, in some cases, after the infection is resolved as part of the so-called *Long-Covid syndrome*. Neurological manifestations are prevalent among patients hospitalized with COVID-19 and are associated with higher in-hospital mortality (Chou, Beghi, Helbok, et al., 2021). The number of those in need of psychiatric help has also increased since the beginning of the pandemic with a stark rise of major depressive and anxiety disorders globally. In 2020, an additional 53.2 million and 76.2 million cases of anxiety and major depressive disorders (MDD) have been reported (COVID-19 Mental Disorders Collaborators, 2021). This phenomenon requires a reconsideration of the current practices.

Most importantly, brain research and brain health have a major impact on the management of most chronic diseases, and in particular cancer. On the one hand, the level of physical and brain health significantly influences the response to anticancer treatments while chronic stress promotes cancer development (Dai et al., 2020). On the other hand, up to 70% of cancer survivors of adult-onset report cognitive symptoms, and approximately 30% have impairment on formal neuropsychological testing (Chung et al. 2018). These cognitive disorders, often associated with enduring mental fatigue, often result in an inability for patients whose cancer is otherwise cured or controlled, to resume their professional activities (Shaw et al., 2021). Brain health and brain disorders are thus not a disorder standing on its own but are often related to other acute or chronic health problems. Given the medical, economical, and ethical impact of brain related diseases, it is essential to further understand brain health under normal and pathological conditions. Strong and long-term support to brain research is therefore required. Strong support for brain research is therefore required.

To address the importance of brain health and brain research, the European Union (EU) has undertaken some important steps to boost brain research initiatives with partners around the world, including the EU Joint Programme on Neurodegenerative Diseases (JPND), the Network of European Funding for Neuroscience Research (ERA-NET NEURON) and the Human Brain Project (HBP).

Coordinated by the European Brain Council (EBC), those initiatives came together in 2018 under the EU-funded project the European Brain Research Area (EBRA). Through accelerating collaboration and coordination in the brain space, the EBRA Consortium aims to support brain research and health. Its goal is to help reduce the burden of disease, understand the complexity of the brain, and pave the way for a long-term European Partnership for Brain Health. This will be achieved by streamlining and better coordinating brain research across Europe while fostering global initiatives. In this perspective, the need for a strategic research and innovation agenda that ensures coordination and collaboration at European and global level is a critical objective that cannot be overstated. The EBRA consortium developed a Shared European Brain Research Agenda (SEBRA) with the aim to provide recommendations on future areas for excellent, innovative, and translational research. The EBRA partners[1] urge the European Commission (EC) to come forward with a clear plan to tackle brain health in a collaborative, integrated and forward-looking manner in Europe and to further support EU Member States and associated countries in their efforts to combat the impact of brain disorders. EBRA also calls upon the EU Member States and associated countries to implement, and where appropriate create, brain research programmes addressing brain health in a systematic and comprehensive way.

2. Methodology of SEBRA

The development of the Shared European Brain Research Agenda was launched in December 2019 and led by EBC. In 2020 and 2021, regular meetings with the EBRA partners ERANET-NEURON, JPND and HBP, were organised to define and monitor the development process of SEBRA. This happened in 2 steps. In a first step, existing Strategic Research Agendas were taken into consideration. In a second step, inputs from experts in the European Brain Research Area were collected.

Existing Strategic Research Agendas in the European Brain Research Area To define the current priorities, gaps and enabling actions in brain research in Europe, the existing research strategies from the 4 EBRA partners were analysed:

- Consensus Statement on European Brain Research: The need to expand brain research in Europe – 2015
- Human Brain Project (HBP) 2020-2023: Research Agenda Input[2]
- JPND research and innovation strategy
- NEURON research and innovation strategy

An overview of these agendas has been created and overlapping fields have been identified (see ANNEX I).

[1] Including the EBRA third parties (European Academy of Neurology (EAN), the European Psychiatric Association (EPA), the Federation for Neuroscience Societies (FENS), the International Brain Research Organization (IBRO), the European College of Neuropsychopharmacology (ECNP), the European, Middle East and Africa Chapter of the International Federation of Clinical Neurophysiology (EMEAC-IFCN), the European Federation of Neurological Associations (EFNA), GAMIAN-Europe (Global Alliance of Mental Illness Advocacy Networks-Europe), Berlin Institute of Health - Quality | Ethics | Open Science | Translation (BIH-QUEST) center and the French National Research Agency (ANR)) as well as EBC members (the European Association of Neurosurgical Societies (EANS) and the European Pediatric Neurology Society (EPNS)).

[2] One step towards an integrative approach to neuroscience has been made with the European Commission's Flagship Human Brain Project (HBP) and the creation of the EBRAINS Research Infrastructure. Running from 2013 to 2023, the HBP has established a co-design process of highly multi-disciplinary teams from different areas of neuroscience, clinical research, technology development and ethics (1). Research results, data and open tools were all made openly available on a unified infrastructure, which provides them as standardized services. The project envisions these developments to lay the foundation for a new paradigm of collaborative research enabled by digital technologies (2).

Expert inputs To identify future priorities, gaps and enabling actions of brain research in Europe, the existing agendas as well as the overlapping fields have been shared with 90 experts in March 2020. These experts were recommended by the EBRA partners – JPND, ERANET-NEURON and HBP, and EBC third parties – IBRO, EAN, EPA, FENS, ECNP, GAMIAN-Europe, IFCN and EFNA. In 2 surveys (one in March 2020 and another one in July 2020), they were asked to share their 5 most important future priorities, gaps and enabling actions and to rank them in order of priority. In November 2020, those were further dissected with 35 experts during a virtual workshop. More information on the surveys and workshop can be found in ANNEX I.

3. SEBRA

Millions of Europeans are living with brain conditions, mental and neurological alike. To improve their lives and prevent others from being affected, we need to advance the understanding of the healthy and diseased brain, as well as the interaction with the environment. To do so successfully, gaps in currently existing brain research should be identified and priorities for the future should be set.

Brain research has always been a dynamic and evolving field. However, as brain health and brain disorders are an integral part of society and impact society in a large extent, the view on brain research needs to be further broadened. Brain research nowadays must therefore touch upon fields beyond its own biological background and beyond fundamental and translational brain research. Connections should be established with experimental, computational/artificial intelligence and theoretical approaches. Also disciplines like psychology, sociology, and philosophy must be comprised. This interdisciplinary approach allows to link neuroscience with empirical and phenomenological sciences, and ultimately transforms brain research towards a more holistic approach.

To address present gaps and priorities in brain research, the involvement of all relevant stakeholders in the brain area is required including basic, translational, and clinical scientists, neurologists, neurosurgeons, psychiatrists, industry, regulators, funders, and policymakers. In addition, the role of people with brain disorders, their families and citizens is of utterly importance and their perspective must be considered during all steps of a research project. Their experiences, needs, views, and quality of life should be considered when performing research. Guidelines, tools, training, and support to enable patient and caregiver involvement in research are critical and should be facilitated. Such collaborations reduce fragmentation in the brain space and contribute to a better understanding of the brain.

To improve the lives of persons with brain conditions and to understand the healthy, interacting, and diseased brain, particular attention should be paid to the use of animal models. Animal models have been and still are utterly important in the understanding of molecular and single neuron basis of brain functions, as well as in the pre-clinical phases of drug discovery pathways. Between 2007 and 2019, animal models were used in 1389 (out of 3874 which is 36%) brain research projects funded by the EC (ref. EBRA mapping report). Animal models in research are also needed for the development of new brain research technologies aiming to produce biomarkers of brain functions and to stimulate the brain or develop therapeutic drugs. The use of animals in this context is strictly regulated by ad hoc EU legislation, which has been revised and updated over the years to prevent misuse and mistreating of the animals used for scientific purposes. Enforcing the 3 Rs (Replace, Reduce and Refine the use of animals) is a guiding principle in the Directive adopted by the EU in 2010 (2010/63/EU), whose aim was to strengthen legislation and improve animal welfare. The Directive was further amended in 2019, to incorporate additional requirements related to reporting and transparency obligations, as a further step toward the ultimate goal - set by the EC- to replace animal use for scientific purposes with non-animal approaches. The ethical value of this goal is undeniable and fully acknowledged by

neuroscientists, who would gladly replace animal models with non-animal approaches granting the same wealth of information. Until that goal is reached, it will be crucial to benefit from all possible tools, methods, and models, including alternative methods.

In addition to animal models, the experimental field of Induced Pluripotent Stem Cells (IPSCs) based research is extremely important and rapidly developing in neurosciences. While seemingly more basic than animal models, human IPSCs can fill some translational gaps by directly using patient's cells. Human iPSCs models have already produced important results for diseases such as Alzheimer's disease (Israel et al. 2012), schizophrenia (Hoffman et al. 2017) and Multiple sclerosis (Nishihara et al. 2022; Perriot et al. 2018). Besides their potential for disease modelling, hiPSCs also hold many promises for cellular therapies for diseases such as Parkinson's disease (Doi et al. 2020).

Importantly, the generation and interoperation of big data sets including clinical data (e.g., from neuroimaging, electrophysiology, novel omics data, etc.), non-clinical real-world data (e.g., from mobile and smart sensors), and novel, validated, analytical tools (e.g., machine learning, artificial intelligence) have to be supported. This allows to stratify patient populations, identify risk factors, qualify biomarkers, predict clinical trajectories, etc.

Finally, to improve the positive impact of brain research on society, increased attention must be placed on how brain research is communicated to lay audience and policy makers. The quality of lay scientific communication should be ensured, and awareness should be raised about the potential positive or harmful effects scientific claims can have on society and on (political) decision making.

3.1. Future brain research priorities

3.1.1. Understand the healthy brain

To understand the healthy brain, different aspects need to be considered: Its development, maintenance, and function. Especially developmental neuroscience still represents a challenge because abnormal brain development contributes to a wide range of psychiatric and neurological diseases. Understanding the biological processes that underpin healthy brain development is therefore of critical importance. For example, how does a gene translate at the level of protein and how does a protein translate at the level of the system? In this context, a particular focus on stem cells is required. This also includes the understanding of the development of the brain throughout its lifetime and more concretely in the different age groups (< 1 year, children, adolescents, adults, elderly). Such understanding will allow to correct or mitigate defects at each stage during brain development and so reduce the burden of brain disorders in society.

1. **Understand the foetal brain** Brain health and brain disorders can be triggered before birth, during the pregnancy. A healthy prenatal environment is therefore of utter importance for healthy brain development and adverse prenatal exposures have been found to increase the risk for brain disorders. Therefore, efforts need to be put into the understanding of the foetal brain and its development throughout pregnancy using for example advanced foetal magnetic resonance imaging (De Asis-Cruz et al., 2021).

2. **Understand the ageing brain** With the increasing life expectancy of European citizens, the understanding of healthy ageing as well as age-related brain disorders must continue. Therefore, it is necessary to increase the number of brain research studies in the elderly (> 65 years old).

3. **Harmonize animal studies across species up to complex human findings and complement them by *in silico* computational studies.** To understand the human condition, both humans and animals should be studied. However, the vertical approach – from animal to human models –

should not be systematically used as the only approach to understand the human brain. The human brain structure and function differs from the mouse brain. Therefore, a more horizontal interspecies approach to study the brain is suggested. Modelling and simulation are capable to make predictions and to constrain experiments.

4. **Develop the theoretical including mathematical, and conceptual level of neuroscience** To accelerate the understanding of the healthy brain, it should also be approached from a philosophical point of view. Conceptual frameworks need to be developed to explain brain functions including the social and societal frame. Such theoretical and conceptual models should also include mathematical and physics models and accelerate the development of clear hypotheses and expectations motivating targeted data collection and analysis.

3.1.2. Unravel the interacting brain

The brain does not stand alone but is embedded in an internal environment - the body - and an external environment – the outside world (e.g., geographically, socially). As the brain structure and function depend on interactions with these environments, all aspects of these complex brain-environment interactions should be examined. Future research should thus consider the impact of the environment (e.g., political, economic, social, technological, cultural and climate factors) on the brain. This should happen in an integrative manner and in relation to the bodily interactions. In addition, it is also necessary to broaden our approach from studying the neuron and network of neurons to understanding the impact of other cells of the body and, the external environment on the brain. Finally, the translation between basic and clinical neuroscience, and from animal to human research are relevant and ambitious goals requiring multiscale analysis as well.

The following specific priorities have been identified:

1. **Understand the phenotypic and endophenotypic expression of (molecular) pathologies across scales** We should foster research that allows to understand how the molecular level translates to higher level/s and how it interacts with the environmental level. For example, how does the environment (e.g., childhood deprivation) alter the molecules and the plasticity of the brain?

2. **Understand networks between different brain compartments** Structural and functional networks and interactions between brain compartments must be assessed. Brain compartments do not only include neurons and non-neuronal cells (e.g., like astrocytes, microglia), but also the immune system, body fluids (e.g., blood, cerebrospinal fluid, etc) as well as the entire network of cellular and compartmental features of the brain and their interactions (molecules, sub-cellular structures, non-neuronal and neuronal cells, immune system, „body fluids “). Research across those levels must be promoted.

3. **Understand the development, maintenance, and function of the brain through interaction with its internal environment** As the environment in which the brain is embedded is everchanging, an understanding is needed of how the brain develops in such a dynamic environment, how the brain compartments interact with this environment, and how brain plasticity developed and maintained. This does not only include the external environment but specifically the internal environment of the brain in the body (e.g., brain-gut connection).

4. **Cognitive, affective, and social neuroscience** A better understanding of the role of the brain in complex cognitive functions is required. Memory, consciousness, emotions (e.g., stress, anxiety, happiness), empathy, compassion, actions, and communication, are all complex functions

allowing humans and animals to interact with each other and with their broader external environment (e.g., emotional responses play an important role during brain disorder interventions). Therefore, more brain research studies investigating interactions between the brain, the body and its external environment are required. Those studies should also consider individual differences in emotional, cognitive, and social functions, as well as interactions between nature and nurture.

3.1.3. Fix the diseased brain

To understand and cure the diseased brain, there is first a clear need to improve the capacity to translate ground-breaking discoveries into basic neuroscience to the clinical settings. Furthermore, a better and complete understanding of disease mechanisms is crucial. The creation of a translational awareness supported and fostered in all research centres where basic and applied/clinical researchers work together and interact with the goal of potential clinical application will be instrumental and should be encouraged.

In addition, we need to gain better insights in the development and progression of brain diseases, improve the prediction of brain disorders, identify appropriate treatments, understand the impact of neurorehabilitation, uncover protective and preventive factors (including genetic, epigenetic, environmental, and social factors for brain disorders), as well as compensation mechanisms. To address these disease priorities, investments are particularly fundamental in the field of personalised and precision medicine.

1. **Development, reappraisal, and validation of brain disease models** A better characterization of existing models of disease development is necessary. Also, more advanced animal models and patient specific pre-clinical models should be developed, evaluated, and validated. To allow for this, novel technologies (e.g., digital models), and advanced methodologies (organoids, iPSC, simulations) must be used, and preclinical trial networks should be implemented. Reproducible statistically powered translational studies/confirmative studies should also be performed allowing for providing information for preventive, diagnostic, treatment, and rehabilitation strategies. Such information needs to be in line with regulatory aspects to speed up the transformation in clinical settings.

2. **Need for large longitudinal based studies** There is a need for well characterized phenotyped and genotyped longitudinal patient cohorts that can be used for different types of studies. This allows gaining better insight into the development and progression of brain diseases. Specifically in clinical trial programmes, the target population must be stratified and described precisely. This practice increases the translation capacity of brain research.

3. **Identification, characterization and validation of biomarkers** Omics and other biomarkers (clinical features, neuroimaging, EEG) for different diseases occurring at specific developmental ages should be identified, characterized, and validated and its contribution to diagnostics, prognosis and prediction of treatment outcomes should be investigated. In this perspective, also the ethical development of specific and effective biomarkers and treatments in relation to sex/gender (including non-binary), socio-cultural and ethno-racial differences need to be reflected on and considered.

4. **Performance of effective prevention, treatment, and intervention studies** Studies on effective interventions, including effects of diet and lifestyle, to prevent and delay the progression of dementia (e.g., cognitive, and behavioural impairment), stroke and other cerebrovascular disorders, mental and neurodevelopmental disorders, behavioural disorders, rare diseases over

lifetime and epilepsy should be performed. In addition, it is required to focus on early stages of diseases and to move the intervention window from full blown pathologies to asymptomatic or early-stage patients, and from repair to prevention. Such shift is mainly critical for neurodegenerative and other chronic brain disorders.

5. **Identify and investigate common disease factors** We need to identify and investigate factors, (e.g., symptoms and predictors) which are transversally manifested in several brain disorders. The role of those transversal factors common to several disorders should be defined. Both the pathogenetic level and the putative interaction of these factors with the environment should be addressed. For example, sleep plays an important role in brain disorders throughout the lifetime, acts as a modulator of brain development and alterations of the physiological structure of sleep can interact with specific mechanisms underlying neurodegenerative disorders (i.e., accumulation of pathological proteins). Also, behavioural changes, often observed in neurological and psychiatric disorders, deserve more attention. Finally, effects of cultural context including social factors as common factor of brain disorders need to be addressed. For example, social media usage/addiction on brain and cognitive development should be studied.

6. **Understand sensory organ diseases from a brain perspective** Due to the fragmentation in the scientific and medical world (neurology, psychiatry, ophthalmology, and Ear Nose Throat - ENT), sensory organ diseases have often received little attention in brain research. Therefore, a particular focus needs to be put on understanding sensory organ diseases from a brain perspective (ref. SRA NEURON).

3.2. Enabling actions

To ensure that the priorities can be addressed by the brain research community, the conditions for carrying out brain research should improve. Implementing the enabling actions listed below allows excellent brain research as well as the exploitation of the research results. Novel tools to advance the understanding of unknown basic brain functions will be developed and the generation of novel therapeutic approaches will result in a reduced burden of brain disorders in Europe and worldwide.

3.2.1. Create a multiscale, including translational, environment on the work floor.

Excessive fragmentation in the Brain Research Area limits its full potential. The brain research landscape consists of silos of basic researchers, clinical researchers, neurologists, psychiatrists, neurosurgeons, Ear Nose and Throat (ENT) specialists, ophthalmologists, etc. Collaboration between all these “silos” is required and a change in “spirit” or culture in the brain research community needs to be implemented. Especially the gap between basic and clinical researchers must be closed. In addition, cooperation with other experts (e.g., engineers, computational scientists) and stakeholders (e.g., health care professionals, patients, and their representatives) should be encouraged.

The following actions will pave the way to improvement:

1. **The creation of dedicated translational structures and teams** Brain research teams should consist of basic AND clinical researchers. Such teams should be sustainable in the long term (i.e., 5-20 years) instead of only being functional for the short duration of a project (3-5 years).

2. **Interdisciplinary education and training** for current and future generations of basic, preclinical, and clinical brain researchers.

3. **Set up of specific multidisciplinary programs** e.g., dedicated funding; infrastructure (e.g., innovation hubs) for clinicians and scientists’ programs at national and EU level.

4. **The creation of permanent positions and career tracks for senior clinician scientists / medical scientists / computational (AI) scientists and specialized clinical experts.**

5. **The removal of legal constraints and increased flexibility for inner EU and international education** at all stages of professional life (i.e., master student, PhD, postdoc, established researcher, professor).

6. **Support for multi-stakeholder associations** to bring together the relevant key players in the brain space (including the patients).

3.2.2. Encourage smart data sharing.

There is a wealth of existing data in brain research. This huge amount of data should be exploited to ensure relevant use, intelligent interpretation, and smart application. Use of existing datasets and sharing of existing and new pre-clinical and clinical (e.g., from neuroimaging, electrophysiology, novel omics, behavioural data, etc.) data should be a priority. Acquisition and storage of new data should follow standardized rules and best practice examples. They should be available in open access mode. For example, the Human Brain Project has developed openMINDS (open Metadata Initiative for Neuroscience Data Structures) to address such needs [https://github.com/HumanBrainProject/openMINDS].

1. **Inclusion of real-world data in datasets** Data sets should include biomarkers, stratification of patients and real-world data (RWD) including non-clinical RWD (e.g., quality of life data from mobile and smart sensors). The collection of RWD in addition to other types of data is important for the development of accurate brain health and disease models, for the development of novel interventions like prevention, to allow early detection, to evaluate disease progression and treatment efficacy as well as the ongoing management of brain disorders (including both mental health and neurological disorders).

    a. **Use of wearables and sensors** To accelerate the detection of early symptoms and evaluate disease progression and treatment efficacy under real life conditions, wearables and sensors need to be used. However, attention need to be paid to the safety of those technologies and especially to the protection of data and privacy (e.g., collection, storage and sharing of location and personal – health - information).

    b. **Patient relevant outcomes (PRO)** When performing brain research, not only disease outcomes should be considered but also personalised neurorehabilitation and effects of interventions on quality of life of patients and/or other PRO's like social inclusion, return to work, etc. Ideally, standard sets of patients reported/relevant outcome measures would be developed. The individual preferences, needs and goals of patients need to be prioritised.

2. **Standardisation and harmonisation** An effort should be made at European level to harmonize existing data, protocols, and procedures. This should include a regular updating of the guidelines for clinical trials by the EMA as the guidelines for Parkinson or schizophrenia, for example, are almost 10 years old[3][4]. Scales, questionnaires, and approaches need standardisation to allow

[3] https://www.ema.europa.eu/en/documents/scientific-guideline/guideline-clinical-investigation-medicinal-products-treatment-parkinsons-disease_en-0.pdf

[4] https://www.ema.europa.eu/en/documents/scientific-guideline/guideline-clinical-investigation-medicinal-products-including-depot-preparations-treatment_en.pdf

comparability of datasets. Finally, such harmonization and standardisation need to allow for integration of specific data into regulatory and reimbursement processes.

3. **The development of open multiscale infrastructures and platforms** Efforts are needed to continue in further developing open multiscale infrastructures and platforms such as EBRAINS, the digital research infrastructure developed by the Human Brain Project that provides open access to digital tools, models, data and services to advance brain research [https://ebrains.eu]. One example of a necessary platform is a European-wide proof-of-concept trial and preclinical trial data-sharing platform and related technology development platform. In addition, the inclusion of regional and national research infrastructures as partners in the EU programmes should also be reinforced.

4. **Sound analysis and interpretation of big data sets** Existing analytical tools should be updated, and novel ones should be developed. In this context, special attention needs to be paid to the validation of AI algorithms to predict the risk for and progression of chronic diseases. Appropriate IT-infrastructures should be developed, and competent personnel needs to be hired. These needs are shared by other research communities, e.g., biomedicine. Therefore, the joint computing infrastructure Fenix has recently been established in Europe. It has been set up by Europe's leading Supercomputing Centres as part of the Human Brain Project and will serve communities beyond brain research [https://fenix-ri.eu].

3.2.3. Develop new technologies and innovation

Brain research has been characterised by significant progress over the past years. Breakthroughs in the understanding of the brain are imminent, and recent advances offered by enabling tools such as artificial intelligence (AI), biomarkers and big data will further benefit neuroscience and accelerate the discovery of innovative therapeutic solutions for unmet needs (Chen et al., 2020; Markram et al., 2013).

1. **Novel technologies** New technologies can accelerate brain research and the development of new therapies, as well as improve quality of life. This includes nanotechnology for drug delivery, digital therapeutics and techniques (e.g., the use of virtual reality in psychotherapy), wearables/sensors and neuroprosthetics/robotics. For example, neuroprostheses to restore vision and to enable paraplegics to walk have recently been developed (Chen et al., 2020; Rowald et al., 2022). Furthermore, *in silico* brain models that integrate individual patient data have the potential of improving both diagnostics and therapy [ADD REFERENCE TO: The coming decade of digital brain research - A vision for neuroscience at the intersection of technology and computing (Living Paper, Version 2.0)]. The same strict standards and regulation as for pharmacological treatment should be used to evaluate the efficacy of such novel technologies. This requires dedicated funding to perform randomised control trials of technologies. In addition, current and existing technologies (e.g., neuroimaging, brain stimulation) must be validated. This will accelerate the field of translational neuroscience and allow for personalized monitoring of responses to individualized treatments and neurorehabilitation. In general, also the efficacy of validated existing and novel technologies (e.g., helping patients to treat and manage their disease) needs to be ensured.

2. **Telemonitoring/telemedicine** Due to the Covid-19 pandemic, the digital transformation of healthcare accelerated, and a reconfiguration of care pathways occurred (e.g., home care, online consultation). For example, the use of telemedicine[5] approaches for diagnosis, monitoring and interventions accelerated which also facilitated the collection of more real-world data including

[5] Telemedicine is the use of telecommunication and information technology to provide clinical health care from a distance.

those from caregivers and families of young people. However, the impact of telemonitoring/telemedicine on the patient, the gaps and best practices still need further assessment and understanding. In addition, electronic Health[6] and mobile Health approaches need to be developed under an ethical framework considering the potential harmful effects these novel approaches can have on an individual and on the society. Therefore, outcomes, user satisfaction, friendliness, autonomy, and implications of those novel approaches need to be measured and compared with traditional care.

3. **Value of innovation** Socio-economic and cost data of novel approaches for the management/treatment of brain disorders need to be generated. These studies should include questions around reimbursement and implementation in the healthcare system. Novel approaches should be compared with current best practice intervention. For example, can money be saved when people get diagnosed early or does that mean that patients will receive treatment for another 10 years (which will be very expensive)?

4. **Get industry back** Industry has left most of neuroscience research particularly in neurodegenerative diseases but also in others. Therefore, funding programs need to be developed to get industry/biotech back. Those funding programs and opportunities should not be restricted to Europe but should also be developed globally and allow for collaboration with US/Canada, Asia, Australia etc. Moreover, scientists need to be trained on how to approach and talk to industry/biotech partners/investors (e.g., be aware of their priorities), on how to create a business plan, be informed about intellectual properties/rights, etc.

3.2.4. Overcome regulatory, administrative, and legislative hurdles/limitations.

Currently, brain research is faced with several regulatory, administrative, and legislative hurdles which slows down discoveries and breakthroughs in the field.

1. **Enhancement of the engagement between brain researchers and regulators** The access to regulators should be facilitated and researchers need to increase their knowledge on the regulatory rules. In this perspective, several aspects of brain research should be considered: From animal – also primates - experimentation to data sharing and ethics to biobanking / human post-mortem studies to clinical trials.

2. **The creation of common data rules on the use of complex human and patient data** across the member states in Europe, data sharing with industry, Small and Medium Enterprises (SME's) and between different EU and non-EU countries. In particular in the field of technology and innovation (e.g., web-based ICT platform for telemonitoring assistance) there is an urgent problem related to national regulations and legal barriers about treatment of data and platforms of sensitive patient data. It is very important to consider both national and European laws when developing/using/taking up study results, new technologies, therapies, for brain research and clinical applications. We need to ensure that EU-member states allow for data sharing. Harmonisation of the legislative pathway is needed.

3. **The development of a clear scientific discovery-to-market pathway** This will accelerate the regulatory process. Such engagement will also allow to develop new methodologies through which

[6] The WHO defines eHealth as the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research.

evidence can be collected, validated, and integrated into regulatory and reimbursement processes. This will allow innovations to reach the patients and citizens who need them.

PART II. Feedback From the Brain Community

1. Introduction

Good brain health encompasses both the absence of neurological and psychiatric conditions. It is a life-long state in which every individual can realize and maintain their own abilities and potential; optimize their mental, cognitive, emotional, psychological, behavioural, and motor functioning to cope with life situations; and contribute to their community. It encompasses neural development, plasticity, functioning and recovery across the life course.

To address the importance of brain health and brain research, the European Union (EU) has undertaken some important steps to boost brain research initiatives with partners around the world, including the EU Joint Programme on Neurodegenerative Diseases (JPND), the Network of European Funding for Neuroscience Research (ERA-NET NEURON) and the Human Brain Project (HBP). Coordinated by the European Brain Council (EBC), those initiatives came together in 2018 under the EU-funded project the European Brain Research Area (EBRA). Through accelerating collaboration and coordination in the brain space, the EBRA Consortium aims to support brain research and health. Its goal is to help reduce the burden of disease, understand the complexity of the brain, and pave the way for a long-term European Partnership for Brain Health. This will be achieved by streamlining and better coordinating brain research across Europe while fostering global initiatives. In this perspective, the need for a strategic research and innovation agenda that ensures coordination and collaboration at European and global level is a critical objective that cannot be overstated.

The EBRA consortium developed a Shared European Brain Research Agenda (SEBRA) with the aim to identify the future European brain research priorities and enabling actions that will improve the understanding of the healthy brain, stimulate unravelling the interacting brain and accelerate fixing the diseased brain. The development of the SEBRA happened in 2 steps. In a first step, existing Strategic Research Agendas were taken into consideration. In a second step, inputs from experts in the European Brain Research Area were collected.

Promoting dialogue and fostering cooperation between scientists, clinicians, patients, industry and society is the main aim of the European Brain Council (EBC) and the EBRA project. Only by involving the whole brain community and speaking with one voice will ensure that brain research is promoted and that the lives of Europeans living with brain conditions improve. Therefore, all brain stakeholders in Europe and globally were consulted to share their views on the future of brain research and provide feedback on the SEBRA.

2. Methodology

The whole brain community was invited by the EBRA partners and third parties (EBC members) using social media (Twitter, LinkedIn, Facebook) and personal invitations, to join the open consultation. The open consultation community includes individuals, associations, and organisations. Those are neuroscientists, neurologists, psychiatrists, persons with brain disorders (mental and neurological), scientific, professional, and patient organisations, research infrastructures and industry. The survey contained a short description of the priorities and enabling actions, satisfaction scales and open-end questions (see ANNEX III).

Respondents profile

In total, 467 (47% female, 52% male, 1% other; all age ranges are represented, see Figure 1) brain stakeholders filled out the open consultation. 62% (n = 291) of all respondents are involved in research, (i.e., neuroscientists, research infrastructures, scientific associations). One out of 3 respondents were healthcare professionals. This category includes neurologists, child neurologists,

neurosurgeons, psychiatrists, psychologists, professional organisations, and other HCP. Patients and caregivers (including patient organisations) represented 10% of all respondents. Finally, funders, industry, policymakers, regulators, and the public constituted also 10% and were included in the" other" category.

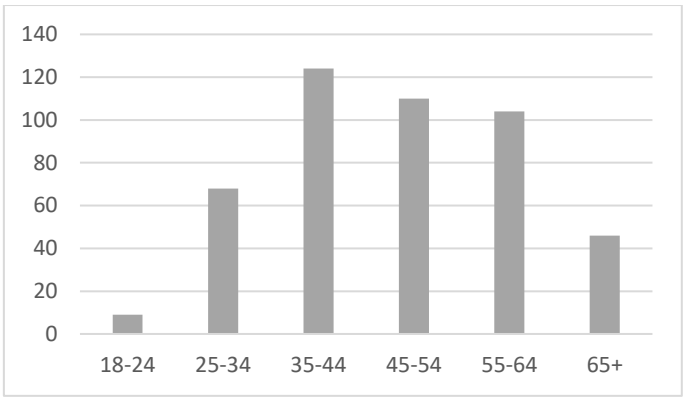


Figure 1. Number of respondents in the different age categories

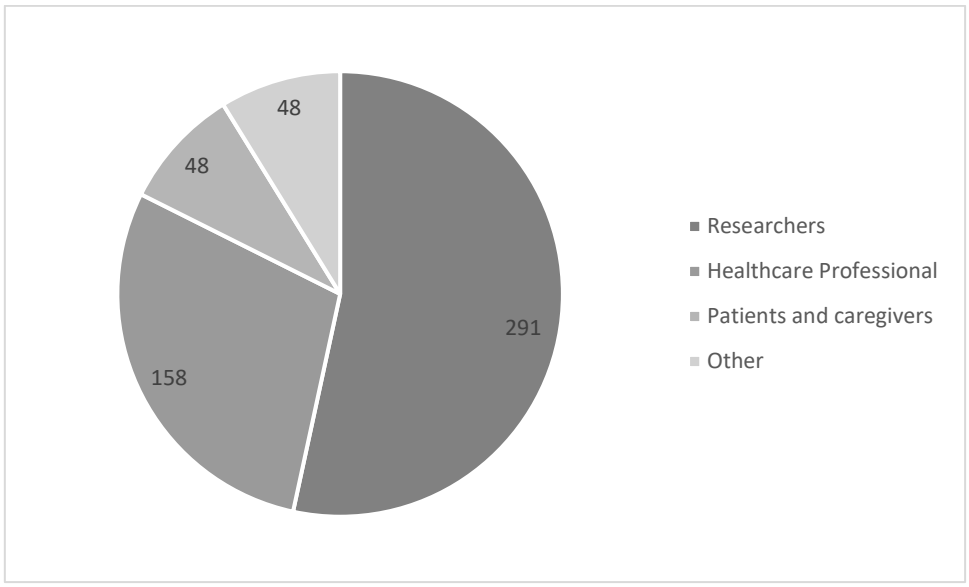


Figure 2. Number of respondents per stakeholder group

75% of the respondents lived in one of the countries in the European Union. 18% Lived in another European country and 6% lived outside Europe (see table 1).

Table 1. Number of respondents per country

Countries	Number of respondents
EU	**348**
Portugal	*47*
Germany	*40*
France	*39*
Netherlands	*37*
Spain	*37*
Italy	*33*
Belgium	*26*
Ireland	*14*
Greece	*13*
Denmark	*10*
Poland	*10*
Sweden	*10*
Romania	*7*
Austria	*6*
Hungary	*5*
Finland	*3*
Cyprus	*2*
Estonia	*2*
Latvia	*2*
Bulgaria	*1*
Czech Republic	*1*
Lithuania	*1*
Luxembourg	*1*
Malta	*1*
Europe	**84**
United Kingdom of Great Britain and Northern Ireland	*26*
Norway	*17*
Turkey	*14*
Switzerland	*11*
Other including Russia,Serbia, Albania, Andorra, Armenia, Georgia, Macedonia, Ukraine	*16*
Non-European including Australia, Bahamas, Bangladesh, Benin, Brazil, Canada, Chile, China, Colombia, Egypt, India, Iran, Israel, USA	**27**

For the analysis, only the respondents who filled out at least 1 rating were included in the analysis. This means that 76 (or 16%) respondents were excluded and that 391 respondents were included in the quantitative analysis (see Table 2). We also received 642 comments from the respondents. Those comments can be found in ANNEX IV-XI. Note that this list only contains comments from respondents who agreed with the (anonymous) publication of their or their organization's response (72% in total).

Table 2. Number of ratings completed

Number of ratings filled out	Number of respondents	Number of comments
Demographic info	467	NA
Priority 1	391	124
Priority 2	373	66
Priority 3	364	102
Enabling action 1	357	97
Enabling action 2	352	61
Enabling action 3	349	61
Enabling action 4	348	50
Other comments		81

3. Results

3.1. Future brain research priorities

In general, respondents were (very) satisfied with the future brain research priorities and enabling actions. There was an overall satisfaction of 78 percent about SEBRA by the whole community. No major differences were apparent between the research, clinical and patient community.

Concerning the "understand the healthy brain priority", 70% of respondents were satisfied or very satisfied, 17% were neutral and 13% were unsatisfied or very unsatisfied with these priorities (see Figure 3). One major comment was that the brain development from infancy to adolescence to adulthood should be included instead of a primary focus on ageing and foetal.

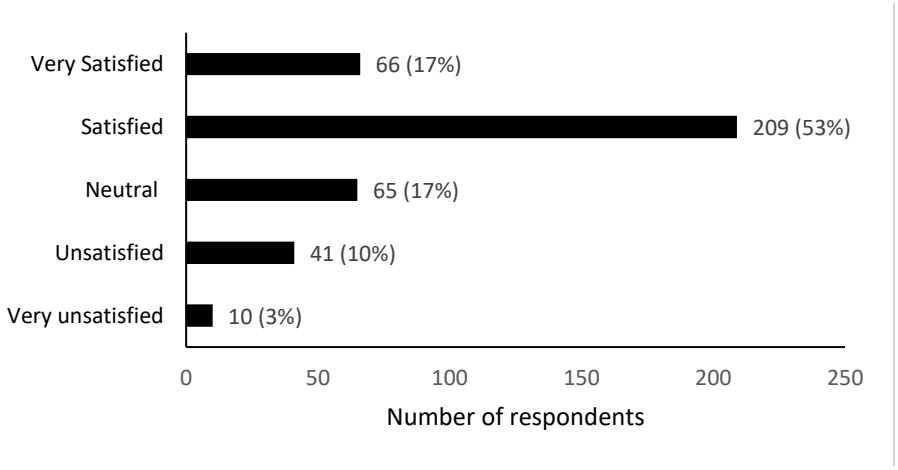


Figure 3. Satisfaction rates (number and percentage of respondents) for the understanding of the healthy brain

Concerning “unravel the interacting brain” priorities, more than 80% of respondents were satisfied or very satisfied, 12% were neutral and 6% were unsatisfied or very unsatisfied with these priorities (see Figure 4). A major comment was that priorities should not only focus on neurons but also on networks.

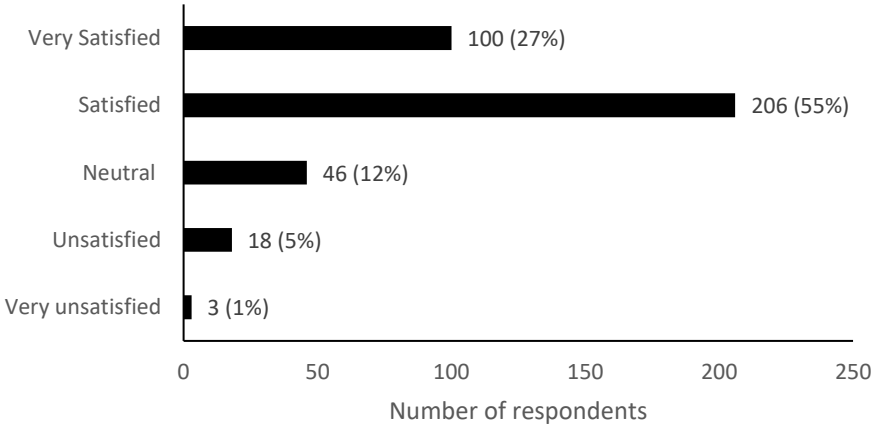


Figure 4. Satisfaction rates (number and percentage of respondents) for the “unravel the interacting brain”

Finally, for the diseased brain priorities, 76% of respondents were satisfied or very satisfied with the priorities concerning the diseased brain, 13% were neutral and 10% were unsatisfied or very unsatisfied with these priorities (see Figure 5). One major comment was that social aspects of brain disorders like social interaction should receive more attention.

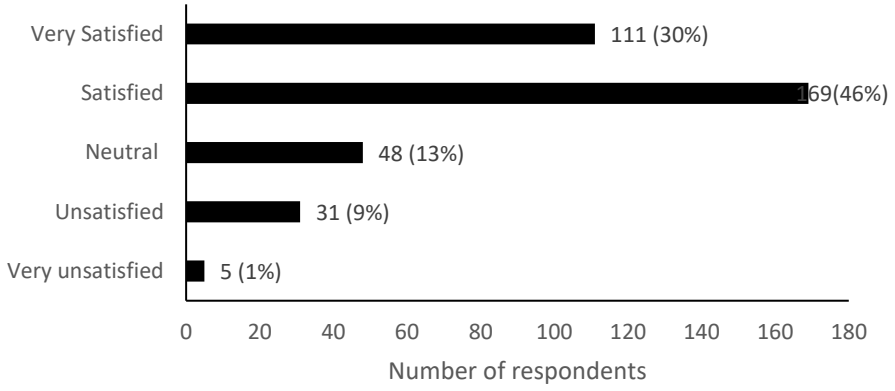


Figure 5. Satisfaction rates (number and percentage of respondents) for the “fix the diseased brain”

3.2. Enabling actions

In general, 80% of the respondents were (very) satisfied with the enabling actions.

Concerning “Create a multiscale, including translational, environment on the work floor”, 80% of respondents were satisfied or very satisfied with the enabling action, 12% were neutral and 8% were unsatisfied or very unsatisfied with this enabling action (Figure 6). Major comments were that the focus should be on bringing all players together on the work floor. Collaboration is relevant but it depends on the research context. Relevant players should be carefully chosen based on the context.

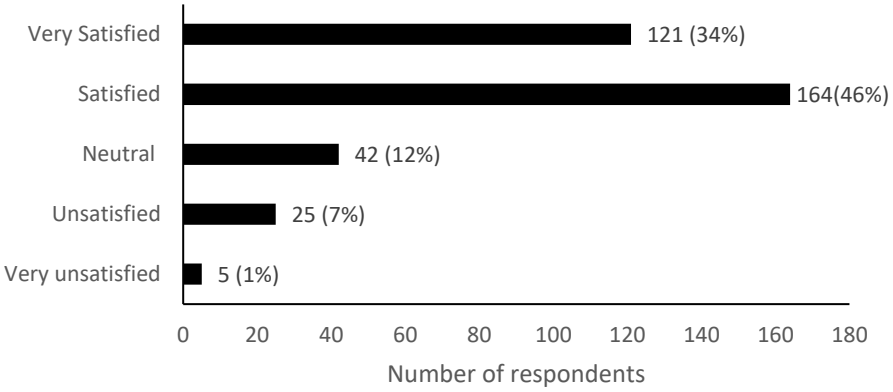


Figure 6. Satisfaction rates (number and percentage of respondents) for the "enabling action: Create a multiscale, including translational environment on the work floor".

82% of respondents were satisfied or very satisfied with the enabling action "Encourage smart data sharing", 14% were neutral and 5% were unsatisfied or very unsatisfied with this enabling action. It is important to set up robust international cooperation programs and incorporate different actors from different region to the smart data sharing discussion.

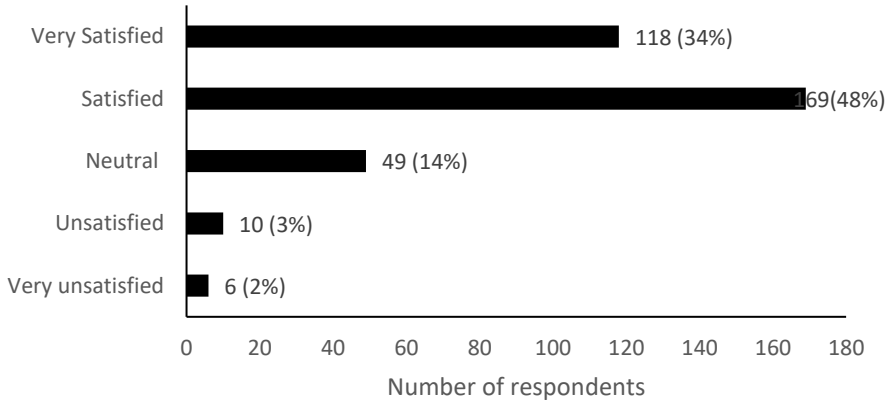


Figure 7. Satisfaction rates (number and percentage of respondents) for the "enabling action: Encourage smart data sharing".

79% of respondents were satisfied or very satisfied with the enabling action "Develop new technologies and innovation", 13% were neutral and 6% were unsatisfied or very unsatisfied with this enabling action (see Figure 8). An important comment was made about the dissemination of the new technologies and innovation which is often missing nowadays. Tools and practices should be developed to improve the quality of dissemination to the public (through media) and to the practitioners, in order to implement quickly new discoveries, therapeutics or best practices.

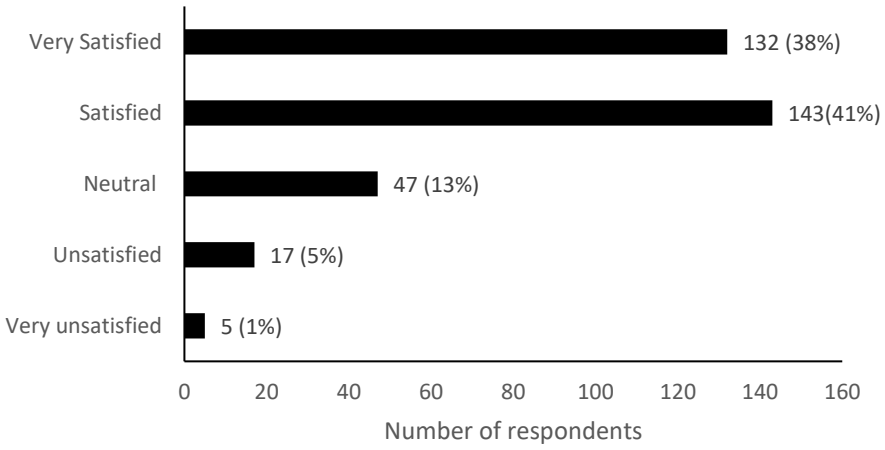


Figure 8. Satisfaction rates (number and percentage of respondents) for the "develop new technologies and innovation".

77% of respondents were satisfied or very satisfied with the enabling action "Overcome regulatory, administrative, and legislative hurdles/limitations", 16% were neutral and 7% were unsatisfied or very unsatisfied with this enabling action (see Figure 9). One major comment was that the administrative burden for animal research should be reduced.

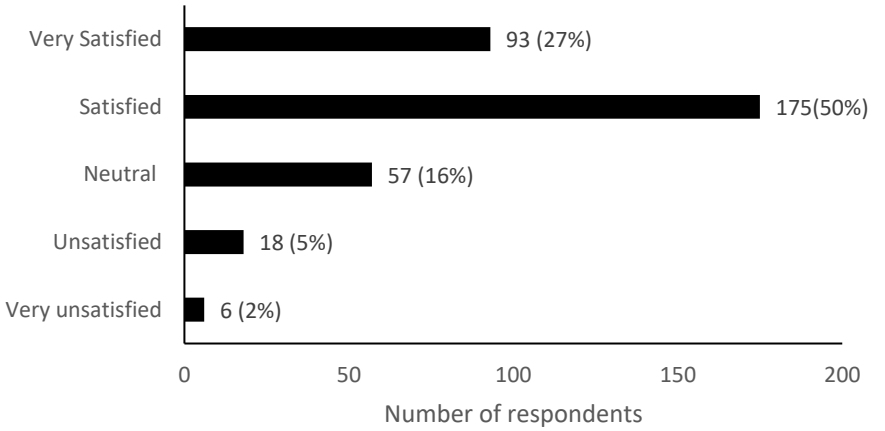


Figure 9. Satisfaction rates (number and percentage of respondents) for the "Overcome regulatory, administrative, and legislative hurdles/limitations".

References

Amunts et al. (2022). Linking Brain Structure, Activity, and Cognitive Function through Computation. eNeuro. 2022 Mar 11;9(2):ENEURO.0316-21.2022. doi: 10.1523/ENEURO.0316-21.2022. PMID: 35217544; PMCID: PMC8925650.

Amunts et al. (2022). The coming decade of digital brain research - A vision for neuroscience at the intersection of technology and computing (Version 1.0). Zenodo. https://doi.org/10.5281/zenodo.6345821

Chen et al. (2020). Topics and trends in artificial intelligence assisted human brain research. PLoS One. 2020;15(4). doi:10.1371/journal.pone.0231192

Chen et al. (2020). Shape perception via a high-channel-count neuroprosthesis in monkey visual cortex. Science. 2020 Dec 4;370(6521):1191-1196. doi: 10.1126/science.abd7435. PMID: 33273097.

De Asis-Cruz et al. (2021). Adverse Prenatal Exposures and Fetal Brain Development: Insights from Advanced Fetal MRI. Biol Psychiatry Cogn Neurosci Neuroimaging. 2021 Nov 27:S2451-9022(21)00322-0. doi: 10.1016/j.bpsc.2021.11.009. Epub ahead of print. PMID: 34848383.

Doi et al. (2020). Pre-clinical study of induced pluripotent stem cell-derived dopaminergic progenitor cells for Parkinson's disease. Nat Commun 11, 3369 (2020). https://doi.org/10.1038/s41467-020-17165-w

Israel et al. (2012). Probing sporadic and familial Alzheimer's disease using induced pluripotent stem cells. Nature 482, 216–220 (2012). https://doi.org/10.1038/nature10821

Markram (2013). Seven challenges for neuroscience. Funct Neurol. 2013;28(3):145-151. doi:10.11138/FNeur/2013.28.3.145

Nishihara et al. (2019). Intrinsic blood-brain barrier dysfunction contributes to multiple sclerosis pathogenesis. Brain, awac019, https://doi.org/10.1093/brain/awac019

Perriot et al. (2018). Human induced pluripotent stem cell-derived astrocytes are differentially activated by multiple sclerosis-associated cytokines. Stem Cell Reports 2018;11(5):1199-1210. https://doi: 10.1016/j.stemcr.2018.09.015

Rowald et al. (2022). Activity-dependent spinal cord neuromodulation rapidly restores trunk and leg motor functions after complete paralysis. Nat Med. 2022 Feb;28(2):260-271. doi: 10.1038/s41591-021-01663-5. Epub 2022 Feb 7. PMID: 35132264.

ANNEX I: Methodology

Here below, detailed information can be found for each step in the SEBRA development process:

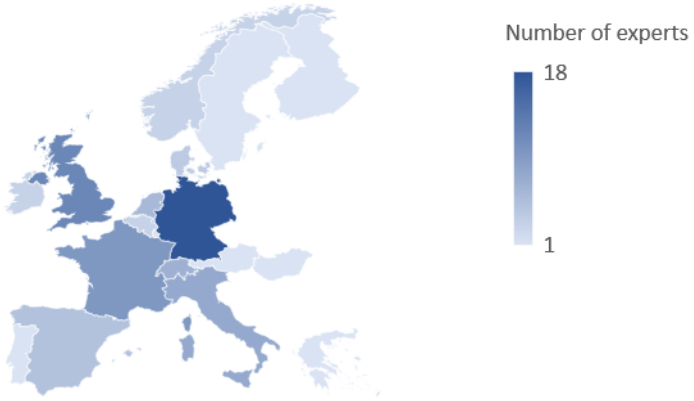
1. **Existing Strategic Research Agendas in the European Brain Research Area**: In order to define the current priorities, gaps and enabling actions in brain research in Europe, the existing research strategies from the 4 EBRA partners were analysed:
    - Consensus Statement on European Brain Research: The need to expand brain research in Europe – 2015
    - Human Brain Project (HBP) 2020-2023: Research Agenda Input
    - JPND research and innovation strategy
    - NEURON research and innovation strategy

An overview of these agendas has been created and common priorities have been identified and are listed below.

Theme	Overlapping priorities
Fundamental research	Computational neuroscience: Modelling of brain and brain diseases; Multiscale brain understanding: cell, animal, human,cognition, behavior; spatial, temporal; Brain structure and physiology
Preclinical/clinical research	Translational neuroscience: From basic research to clinical beneft; healthy and diseased brain; Disease mechanisms; Risk; Prevention; Diagnosis; Biomarkers; Treatment/Therapy/Intervention: Neurorehabilitation; europrotection; neuromodulation; deepbrain stimulation Personalised medicine Complex neurologic and psychiatric diseases
Technology and Innovation	Big data; Shared infrastructure: Tools; Data; Analysis; Software; Neurotechnology, access and availability/industry (AI; Brain/Machine; robotics): Imagning; Brain stimulation, optogenetics,
Socio-Economic Aspects	Open science, Brain research investments, Neuro-Ethics, Public health, societal frameworks e.g. stigma, policy; regulatory frameworks e.g. GDPR, ethical votes; Patient&Public Involvement/Multi stakeholder involvement: research, industry, patients, carers, clinicians, funding organisations, policy makers, regulators, citizens
Research Ecosystem/Environment	Collaboration/Network: interdisciplinary (mathematics - medicine - biology - psychology - engineering - computer science - statistics - sociology - philosophy); researcher-industry (pharma-ICT)-clinician - policymakers; national - EU - Global; Open science; Training and education; Ethics - availability and access of and to latest neuro technology developments; Shared infrastructure

2. **Expert identification:** EBC launched a call for experts within the EBRA consortium, including EBRA partners ERANET-NEURON, JPN, HBP and EBC third parties/members including EAN, EPA, ECNP, FENS, Gamian-EU, EFNA and EC-IFCN. 90 experts (23F/67M) were suggested. Those experts consisted of basic and translation brain researchers, clinicians – neurologists and psychiatrists and patient representatives. They came from different countries in Europe

and institutions and were covering a variety of research areas, research tools and disease areas.



Institutions		
Aarhus University Hospital	*Kings College london/University of Pavia*	*Universiteit van Amsterdam*
AbbVie	*London school of Economics*	*University College London*
Amsterdam University /VU Medical Center	*Maastricht University*	*University Hospital of Liège*
Cajal Institute Madrid	*Medical University Innsbruck*	*University Hospital of Zürich*
Carlos III Institute of Health, Madrid	*Medical University Munchen*	*University Medical Center Mainz, Johannes-Gutenberg University Mainz*
Champalimaud Center for the Unknown	*Pierre et Marie Curie Paris 6 University Paris*	*University of Basel*
Charité – Universitätsmedizin Berlin	*Poole Hospital*	*University of Bergen*
CNRS	*Prevail therapeutics*	*University of Bonn*
Columbia University	*Rigshospitalet-Glostrup Hospital*	*University of Campania Luigi Vanvitelli*
Danish Board of technology Foundation	*Sanofi*	*University of Copenhagen*
De Montfort University	*Sapienza University of Rome*	*University of Edinburgh*
Ecole Polytechnique Fédérale de Lausanne (EPFL)	*Semmelweis University | SOTE*	*University of Edinburgh*
EFNA	*Technische Universität München*	*University of Ferrara/ Università Vita-Salute San Raffaele*
Fondazione IRCCS Istituto Neurologico "Carlo Besta"	*Tel Aviv University*	*University of Frankfurt*
Forschungszentrum Jülich	*The Royal College of Surgeons (RCSI)*	*University of Geneva*
Foundation of Research and Technology-Hellas (FORTH)	*Trinity College Dublin (TCD)/ University of Melbourne, Australia*	*University of Goettingen*
Gamian Europe	*UCL*	*University of Heidelberg*
Geneva University Hospitals	*UEF*	*University of Leiden*
German Center for Neurodegenerative Diseases (DZNE)	*Universidad Politecnica de Madrid*	*University of Luxembourg*
Helmholtz Zentrum München	*Università degli Studi di Perugia*	*University of Milan*
Hôpital de la Salpêtrière and University Paris VI	*Università Vita-Salute San Raffaele*	*University of Muenster*

IDIBAPS (Institut d'Investigacions Biomediques August Pi i Sunyer)	*Universitätsspital Bern, Inselsp*	*University of Navarra*
INSERM	*Universite d'Aix Marseille*	*University of Oslo*
Institut du Fer à Moulin, UMR-S 839, Inserm, UPMC	*Universiteit Antwerpen*	*University of Tuebingen*
Karolinska Institutet	*Universiteit Leiden*	*University of Zurich*
		University Pierre & Marie Curie

3. Survey I: 90 experts in brain research including basic scientists, clinical researchers, clinicians, and patient representatives were invited to share their top 5 priorities and gaps in brain research, as well as the enabling actions needed to address these. 50 experts or 56% answered. Their input was grouped into 5 different categories:

1. Fundamental/basic brain research
2. Disease-related brain research
3. Disease specific brain research
4. Social, societal, ethical, and technological brain research
5. Enabling actions

The priorities raised by the experts were then compared with the priorities noted in the existing SRA's. This comparison resulted in 2 lists: 1. Commonalities: Overlapping priorities between the survey and the existing agenda's; 2. Gaps: Priorities raised by experts in the survey which are not mentioned in the existing agendas.

4a. List of gaps: Gaps between brain research expert survey answers on the survey and existing SRA's (NEURON, JPND, HBP and EBC) priorities

Fundamental/basic brain research gaps

1. Body-brain interactions: Understanding of the brain through many pathways that are common to other organs/systems in the body (e.g., immune, heart etc.). These include autoimmune/inflammatory processes, coagulation, lipid transport and others.
2. Brain cell nucleus: The nucleus of a brain cell is often not included in brain models. As this is an integral part of a brain cell, it should be included in the future.
3. Understand the role of spike timing, synchrony, and oscillations in neural coding. The firing rate is an important parameter for information processing in the brain, but we do not yet understand the causal importance of spike timing for single-cell coding or population coding, nor the causal role of brain oscillations.
4. Molecular/cellular neuroscience: In addition to systems neuroscience (ref. ERANET-NEURON SRA), molecular and cellular neuroscience will contribute to better understand and treat brain diseases.
5. Communication in the brain: Understanding how communication in the brain works through a well-tested theory of how information is transmitted through larger neuronal networks and how different cell assemblies communicate with each other.
6. Brain research on (spatial) memory (e.g., navigation).
7. Brain research on emotions, empathy, and the mind.

Disease-related brain research gaps

8. Real world data need to be collected and included in brain health and disease models.
9. Translational research: To effectively perform translational research and because the brain is a very complex matter, we need to maintain focused on basic research and need to keep investing resources in fundamental research.

10. Translational strategies: Strategies to achieve translation of research findings in preventive, diagnostic, treatment, and rehabilitation strategies.

11. Reproducible statistically powered translational neuroscience that can provide the information required by regulatory offices to proceed to testing of treatments/laboratory tests in clinic (e.g., drugs, biomarkers).

12. Environmental change: Adaptation to environmental change, and vulnerabilities for brain disease that come with that (e.g. psych neuroendocrine processes).

13. Prevention-treatment balance: Importance and practicality of efforts and the differences between brain diseases. In stroke, prevention may be more important. In PD prevention may require an understanding of aetiology, so research into amelioration and treatment might be more effective.

14. Common vs. specific disease factors: Differentiate between common (often secondary) factors (e.g., oxidative stress, apoptosis), mechanisms and symptoms (e.g., sleep, pain, fatigue, well-being, cognitive function, etc.) in brain diseases and disease specific factors and symptoms (e.g., in neurodegenerative disorders).

15. Sleep: Understanding sleep, sleep disorders, the impact of sleep on brain disease (e.g., as a risk factor for neuropsychiatric morbidities) and neuromodulation.

16. Vertigo and dizziness as multidisciplinary key symptoms in brain disease.

17. Drug development programmes/models driven by the social needs of EU citizens.

18. Meaningful or risky clinical trials

19. Increase the speed at which new therapies can be quickly tested in humans for proof of concept.

20. Proof of principle (POP) studies to test new targets swiftly and definitively.

21. Understand the role of stem cells in the development of new potential therapeutic agents that may have on impact on disease progression.

22. Scales and outcome measures reflective of the real benefit of treatments to those affected by brain disorders.

Disease specific brain research gaps

Neurology

23. Prevention and treatment of stroke and other cerebrovascular disorders.

24. Prevention and treatment of inflammatory diseases.

25. Lesser known, rarer, and neglected (also paediatric) brain disorders like ALS, Spinocerebellar and Friedreich ataxias.

26. Neuromuscular and neurological gait disorders (in the elderly). Without a functional neuromuscular system, no useful brain activity can be transmitted/lived today.

27. Strategies to prevent and treat migraine and other headache disorders need to be promoted too.

28. In epilepsy, we need to understand how despite effective pharmacological treatments, more than 50% of patients develop abnormal neurobiological and neurophysiological processes underpinning motor and cognitive impairments, especially over aging.

29. Understand short, mid-, and long-term effects of covid-19 in the nervous system, brain and on cognition. For example, possible long-term association with neurodegenerative diseases, access of drugs to the brain tissue, direct action on respiratory centres, thrombotic effects, encephalopathies by the virus, etc.

30. Understand death and the limits of brain function recovery because chronic progressive neurological conditions are often, eventually, fatal or a large contributory factor in death.

Neurodegenerative

31. Understanding interaction and antecedents between body and brain as well as the early identification of autonomic disorders in NDD's.

32. Coordination of effort against key knowledge gaps e.g. role of amyloid as either risk for or expression of disease.

33. Effective treatments to delay the progression of degenerative dementias.

34. Big datasets for understanding NDD. Need for larger more global studies with commitment to data pooling on a single platform with open data access.

Psychiatry

35. Psychiatric disorders: What makes a "state" in a psychiatric disorder (e.g., depression, psychosis, etc.) and how to change it.

36. High quality psychotherapy trials

37. Somatoform (functional) disorders and neurological aspects of anxiety.

38. Therapy resistant mental disorders.

39. Reducing mortality of mental disorders.

Neurodevelopmental disorders

40. Comorbidity in autism (and other neurodevelopmental disorders).

Social, societal, ethical, and technological brain research priorities

41. Enabling advanced technologies

42. User friendliness of technologies

43. Application of neurotechnology's used in animal research, such as optogenetics, into human brain research.

44. Understanding of the effects of cultural context on brain disorders.

Enabling actions

Funding policy

45. A brain mission in Horizon Europe

46. Priorities addressed by the brain research community (including patients).

47. Evaluation of grant applications based on scientific output of the previous years.

48. Do not ask for full proposals at a too early stage is a waste of resources.

49. Assure high quality brain research (e.g., how they deal with biases, confounders, statistics, experimental planning, reporting).

50. Preregistration as a goal for the future.

51. Train referees (like e.g. Wellcome trust)

52. Simplify bureaucracy and paperwork in applying for funding and in research management.

53. Trust the brain science teams with strong track records, invest in recognition of brain scientists (with financial security and tenure whilst stimulating meritocracy), the quality of their working environment, and let them do their science.

54. Reduce repetitive "invention of the wheel" tasks and issues in all EU proposals (e.g. central platforms for data sharing, data storage, IRB, dissemination etc.).

55. Novel instruments to fund EU-USA joint research consortia.

Education, training, and career

56. Plan European training programmes (e.g., on the basic philosophical principles of science).

57. Promote career positions for non-medical basic scientists within the clinical structures of a department (e.g., engineers, physicists, mathematics, informatics, biologists).

Partnerships

61. European wide collaborations should only be stimulated if needed and relevant.

62. Do not to force all research to include industry.

63. Better understand the potential of collaboration and interaction, especially with civil society, policy, interest organisations and lay public for the advancement of neuroscience.

64. Training in skills on how to collaborate with ethicists, social scientists, civil society, and other brain research stakeholders.

Infrastructures and platforms

65. Local establishment of research infrastructures. For many advanced methods, such as cellular imaging, this can be coupled with European Infrastructures. The new EMBO imaging initiative is a good example.

66. An open access European-wide proof-of-concept trial & preclinical trial data-sharing platform and related technology development platform.

67. Increased availability and access to high quality human brain tissue during neurosurgery.

Open Science

68. Harmonization and standardisation should be defined at European/international level and by a dedicated board. These standards should then be adopted at the national level by the appropriate authorities.

4b. List of commonalities: Overlap between brain research expert survey answers on the survey and existing SRA's (NEURON, JPND, HBP and EBC) priorities

Fundamental/basic brain research priorities

1. Research on non-neuronal cells and its interaction and networks with neuronal cells.

2. Multiscale understanding of the brain and related disorders.

3. Theories and concepts to explain the brain, its phenomena, and diseases.

4. (Dys)connectivity in the brain.

5. Consciousness, and related disorders in the brain.

6. Learning.

7. Perception.

8. Computational neuroscience.

9. Developmental neuroscience: Brain and brain disease development.

10. Brain-gut interactions.

Disease-related brain research priorities

11. Translational neuroscience.

12. Validation and improving existing brain health and disease models (animal, cellular, human).

13. Development of novel appropriate and relevant disease models (e.g., pre-clinical, for intervention) with a focus on reverse translation from brain patient's data into predictive models.

14. Co- and multimorbidity: Underlying mechanisms.

15. Ageing: Mechanisms, role in chronic brain disorders,

16. Risk: Uncovering the genetic, epigenetic, environmental, and social risk factors for brain disorders.

17. Protection/resilience/compensation: Uncovering the genetic, epigenetic, environmental, and social protective/resilience factors for brain disorders, and compensation mechanisms.

18. Developmental approach: Longitudinal studies: Large longitudinal population-based studies integrating different types of data (i.e., genetics, biomarkers, and clinical aspects) to understand the development of a disease (as well as healthy brain development) and disease pathways.

19. Biomarkers: Discovery of new and improved diagnostic, progression tracking and treatment response tools and biomarkers by for example using artificial intelligence.

20. Standardisation and harmonisation of disease classification, diagnostics, etc

21. Real-time monitoring and technologies (including artificial intelligence)

22. Personalised and precision neuroscience: More effective individualised treatment and neurorehabilitation is needed. Individual responses to specific pharmacological agents need to be monitored.

23. Interventions: Focus on novel treatments, neuroprotection and repair, deep-brain stimulation and non-invasive treatments.

24. Drugs: Discover and probe innovative pharmacological interventions.

25. Combining interventions: The combination of drug treatment combined with other non-pharma interventions like technological and social at different intervention time points as well as lifestyle and care approaches.

26. Patient selection criteria and stratification in intervention studies should be refined and optimised.

Disease specific brain research priorities

27. Neurodevelopmental disorders: Brain diseases in children and during development require more attention.

28. Neurological disorders: Focus on cerebrovascular (e.g., stroke) and neuro-immunology.

29. Neurodegenerative diseases: Understanding neurodegenerative diseases remains a priority.

30. Psychiatric disorders: Better understanding of brain development remains a major challenge. An understanding of psychiatric diseases in children, teenagers and young adults is needed. In general, A specific focus needs to be put on psychiatric disease models (e.g., pre-clinical and validity), diagnosis (e.g., circuit based account), risk assessments, new targets for prevention and treatment, personalised medicine and genetics and its combination with neuro-imaging and computational studies.

31. Understanding of autonomic nervous system disorders.

Social, societal, ethical and technological brain research priorities

32. Social and societal research in brain research (e.g., quality of life).

33. Socioeconomics: Cost studies to address the burden of brain disorders in our society (e.g., loss of working capacity) and health economy.

34. Social inclusion and stigma of patients

35. Sex-related differences in brain research.

36. Patient and carer involvement in brain research (priority setting, governance, development of methodologies, selection of patient relevant outcomes, interpretation of results, innovation platforms, etc.)

37. The integration of PROMS in methodologies and outcomes.

38: Brain research technologies: Artificial intelligence and machine learning, novel brain-machine interfaces, telemedicine and monitoring, real-time disease monitoring and new imaging methodologies.

39. Ethical aspects and societal implementations of (neuro)technologies.

40. Big data: Exploitation and integration of new and existing data from different sources and levels need.

41. Artificial intelligence to analyse big data in brain science.

Enabling activities priorities

42. Open infrastructures and platforms.

43. Capacity building.

44. Standardisation and harmonization to allow for larger and more comparable datasets worldwide.

45. Education and training of current and future generations of brain researchers.

46. Partnerships between disciplines, stakeholders (e.g., industry, policymakers, regulators), EU member states and globally.

47. Publication of Null/negative results.

48. Incentives for responsible research (e.g. use criteria like previous records in timely publication of study results, measures to prevent bias, etc.).

49. Funding of fundamentally new, high risk, unconventional brain research.

50. Stimulating serendipity in brain research via funding of people not of projects.

51. Coordination of the continuity between EU and national funding need to be coordinated.

52. Standard operating and control procedures for specific brain research methodologies (e.g., neurocognitive assessment, neuroimaging, non-invasive brain stimulation and EEG databases)

53. Standard operating and control procedures for data collection of physical, physiological, cognitive, and affective information collected via telemonitoring.

5. Survey II: The 50 experts who filled out the first survey were then invited to read the list of commonalities and the list of gaps, and rank (i.e., TOP 3) the commonalities and gaps according to their importance in the field of future brain research within each category (i.e., 1. Fundamental/basic brain research; 2. Disease-related brain research; 3. Disease specific brain research; 4. Social, societal, ethical and technological brain research; 5. Enabling actions.). 34 experts or 68% replied and their answers were synthesized in a ranked list of priorities.

6. Ranked list of priorities: The ranked list of priorities and gaps in brain research is the result of the 2nd survey. In this survey, experts had to indicate their top 3 of most important commonalities/gaps in each category:

- Fundamental/basic brain research
- Disease-related brain research
- Disease specific brain research
- Social, societal, ethical, and technological brain research
- Enabling actions

For each commonality/gap within each category, we calculated the total number of experts who added a certain commonality/gap in their top 3. In the list below, you find the ranking of the commonalities and gaps from most mentioned (1, 2, 3, …) to less mentioned in the top 3 of the experts.

FUNDAMENTAL/BASIC BRAIN RESEARCH

Overlap

1. *Multiscale understanding of the brain and related disorders.*
2. *Research on non-neuronal cells and its interaction and networks with neuronal cells.*
3. *Developmental neuroscience: Brain and brain disease development.*
4. *Develop new theoretical and conceptual frameworks to explain the brain, its phenomena, and diseases, as well as the link between the brain and the mind*
5. *(Dys)connectivity in the brain.*
6. *Computational neuroscience.*
7. *Consciousness, and disorders affecting it in the brain.*
8. *Perception.*
9. *Brain-gut interactions.*
10. *Learning.*

Gaps

1. *Communication in the brain: Understanding how communication in the brain works through a well-tested theory of how information is transmitted through larger neuronal networks and how different cell assemblies communicate with each other.*
2. *Brain body interactions and more generally, interaction with environment: Understanding of the brain through many pathways that are common to other organs/systems in the body (e.g., immune, heart etc.). These include autoimmune/inflammatory processes, coagulation, lipid transport and others.*
3. *Molecular/cellular neuroscience: In addition to systems neuroscience (ref. ERANET-NEURON SRA), molecular and cellular neuroscience will contribute to better understand and treat brain diseases.*
4. *Brain research on emotions, empathy, and the mind.*
5. *Understand the role of spike timing, synchrony, and oscillations in neural coding. The firing rate is an important parameter for information processing in the brain, but we do not yet understand the causal importance of spike timing for single-cell coding or population coding, nor the causal role of brain oscillations.*
6. *Intracellular organelles, including brain cell nucleus: Intracellular organelles, including brain cell nucleus, are often not included in brain models. As these are integral parts of a brain cell, they should be included in the future.*
7. *Brain research on (spatial) memory (e.g., navigation).*

Added gaps by experts in survey 2

8. *Genetics should be addressed in the "communication in the brain" gap, say in chronic pain, PDS, etc.*
9. *No overt mention of social neuroscience*

DISEASE-RELATED BRAIN RESEARCH

Overlap

1. *Longitudinal studies: Large longitudinal population-based studies integrating different types of data (i.e., genetics, physiology, biomarkers, and clinical aspects) to understand the development/progression of a disease (as well as healthy brain development) and disease pathways.*
2. *Translational neuroscience.*
3. *Protection/resilience/compensation: Uncovering the genetic, epigenetic, environmental, and social protective/resilience factors for brain disorders, and compensation mechanisms.*
4. *Biomarkers: Discovery of new and improved diagnostic, progression tracking and treatment response tools and biomarkers by for example using artificial intelligence.*
5. *Development of novel appropriate and relevant disease models (e.g., pre-clinical, for intervention) with a focus on reverse translation from brain patient's data into predictive models.*
6. *Personalised and precision neuroscience: More effective individualised treatment and neurorehabilitation is needed. Individual responses to specific pharmacological and nonpharmacological interventions need to be monitored.*
7. *Ageing: Mechanisms, role in chronic brain disorders,*
8. *Risk: Uncovering the genetic, epigenetic, environmental, and social risk factors for brain disorders.*
9. *Real-time monitoring and technologies (including artificial intelligence)*
10. *Interventions and combined interventions: Focus on novel treatments, neuroprotection and repair, deep-brain stimulation and non-invasive treatments.*
11. *Validation and improving existing brain health and disease models (animal, cellular, human).*
12. *Co- and multimorbidity: Underlying mechanisms.*
13. *Standardisation and harmonisation of disease classification, diagnostics, etc*
14. *Combining interventions: The combination of drug treatment combined with other non-pharma interventions like technological and social at different intervention time points as well as lifestyle and care approaches.*
15. *Drugs: Discover and probe innovative pharmacological interventions.*
16. *Patient selection criteria and stratification in intervention studies should be refined and optimised.*

Gaps

1. *Translational strategies: Strategies to achieve translation of research findings in preventive, diagnostic, treatment, and rehabilitation strategies.*
2. *Common vs. specific disease factors: Differentiate between common (often secondary) factors (e.g., oxidative stress, apoptosis), mechanisms and symptoms (e.g., sleep, pain, fatigue, well-being, cognitive function, etc.) in brain diseases and disease specific factors and symptoms (e.g., in neurodegenerative disorders).*
3. *Real world data need to be collected and included in brain health and disease models.*
4. *Reproducible statistically powered translational neuroscience that can provide the information required by regulatory offices to proceed to testing of treatments/laboratory tests in clinic (e.g., drugs, biomarkers).*
5. *Translational research: To effectively perform translational research and because the brain is a very complex matter, we need to maintain focused on basic research and need to keep investing resources in fundamental research.*
6. *Increase the speed at which new therapies can be quickly tested in humans for proof of concept.*
7. *Prevention-treatment balance: Importance and practicality of efforts and the differences between brain diseases. In stroke, prevention may be more important. In PD prevention may require an understanding of aetiology, so research into amelioration and treatment might be more effective.*
8. *Sleep: Understanding sleep, sleep disorders, the impact of sleep on brain disease (e.g., as a risk factor for neuropsychiatric morbidities) and neuromodulation.*
9. *Environmental change: Adaptation to environmental change, and vulnerabilities for brain disease that come with that (e.g. psych neuroendocrine processes).*
10. *Scales and outcome measures reflective of the real benefit of treatments to those affected by brain disorders.*
11. *Drug development programmes/models driven by the social needs of EU citizens.*
12. *Lack of meaningful or risky clinical trials*
13. *Proof of principle (POP) studies to test new targets and therapeutic strategies swiftly and definitively.*
14. *Vertigo and dizziness as multidisciplinary key symptoms in brain disease.*
15. *Understand the role of stem cells in the development of new potential therapeutic agents that may have on impact on disease progression.*

Added gaps by experts in survey 2

16. *We know a lot of the brain, but there is still a big part we don't know. Rehabilitation will help the patients to have a good quality of life. So research on rehabilitation (methods, effectiveness …) should be performed. This research can have an influence on the global brain research.*
17. *Robotic assistance systems for care support in the hospital and at home in chronic motor disorders*
18. *Development of novel interventions to prevent mental and brain disorders in young people/neurodevelopmental disorders*

DISEASE SPECIFIC BRAIN RESEARCH

Overlap

45. *Neurodegenerative diseases: Understanding neurodegenerative diseases remains a priority.*
46. *Neurodevelopmental disorders: Brain diseases in children and during development require more attention.*
47. *Psychiatric disorders: Better understanding of brain development remains a major challenge. An understanding of psychiatric diseases in children, teenagers and young adults is needed. In general, A specific focus needs to be put on psychiatric disease models (e.g., pre-clinical and validity), diagnosis (e.g., circuit based account), risk assessments, new targets for prevention and treatment, personalised medicine and genetics and its combination with neuro-imaging and computational studies.*
48. *Neurological disorders: Focus on cerebrovascular (e.g., stroke), epilepsy and neuro-immunology.*
49. *Understanding of autonomic nervous system disorders.*

Gaps

1. *Prevention and treatment of inflammatory brain disorders.*
2. *Effective treatments to delay the progression of degenerative dementias.*
3. *Prevention and treatment of stroke and other cerebrovascular disorders.*
4. *Understand short, mid-, and long-term effects of covid-19 in the nervous system, brain and on cognition. For example, possible long-term association with neurodegenerative diseases, access of drugs to the brain tissue, direct action on respiratory centres, thrombotic effects, encephalopathies by the virus, etc.*
5. *Big datasets for understanding NDD. Need for larger more global studies with commitment to data pooling on a single platform with open data access.*
6. *Psychiatric disorders: What makes a "state" in a psychiatric disorder (e.g., depression, psychosis, etc.) and how to change it.*
7. *Lesser known, rarer, and neglected (also paediatric) brain disorders like ALS, Spinocerebellar and Friedreich ataxias.*
8. *Therapy resistant mental disorders.*
9. *In epilepsy, we need to understand how despite effective pharmacological treatments, more than 50% of patients develop abnormal neurobiological and neurophysiological processes underpinning motor and cognitive impairments, especially over aging.*
10. *Reducing mortality of mental disorders.*
11. *Understand death and the limits of brain function recovery because chronic progressive neurological conditions are often, eventually, fatal or a large contributory factor in death.*
12. *Comorbidity in autism (and other neurodevelopmental disorders)*
13. *Understanding interaction and antecedents between body and brain as well as the early identification of autonomic disorders in NDD's.*
14. *Coordination of effort against key knowledge gaps e.g. role of amyloid as either risk for or expression of disease.*
15. *Somatoform (functional) disorders and neurological aspects of anxiety.*
16. *Neuromuscular and neurological gait disorders (in the elderly). Without a functional neuromuscular system, no useful brain activity can be transmitted/lived today.*
17. *Strategies to prevent and treat migraine and other headache disorders need to be promoted too.*
18. *High quality psychotherapy trials*

Added gaps by experts in survey 2

19. *Implementation science for brain and psychiatric disorders generally poor*
20. *Prevention of mental and brain disorders in young people*
21. *In epilepsy, anti-epileptogenic and disease-modifying or interceptive treatments*
22. *Development of novel interventions to prevent mental and brain disorders in young people/neurodevelopmental disorders*
23. *Research into the effects of childhood/ adolescence social media addiction on neurocognitive development (under social/societal research priorities)*
24. *Hearing loss in the elderly – a huge scale problem and traditionally left out of the focus of brain research*
25. *Pain research*
26. *Preventing the onset of severe mental disorders*
27. *Improving functional outcomes*
28. *Developing innovative preventive interventions for young people*

SOCIAL, SOCIETAL, ETHICAL, AND TECHNOLOGICAL BRAIN RESEARCH

Overlap

1. *Brain research technologies: Artificial intelligence and machine learning, novel brain-machine interfaces, telemedicine and monitoring, real-time disease monitoring and new imaging methodologies.*

2. *Social inclusion and stigma of patients*
3. *Patient and carer involvement in brain research (priority setting, governance, development of methodologies, selection of patient relevant outcomes, interpretation of results, innovation platforms, etc.)*
4. *Social and societal research in brain research (e.g., quality of life).*
5. *Sex-related differences in brain research.*
6. *Big data: Exploitation and integration of new and existing data from different sources and levels need.*
7. *Ethical aspects and societal implementations of (neuro)technologies.*
8. *Artificial intelligence to analyse big data in brain science.*
9. *Socioeconomics: Cost studies to address the burden of brain disorders in our society (e.g., loss of working capacity) and health economy.*
10. *The integration of PROMS in methodologies and outcomes.*

Gaps

1. *Enabling advanced technologies*
2. *User friendliness of technologies*
3. *Understanding of the effects of cultural context on brain disorders.*
4. *Application of neurotechnology's used in animal research into human brain research.*

Added gaps by experts in survey 2

5. *In Social, societal etc., it might be good to have something which covers the first-person experience of conditions.*
6. *Gaps not currently listed include research into the effects of childhood/ adolescence social media addiction on neurocognitive development, this would be my number 3 rank*
7. *Understanding of the effects of cultural context on brain disorders I would add the social dimension and epigenetics to allow for animal research.*

ENABLING ACTIVITIES

Overlap

1. *Standardisation and harmonization to allow for larger and more comparable datasets worldwide.*
2. *Funding of fundamentally new, high risk, unconventional brain research.*
3. *Open infrastructures and platforms.*
4. *Education and training of current and future generations of brain researchers.*
5. *Capacity building.*
6. *Publication of Null/negative results.*
7. *Standard operating and control procedures for specific brain research methodologies (e.g., neurocognitive assessment, neuroimaging, non-invasive brain stimulation and EEG databases)*
8. *Incentives for responsible research (e.g. use criteria like previous records in timely publication of study results, measures to prevent bias, etc.).*
9. *Coordination of the continuity between EU and national funding need to be coordinated.*
10. *Standard operating and control procedures for data collection of physical, physiological, cognitive, and affective information collected via telemonitoring.*
11. *Partnerships between disciplines, stakeholders (e.g., industry, policymakers, regulators), EU member states and globally.*
12. *Stimulating serendipity in brain research via funding of people not of projects.*

Added commonality by experts in survey 2

13. *Harmonisation of assessment and outcome measures*

Gaps

1. *A brain mission in Horizon Europe*
2. *Reduce repetitive "invention of the wheel" tasks and issues in all EU proposals (e.g. central platforms for data sharing, data storage, IRB, dissemination etc.).*
3. *An open access European-wide proof-of-concept trial & preclinical trial data-sharing platform and related technology development platform.*
4. *Harmonization and standardisation should be defined at European/international level and by a dedicated board. These standards should then be adopted at the national level by the appropriate authorities.*
5. *Simplify bureaucracy and paperwork in applying for funding and in research management.*
6. *Novel instruments to fund EU-USA joint research consortia.*
7. *Promote career positions for non-medical basic scientists within the clinical structures of a department (e.g., engineers, physicists, mathematics, informatics, biologists).*
8. *Evaluation of grant applications based on scientific output of the previous years.*
9. *Do not ask for full proposals at a too early stage is a waste of resources.*
10. *Train referees (like e.g. Wellcome trust)*
11. *Plan European training programmes (e.g., on the basic philosophical principles of science).*
12. *Better understand the potential of collaboration and interaction, especially with civil society, policy, interest organisations and lay public for the advancement of neuroscience.*
13. *Increased availability and access to high quality human brain tissue during neurosurgery.*
14. *Priorities addressed by the brain research community (including patients).*
15. *Assure high quality brain research (e.g., how they deal with biases, confounders, statistics, experimental planning, reporting).*
16. *Do not to force all research to include industry.*
17. *Local establishment of research infrastructures. For many advanced methods, such as cellular imaging, this can be coupled with European Infrastructures. The new EMBO imaging initiative is a good example.*
18. *Trust the brain science teams with strong track records, invest in recognition of brain scientists (with financial security and tenure whilst stimulating meritocracy), the quality of their working environment, and let them do their science.*
19. *European wide collaborations should only be stimulated if needed and relevant.*
20. *64. Training in skills on how to collaborate with ethicists, social scientists, civil society, and other brain research stakeholders.*
21. *Preregistration as a goal for the future.*

Added gaps by experts in survey 2

22. *Mechanisms for continuity of coordination for large-scale cooperative programmes of research*
23. *Design disorder and stage-specific grant calls without merging neurological and psychiatric disorders in the same call*
24. *Plan European training programmes in transitional psychiatry/neuroscience*
25. *An open access European-wide proof-of-concept trial & preclinical trial data-sharing platform and related technology development platform.*
26. *To provide shared platforms for research at the European level: e.g. European Viral Vector Core; Animal line repositories.*

7. SEBRA themes: Based on the results of the 2 surveys, 6 overarching SEBRA themes have been defined.

- Theme 1. Multiscale/level understanding of the brain and related disorders
- Theme 2. Understand the brain and related disorders throughout lifetime

- Theme 3. Closing the translational gap
- Theme 4. Personalized and precision medicine
- Theme 5. Society and ethics
- Theme 6. Innovation and technology

8. Workshop: The SEBRA workshop took place on 25th and 26th of November. During the expert workshop, the SEBRA themes were further discussed in breakout groups, together with the results from the mapping exercise (see EBRA mapping information sheet). The aim of the virtual expert workshop was to further build on the results of the 2 surveys and to agree on the most pressing priorities, gaps and enabling actions needing to be addressed at the European level. To reach this goal, the experts were divided in 4 smaller groups to further refine the priorities, gaps and enabling actions in 1 or 2 themes. To guide the discussion, the experts were provided with the ranked list of priorities and gaps, as well as a factsheet with the most important results from EBRA's landscape analysis (See ANNEX II). For each of the themes, the experts came up with the most important priorities, gaps and enabling actions. This consensus was then presented to the EBRA partners and additional experts for further discussion on the 26th of November 2020.

ANNEX II: Summary of Mapping Report

The current European Brain Research Landscape

Mapping methodology:

1. Project collection
2. Screening/validation of collected projects
3. Classification of projects into relevant brain research topics.
4. Analysis of the number of projects per topic.

Selection criteria

Type of projects:

- Brain research

Funded by:

- FP7
- H2020
- ERANET- NEURON
- JPND
- Human Brain Project (HBP)

Funding period:

2007-2019

Classification into topics:

24 topics divided into 3 areas

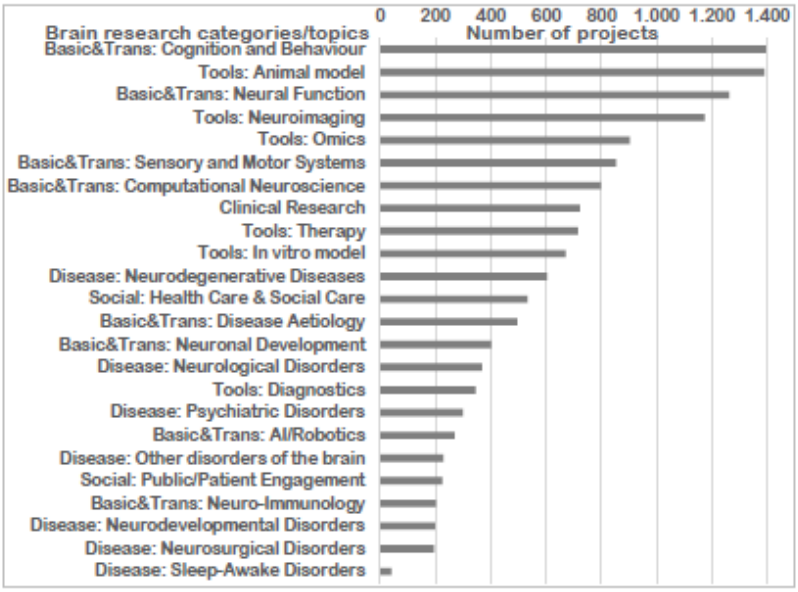
1. Research: Basic & Translational; Clinical; Social
2. Brain research tools
3. Brain disorders

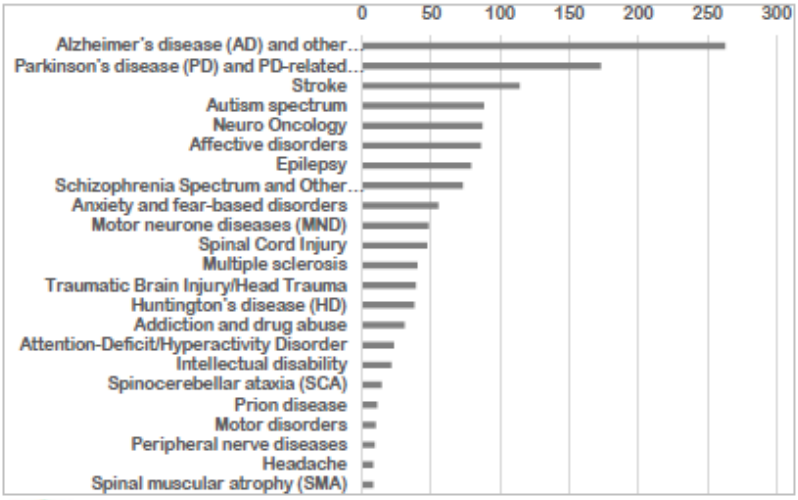
Number of projects:

Total: 3874
FP7: 1990
H2020: 1561
ERANET- NEURON: 124
JPND: 90
HBP: 109

Aim

EBRA's mapping exercise provides an overview of the brain research activities funded by the EU.





EBC European Brain Council
Human Brain Project
JPND research
neuron

EBRA EUROPEAN BRAIN RESEARCH AREA

www.ebra.eu
@EBRA_EU

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No. 825348

ANNEX III: Questionnaire

About this consultation

The below consultation frames into the development of the Shared European Brain Research Agenda (SEBRA) which is one of the main goals of the EU-funded European Brain Research Area (EBRA) project (November 2018 - October 2022). A summary of the project can be found on the next page.

About the Shared European Brain Research Agenda

The EBRA consortium developed a Shared European Brain Research Agenda (SEBRA) with the aim to provide recommendations on future areas for excellent, innovative, and translational research. This happened in 2 steps. In a first step, existing Strategic Research Agendas were taken into consideration. In a second step, inputs from experts in the European Brain Research Area were collected.

Objective

The aim of this open consultation is to gather the perspectives of all key players in the brain area. Your responses to the consultation will be analysed and written down in the SEBRA part II: Feedback from key players in the brain area. This document will then be presented to the European Commission to highlight the need for a brain health partnership.

Overview

The consultation is divided in 5 parts and will take approximately 20-30 min. to fill out:

1. Demographic information

2. Contact information (optional)

3. Feedback and comments about the 3 future brain research priorities:

- Understand the healthy brain.
- Unravel the interacting brain
- Fix the diseased brain.

4. Feedback and comments about the 4 enabling actions:

- Create a multiscale, including translational, environment on the work floor.
- Encourage smart data sharing.
- Develop new technologies and innovation.
- Overcome regulatory, administrative, and legislative hurdles/limitations.

5. Other comments and remarks

Please note that the priorities and actions have been shortened for the purposes of this consultation and the full version of the Shared European Brain Research Agenda can be viewed clicking here.

Target group

All key players in the brain area including patients, caregivers, associations, industry, scientists, neurologists, psychiatrists, regulators, decision makers, politicians, funders, etc.

Duration

March 14th, 2022, to May 15th, 2022.

Contact

If you have any problems accessing or using the survey, please email info@ebra.eu

Background

About Brain Health

Good brain health encompasses both the absence of neurological and psychiatric conditions. It is a life-long state in which every individual can realize and maintain their own abilities and potential; optimize their mental, cognitive, emotional, psychological, behavioural, and motor functioning to cope with life situations; and contribute to their community. It encompasses neural development, plasticity, functioning and recovery across the life course.

About the European Brain Research Area Project

To address the importance of brain health and brain research, the European Union (EU) has undertaken some important steps to boost brain research initiatives with partners around the world, including the EU Joint Programme on Neurodegenerative Diseases (JPND), the Network of European Funding for Neuroscience Research (ERA-NET NEURON) and the Human Brain Project (HBP). Coordinated by the European Brain Council (EBC), those initiatives came together in 2018 under the EU-funded project the European Brain Research Area (EBRA). Through accelerating collaboration and coordination in the brain space, the EBRA Consortium aims to support brain research and health. Its goal is to help reduce the burden of disease, understand the complexity of the brain, and pave the way for a long-term European Partnership for Brain Health. This will be achieved by streamlining and better coordinating brain research across Europe while fostering global initiatives. In this perspective, the need for a strategic research and innovation agenda that ensures coordination and collaboration at European and global level is a critical objective that cannot be overstated.

Click next to start the consultation.

Demographic information

* 1. Which of the following best describes your organization or yourself?

- ☐ Neuroscientist
- ☐ Psychiatrist
- ☐ Neurologist
- ☐ Healthcare professional
- ☐ Person with a brain (neurological-psychiatric) condition
- ☐ Caregiver of a person with a brain condition
- ☐ Scientific association
- ☐ Professional association
- ☐ Patient association
- ☐ Research Infrastructure
- ☐ Funder
- ☐ Industry/Private sector
- ☐ Regulator
- ☐ Policymaker
- ☐ General public
- ☐ Other (please specify)

2. In what country do you live?

* 3. What is your gender?

- ☐ Female

- ☐ Male
- ☐ Other (specify)

4. What is your age?

Under 18

- ☐ 18-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55-64
- ☐ 65+

* 5. Do you consent to EBC publishing your/your organization's response?

- ☐ Yes, attributed to myself or my organisation
- ☐ Yes, anonymously*

* If you select this option, you should ensure that your name does not appear in the main text of your response. EBC cannot take responsibility for anonymising responses in which the individual or organisation is identifiable from the content of their response

- ☐ No, I/we do not wish my/our response to be used other than in the overall analysis of responses

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Contact information (optional)

6. What is your title?

- ☐ Ms.
- ☐ Mr.
- ☐ PhD.
- ☐ MD.
- ☐ Prof.
- ☐ Other (please specify)

7. What is your email address?

8. What is your first name?

9. What is your last name?

10. What is your organisation?

11. May we include you in the EBC database?

- ☐ Yes
- ☐ No

Future brain research priorities: Understand the healthy brain

To understand the healthy brain, different aspects need to be considered: Its development, maintenance, and function. Especially developmental neuroscience still represents a challenge because abnormal brain development contributes to a wide range of psychiatric and neurological diseases.

1. Understanding the foetal brain

Brain health and brain disorders can be triggered before birth, during the pregnancy. A healthy prenatal environment is therefore of utter importance for healthy brain development and adverse prenatal exposures have been found to increase the risk for brain disorders.

2. Understanding the ageing brain

With the increasing life expectancy of European citizens, the understanding of healthy ageing as well as age-related brain disorders must continue.

3. Harmonizing animal studies across species up to complex human findings

To understand the human condition, both humans and animals should be studied. However, the vertical approach – from animal to human models – should not be systematically used as the only approach to understand the human brain. The human brain structure and function differs from the mouse brain. Therefore, a more horizontal interspecies approach to study the brain is suggested.

4. Developing the theoretical including mathematical and conceptual level of neuroscience

To accelerate the understanding of the healthy brain, there is a need to consider the contribution from humanities and social sciences (philosophy, sociology, economics, …). Conceptual and theoretical models need to be developed to explain brain functions including the social and societal frame. Such models should be based on computational neuroscience and brain simulation.

* 12. How satisfied are you with the above priorities concerning the healthy brain?

○ Very unsatisfied ○ Unsatisfied ○ Neutral ○ Satisfied ○ Very satisfied

Do you have any comments or remarks?

Future brain research priorities: Unravel the interacting brain

The brain does not stand alone but is embedded in an internal environment - the body - and an external environment – the outside world. As the brain structure and function depend on interactions with these environments, all aspects of these complex brain-environment interactions should be examined.

1. Understanding the phenotypic and endophenotypic expression of (molecular) pathologies across scales

We need a clear understanding of how molecular processes act at the level of specific neurons to affect information processing at the level of circuits, and finally how these circuit level processes are integrated within neural systems to control the behaviour and cognition of the whole animal in both normal and pathological situations.

2. Understanding networks between different brain compartments

Structural and functional networks and interactions between brain compartments must be assessed. Brain compartments do not only include neurons and non-neuronal cells, but also the immune system, body fluids as well as the entire network of cellular and compartmental features of the brain and their interactions. Research across those levels must be promoted.

3. Understanding the development, maintenance, and function of the brain through interaction with its internal environment

As the environment in which the brain is embedded is everchanging, an understanding is needed of how the brain develops in such a dynamic environment, how the brain compartments interact with this environment, and how brain plasticity developed and maintained. This does not only include the external environment but specifically the internal environment of the brain in the body.

4. Cognitive, affective, and social neuroscience

Memory, consciousness, emotions, empathy, compassion, actions, language and communication are all complex functions allowing humans and animals to interact with each other and with their broader external environment. Therefore, more brain research studies investigating interactions between the brain, the body and its external environment are required. Those studies should also consider individual differences in emotional, cognitive, and social functions, as well as interactions between nature and nurture.

* 13. How satisfied are you with the above priorities concerning the interacting brain?

Very unsatisfied	Unsatisfied	Neutral	Satisfied	Very satisfied

Do you have any comments or remarks?

Future brain research priorities: Fix the diseased brain

To understand and cure the diseased brain, there is a clear need to improve the capacity to translate ground-breaking discoveries into basic neuroscience to the clinical settings. Furthermore, a better and complete understanding of disease mechanisms, development and progression is crucial.

1. Development, reappraisal, and validation of brain disease models

A better characterization of existing models of disease development is necessary. Also, more advanced models and patient specific pre-clinical models should be developed, evaluated, and validated.

2. Need for large longitudinal based studies

There is a need for well characterized phenotyped and genotyped longitudinal patient cohorts that can be used for different types of studies.

3. Development of research on the nosography of brain disease

The common classification of mental disorders should be revisited in light of the common symptoms seen in different mental disorders. Therefore, omics and other biomarkers should be identified, characterized, and validated.

4. Understanding the blood-brain barrier

Increasing insight into the pathophysiology of brain diseases has led to the development of many promising therapeutic agents. The biggest challenge in the design of new neurotherapeutics is to enable them to attain an even distribution within the brain inside the blood brain barrier.

5. Understanding the effectiveness of treatment strategies

Several treatment options for brain disorders exist, from pharmacological treatments to non-pharmacological approaches and brain computer interface-based strategies. However, a better understanding is needed on the effectiveness of all those different strategies.

6. Performance of effective prevention studies

Studies on effective interventions, including effects of diet and lifestyle, to prevent and delay brain disorders should be performed. It is required to focus on early stages of diseases and to move the intervention window from full blown pathologies to asymptomatic or early-stage patients, and from repair to prevention.

7. Identification and investigating common disease factors

We need to identify and investigate factors which are transversally manifested in several brain disorders. Both the pathogenetic level and the putative interaction of these factors with the environment should be addressed. Examples are sleep, behavioural changes, and cultural and social context.

8. Understanding sensory organ diseases from a brain perspective

A particular focus needs to be put on understanding sensory organ diseases from a brain perspective.

* 14. How satisfied are you with the priorities concerning the diseased brain?

Very unsatisfied | Unsatisfied | Neutral | Satisfied | Very satisfied

Do you have any comments or remarks?

Enabling actions

To ensure that the priorities can be addressed by the brain research community, the conditions for carrying out brain research should improve. Implementing the enabling actions listed below allows excellent brain research as well as the exploitation of the research results. Novel tools to advance the understanding of unknown basic brain functions will be developed and the generation of novel therapeutic approaches will result in a reduced burden of brain disorders in Europe and worldwide.

Enabling actions: Create a multiscale, including translational, environment on the work floor.

The brain research landscape consists of silos of basic researchers, clinical researchers, neurologists, psychiatrists, neurosurgeons, Ear Nose and Throat (ENT) specialists, ophthalmologists, etc. Collaboration between all these "silos" is required and a change in "spirit" or culture in the brain research community needs to be implemented.

1. The creation of dedicated translational structures and teams

Brain research teams should consist of basic AND clinical researchers. Such teams should be sustainable in the long term (i.e., 5-20 years) instead of only being functional for the short duration of a project (3-5 years).

2. Interdisciplinary education and training for current and future generations of basic, preclinical, and clinical brain researchers

3. Set up of specific multidisciplinary programmes

e.g., dedicated funding; infrastructure (e.g., innovation hubs) for clinicians and scientists' programmes at national and EU level.

4. The creation of permanent positions and career tracks for senior clinician scientists / medical scientists / computational (AI) scientists and specialized clinical experts.

5. The removal of legal constraints and increased flexibility for inner EU and international education at all stages of professional life (i.e., master student, PhD, postdoc, established researcher, professor).

6. Support for multi-stakeholder associations to bring together the relevant key players in the brain space (including the patients).

* 15. How satisfied are you with the above enabling actions?

Very unsatisfied | Unsatisfied | Neutral | Satisfied | Very satisfied

Do you have any comments or remarks?

Enabling actions: Encourage smart data sharing

The huge amount of data should be exploited to ensure relevant use, intelligent interpretation, and smart application. Use of existing datasets and sharing of existing and new pre-clinical and clinical data should be a priority. Acquisition and storage of new data should follow standardized rules and best practice examples. They should be available in open access mode.

1. Inclusion of real-world data in datasets

Data sets should include biomarkers, stratification of patients and real-world data (RWD) including non-clinical RWD. The collection of RWD in addition to other types of data is important for the development of accurate brain health and disease models, for the development of novel interventions like prevention, to allow early detection, to evaluate disease progression

and treatment efficacy as well as the ongoing management of brain disorders (including both mental health and neurological disorders).

1. Use of wearables and sensors

To accelerate the detection of early symptoms and evaluate disease progression and treatment efficacy under real life conditions, wearables and sensors need to be used. However, attention need to be paid to the safety of those technologies and especially to the protection of data and privacy.

2. Patient relevant outcomes (PRO's)

When performing brain research, not only disease outcomes should be considered but also personalized neurorehabilitation and effects of interventions on quality of life of patients and/or other PRO's like social inclusion, return to work, etc.

2. Standardisation and harmonization

An effort should be made at European level to harmonize existing data, protocols, and procedures. Such harmonization and standardisation need to allow for integration of specific data into regulatory and reimbursement processes.

3. The development of open multiscale infrastructures and platforms

Efforts are needed to continue in further developing open multiscale infrastructures and platforms. In addition, the inclusion of regional and national research infrastructures as partners in the EU programmes should also be reinforced.

4. Sound analysis and interpretation of big data sets

Existing analytical tools should be updated, and novel ones should be developed. In this context, special attention needs to be paid to the validation of AI algorithms to predict the risk for and progression of chronic diseases. Appropriate IT-infrastructures should be developed, and competent personnel needs to be hired.

* 16. How satisfied are you with the above enabling action? 0

Very unsatisfied | Unsatisfied | Neutral | Satisfied | Very satisfied

Do you have any comments or remarks?

Enabling actions: Develop new technologies and innovation

Brain research has been characterised by significant progress over the past years. Breakthroughs in the understanding of the brain are imminent, and recent advances offered by enabling tools such as artificial intelligence (AI), biomarkers and big data will further benefit neuroscience and accelerate the discovery of innovative therapeutic solutions for unmet needs.

1. Novel technologies

New technologies can accelerate brain research and the development of new therapies, as well as improve quality of life. The same strict standards and regulation as for pharmacological treatment should be used to evaluate the efficacy of such novel technologies. In addition, current and existing technologies must be validated.

2. Telemonitoring/telemedicine

Due to the Covid-19 pandemic, the digital transformation of healthcare accelerated, and a reconfiguration of care pathways occurred. However, the impact of telemonitoring/telemedicine on the patient, the gaps and best practices still need further assessment and understanding. In addition, electronic Health and mobile Health approaches need to be developed under an ethical framework.

3. Value of innovation

Socio-economic, cost and quality of life data of novel approaches for the management and treatment of brain disorders need to be generated. These approaches should be compared with current best practice intervention and studies should include questions around reimbursement and implementation in the healthcare system.

4. Get industry back

Industry has left most of neuroscience research particularly in neurodegenerative diseases but also in others. Therefore, funding programs need to be developed to get industry/biotech back. Moreover, scientists need to be trained on how to approach and talk to industry/biotech partners/investors, on how to create a business plan, be informed about intellectual properties/rights, etc.

* 17. How satisfied are you with the above enabling action? 0

Very unsatisfied | Unsatisfied | Neutral | Satisfied | Very satisfied

Do you have any comments or remarks?

Enabling actions: Overcome regulatory, administrative, and legislative hurdles/limitations.

Currently, brain research is faced with several regulatory, administrative, and legislative hurdles which slows down discoveries and breakthroughs in the field.

1. Enhancement of the engagement between brain researchers and regulators

The access to regulators should be facilitated and researchers need to increase their knowledge on the regulatory rules. In this perspective, several aspects of brain research should be considered: From animal – also primates - experimentation to data sharing and ethics to biobanking / human post-mortem studies to clinical trials. On the other hand, regulators need to be made aware of the regulatory struggles and administrative burden for researchers.

2. The creation of common data rules on the use of complex human and patient data

across the member states in Europe, data sharing with industry, Small and Medium Enterprises (SME's) and between different EU and non-EU countries. In particular, in the field of technology and innovation, there is an urgent problem related to national regulations and legal barriers about treatment of data and platforms of sensitive patient data. It is very important to consider both national and European laws when developing/using/taking up study results, new technologies, therapies, for brain research and clinical applications. We need to ensure that EU-member states allow for data sharing. Harmonisation of the legislative pathway is needed.

3. The development of a clear scientific discovery-to-market pathway

This will accelerate the regulatory process. Such engagement will also allow to develop new methodologies through which evidence can be collected, validated, and integrated into regulatory and reimbursement processes. This will allow innovations to reach the patients and citizens who need them.

* 18. How satisfied are you with the above enabling action?

Very unsatisfied | Unsatisfied | Neutral | Satisfied | Very satisfied

Do you have any comments or remarks?

Other comments

19. Do you have any other comments?

Thank you!

Thank you for having filled out the open consultation for the Shared European Brain Research Agenda!

Your responses to the consultation will be analysed and written down in the SEBRA part II: Feedback from key players in the brain area. This document will then be presented to the European Commission to highlight the need for a brain health partnership.

If you have any questions or remaining comments, please email info@ebra.eu

ANNEX IV. List of comments related to the priorities concerning the healthy brain

(1) The fourth point seems to mix humanities and economics with computational neuroscience. I do not see the added value or a clear statement. With the improvement of recording techniques, mathematical models of the brain, are getting better and better constrained. Hence, there is a lot of promising directions; whereas about the contribution of economics, I am less sure. (2) A neglegted, but very important topic are small and non-standard animal models. Many of the core discoveries have been made in unusual systems: (a) action potentials in the squid giant axon; (b) learning and plaasticity in the sea slug; (c) central pattern generator in the stomatogastric ganglion of the lobster... Concentrating on just the standard model animals narrows down our opportunities for truely novel insights.
1 and 2 are key, I really wonder about an 'interspecies' approach and disagree with 4; for understanding the brain (mechanisms), focus should be on neuroscience and NOT on humanities, social sciences and conceptual frameworks, sorry, but I do not see the added, practical value here at all. Also, the computational neuroscience may be useful for modelling aspects of the brain but unlikely to benefit understanding disease mechanisms.
1. Ensure sufficient support for basic neuroscience research (rather than solely focusing on translational, clinical and/or applied research). Translational and clinical research require information from fundamental research in order to be successful and to remain up to date. 2. Reduce the administrative burden on animal research. In many European countries (including the Netherlands), the bureaucracy surrounding animal research has increased such that it becomes very unattractive. This is a direct threat to neuroscience research. Animal and human research should be seen as complementary approaches that both have their merits and drawbacks.
3. Humans are animals, essentially common mechanisms of brain function. 4. Brain stimulations are only one aspect of brain studies. It has already been too much emphasized without much success (cf funding of the blue brain project)
4 is too preliminary and so much has been overspent with the BRAIN project in CH over the last years with almost no concrete deliverable
5. Developmental neuroscience in child- and adolescent biological psychiatry
A psychosocial perspective seems lacking , and it doesn't have to be based on computational neuroscience
All ethical considerations should be upheld in our quest to achieve a better understanding of the human brain
Arguably, the key aim of brain research is to understand causal brain-behaviour/cognition relationships. To advance such understanding, it would be important to prioritize manipulation approaches in combination with behavioural and cognitive testing. Moreover, it would be important to prioritise translational/cross-species methods to measure neural function and behaviour, i.e. methods that can be similarly applied across species, including humans.
Between foetal and aged brain, there is a big gap, very relevant and apparently ignored by SEBRA.
Brain development from infancy to adolescence and adulthood also needs to be included
childhood, adolescent and healthy adults should be included
detal and aging is picking up two extremes, but the entire lifespan is relevant as are enviromental factors affecting this
Early development and sociobiology may be paramount
Early postnatal development is just as crucial as priority 1. In priority 3, diverse non-model organisms should be encouraged, well beyond the typical mammalian organisms.
EBC to do a great job. More patient involvement by brain councils or EBC????
Example of Semmelweiss Ignaz emphasize the importance of simple observations.
Factors that have major impact on early development, aquisition of speech and social skills are another very important topic
Far too stong focus on animal studies.
Fastest way to develop treatment of these disease would be to optimize use of current drugs in psychiatric disorders. We should aim to understand pharmacogenetics and drug combinations better.
focus has largely been on non-sustainable and longterm outcomes which are risky and often yield very few or poor results. They may seen very uplifting like seeing 3 spinal cord injury subjects move their legs but it is unlikely to be useful beyond a media hype.
Focus on adolescent age which is very important time for developing psychosis

Foetal brain research programs should be handled with extra care, as they are sometimes a call for future prenatal testing focused research, which is a great danger but also appealing for industry. The mouse model in autism research has proved ineffective and is prone to perpetuating false understanding of autism, therefore it is a good thing that it is questioned and ultimately ruled out.
Genetics is not mentioned althoug it is not mentioned
Healthy brain and its circuits are not developed enough. How would you understand a disease if you don't understand how everything is working in the healthy brain
healthy brain is also result of an interaction with environment that in this ranking is not captured
I am missing a point on sex differences, as male and female healthy brains function quite differently.
I believe that we should include the decision making brain & Normal & Pathological behavior of our brain
I don't really understand what's meant with point 3 and a 'horizontal interspecies approach'
I have joined the workshop(s) on SEBRA and there was a lot of interest for patients and carers concerns and priorities in research. It looks a bit awkward to find contribution of social sciences as last priority
I miss the important focus on the psychotherapeutic process: while the number of patients in the need of psychotherapy is constantly increasing, the processes at the base of successful treatments need to be scientifically identified in order to improve the quality of therapy and the long-lasting wellbeing of the population.
I miss 'understanding the developing (child) brain'.
I suggest to include studying brain development and mature brain
i think it makes quantum leaps; we still lack fundamental data in order to be able do this kind of prioritizing
I would add also 'Understanding the postnatal/adolescent brain'
I would cross 2 with 1 and 3 with 4
I would emphasise basic science, including cellular and molecular more. There is a danger that too much emphasis on translation leads to narrow focus on different disorders rather than a broader approach to neuronal function.
I would include evolution as a theoretical framework to understand brain computations across species
I would like to see also child brain as part of first priority (foetal-child brain)
I'd like to see a focus on fundamental neuroscience and also on new forms of therapy
Impact of sex on the healthy brain should be also specifically addressed
In addition to stressing the differences between rodent brains and human brains, we should carefully develop non-human primates as an intermediate model because NHP model is unique for investigating neural and computational mechanisms underlying human-like cognitions and is critical for translational research.
In my estimate, we need progress in the prevention of mental disorderts and specifically environmentally-related risks and these issues should be captured in the work ahead.
in part very specific (stem-cells) and normal aged brain should be more prominent
In the general population and public policies, brain is the forgotten organ as it competes with free-will
Include an ethical approach
Include evolution of vertebrates to find leads
Include evolutionary development of vertebrates
Include sex/gender differences
Inequalities in brain health is a big issue in my region (Latin America and the Caribbean). Fragile health-care systems, unstable economic development, deficiencies in formal care, and large economic disparities are overburdening brain health in the region. Certain life style and other modifiable risk factors (e.g. low wellbeing, sedentary lifestyle, low education, loneliness, age-related impairments), are associated with increased risks that negatively impact brain health. There is potential to improve health and wellbeing by addressing these modifiable risk factors. However, there is a knowledge and awareness gap amongst health care workers,

health care professionals, and specially the general public. Building brain capital and health in this post COVID-19 world has been made more urgent due to the negative impact that the pandemic will have on brain health.
instead of foetal brain would rather rrefer to developmental. The critical developmental period is up to 2 years of age whcih is a critical window of exposure that can increase risk for mental helath problems later. so is both prenatal and postnatal period that are key
Integrated neuroscience
it does no tackle very important areas of brain science
It is also necessary to develop new brain-machine interface technologies that may help both in research and in pathology treatment
It is unfortunate to compartmentalize the study of the brain into 2 large windows: fetal and aging. The challenges facing research require that neurodevelopment be considered in a "whole life" manner, from the embryo to old age, passing through childhood, adolescence and adulthood. In addition, research must also provide solutions to improve the daily lives of people affected by brain diseases. In this respect, it would also be appropriate to promote the transfer of scientific knowledge towards the development of solutions (technological in particular).
Item 3 does not make any sense. Almost all we know is from animal experiments and this has been very succesful and the level that is relevant can only be investigated at the levels with high spatial and temporal resolution. Also the idea that only mice are investigated as animals is ridiculous..
link between aging with middle age population is missing, middle age population is underrepresented
longitudinal health trajectories of healthy ageing is not included
Mathematics and computer science (incl. machine learning) in brain research should be incorporated where possible
Mental disorders and neurodevelopmental disorders are not mentioned; nor drug treatments studies
More emphasis at the Cell intra/ interaction mechanisms.
Most important from my point of view is number 2.
My own area of interest is in motor learning, which can be broadly represented in priorities 1, 2 and 4
Neuroscience as a field is deeply confused about its goals. Investigators and funding agencies fail to grasp the importance of fundamental research and stifle progress by demanding translational and clinical potential in most research. Because these demands are premature, much of the field pushes misleading results and pursues short-sighted goals for the simple reason that they are trying to fix or cure a system that they don't properly understand, with tools that are inadequate for the task. They fall into silly debates about the 'best' model organism, without calibrating this to the question. They miss opportunities to push other scientific aspects of neuroscience, including connections to artificial intelligence, systems biology and bioengineering/biotechnology. In short, they don't view neuroscience as a science, but an underdelivering clinical subdiscipline. This is worse in Europe than in China and the US.
Neurosurgical disorders do affect the elderly and the ageing brain, and they do present particular challenges. Such patients can often be left untreated due to biases against elderly, and it would be great if EBRA can coordinate work towards improving healthcare for this citizens, and challenging dogmas against these.
Point 3 is vague and does not mention possible biomarkers of damage; Moreover, no mention is given to neurotoxins
Priority 4 acknowledges the need of interdisciplinary collaboration
Progress is needed with regard to efficiency of the treatments
Propose to focus on the developing brain in general instead of just on foetal brain development. Neurogenetic and neurodegenerative disorders with onset in childhood also need more attention.
re 1: very satisfied; re 2: satisfied (research on healthy ageing must increase rather than just continue); re 3: neutral; re 4: unsatisfied (brain function models should be based on real life evidence rather computational simulation).
regarding the animal models, it is in addition critical to consider the environment in which laboratory animals are living and being tested in. In current labs the environment is artificial, hindering natural behaviours and affecting brain development and all consequent output. Hence, by making the environment more natural ecological validity and thereby generalisability/translatability are likely to increase
Should include understanding the function of the normal brain as networks
Some aspects are not considered
Suggest more focus on the developing human brain from birth to adult age

The agenda should be enlarged to other neuropathologies.
The clinical benefit of animal studies remains a matter of debate. Animal research should not be a priority.
The full timeline of the Brain is key, focusing here on foetal and ageing is limiting.
The impact of environmental pollution on morbidity from various psychiatric and neurological diseases should be included
The importance of brainmapping by combining different research domains, approaches, existing data and influentual key actors are bundeled in the above defined priorities.
The knowledge dissemination and the communication between the field into a multifaceted "healthy brain across life span" is missing
The majority, if not all, psychiatric disorders are stress-related. Still, we do have not enough knowledge to cure or prevent stress-related psychiatric diseases. Therefore more efforts should be undertaken to understand the mechanism of stress pathology in detail on each level of the organism.
The potential impact of genetics on brain function may also deserve some special attention
the prenatal and childhood stages are of utmost importance
The technologies associated with future brain research should also be included
The text is very broad; it would be interesting to see the resulting, more focused and further prioritized research questions.
There are many research directions and approaches in fundamental and clinical neuroscience; some active research ares that are not listed above are systems biology approaches (modeling the brain and mental processes at multiple levels), stem cell-based therapies, novel neuroprotective treatments, etc.
There are three reasons to study the brain: i) to understand brain disorders in order to help alleviate mental health problems brain disorders, aging etc; ii) to derive brain-inspired technology, bearing in mind that many humans and animals in general are still far more computationally important than computers/robots in solving real world problems such as navigation; visual processing, etc; iii) to understand our own nature: who we are, what we are, how we make decisions, etc. These four priorities are too narrow, with only priority 4 narrowly addressing these issues. Priority 4 has the order wrong: it should be how can insights of the brain further humanities etc.
There is need of new research methods, using such I have reached the Brain Basic Functional Circuit Structure, which allowed me to think the brain as a mixing machine, biological, electromagnetic, mechanical and governed by quantum physics
There is no focus on the normal, adult brain. This should also be included.
There is so much not known or understood in the brain of rare diseases, that aiming to understand the healthy brain seems inappropriate
There should be a key area concerning human/brain machine interface (BCI)
There should be a mention of "computational" in addition to "mathematical" in item #4
There should be more focus on brain development in childhood and adolescence, which is the period of greatest vulnerability for psychiatric illness
These priorities do not directly include a large number of patients suffering from other conditions with great societal impact (and that are a priority in the 2030 Agenda).
too much focus on fetal and I dont like animal work
Understand the ageing brain to include research in neurodegenerative chronic conditions
Understanding resilience is an important approach
Understanding the adult brain should be included.
Understanding the ageing brain should be the first priority
Understanding the healthy brain may be possible by developing new models
Understanding the molecular brain
we need focus on neuropsychiatric and neurodegenerative diseases

we need to understand the function of an adult brain and focus on mechanistic studies rather than trying to jump to ageing, development and models
We need to understand the neural bases of behavior and cognition, and the brain's response to injury (not only aging)
we should also consider neuromodulation and brain targets for treatments
We speak of the foetus and the elderly. Could we also prioritise the teenage brain?
What about non age related disorders of the brain?
what it does not tackle that much is how to get the laboratory knowledge from the human brain including neuropsychological function or capacity tests related or translated in real life experiences and the other way round
Where is sleep
While it is clear that studying the foetal and ageing brain is both interesting and important, the young adult and adolescent brain are of great medical importance for some of the commonest diseases (e.g. schizophrenia, anxiety, depression). We also still do not understand big questions about the normal (adult) brain, such as how memories and representations are recalled, and these fundamental questions are at the root of understanding disease at all ages.
you might include the normal brain between foetal and aging, as early and midlife (e.g., cardiovascular risk factors, atherosclerosis is known to start at the age ~ 11-14) predisposes to accelerated aging. If we want to understand the aging brain, we should probably (first) understand the non-aging or pre-aging brain

ANNEX V. List of comments related to the priorities concerning the interacting brain

1. See my previous comment. Again, ensure enough possibilities for basic, fundamental research and 2. Reduce the administrative burden on animal research.
Add the importance of change of gene expression in the living brain
add: interactions between the different sensory systems in the aging brain and in diseases
Ageing and degenerative diseases and environmental effect
Although, I believe that we should consider the human relationships on brain change
Among the non-neuronal cells it should be highlighted the vascular component.
Beyond emotional processes, also interoceptive processes may be a key-element of the body-brain interaction.
by working on these, a good foundation is generated for the topics of the previous question
developing new mechanisms targeting traetment of brain disorders including schizophrenia and demancia.
Difficult to understand the descriptions, but I do not see anywhere understanding of the brain and it's connections to the rest of the body
Example of Semmelwieiss Ignaz emphasize the importance of simple observations.
Excellent and much needed priorities, this at the heart of what the brain does, and of what the future of neuroscience, and the understanding of brain disease origins and mechanisms, needs now.
For many years applying a bottom-up like way of thinking has not led to new neuro-treatments (eg. PTSD, ASD). It's time to move to a top-down approach by emphasizing behaviour and physiology first and then going into molecular and genetics (when relevant).
Genetics is very important. The function of the protein associated with a mutated gene can be determined, which may lead to drugs that benefit all PWP. And Mendelian Randomization will likely find additional causal associations with progression.
Gut brain axis
I like the genetic -> phenotypic (1). A phenotypic biomarker could then be (2) and (3), which leads to affected cognition (4)
I think number 3 should include signalling to the brain from the periphery. As written, it sounds more as if we are only interested in the internal environment of the brain rather than the whole body.
I think this more than the last one covers all aspects
I would like to add comparative studies among regions and analysis of the interactions between climate change and brain healthhe
In point 3, why restrict this to internal environment? As pointed out in clarification, external environment is very important and its role is not currently sufficiently emphasised. I would drop the word internal, it restricts too much.
In the external interaction I would also included pharmacological treatments
Include ethical approach
interaction between brain regions is missing
it covers everything
it is working towards the same vision of all solutions are complex and genetic and needs intervention that is non-sustainable. why not address them in steps and make them tangible and allow interdisciplinary processes that go beyond the standard routes that senior professors tend to take to ensure their legacy of work instead of addressing the issues that the users and patients face. Also, not all nations in the European community are equal in their capacity to take these forward.
it seems that all focus on in-body/brain internal environment so title could include: internal interaction
It would be great to include new methods for brain reading and writing and its future applications
Items 1 and 4 should be top priority, with 2 and 3 of lesser priority
longitudinal evaluation of healthy & disordered brain in the community is missing

molecular and single-cell systems biology are not considered
Most important from my point of view are number 2 and 4.
Neural cells are biological entities, but they are made to work generating electromagnetic fields and they make change the charge of such EMF in order to generate the binary code, the bit, in every synaptic station in the NS, this is a higher level of neural cells function. To understand that new research methods were needed.
Neurotoxicology is ignored
Nutrition does effect the brain and executive functioning. How does blood-brain-barrier function? What are nutritional risk factors for brain disorders? (Reference: Prof. Dr. Soyoung Q Part, German Institute for Nutritional Research Potsdam)
On the topic of interactions between internal and external environments, PAREA supports the importance of going beyond a strictly biomedical approach to diseases, which does not take into account the social, cultural and environmental determinants (besides personal determinants such as life-style and diet) that may contribute to them. It is necessary to include these parameters to get a more complete understanding of how those diseases develop, how to treat them, and to determine the effectiveness of existing treatment options. Therefore, non-biomedical treatment options should be further supported in the research (and treatment) agendas. Ultimately, in order to tackle mental health issues, we need to tackle sociopolitical and economic problems because capitalism and the mental health system are fundamentally intertwined and mental health problems are those of communities or societies.
Once sgain, while I appreciate the research is to be carried out by qualified researchers/scientists/practitioners, the translation of the data into terms that move these results toward a greater understanbding of brain function and brain issues in the business, economic and political communities are an important outcome of the initiative overall.brain
Point 3 is a bit unclear. Maybe you should separate the external and internal environments in different points, i.e., making one main point for each of them.
Psychiatric disorders should be emphasized too - most patients experience social difficulties and neuroscience can help build a biomedical profile of these difficulties.
Regional brain and discrete neurotransmission approaches are still too present in the minds of clinicians and researchers
Relationships should be simplified
should consider a better definition of brain dysfunction in pathology with a clear and unique ontology
The concept of social health in relation to neuroplasticity is relevant in this context
The external environment needs to be included to point 3, since the external environment has a major influence on brain development. This already starts in utero, e.g. the maternal environment (smoking, stress, genotype, diet, medication, obesity, etc.) influence foetal development with long-lasting consequences after birth
The impact of social interactions on the brain and brain health is under-researched. More studies are needed on the relevance of the presence, timing and quality of social interactions are needed.
The individual versus population disease expression is a key
The need for understanding cognition and changes with disease progression is important. The role of palliative care in supporting people with progressive and life threatening illness, including neurological disease, is important and should be included
the priorities need prioritization, both in specific subjects and in time.
There is a lack of tools and devices to measure and monitor brain disorders/dysfunctions and their manifestation or impact on a patient's life. At the moment, neurological testing happens in a pre-defined clinical set-up, under ideal standards and are just a 'snapshot' of a patient's condition (total misrepresentation of reality and dito outcome). While the impact and manifestation of brain dysfunctions only show over a longer period of time and is subject to both internal and external influencers. Real life monitoring during e.g. a week of longer would benefit all stakeholders involved.
there is no disease focus here: neuropsychiatry and neurodegeneration
there is too much focus on neurons, without considering oligodendrocytes, astrocytes and microglia.
these descriptions are very "neuron" focused. is emerging more and more that cells in the brain other than neurons are also key for brain function and have key role in pathology
These priorities are somewhat vague, as the do not specify (or even hint at) the means to achieve the goals

This is a pretty random and unsystematic laundry list of goals that likely comes from a few vested interests and current trends. We would benefit from a hard, sober assessment of 'molecules to phenotype' approaches in Neuroscience and other fields and ask whether such a reductionist approach is likely to succeed, or whether this is just in place due to the choice of tools, infrastructure and methods preferred by molecular neuroscientists with a narrow background. The other goals all seem rather broad - sure, let's study how the brain interacts with the world and acknowledge that systemic physiology is important. What does this mean in practice though?
This is too focused on molecular/basic science aspects. We should also include purely clinical science, as it applies to the neurosurgery for conditions that affect the ageing brain; eg intracranial haemorrhage, movement disorders, craniovertebral junction degeneration, trigeminal neuralgia (eg with multiple sclerosis and without), oncology, etc
To brindge the different scales, and combine the data of multiple types, advanced data science and modelling might become essential. Else, all the different bits and parts of knowledge might remain disparate, and not well integrated into a full, mutli-scale understanding of the brain.
we need to focs not only in neurons but in non-neuronal cells as well. This is not covered in some sections mentioned above.
We need to understand the networks _within_ the brain, not only those between the brain and other systems
We would be in agreement with the World Health Organisations assertion that priorities need to be identified for the actions required to prevent, recognise and treat neurological disorders associated with the ingestion of toxic compounds such as alcohol. One in twelve Europeans consume alcohol everyday, with the largest share being found among people aged 45 to 54 (33.5%), a key target age group for modifiable behaviours associated with brain health. The European region has the highest overall prevalence of Foetal Alcohol Spectrum Disorder, at 19.8 per 1000 population. Further consideration is required in terms of best practice to cultivate an awareness of the impact of alcohol on brain health, motivate people to maintain brain-healthy lifestyles, community and national policies to promote this vital goal. Further to this effective strategies to enhance brain health should focus not only on individuals but on the social and environmental factors that influence their behavior. Such research should consider the commercial determinants of ill health and the relationship between industry influence and brain health outcomes.

ANNEX VI. List of comments related to the priorities concerning the diseased brain

"Personalized prevention" might be a keyword for the next years to come, instead of "personalized treatment" (in which case we are mostly too late). Prevention is much more affordable but not the first medical priority. Would be good if we can invest in this more, longitudinal studies can help here
3. In terms of better definition of psychiatric disorder, circuit-based diagnosis and treatment should be stressed in addition to biomarkers because many brain structures are locally involved in pathological behaviours. These brain circuits can now be studies via computational models and manipulated via targets brain stimulation.
4. The therapeutics ought to have a targeted distribution, rather than even, as brain disorders affect localized areas, and/or cell types within the brain.
A dialogue between clinicians and neuroscientific researchers, but also from other disciplines must be more important and sustained for the creation of a true common culture. The weight of disease names and pharmacology from the pharmaceutical industry is too strong to allow a meaningful common representation of neuroscientific and clinical issues
About point 3.: consult also psychiatrists and psychologists in this matter. Do not solely rely on omics and biomarkers (that may result in a simplified, reductionist approach).
Acute brain injury (TBI, stroke, SAH..) is a leading cause of disability and requires intensive care to guarantee circulation/respiratory function and prevent secondary insults. We can monitor physical variables (eg pressure) but not pathological processes in the brain (impairment of autoregulation, metabolic uncoupling, spreading depolarizations...). We should invest in the understanding, monitoring and treatment of these processes attacking adequate cerebral blood flow.
Agree with focus on pharmacological and non-pharmacological intervention studies as well as on prevention. Lifespan perspective. Need for more innovative clinical trial designs for rare neurological diseases.
All
All ethical consideration observed
At point 7 I would add relational patterns.
better cognitive tools to assess models of brain diseases needed
building better SHARED database and tissue banks
consider to consolidate exsiting data/insights as much as possible
Considering the point 1, it would be important to induce different comorbidities in the same pre-clinical model (e.g., Parkinson's disease and depression) to evaluate linking factors in their development and progression.
Development of tissue repositories for current and future research in brain diseases
Disagree with #3, #6, and #8.
Diseases related to the gut-brain axis also represent a real opportunity
early intervention should be a focus
Epilepsy brain studies on function of neural receptors and neurotransmitter should be included
Focus on models for aspects of brain circuit dysfunction rather than on "disease" models
Gaining an understanding of the disease process should be emphasized, though not exclusively. Everything else relies on guessing, with varying likelihoods.
How the person copes with deteriorating brain function is important - and there is a role for palliative care. This should be included in the plans
However, I would add an extra priority for neuro-immunoregulation.
I am convinced that our current diagnostic entities are false, particularly in psychiatry, but also in neurology. Systematic collection of behavioural data in humans, patients and controls, would be very helpful to define new diagnostic entities. These may include the "common symptoms" indicated in 3. and 7. Points 3 and 7 should be rewritten with more ambition and a wide perspective
I am missing a link to more longitudinal studies also in animal models of brain disorders and the focus on more multi-demensional and translational readouts in the animal models.

I Belize we should have studies focused on intervention programs specifically for trauma, depression, anxiety & obesity, take in count that are the most common pathologies around the world.
I consider 4, 5 and 6 most important (from a PKU patient representatives perspective).
I fully agree with these priorities. It will be wonderful to see them considered and applied to clinical neurorehabilitation.
I like 1-6
I miss the search for new therapeutic targets
I think it is important to research therapies aimed at the progression of neurodegenerative diseases
I think that 7 is wrong. If factors are common to different diseases, ie to diseases that have differentnt etiologies, they are likely to be secondary rather than causal factors.
I think that we would need to include new neurotechnology for brain reading/writing in this list.
I would add additional emphasis on the point 6!
I would add more specific human modelling, to support the 3Rs, with more standardization, as well as studying drugs already used in the clinic to understand better their mechanism and long term effects, in addition to new drug discovery.
I would include that some psychological disorders should be studied at the scale of "circuit disorders" through computational neuroscience approaches instead of focusing on genetic or molecular perspectives.
I would like a more direct reference to improved diagnosis (including identification of biomarkers) and therapy (drug therapy but also gene and celle therapy)
I would like a stronger and seperate focus on surgical studies. These are greatly underfunded compared to drug trials and therfore methodologically often inferior.
In order to the capacity to translate discoveries from basic neuroscience to the clinical settings, one should put emphasize on behavioural neuroscience that establishes valid animal models. The sparse research on sex differences in animal model is one example for the gap that disables this translation.
In relation to understanding the blood brain barrier, we may also focus on understanding other barriers within the brain. This includes CSF-brain-barrier, and the interaction blood-brain-CSF in health and disease.
Include differentiation between disease and disability
Include standardisation of research and quality improvement
Is missing the design of new technological solution for new/enhanced diagnosis, therapies and follw-up
Missing consciousness and how to better translate to clinical trials with thinking of the best models
More advanced models of the human brain neural circuitry using pluripotent stem cells are needed
more patient involvement...like me (!!!!)
Most important from my point of view are number 5, 6, 7 and 8.
most important one appears to the the understanding of the BBB. Future in drug developments in CNS is now moving to biological compounds rather than small molecules and crossing the BBB is a huge challenge. The understanding of the BBB will pave the way for technologies aiming to find a way for distribution in the CNS. this would also reopen the door for older products not selected for further development because not crossing the BBB.
Need for an explicity focus on neuroimmunology. Disease more broadly needs to be understood through a developmental lense, such as critical period studies.
Need to include Understanding the effects of very early life environment on later brain health
New treatment modalities
No categorical approach but functional
Not sure if it is required to mention specific aspects since this has the risk that something is omitted.

Number 5: is not only the effectiveness that needs to be understood, but also mechainism of action of the treatments (to provide evidence base to clinicians) time windows for treatment, and who benefits most of which specific treatments
Particularly for the mental disorders, the influence of the social environment is largely neglected
personalized approach should be included
Please include drug repurposing in neurodegenerative disorders as a priority.
Point 3 title should focus on biomarkers; In point 7, drugs must be mentioned
Point 6 requires caution as risk indicators may reflect loss of function or comorbidity during SN latency period. Punkt 8 is essential as deafness and age related macular atrophy have been neglected at JPND
Point 8 could use some more precise wording
Point 8: in the aging system and in sensory and motor disorders
Psychedelic-assisted therapies can be a potent new class of treatments for brain disorders. For instance, a study in JAMA Psychiatry concluded that the randomized clinical trial found that psilocybin-assisted therapy was efficacious in producing large, rapid, and sustained antidepressant effects in patients with major depressive disorder. Another study in the New England Journal of Medicine showed that patients with moderate to severe major depressive disorder who received two doses of psilocybin did just as well — if not better — at six weeks than patients who received daily dosages of escitalopram. In 2021, COMPASS Pathways released initial data on from phase IIb trial on psilocybin-assisted therapy for treatment-resistant depression – largest randomised, controlled, double-blind psilocybin therapy study ever completed. It showed that 30% of people appeared to be in complete remission from their symptoms 3 weeks after treatment. There have been three placebo-controlled trials of psilocybin for anxiety and depression related to end-of-life diagnoses. There have also been studies showing efficacy in treating alcoholism and tobacco dependence, and similar studies in anorexia, obsessive-compulsive disorder (OCD), chronic pain, and opioid use disorder are being developed. This might seem a strange and disparate set of disorders for a single medicine to work in, and this speaks to the innovative nature of psychedelic therapy. In most studies, the psychedelic is given one to three times over a period of weeks as part of an ongoing psychotherapy course, in complete contrast to currently available medications, which are given at least daily, often with little therapeutic support. One way of looking at the difference between them is that current medicines suppress symptoms in a similar way that insulin suppresses hyperglycemia in diabetes. Standard antidepressants protect against the stressors that lead to and perpetuate depression, but don't directly access and remedy underlying biopsychosocial causes. In contrast, psychedelic therapy harnesses a therapeutic window opened up by the brain via the effects of the drugs to facilitate insight and emotional release and, with psychotherapeutic support, a subsequent healthy revision of outlook and lifestyle. Arguably, all of the conditions in which psychedelics have been shown to work share the common feature of being internalizing disorders. In depression, patients continually ruminate about their failings, reiterate thoughts of guilt, and engage in self-critical inner narratives. In addictions, the object of addiction takes on the role of negative thinking in depression, driving behavior that is specific, narrow, and rigid; addicts ruminate on relief afforded by the object, how to get it, how to pay for it, etc. The rationale for using psychedelics in OCD and anorexia is consistent given that there is rumination on intrusive thoughts, e.g., about contamination or calorie mismanagement. Psychedelics likely work by dysregulating activity in systems and circuits that encode these habits of thought and behaviour, allowing them to recalibrate as the acute effects of the drugs subside. Against this backdrop, the future brain research priorities suggested by EBRA in the area "Fix the diseased brain"- aiming to understand better disease mechanisms - could recommend one additional distinctive category looking at internalized disorders related to rigid beliefs, thoughts and behaviours, characterized by pathological levels of rumination. Together, these disorders are responsible for a huge disease burden and research leading to the discovery of new pharmacological treatments for them has been painfully slow. In this regard, psychedelics seem to be able to relax limiting beliefs and, in parallel, promote insight and an emotional release that can motivate the revision of these beliefs and rigid patterns, all the while promoting neuronal plasticity. More work is needed to test those assumption. We need a combined, multi-level, multidisciplinary program of research into the mechanisms underpinning these findings.
Psychiatric disorders and social interaction difficulties should be part of the agenda
Real world use that doesn't involve drugs, like behavioural and educational interventions
Regarding No 2, I believe it is time to move beyond epidemiological studies and increase focus on mechanistic links. Therefore it should not be assumed that longitudinal studies should extend beyond epidemiology and be complimented by mechanistic studies in animals.
Replace categorical approach by a functional one
See previous comments. This approach occupies far too much time and budget. If we ask for 'apprailas of model organisms' we will get a slew of selective results canvassing for the superiority of one model over another. We have to push basic research ahead of expensive, time consuming and unprincipled shots in the dark at translation. The past three decades shows this doesn't work.
the distinctions between neuro-degeneration and neuro-development should be specified, and on that basis, the definition of 'psychiatry' vs neurology should be affirmed, or re-stated or revised.
The diversity of brain diseases and disorders calls for the development of a truly personalized medicine adapted to each situation. Achieving this objective requires first of all the study of common mechanisms in order to develop solutions that benefit the greatest

number of people. In addition, it is also necessary to focus on the challenges of very early identification, in order to provide interventions with the maximum impact Translated with www.DeepL.com/Translator (free version)
The identification and investigation of the factors that are manifested transversally in various brain disorders will require the inclusion of a comparative approach between regions and unequal socioeconomic sectors. Also take into account studies that are carried out with biomarkers in other regions outside Europe.
The more I see the list of priorities, the more I discover that fundemental research is put on highest priority, whilst the lower priority topics do matter most for patients and their quality of life.
There is a great need to develop and characterize in vivo models of disease to
There is a need to expand the field of research not only to diseased brain, but also to different (but not diseased) brains, like in autism. Some of the points are somewhat relevant to autism, though the general wording either keeps it apart, or may appear as a strong stigmatization of autistic individuals.
there is also a need to assess and monitor disease symptoms and evolution better to evaluate both disease and effectiveness of treatment better
This is the most relevant section for me
To better understand the neurobiology of brain disorders, the use of manipulation and translational/cross-species approaches, as mentioned on a previous page will be important.
Traumatic brain and spinal cord injury are not diseases, so why have they been excluded? The key feature of any brain disease model is predictive validity - this needs to be considered.
understanding and fixing motor impairments should be a priority
understanding of the nose to brain barrier is lacking
Understanding the blood-brain barrier should be in 2nd place
Until now medical science has fragmented the human person in many parts aiming to better understand each part, but the correct way of dealing with it is studying it integrated, made of three instances: mental information covered with affection, the brain where that information is stored in terms of binary codes and the body which is a subordinate of the previous two and can't be approached in an independent way. These three instances have no equivalent power inside the human person.
Very good approaches, innovative and highly relevant. Except for 8, which needs to involve a more holistic approach including the body and sensory organ interactions as well.
we dont need preclinical models. human disease is an experiment of nature
we have to make the step from understanding brain mechanisms to influence these mechanisms in prevention and therapy
we miss the attention to the social aspects of brain disorders; what is the effect of having to live with a diseased brain and of having it fixed? Quality of life
We would emphasise that alcohol-related neurological conditions require particular consideration in the aforementioned actions.
WRT 3, I think we're only in the infancy of correctly classifying brain diseases.

ANNEX VII. List of comments related to the enabling action “Create a multiscale, including translational, environment on the work floor”

(1) The long-term perspective is very important and helpful. (2) Interdisciplinary training would strongly profit from the triplet: medical application + basic neuroscience research + theoretical understanding (dynamical systems, physics, AI, ...); we have very good experience with that kind of tri-directional teams. (3) Groups should not necessarily be extremely large; (4) a special call for PIs at the beginning of their career might lever the energy and creativity of the young, i.e. the next generation.
A culture of holistic understanding of neuroscientific issues by researchers and clinicians from different conceptual fields is not achieved by one-off meetings between these protagonists, as each one takes the lowest common denominator necessary for the issue being studied. It is the regular contact with clinicians, researchers, patients and relatives that allows the slow forging of an intellectual framework favourable to innovation.
Again, the focus here is on clinicians and bench neuroscientists. We've been pushing this for decades, so this is just a call for maintaining the status quo. We need proper interdisciplinary education and training with engineering, chemistry, statistics, computer science, psychology and other allied disciplines, not jumping on a bandwagon in with "computational' approaches are synonymous with "AI". The writing shows how naive the thinking is behind these proposals.
All
All the defined priorities lack patient involvement and experience experts from the early stage or initial phase. As each brain disorder or dysfunction will have common traits or consequences per diagnosis, the level of knowledge, understanding (requirements and needs), abilities and value contribution varies per person. In general, patient's are only involved at the end stage, when all programs (research, educational, care, rehabilitation, tools and devices) are already defined and in place. Or they are called upon as test subjects or data contributors. This way of working, often provides patient products or services that don't meet their needs or could me more effectieve, functional and delivered in a short period of time. Valuation, validation and return on investment would benefit all stakeholders involved.
All these are hot points for better research and R&D systems, although in some EU countries like mine past and current plans are far away from these.
Artificial intelligence likely has not any substantial role in brain disease research, except in image analysis. The hype should not be continued. We will never have large enough data sets for AI to work in other than image analysis.
basic AND clinical researchers in point 1 are not enought you should include more actors, researcher of applied technology, social science etc
bring together not only physicians from different disciplines but also other professionals such as ingenieurs etc
Child neurologists should be included. They can contribute in developmental medicine /clinical research as well as in translational research considering the many rare neurogenetic disorders that manifest in the first decade of life.
Combine clinical and preclinical facilities
consider also non-scientific professionals like knowledge brokers and projecst developer, strategists and advisors etc
Couldn't agree more with point 5.
Creation of platforms for collaboration with SMEs, IT and Pharmaceutical Industry
Difficulty in communication between basic and clinical scientists - even when working together for a long time
Disagree with #3 and #6.
Do not underestimate the need for disciplines like physics, math, and computer science, in addition to the clinical disciplines.
Due to the major differences between human and animal brain, a priority should be on education, training and funding of clinical research.
Education for fist line caregivers, Schools, social workers to identify problems within this area indentify problems with
European neuroscience is too focused on diseases. Most of the EU programs are disease based, basic science is in an auxiliary role, if any. We need more emphasise on training in maths, statistics and computation to our young neuroscientists, emphasising these skills is more important than translational connection to clinicians.
Framing the EU Responsible Research Innovation principles in European Brain Research agenda and have a capacity & awareness building plan should be clearly indicated as a priority. This has several implications e.g. citizens/patients as key change agent in the health brain data ecosystem

From the Latin American Brain Health Institute (BrianLat) at Universidad Adolfo Ibáñez (UAI, Chile) in association with the Global Brain Health Institute (GBHI) at Trinity College Dublin (TCD, Ireland), we have a broad experience in creating and offering different educational and training tools for different audiences (undergraduate and graduate students, researchers, doctors, professionals and workers from diverse sectors, public servants, and decision making officers). There is an unmet need in this area and it is important to handle the point from a multiregional way to reach the specifities of different .
Gathering human, technological and scientific knowledge by creating a long-tem dedicated research groups is the new way to untangle the scalability barriers in neuro-treatment development
Generation of work teams should follow work theory development.
Hear hear! Also: promote collaboration over competition (for funding, publishing, etc.), and collaborative sharing of methods and data between institutions.
I am very satisfied by the French system with permanent research positions.
I consider the "The creation of dedicated translational structures and teams " an action of ultimate importance. The rotativity of research teams does not enable the professionals to obtain and retain the needed competences.
I consider the network neuroscience perspective as an eye-opening perspective, not only to support neurological diagnosis of acquired and neurodevelopmental disorders and treatment processes, but also to strengthen the therapy and special education approaches to improve quality of life. I think that translational studies, which will serve as an interdisciplinary interface, can be helpful to disseminate an understanding of the brain based on network neuroscience and raise awareness to all relevant "non-neuro stakeholders".
I don't agree that all research teams should include both basic and clinical researchers. This really depends on the topic. Fundamental brain research should also be possible, without a clinical context.
I like this a lot, especially because no single person can master all techniques and approaches. Collaboration will be crucial. This is also brings a risk because people not made for networking (e.g. because of being shy) may drop out whereas their expertise may be relevant too. It thus will be important to create conditions that are accessible for everyone
I miss somehow the pediatrians and the metabolic physicians (mainly pediatricians). That may seem strange as neurologists are on board, but pediatricians (metabolic diseases) have an overarching role as they have knowledge of precise molecules that interact with brain function that can help other professionals understand specific mechanisms
I stron gly recommend you ensure that the nomenclature of the translation process and the final results is understandable to non-sc ientificsectors with an influence on future funding, prevention of environmental-or population-based risks.
I suggest to prioritize 'Interdisciplinary education and training' to train the next generation in this aspect.
I think 1 is important, but not only. Studying healthy, basic brain functions might not always be very relevant to clinicians, but is very important.
I think a truly efficient partnership between clinical and fundamental researchers will be difficult to achieve; the former are generally too busy and too reluctant regarding new therapeutic approaches, and this attitute generally precludes clinical translation of many innovative diagnostic and therapeutic methods
I think focused project calls and opportunities for open competition for excellent (free to choose) research should be promoted rather that large actions. Large initiatives spoil a lot of money on science that is not good- from a distance they look excellent but in detail often they are not so good
I think including the including human sciences would be useful to have a unique and holistic perspective for the studies.
I would like to add: Facilitate the creation of disease-specific pan-European networks/hubs that enhance clinical/fundamental research collaborations and joint research agendas as well as clinical/scientific educational exchanges.
If missing a key point that is clinical labs to test new technologies, such as sandboxes with a low level of regulatory restrictions under a controlled environment to test new technologies for clinical/medical validation
Implementation of these enabling actions is urgently needed.
In my field (MRI biomarkers for brain aging/related diseases) I find that most gain can be made when we try to speak the same language, e.g., engineers and doctors do not always understand one another, delaying research progress. Interdiscplinary education would help here (2). Research is usually funded for short-term projects, (1) could help here. (4) is certainly important but I wonder how you would do this fairly, outside of the current abilities of future PIs to develop themselves
Include ethical approach
Include non-governmental / charity organizations in this work

include patients and caregivers throughout all initiatives listed above.
Including refugees and migrants are very important for a healthy and happy future
Increase European collaborations between academics and biotech comoanies
Increase linkage between science and business
Integrate preclinical and clinical research
integrative and inter-disciplinary teams that operate in an open and collaborative manner (beyond institutional borders) are key for brain research. Inherent incentives should reward this chance in culture.
More education required. EPA can help? or more free courses with Kings College London??
Most important from my point of view are number 1, 2 and 3.
Multidisciplinary groups for research is a good idea but I propose to consider that every medical doctor to be committed to understand the complete human person (mind, brain and body) and to study the electronics and math that are in the bases of the brain functioning. Again R. Descartes, N. Steno, von Helmholtz, G. von Bekesy, etc. If we study even superficially the unconscious level of the mind we will understand better our mind and our brain and therefore the function and the disfunction.
Nr's 1 and 6 seem to be most relevant (from a PKU patient representatives perspective)
PAREA particularly endorses point 6. Support for multi-stakeholder associations to bring together the relevant key players in the brain space (including the patients). Multi-stakeholder health and research civil society organisations play a crucial role at many levels. They are a vital partner to both European and national institutions to shape and implement public health and research strategies and policies. They are essential in bridging the gap between policymaking and the communities they represent in a professional, efficient, and democratic manner. Opportunities via EU funding should be increased to help ensure sustainability and independence of multi-stakeholder associations in the area of brain health to safeguard their essential role as partners in EU health policymaking. Indeed, health and research organisations such as PAREA must be recognised and supported as an integral part of EU health and research policy development and implementation.
points 1-3 especially
Potentiaite and implement existing network of excellence. Create more
Protection of animal research, where necessary.
Provide researchers time to independently explore and understand the disease process, with access to nanoscale resolution microscopes.
public education against stigma towards brain disorders.
Regarding 1 such translational team was established for instance priviously at the MAx Plancl Institute of Psychiatry, Munic, Germany. Anyway this strategy should be further developed.
Shouldn't psychologists also be involved in the above initiatives?
Some additional discipline may need to be taken into account (eg. clinical Psychology)
Sounds very logical but will require serious funding and implementation. How can this be achieved..?
Stable structures and long term funding are necessary for science sustainability
The above enabling actions sound excellent, but these actions are crucial for the progress of basic scientific research in Europe also. It would be a shame if these actions were only focussed on translational environments.
The creation of shared EU contracts, or the equalization of laboral conditions throughout the EU should be revised to make sure the dignification of the research career.
The EANS is very keen to participate, collaborate and contribute to shared projects.
The hubs, multi-stakeholder associations, education and career tracks should also include many other functions so facilitate research and innovation, such as business developers, program management etc. Point 4 above seems narrow.
the n1 absolute top priority should be : The removal of legal constraints and increased flexibility for inner EU and international education.

The participation of non-profit organizations must be promoted. It is critical to connect research priorities to needs and expectations of impacted persons
The removal of legal constraints for data sharing and collarboration should be added
There should be more focus on participatory science, which, in brain research, is definitely a way for a more pertinent research and a way for new approches. Also, collaboration between different areas of research should be enhanced, for example studying the autistic brain is a perfect way to better understand the non autistic brain.
There should be more interaction between fundamental neuroscientist (e.g. ERC grants) and more applied work (Horizon Europe). Due to the separate funding schemes there researchers may work independently.
There will always be a place for smaller groups, which flexibly interact with other smaller groups. Also,
This all the above are highly important; and more funding should be available for all of these!
This list includes very relevant points, particularly, reducing scientific precarity will by it self have a very positive impact in mental health (stress, anxiety and depression among researchers).
this may come later, but what about measures to promote inclusion and equity?
too vague, what will this mean in action?
Very complex labyrinth which only ALLOWS SUPER organizations to "Pass the Test"! I tried 1 Million times, all in vain!
very welcome
We believe that such research and translational efforts could be strengthened through the addition of professionals with expertise in alcohol policy
We miss attention to public and patient involvement (PPI)
We need to remove many useless legal constraints on research. Bureaucracy is killing our research on brain-damaged patients. Even when this research is non-invasive or minimally invasive (e.g. MRI), the legal requirements are similar to those of clinical research (e.g., giving new medications). This needs to change. This research is currently considered as clinical
www.forebrain.org
You speak of translation between different languages, but it is also essential that all parts of research are translated into more simple language and terminology that the ordinary patient, like myself, can understand. This should be emphasised here. Patients are mentioned in point 6 here as an afterthought, in brackets: "(including the patients)". They should be in other points as well, such as: 2. Interdisciplinary education and training

ANNEX VIII. List of comments related to the enabling action "Encourage smart data sharing"

1. Favour open acess data bases and validation between countries
A huge problem of the smart data sharing, and the big data, in neuropsychology is the high heterogeneity of the instruments used across the world. A uniformization of the instruments used is needed to allow multicultural studies.
Add open science a d change publication economic!!
Again, a translational/cross-species approach would be important: use similar methods to measure brain function and behaviour across species, including humans, so the data are comparable and findings from animal models can be more easily applied to people.
as long as anonymity and/or patient confidentiality is strictly protected
COMPLEX! One can SIMPLIFY without "being stupíd"! Fancy super academic TERMINOLOGY does NOT mean Science & CONCRETE Results!
consider the consistency over years of studies for analytical tools
Data sharing is obviously necessary for the development of brain research, but I think also biological material sharing is fundamental for an inclusive growth of all the European researchers
data sharing is on top!
Development, extension, harmonisation, and validation of (meta)data standards should be included as a specific enabling action
EBRAINS can play an important role in making fundamental data sets openly accessible
Ensure sufficient funding and resources for maintenance and durability of initiatives
ensuring data / device security (e.g. TU Delft, NL is expert on it)
exactly what is needed and time to address these and make them open to collaborations if funds allow. reduce red tape to improve scientific collaborations and progress
Focusing on Inclusion of real-world data in datasets is blind to the methodological heterogeneity of this data collection. We should start almost at ground zero and move forward with new multidisciplinary teams the divided into constantly interacting working groups
From a PKU patient representative, Nr's 1 (1.1. and 1.2.) and 2 seem to be particularly important.
Garbage in - garbage out
GDPR legislation in EU makes collecting and sharing of personal data (even in pseudonymized form) internationally very complicated, bureaucratic and expensive. While personal data protection is very important, the very strict legislation creates obstacles for clinical research utilising existing clinical data.
Here again, participatory science is the way forward, for example developing tools to capture PROs, or calibrating the data analysis tools.
Holistic inclusion of data from the whole body e.g. microbiome.
I am rather skeptical about harmonizing and unifying standards in the medical field, due to huge differences in many respects: technical, cultural frames, patient privacy, etc.; nevertheless, it is a goal worth pursuing.
I Belize we should create an worldwide database with AI that allow us research in different pathways than others, like a free database & publisher for free to encourage new researchers to share their findings
I can only underline how important and helpful a European data base could be for the re-use and especially the combination of study data; privacy protection needs to be solved for that.
I miss a statement on the sharing of experimental (preclinical) data and tools
Include NGO/ charities in this role
increase the quality of molecular tools (ex: antibodies)
Increasing the IT resources to manage even larger data-sets is not going to solve these problems. There is a risk of hoping that more data will bring more understanding. But this is absolutely not granted.

is this feasible in the near future?
It is a difficult question to collect relevant information for the purpose of sharing. Any collection of information presupposes a theoretical model from which an order is established, whether at the clinical, biological or sociological level. As a result, the conceptual context within which the data collection takes place is as important as the data itself. However, we consider that what is observable is observable in the same way by everyone, regardless of their level of knowledge, expertise and conception. This is not true. For example, whether one knows soccer or not, the collection of important elements of the match will vary greatly from one subject to another, unless one is satisfied with very basic information such as the time and end of the match and the final score. It is therefore necessary to have several registers of information collection, particularly according to the expertise. Some are relevant because of the large number of simple markers, others because of the small number of expert approaches
it is important to set robust international cooperation programs on this issues to incorporate different actors from different region to the discussion. Governments needs to be included. Maybe you could add these issue to the biregional and bilateral political dialogues in science, technology and innovation.
Minimising national limitations (higher risk in lack of in-field knowledge of decision-makers, delayed implementation of frameworks) through binding pan european legal frameworks. Datascience (AI) approaches need to go hand in hand with hypothesis testing & science driven research.
More active usage combination of artificial intelligence and smart phones to provide better health care
Most important from my point of view is number 1.
most important one here is the real world datasets topic. Whetever neurodevelopmental or neurodegnerative diseases, it is crucial to identify the different clinical stages of progression (from a pre-symptomatic one to a severe one) and its is today difficult as not only biomarker are missing but also large clinical data sets. In addition, scales might not be sensitive especialy in the CNS field enough for such a definition so opening the gate to digital wearable sensors will provide a new type of data that might be quite usefull.
New directive passed this week , but its not in principle!! https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0197
not sure whether No1 is mature and whether it will contribute or on the contrary it will confuse more, especially in combination with No4. We could end up with huge useless and full of biases datasets
only invest in data sets that are really sustainable (like DNA) and where there is consensus that markers are established. A lot is collected that is not useful
open healthy volunteer and clinical data-sets are the most important
Patient data, information and contribution tot research programs are all based on a voluntary basis or collected and gathered on the basis of good will, general public health purpose or without their knowing/consent anonymised. Patient's dealing with the consequences of brain disorders (recovery, re-integration in society (at professional and personal level) face a lot of mental, physical and financial hurdles. Nudging and validating their contribution (comparable to the budgets and ROI's attributed to other (professional) stakeholders involved) is i.m.h.o. an important incentive to improve and accelerate research deliverables and tangible outcomes in each stage of the R&D life cycle.
Point 1 is very important and should include re-evaluation of diagnostic entities. In point 4, training of neuroscientists in computation and statistics should be emphasised, this would facilitate cooperation in big data analysis.
Providing metadata, sharing data, storing data etc cost time, effort and money. Make sure researchers get funds for this, and are recognised and awarded for it, or it will not happen.
Psychedelic clinical research could benefit significantly from the RWD approach, given that the existing data so far supports several psychedelic compounds as: i) a proven, safe substance; ii) addressing an urgent and unmet healthcare need. This makes compounds like psilocybin, LSD and MDMA strong candidates for RWD drug development. With the above criteria met, the RWD pathway for regulated drug approval for these drugs could be much faster than traditional RCT and bring psychedelic medicines to market more quickly, as a result. Given huge unmet needs in the area of mental, neurological and substance use disorder, any efforts to accelerate unlocking the therapeutic potential of psychedelic novel treatments should be treated with utmost importance because they can result in helping faster millions of Europeans who are in need of better treatment options. Moreover, given that the costs of an RWD trial are significantly lower than those of RCT's, it could help smaller drug development companies with advancing their own trials. This is of particular relevance to the psychedelic drugs market where the vast majority of companies are relatively new players, being much smaller than traditional and well established pharmaceutical companies. Consequently, RWD approach could help them with faster approval and lower costs, leading to generating revenues and profits more quickly. This can be a win-win for all players, patients and investors alike. A recent study by the Imperial College London "Can pragmatic research, real-world data and digital technologies aid the development of psychedelic medicine?" provides further evidence supporting the idea of supplementing traditional confirmatory trials with pragmatic trials, real-world data initiatives and digital health solutions to better advance the discovery of optimal and personalised treatment protocols and parameters in the area of psychedelic novel treatments. PAREA believes that psychedelic drugs

will revolutionize the treatment of mental, neurological and substance use disorders. RWD drug development can help to accelerate this revolution.
See my previous comment. Encourage (i.e. financially facilitate) sharing of methods and data between institutions. Stimulate collaboration rather than competition. Also: create an environment that supports the publication of ALL data (i.e. negative results as well).
Sign of the times.. and important, but still a lack of knowledge, training and experience among many. AVG and privacy issues need to be solved, lots of bureaucracy is a concern. Also, in a way these data-driven approaches are overvalued and too high expectations may, and are already backfiring. Eg the Human Brain Project certainly does not deliver what it promised, has cost an enormous amount for which much better, other fundamental experiments could have been done, etc. Spend your money wisely.
Smart data sharing requires study purpose sharing, i.e. enabling actions
Supporting the development of digital biomarkers in neurodegenerative disorders is vital at this point to improve clinical trials.
The development of sustainable registries across boarders, institutions and networks is a key challenges which need to be addressed. Transparant financial support for data-entry, data maintenance, management and analysis should be put in place.
the discussion about data sharing and common datasets has been around for decades and what is missing in Europe ia a european perspective for real data management in a common and shared visionis the
There is a need in a focus on reprodicibility of the results of the studies in this area
This action can also include personal science (i.e. help patients to collect their own data and answer their own research questions)
This is sensible. Especially taking the burden of data sharing and storage off individuals.
This is very important, again to speak "the same language" in terms of data sharing. I myself have worked on the Brain Imaging Data Structure (BIDS). I'm not sure if we should create specific EU actions on this or rather join existing world-wide efforts (such as BIDS). One thing that I find important, is that dedicated personal (e.g., IT personal (4)), learns how to explain something to a non-IT savvy person in a helpful/easy way.
This should be carefully planned (data mining should be carefully tabulated in order to be useful for everyone, and effective technical support would be available for researchers to adapts these data to their own research). These should be truly available for both basic and clinical researchers.
www.worldpeace2.com

ANNEX IX. List of comments related to the enabling action “Develop new technologies and innovation”

A focus about early detection is critical to develop interventions with maximum impact.
Age related disability and care should be linked to NDD research
As you say, Neuroscience has been almost abandoned by industry.
Better use of existing technologies
Biomakers are missing
brain stimulation
Define "industry" very clearly. Scientists tend to use the term in reference to pharma companies or funding partners. The definition should reach well beyond both.
Dissemination is the missing point here. Tools and practices should be developed to improve the quality of dissemination to the public (through media) and to the practitioners, in order to implement quickly new discoveries, therapeutics or best practices. Industry should also learn about participatory science as well, not only through the lens of marketing, but also to understand what the actual needs of public are and how to address them in a respectful way.
Especially novel technologies should be supported, high risk high gain, even if it also can come to a negative result.
Establishing common criteria for telemedicine and ethics- legal issues
How do you get industry back? Supporting start ups? But what about potential profits of work that is largely funded by the public?
I Belize that we should generate free protocols with AI do share with all professionals in the world allowing better results to every places in the world with translations and adaptations.
I would add longitudinal analysis
I would also add that we prioritise research and education about what we already know about brain health, to healthcare professionals and the general public, in addition to new technologies. In my own field of neurorehabilitation, there is strong evidence for the importance of intensity of practice in recovery after brain injury, yet service-level constraints and typical practice often limit the implementation of appropriate rehabilitation intensity, which adversely affects outcomes. The benefits of physical activity for brain health also have a clear evidence based, and while this overlaps with other areas (e.g. population health and lifestyle medicine), there is still benefit to the brain research community taking this on (or supporting via wearables, as indicated in one of the above priorities)
I would further emphasize point 4 - a new industrial revolution is needed
I would put more emphasis on the socio-economic aspect. Due to the potentially higher costs, there is a risk of excluding some patients from high-quality treatment due to their economic status
in parallel to digital tools in patient care, stakeholders need to negotiate imbursement of this work. The statement on industry is mailny addressing research in dementia, while childhood onset disorders see a hype and big interest by companies developing orphan drugs.
Include tecnologies to safeguard brain interventions
Industry has come back to neuroscience on most levels. Joint efforts are key.
Industry should not be leading it without the users and patients being in charge. Often the field is led by the tools and academic capacity and not the need of the subjects. A 3 way conversation is a must and the focus on the enduser the patient should never be lost sight of
Innovation and novel tech drives progress and major breakthroughs. Also, as Covid has shown, ultimately, while the original mechanisms and novel ideas come from academia, we do need the industry to develop them into patient applications, produced in the right amounts, safe etc, so yes, do promote programs that involve industry in close collaboration with academia.
instead of putting ALL the emphasis on novelty, I would put some emphasis on the wider accesibility of past data, e.g. RCT data from past decades, which are not analyzed to the depth we would like and need
Involve NGOs and charities. Look at all aspects of brain - including deterioration and care at death, and the role of palliative care
Medical charities also need to be considered

more at forebrain.org
More could be mentioned on the infrastructure as well as necessary support personnel besides the training of scientists towards making a business plan. Consider for example successful R&D hubs, incubators as exmaples
More strong points on early biomarkers (mainly peripheral) of brain damage; more input on non degenerative diseases
Most important from my point of view is number 3.
nanomedicines are key enabling technologies
not only get industry back but also politics/policy - prevention of brain/mental disorders is a key for human capital
Novel technologies: In many instances, it is not possible to evaluate clinical technology with the same standards as pharmacological treatments, because e.g. blinded comparison paradigms are not possible or feasible. Even for unblinded comparisons, for example many surgical treatments must be tailored patient-specifically. I'm afraid that requiring "same strict standards as for pharmaceutical treatments" may, at worst, completely halt development of e.g. surgical techniques and treatments. This is not to say they should not be studied, compared and validated, but the appropriate study paradigms are necessarily different than those for pharmacological therapies.
Particularly Get industry back is an important aim.
Point 4: excellent idea!
Positions should be provided, that favor team leaders engaged in technological development rather than "pure" science
Priority 4 about getting industry back could have been put on higher priority, when industry is back, chance that 'solutions' will be quicker accessible is higher, I think.
Psychedelic-assisted therapies are not standard molecular treatments. They require certain specific conditions, enveloped in a psychotherapeutic package spanning the preparation, actual treatment and after dosing integration and care. As such, the success of psychedelic medications depends on tight control of variables like the experience of the therapist team, the environment or setting in which the therapeutic is administered, and the amount of time participants spend integrating what they learn during the psychedelic session. The unique nature of these therapies will create a demand for assistive technologies that can support patient preparation, monitoring, treatment integration, and more. As the first generation of drugs move closer to approvals, many companies have begun to develop new digital therapeutics platforms that will be used to support future psychedelic therapies. While some drug development companies intend to build new in-house digital technologies, others have acquired or partnered with technology-focused companies that are already creating digital therapeutics tailored for these emerging treatments. Of particular therapeutic relevance is the actual treatment session and – until now - conditions into how these experimental treatments can be customized for optimal impact have hardly been researched. As such, more funding is needed to investigate new drug delivery technologies, different therapy modalities as well as individual biomarkers that could eventually lead to a personalized psychedelic therapy. This includes understanding better what “ingredients” can lead to the most favourable and enduring outcomes and how to optimize the delivery of psychedelic-assisted therapies. Against this backdrop, technology could be used to record what is happening in a person's brain during treatment with the goal to use the findings to customize the context of a patient's psychedelic journey by altering smells, sounds and visuals to maximize a positive outcome. By being able to precisely record and understand the experience in the moment, and then deliver stimuli to help guide it, we can help to scale it to more people in need. For this, instruments - requiring multidisciplinary cooperation - will need to be developed that will enable real-time state recording, implement through multimodal bio-sensing. This will allow for a deeper, richer understanding of the experiential aspects, sometimes called extra-pharmacological effects so that we can deliver more personalized and precisely targeted treatments.
Re 3: Many brain disorders are rare, thus criteria for common diseases HTA's are not applicable.
Security of the data !
Some of these points were described by me previously - please check if the previous comments were plausible or not
Telemonitoring/telemedicine sounds as good solution to overcome geographical distance but it is limited to certain treatment strategies and I think that it is good for maintenance and not for treatment. The latter requires profound integration and development of new bio-technologies and basic neuroscience foundations
The brain basic functional Circuit (BBFC), the functional unit of the brain, that generates the binary code, the bit, the way they are assembled in the brain, and other achievements like an electronic retina that can completely identify the obstacles have placed us in the position of proposing an artificial brain that behaves like the human one, I hope this can change the present industry.
The interface between the clinical setting and technology development is not very well structured. Is technical innovation really answering to the most pressing clinical demands? Also, I do not think that it is appropriate to utilize identical concepts, standards etc. for the evaluation of technical and e.g. pharmacological innovations. New technical solutions for a clinical problem are usually more complex including their mode of administration, and testing them within the typical RCT setting may not be appropriate.

These are all very vague ideas, not solid actions.
This is vague and directionless. Things "need to be developed" but what and by whom? Again, there is a narrow view of neuroscience as only relevant to pharma/clinical practice but there are other connections to technology and engineering that we are failing to grasp.
Translation of Research and Innovation results into economy
unclear why funds should be used for digital transformation, as these new avenues for Telemonitoring/telemedicine should derive from communications providers.
Usually, researchers and clinicians are not competent enough to develop by themselves the technological models, the relationship with industry, even the funding. Those who are able to do so are rare and have often moved away from their initial activity as clinicians or researchers. A continuous meeting between these different actors must be maintained while avoiding the pitfall of the mirage of technology that could replace thought because, in the end, there is always a human being who uses the technology with his own representations and constraints related to his own practice
Value and innovation were over valorized through the past decade. Value is not always accompanied by efficacy, deepness and personalized approaches.
we like to see a broad involvement of industry, also in view of quality of life of those living with a brain disorder.
we need more neuromodulation, DBS, etc
We would be particularly concerned about industry influence on health, in particular the influence on the alcohol industry. We promote independence within research communities from the influence the alcohol industry.
yes, we need the private sector back with a patient-centered orientation. This would be crucial.

ANNEX X. List of comments related to the enabling action "Overcome regulatory, administrative, and legislative hurdles/limitations"

1. the burden should be on the regulators, not the researchers, 3 is a very slippery slope
A focus about participatory research involving non-profit organizations is missing
As I said before: the administrative burden on animal research MUST be reduced - and harmonized within Europe - not least to avoid the 4thR (Relocation of animal research to countries with less regulations - and probably lower standards for animal welfare as well) to happen.
bioethical legislation should be made more understandable and less fluid, sometimes we get opposite recommendation from bioethical committees. Clear and logical European guidelines would be appreciated, they should include comparison from studies done from social sciences. One time they requested ISO standarts for usual computer, even it goes as far as requesting ISO standards for a pencil that patient uses. Maybe it is logical, but at least to me it doesn't look that way. This is a strict practice in our country.
Clinical data on drug development, mainly neurologic side effects of drugs must be easily acessible
could apply to any field, not just brain research
Creation of common rules is of paramount importance
deregulate research
Do not forget to cope with the trend of animal research regulatory burden.
european patents system need to be similar to US patents
European, national, and institutional regulatory procedures on animal ethics are becoming increaisngly cumbersome, restrictive, and time consuming. It is crucial that administrative, hurdles be lessened to ensure that European neuroscience can remain productive and flexible.
for the 3rd bullet - make use of a huge community of non-scientific professionals facilitating this pathway
General public, citizens and patients/stakeholders should be heavily included in this thinking. The point is to find the right balance between researchers needs and protection of the public, therefore all voices matter.
good to address this issues!
Grant money is a big hurdle and applications consume a big part of research time, while the success rate varies from 10-25%. There should be better support in the application process and only scientific contents left to researchers.
I Belize we should create an integrated database for each citizen with all medical and health data, for their smartphone to the clinical softwares, with regulamentation to exam data format to share with the national health European system
I would add common sample banks (properly regulated and following standard guidelines for sampling).
In regards to point 1, I indeed think that a mixture of top-down and bottom-up interaction will be helpful
Including NGO and charities in this. Considering all organizations, including palliative care in the consideration of brain health
Increase trust trough improved communication
It is fundamental to lighten the administrative burden related to project submission to funding agencies and also to make criteria for project selection more transparent: the latter resembles too often a lottery and the related review process appears biased, following contingent criteria that have not been disclosed.
Making new regulations to prevent limitation on research and also care
Missing: Overcome the increasing administrative and legal hurdles for animal research.

NO more rules and paper work. Bureaucracy is killing progress, health, careers. PLEASE, make such procedures short, simple and efficient
None of before statements seems to be a priority to me.
point 2 will be the main obstacle unless Europe is not doing more efforts to overcome national differences
point 3 is crucial for innovative SMEs
priority 3 higher, please.. innovations should reach patients.
re 2: This must be adressed to the current legislative process on an European Health Data Space. Re 3) The focus of incentives for orphan drugs should be on "inadequately met needs" rather than "unmet" needs. In the context of the ongoing legislative process of a new EU Orphan Drug Directive, this definition is crucial.
regulations on use of experimental animals do not contemplate the views of the researchers
Regulatory hurdles and limitations are of particular relevance to the field of research on psychedelic compounds since they are classified as Schedule I drugs — “drugs with no currently accepted medical use and high potential for abuse”. This classification has been a barrier for researchers studying these drugs’ therapeutic potentials; Schedule I substances require special approvals from regulators that take time to obtain. Overall, Schedule I led to vastly increased regulations on research, associated costs, and damaging stigma that likely deterred governmental agencies, other reputable funding bodies, and companies from backing the relevant research. Hence, these major hurdles facing research also resulted in the lack of mainstream funding. Indeed, before LSD was banned, the US NIH funded over 130 studies exploring its clinical utility; however, since the ban, it has funded none and until a few years ago, no company was committed to manufacturing medical grade psychedelics and thus procurement of the required drugs for clinical trials was almost impossible. Barriers to doing research with Schedule I drugs must be eased. Research requirements for Schedule I drugs must be loosened so that they become more similar to that of Schedule II drugs. Otherwise, those barriers will continue to restrict research, stifle competition and innovation, and inhibit access. In parallel, existing efforts should be promoted to reschedule psychedelics drugs that show the most promise in clinical research. Moving these substances to Schedule 2 would make them easier, cheaper and quicker to use in clinical trials. It is important to add that the law change would have no effect on their availability or use in a recreational context. They would still be Schedule I drugs for anyone looking to consume them outside of an approved clinical setting. PAREA invites EBRA to support the call to the Commission and the Member States to address the regulatory, financial and cultural barriers which weigh on scientific research into the use of psychedelics for medicinal purposes and on research into psychedelic compounds in general. This is in line with the Bonn Declaration on Freedom of Scientific Research adopted at the Ministerial Conference on the European Research Area on 20 October 2020 in Bonn, Germany.
Security of the data !
See formele comments/remarks
sounds beautiful but the real life is that regulations become only much and much difficult to overcome. At present in the Netherlands a study can be on hold for >1 year due to the legal issues to be handled to contribute with more than one institute to the same (inter)national study
The need of panEU legislation should be stressed
The nomenclature and understanding of psychiatric disorders among regulators is a major problem across the world.
There is always present a risk of more regulation, more bureaucracy and therefore more sclerotic research.
There must be better engagement between basic neuroscientists and clinical neuroscientists, including neurology and neurosurgery, psychiatry, neurophysiology, etc
These are extremely important points (especially items 1. and 2.)
This is another level, not of knowledge, but of letting know. This refers to the capacity to identify, at a given moment, the priorities of communication of scientific results that are acceptable in a given state of socio-cultural context without forgetting the diversity and mobility of these contexts. Here again, a prolonged, regular and respectful cohabitation of the protagonists is necessary

Vague. The best way to reduce admin/regulatory burden is to simplify the process and drop unenforceable rules, not "teach the scientists the rules".
Ways should be found for researchers to publish their results open access, without the financial burden imposed by scientific journals.
We must be diplomatic when agreeing on rules, and not let any member state have control over another

ANNEX XI. Other comments

A main challenge is to facilitate that scientists with background in the physical sciences (math, physics, computer science,..) can pursue a career in neuroscience. Today, the field is dominated by researchers with little knowledge and skills in these areas, and this I think is a key element hampering progress. The strong push-back on the Human Brain Project is an example of this.
Administration of such grants is often a burden. - This is a pity because in principle we as researchers have a strong and foremost interest to advance research, to spend the money for the best of science. The control mechanisms and sometimes the lack of flexibility presents a lack of trust and a lack of freedom. -
Adopt a lifespan perspective on brain health, from fetal life to old age. Focus on prevention. Adopt a multi-stakeholder approach including patients and caregivers, clinicians, scientists, industry and regulators to set priorities for and evaluate progress of brain research in Europe.
All the initial scientific initiatives are all extremely and equally important. The tricky part is how to prioritize them in a practical, useful and meaningful manner.
Brain health relies on the knowledge of this concept of the health community. They do not have it. a full component of brain health as a public health issue is lacking from this survey and at the end is what counts most for policy development. should be added.
Brain research should also concern the analysis of a main brain product, that is language. This means the inclusion of disciplines such as linguistics and the related analysis methods that they offer in order to interpret the social brain as well as mental diseases.
Concerning the "Fix the disease brain" point 7, in addition to investigating the common disease factors, research should also focus on understanding how certain pathologies (e.g, psychiatric disorders) affect the development and progression of neurodegenerative disorders. Additionally, we should investigate if those pathologies could also represent an important therapeutic target to modify disease progression, and improve the quality of life of patients.
Create calls for projects of small size, ie 100 k€ over two years. It is largely enough to test most hypotheses, and it will allow to found more people.
Enhance imaging infrastructure investments for poorly understood brain disorders eg. Epilepsy.
European neuroscience, especially EU FPs, is too focused on brain diseases, often defined by the current (probably incorrect) diagnostic entities. And basic neuroscience is too biology-based, students are typically trained in biology, biochemistry and medicine, too little computation in training. More emphasis on basic neuroscience and more training of young neuroscientists in maths, statistics and computation is the way forward.
Example of Ignaz Semmelweiss emphasize the importance of simple observations.
For the record: I'm replying not only as a neurosurgeon-clinician-scientist of my home institute (Helsinki University Hospital), but also as the chair of the Research Committee of European Association of Neurosurgical Societies (EANS)
Going too fast and too much novelty seeking could prove misleading. We need also to recover data from the past that are not accessible (e.g. RCT data), set a solid ground to stand (e.g. do we still believe that the serotonin hypothesis is valid for depression? Most brain banks are based on this assumption) and then plan for the future. We also need to be careful when incorporating and interpreting real-world data. I have seen disastreous interpretations which imply that real world data equal experimental data and that the sheer size would overcome biases. Unfortunately biases are not random, are systematic
good agenda: what will be the next step?
Good initiative, bit long still (took me >40 min to complets, certainly not 10 min), little space for comments, not sure how and where it is going to be used, and or how I/we could change/improve on the texts, useful nevertheless. Can we see the different texts that came along somewhere? Too bad we can not see them together after the consultation.
good luck
https://www.frontiersin.org/articles/10.3389/fphar.2021.768023/full
I am fully satisfied, no other comments.
I am fully supportive of all initiatives.
I am NOT in the brain field! I am in annex fields!
I don't feel in the position to judge the programm
I hope SEBRA will be more open and integrative than EBRA was.

I hope this consultation makes a difference. I'm pessimistic about European neuroscience for the reasons given and I think we need a radical rethink before we fall further behind the US and China.
I miss the role of patients in these actions. I think it's key to promote the active involvement of patients, through citizen science, co-creation/co-design of research, personal science. Research questions and agenda's should be formulated together with patients.
I think it is really difficult to harmonize strategies and vision and to create effective large-scale research consortia in key areas; the Human Brain Project is just an example where human envy and divergent visions precluded concerted efforts towards extremely generous research objectives. However, I remain optimistic that in the future such hurdles can be overcome and the European Research Community will be able of coherent synergic and synchronized action in ambitious wide-scale projects.
I want to highlight as a great success the concern for knowledge of the brain that has arisen in the European Union, but I want to propose as a true objective the complete and thorough knowledge of the human person, at this time humanity is made up of people who do not know each other themselves, which constitutes an insurmountable barrier to achieving true human solidarity and generates the serious conflicts that we are experiencing; but also the knowledge of themselves is what increases the length of active life, increases creativity, productivity and prosperity of people. Although it is so desirable to know the brain, THE BRAIN IS NOT ENOUGH, THERE IS SOMETHING ELSE.
I was looking out for professions such as Social Work, Law, Neuropsychology all crucial in brain injury and really endorse the need for research and career development for all who want to work in the field
In general, the topics outlined are appropriate. More emphasis should be placed on the development and validation of standards and best practices that enable data sharing and infrastructure interoperability.
In my opinion there was not enough visibility given to the importance to theoretical, computational, and technical disciplines and researchers. Please consider highlighting the importance of including these disciplines in all areas of brain research.
increase the interaction between basic scientists and clinicians on a topic and overcome institutional obstacles.
Involve policy makers to answer this survey
It currently appears that mental health is being used excessively and that references are being construed to draw political attention to issues and questions that have nothing to do with mental health, either directly or indirectly. "Mental health" must not degenerate to a political phrase.
It is important that families and caregivers are considered and included in research aimed at impoving the quality of life of those affected by mental ill health.
Like these ideas as long as the 3 way conversations are maintained and no one group is allowed to take the lead, including universities as they are not run as centres for academic excellence but a business engagement now.
More positions, European collaborations, better access to European infrastructures, change the publication systems
N/A
NDD related research, as well as dementia research, with regard to care might be linked to loss of function and dependency research
Networks should include small research institutions for Southern Europe.
Neurosurgical disorders do affect the elderly and the ageing brain, and they do present particular challenges. Such patients can often be left untreated due to biases against elderly, and it would be great if EBRA can coordinate work towards improving healthcare for this citizens, and challenging dogmas against these.
Neurotoxicology needs to be more addressed
Please beware creating conditions under which only big consortia can gain funding for brain research, and make sure small teams can still compete successfully for funding.
prevention of brain and mendal disorders is a key, understanding of health brain is therefore extremly important - this message should be communicated not only to industry but to policy makers!
prioritization in both subjects and time is essential for successful implementation of the SEBRA.
Provide sufficient resources for public and community outreach
Push the implementation of pharmacogenetics in psychiatry. Pharmacogenes have larges impact on drug metabolism than kidney failure. For some reason, clinicians do not routinely order pharmacogenetic tests but instead check kidney function.
Rare neurological diseases should have their focus.

Recognize that most opinions are not 100% likely. Maybe one is 95%. Embrace contrary evidence. If the success of an approach is 5% likely, it should be researched.
Regulations on the use of experimental animals should be re-visited. Current legislation is hindering scientific progress without providing any extra ethical dimension to our work
Research should result in benefits for the quality of life of persons and their brain disorder(s)
Shaping the future of brain research must include developing participatory science, for which tools and practices are still in the preliminary steps. I believe this agenda should include developing these practices, and highlight the need of public involvement at every stage of research (planning, designing, analyzing, writing, reviewing).
Sounds all good on paper, but how to make it happen?
Thanks
Thanks
Thanks...
the European Paediatric Translational Research Infrastructure (www.eptri.eu) is very willing to be involved
The FENS-Kavli Network also advocates for: - Greater ERC funding support, especially at the ERC Consolidator and Advanced Grant stage. - More fundamental research grant possibilities aside from the ERC itself. - More opportunities for smaller-scale collaborations. - More support for the education of graduates providing interdisciplinary (theory-experiment) training. - To favor European networks of SMALL size, formed according to the choices of the researchers - To favor calls with sufficiently broad themes. This would allow lots of researchers to apply and open the door to real novelties and not always to the richest and/or most influential groups. - To enhance communication between national representatives and researchers to better promote research priorities at the level of Europe. Our research priorities: Priority 1: Blue skies, investigator-driven fundamental neuroscience research Priority 2: Integration of computational and experimental approaches in neuroscience Priority 3: Neuroscience-inspired artificial intelligence research Priority 4: Training networks for neuroscience postgraduate education Priority 5: Open science
The Latin American Brain Health Institute (BrainLat) at Universidad Adolfo Ibañez (UAI) focus on strengthening regional and international multidisciplinary brain health research and diplomacy has empowered innovative brain health leaders across LACs. BrainLat has built an international network for neurocognitive research in dementias in collaboration with the Global Brain Health Institute (GBHI, at Trinity College Dublin and University of California San Francisco). BrainLat is also the coordinator of the Multi-partner consortium to expand dementia research in Latin America (ReDLat Project supported by the NIH NIA, the Alzheimer's Association, the Rainwater Charitable Foundation, and Global Brain Health Institute) which aims to identify the unique genetic and social determinants of health factors that drive Alzheimer's disease and Frontotemporal Dementia in Latin American Countries relative to the US (>4000 participants with assessments of genetics, cognition, and neuroimaging). We would like to contact those who lead the upcoming SEBRA plan and future activities to find common interests for cooperation.
The population size in research is critical. Thus large consortia in clinical studies should be actively encouraged.
The research, especially given the EU's overall interest, must be framed, described, disseminated and deployed in ways that are received and understood by employers, by business decision-makers, by politicians, and an attempt should be made to articulate some kind of return-on-investments - ie., what form that will take - on the funds used in this initiative.
The SEBRA agenda relies heavily on "big" organisation, and this type of research always carries a risk, that to many funds go to established researchers and mainstream confirmatory projects. On the other hand, true innovations and progress are often the result of the work of individuals and small groups. The agenda should therefore include better options for the latter group and "bottom-up"/grassroots research to become part of the overall initiative.
The SEBRA is a great initiative and I hope that it will pave the way and direct neuroscience towards the "roads not taken".....
There are areas of brain health that have been in the past and are in the present totally disregarded: chronic neurogenic and neuropathic pain, nocipalstic pain, neurorehabilitation, neuroplasticity as a tool to guide recovery from disease
This is a great initiative. Downregulation of administrative work regarding research and more straight forward access to funding will be essential to enhance research.
This is on behalf of the European Association for Palliative Care - based in Brussels, Belgium The care of people with neurological disease often requires a holistic approach, including palliative care. this allows quality of life to be maximized and planning for deterioration, including advance care planning for dying and death.
To promote research networks in neuroscience, in particular for clinical research, seems to me the highest priority. Researchers need iniatives to make connections with other researchers, specially when working at medium or small centers to make acces to others. We need to work for a connected clinical (relevant) research.

We are satisfied with the current focus put on mathematical modeling. Mathematical and computational models are essential tools to understand detailed mechanisms behind brain disease when experimental data is hard and risky to obtain.
We must remember that diversity brings more accurate results. If all member states are i) operating under the same rules and ii) relying on/sharing the same research results and data, it could result in a monopoly of methods and information used. Research results need to be 100% accurate if a larger population are going to be referring to them.
We should displace the emphasis from separate projects to pan-European infrastructures/networks that inspire and foster multi-institution collaborations and exchanges and better support continuity and cohesion.
well prepared, thank you!