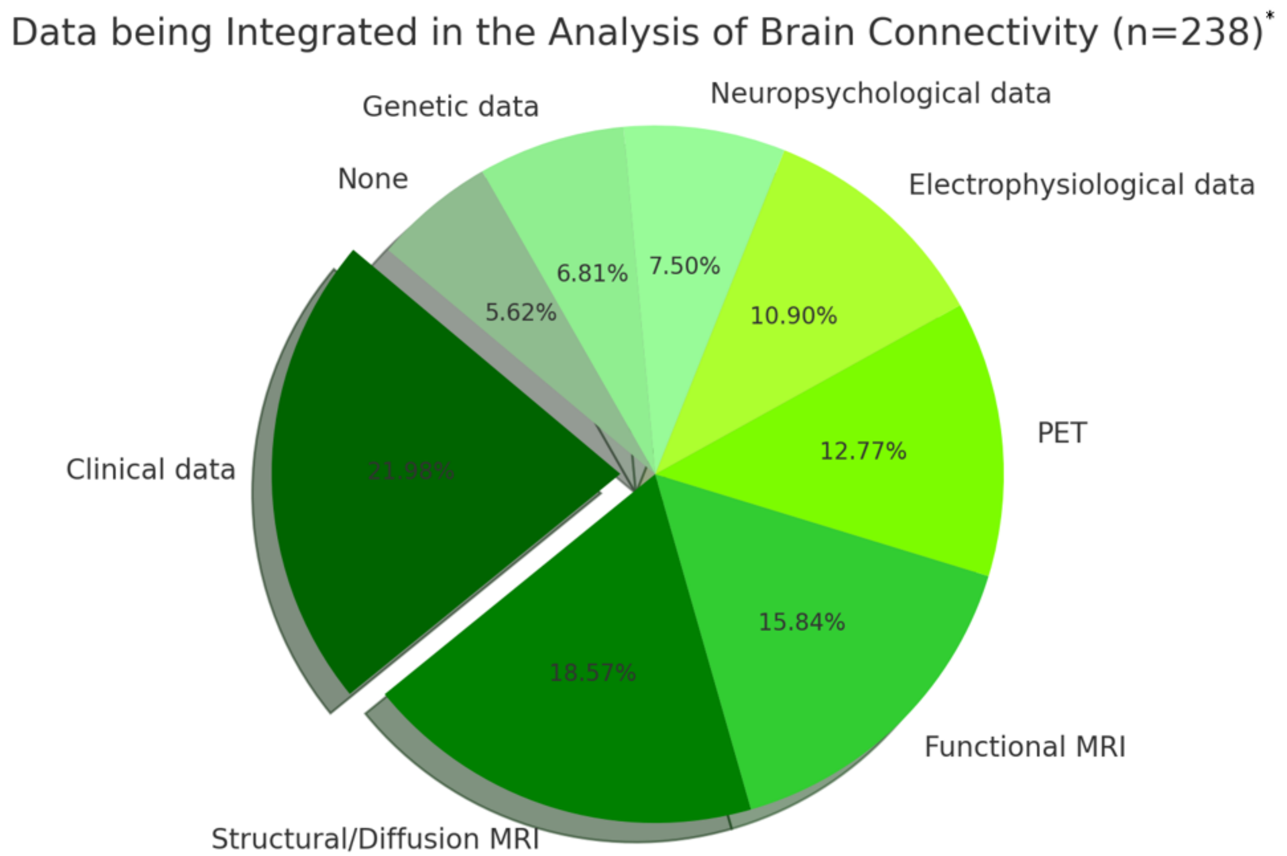
EBRAINS 2.0

D2.5 Co-design strategy for WP2



Results derived from a 2024 EAN poll applied to experts in the European neurological field regarding their experience and knowledge of connectomics research methods.

Figure 1: Integration of Data in Brain Connectivity according to EAN Scientific and Coordinating Panels.

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Keywords:	*Brain Connectivity; Clinical Data; Data Integration; Brain Research Methods*
Abstract:	The co-design strategy for WP2 summarises a collaborative and interdisciplinary approach aimed at unifying diverse expertise across neuroscience, medicine, computing, and engineering to enhance the project's infrastructure and research capabilities. Central to this strategy is the involvement of the European Academy of Neurology (EAN) to measure and raise the level of awareness among the broader neurological and scientific community about the need for harmonised data collection and preparation for exchange.

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1. List of Abbreviations and Acronyms used

Abbreviation	Meaning
EAN	European Academy of Neurology
SP	Scientific Panel
SPs	Scientific Panels
CP	Coordinating Panel
CPs	Coordinating Panels
SD	Standard Deviation
AI	Artificial Intelligence
ML	Machine Learning
SOP	Standard Operating Procedures
df	Degrees of freedom
TL	Task Leader
HIP	Human Intracerebral EEG Platform
MRI	Magnetic Resonance Imaging
DTA	Data Transfer Agreements
LB	Leadership Board
WP	Work Package

2. Introduction

"EBRAINS is a dynamic infrastructure, aiming to address and adapt to the emerging needs of the neuroscience community and brain research at large. To achieve this, a comprehensive model of the different and complementary pathways by which EBRAINS software and services can be built upon and extended by its user community at large is inherent in its architectural design."

This deliverable presents the strategy the EBRAINS 2.0 partners will follow to perform co-design activities within their respective work packages, across the entire project as well as with other project partners and external stakeholders.

Definition of Co-Design:

Co-Design is an iterative process to collect the requirements and expectations from different stakeholders and integrate them into the design and implementation of a tool, service or platform with the objective of maximizing its adoption, usability, reliability, transparency and impact. Stakeholders could be project-internal users, partners from other WPs, external users, communities, indirect beneficiaries, external institutions, society, policy makers etc.

The planning of the co-design deliverables (D1.6, D2.5, D3.6, D4.4, D5.5 and D6.5) was developed in close coordination between the work packages, and the template for the reporting was developed jointly over several iterations.

Work Package 2 is focused on achieving three critical objectives essential to advancing neuroscience research:

The first goal involves the creation of a neuro-imaging platform. This platform will be a specialised bioinformatics tool designed to securely manage sensitive clinical data

The second goal of WP2 is to process and extract features from clinical and brain scan datasets collected from a vast network of European hospitals. The aim is to derive meaningful features from these datasets that can shed light on various brain functions and disorders. Once processed, this data will be shared to promote open access and foster collaboration within the neuroscience community, potentially accelerating research efforts across Europe significantly.

The third and final goal is to acquire a new brain atlas that comprehensively maps the functional, structural, metabolic, and electrical organisation of the human brain. This atlas will be the first to correlate brain signals across multiple spatiotemporal scales in healthy individuals and will not only enhance our understanding of the human brain but also provide a critical resource for future neuroscience research.

3. Co-Design Roadmap

3.1 Identified Co-Design Activities

This deliverable provides an overview of co-design actions aimed at achieving key goals of WP2 in the domain of designing and implementing tools, services, or platforms to maximise adoption, usability, reliability, transparency, and impact. WP2 co-design actions are partially specific to WP2 but mainly integrated into actions across the EBRAINS 2.0 project as a whole. All actions are regularly monitored, and if necessary, updated along the project.

The co-design actions can be categorised along the involved stakeholders:

- amongst contributors of WP2 tasks (Table 1)
- between WP2 contributors and contributors from tasks of other EBRAINS 2.0 WPs (Table 2 and Table 3)
- between WP2 contributors with contributors from external projects (Table 4)

The identification of the co-design actions was guided by the following questions:

- What are the needs and requirements of the users of WP2-relevant tools/services/platforms?
- How can information about user needs and requirements effectively be collected?
- How can success in terms of adoption, usability, reliability, transparency, and impact of WP2-relevant tools/services/platforms be measured?
- How can the consortium effectively deliver co-design actions?

3.1.1 Co-Design Activities within WP2

This deliverable outlines the co-design strategy, objectives, and activities of WP2, which focuses on key project goals involving multiple academic institutions and research groups across nineteen centres. WP2's comprehensive approach integrates tasks such as data collection, analysis, and dissemination, coordinated by a team that includes professionals from medicine, neuroscience, and IT. This multi-disciplinary collaboration is crucial for navigating the technical and ethical complexities of the project, ensuring that the data's clinical and scientific value is maximised.

WP2 has formed three data acquisition groups managed by UNIPD, focusing on task-specific and inter-task activities. The groups, including the Pentamodal, Clinical, and iEEG, meet monthly to discuss operational issues and progress. Additionally, a technical operational meeting occurs monthly to address data sharing and processing challenges. A subgroup, that operates between tasks, focused on harmonising data acquisition practices across tasks is led by the coordinators of tasks 2.4 and 2.5.

Task 2.1 involves the deployment off a Platform for data storage, analysis, and integration, with IT specialists from UNIPD and CHUV meeting bi-monthly to ensure its effective implementation. CHUV is supporting UNIPD on implementing a corresponding platform that will be dedicated not only to EEG data but also to the storage and advanced analysis of imaging data for stroke, glioma and Parkinson. This structured approach facilitates the seamless integration and utilisation of complex data, vital for the project's success.

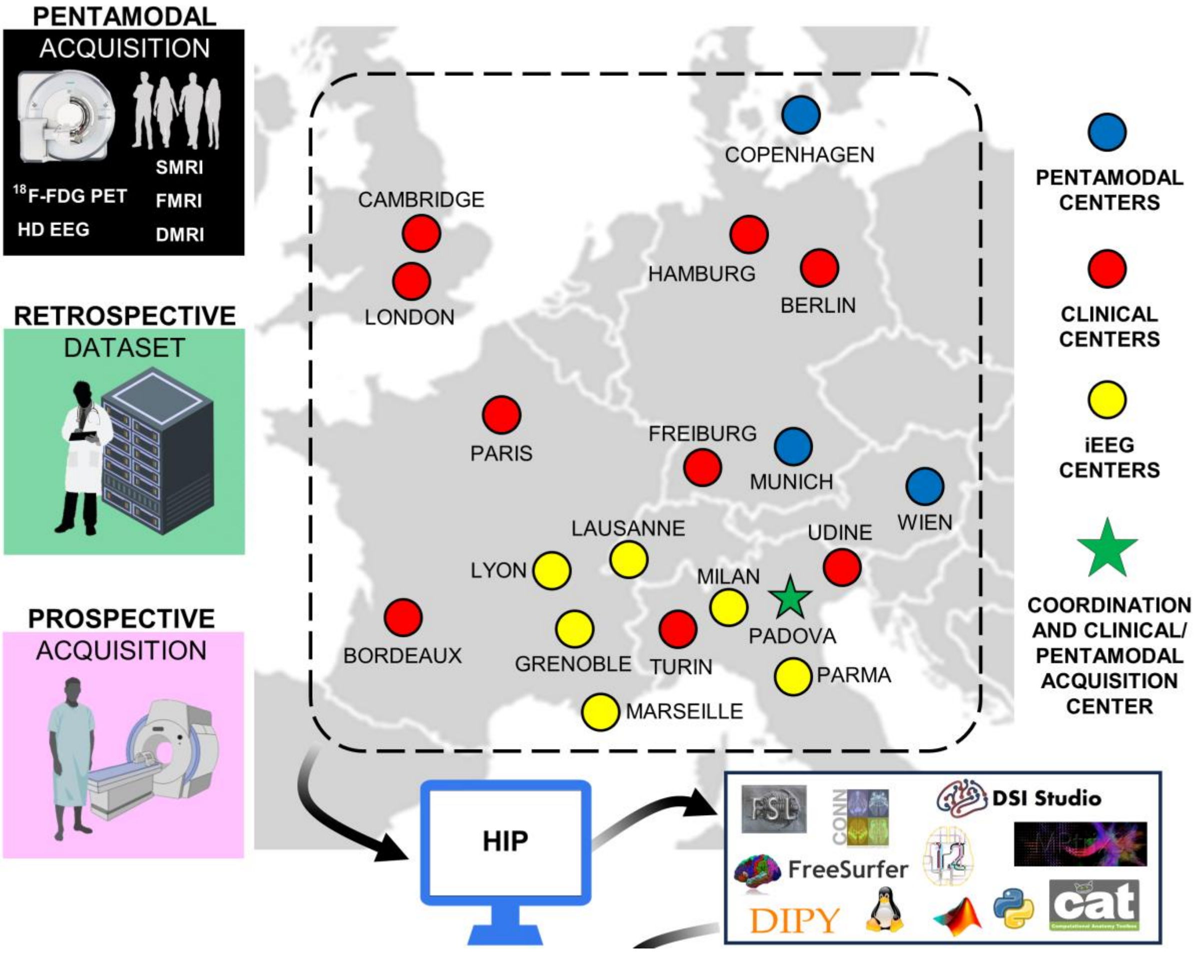

Figure 2: WP2 Centres

Table 1: Overview of Actions for co-design activities with WP2-internal stakeholders

Goal	Action	Responsible for Action (Task, WP or Person)	Time line (Project Month)	Indicators
Establish a collaborative agenda and a feedback mechanism for teamwork	Request every TL to identify what activities are foreseen to support the link between science and technology	WP leader WP manager	M1-M36	Alignment with Project Objectives, Milestone Achievement
	Provide logistical and strategic support to the WP leader, TL, and teams: ensure information flow between WP2 and project coordinators.	WP leader WP manager	M1-M36	Alignment with Project Objectives, Milestone Achievement
Collaborate to design data collection methods and tools for the acquisition of 5M connectome in healthy controls	Share the settings of the sequences and the inclusion/exclusion criteria	Task 2.2 Leader	M1-M6	Supervision
Collaborate on developing data methodologies and tools for the collection, curation, harmonisation, and feature extraction of retrospective clinical data.	Develop standardised protocols for data collection, processing, and sharing	Task 2.4 Leader	M1-M30	Supervision
Increase the amount of actionable research data and expand the uptake of the research community of the data sharing	Participate in Open Calls[1]. Evaluate the proposals and select two proposals for funding	Task 2.8 Leader	M1-M12	Two institutions leading in the field of clinical data becoming part of the consortium
HIP Platform Installation and maintenance	Identify tools and strategy to approach a co-development of the iEEG and MRI platforms (a join development of the two platforms: strategic alignment and tools and software integration). Analysis of the time of use in which the platform is functioning	Task 2.1 Leader	M1-M36	The HIP platform is accessible from the Web. Uptime percentage
Structure the data in a GDPR-compliant manner: managing ethics issues involving all participating centres, aligning with best practices in	Develop common ethical principles that all centres agree to follow. This helps in maintaining a consistent ethical standard across the consortium.	WP2 Tasks Leaders	M1-M36	Local Ethics Approval and Bilateral DTAs

[1] https://www.ebrains.eu/page/open-calls

international research collaborations				
Designing methodologies and data collection processes	Create a data container structure for sharing data within the Consortium.	Task 2.1 Leader	M1-M12	Database building
	Data retrieved from partners (Padova, Munchen, Hamburg, Freiburg, Bordeaux, London, Turin, Berlin, Udine, Cambridge, Paris) data cleaning (anonymisation check, normalisation, data conformity, pre-processing data)	Task 2.1 Leader	M1-M12	Database available
Identify co-design activities in which members of the EAN will be polled about their competence and interest in new connectomics methods to study clinical conditions.	Approval of questions	Task 2.9 Leader WP2 Leader	M2	Approved survey
	Launch survey	EAN	M3	Survey correctly uploaded to the online system and launch performed
	Analyse survey results	EAN	M4	Data base preparation
	Prepare a draft of survey report	EAN	M5	Report for review
	Approval of the Report	EAN	M5	Report approved

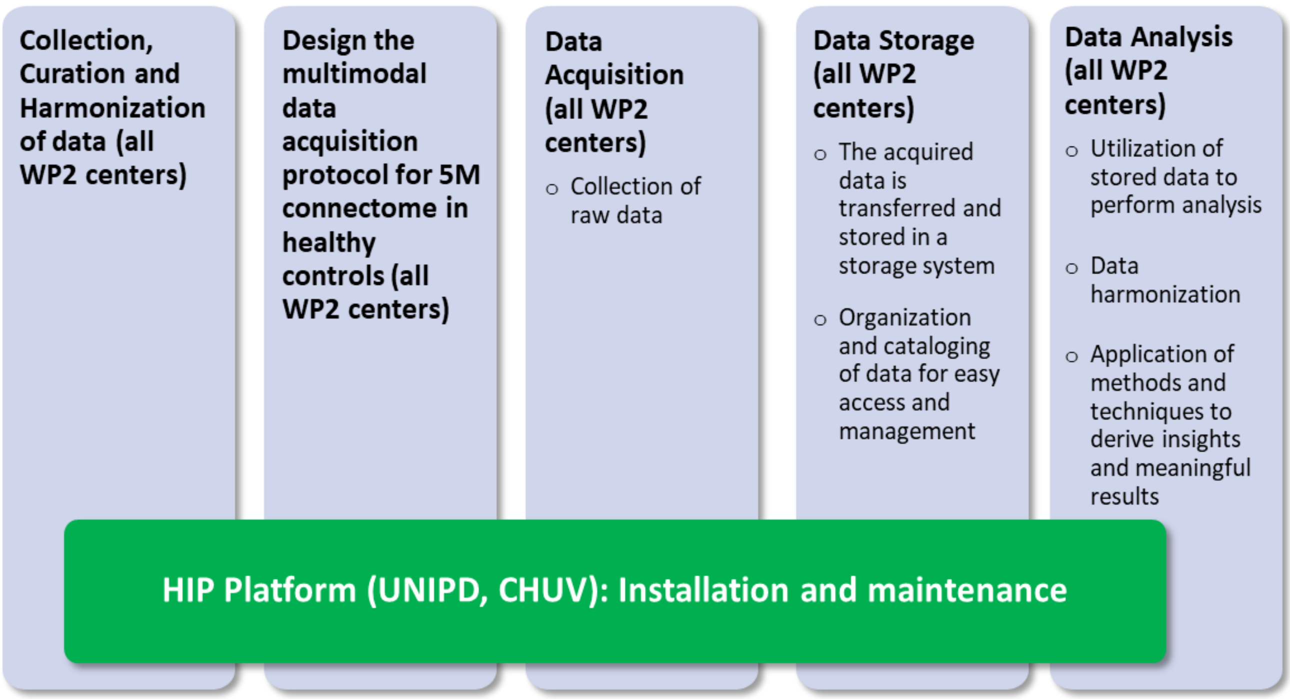

Figure 3: Co-design activities with WP2-internal stakeholders

3.1.2 Co-design activities with project-internal stakeholders

The integration of data within the EEG and HIP platforms is pursued through a co-development approach. This method emphasises strategic alignment and the integration of tools, necessitating ongoing coordination between WP1 and WP2. Meetings, based on technical needs, are arranged when needed.

The collaboration with WP3, which involves using WP2 data to highlight the application of virtual brain twins to epilepsy surgery, will materialise when the necessary data are available (presumably December 2024) to define the technical aspects of the implementation of WP2 features with WP3 modeling.

As for the coordination with WP4, once the Data Management Plan is established, we will organise bimonthly meetings to discuss the implementation of WP2 data service information into WP4.

Table 2: Overview of Actions for co-design activities with project-internal stakeholders

Goal	Action	Responsible for Action (Task, WP or Person)	Time line (Project Month)	Indicators	Co-Design Partner / Stakeholder
The development of atlases and the realization of features	Develop a toolbox for the analysis of pentamodal datasets. Link new multi-scale human datasets and connectomes in the healthy and pathological brain to atlases	Task leaders	M1-M36	Realise atlases and features	WP1, WP2
Strategic and standardised integration of dataset to EBRAINS (see figure 4?)	Coordinate strategic data categories to prioritise resource use. Identify software and data required to connect the WPs.	Task leaders	M12-M36	Roadmap for implementation	WP2, WP4
Highlight the application of virtual brain twins to epilepsy surgery	Identify the software and data necessary. Implementation of WP2 features with WP3 modeling.	Task leaders	M12-M20	A patient-specific digital brain twin	WP3, WP2
EBRAINS Education Coordination	Alignment and synergies in education activities	WP5	M1-M36	Technical coordination	All WPs
EBRAINS management	Participation in coordination meetings to ensure internal alignment (LB, WP managers, etc.)	WP6, WP7	M1 -M36	Technical coordination	All WPs

The workflows in EBRAINS 2.0 are automated, semi-automated, or more manual in nature and are closely integrated with the tools and services of the science, platform and base infrastructure services. Four showcases have been identified and described in the grant agreement (Table 3). More comprehensive descriptions can be found in D6.5. Co-design actions related to showcases are supported and coordinated by T6.5.

Table 3: Overview of showcases identified in EBRAINS 2.0 and contribution from each WP.

Showcase	WP2 involvement
Atlas-driven analysis of multimodal feature maps	Feature contribution and analysis participation
Collaborative Brain Wave Analysis Pipeline (Cobrawap)	Feature contribution and analysis participation
Personalised multi-scale brain models for the creation of digital twins in clinical applications	Feature contribution and analysis participation

3.1.3 Co-design activities with project-external stakeholders

One of the first activities towards achieving WP2 aims, implies surveying expert members from the European Academy of Neurology (EAN) about their competence, interest, and knowledge of new connectomics methods for studying clinical conditions. It is of interest to measure and raise the level of awareness among the broader neurological and scientific community about the need for harmonised data collection and preparation for exchange. By gathering neurologists' initial impressions, the goal is to identify standard operating procedures for best practices in data exchange on virtual platforms.

EAN's scientific and clinical community reunites a representative sample of experts in the European neurological landscape. The Scientific Panels (SPs) and Coordinating Panels (CPs) of EAN serve as the scientific backbone of neurological activities in Europe. Currently there are 28 SPs and 4 CPs. Each panel is integrated by key specialists in the various fields of neurology who participate in the scientific initiatives undertaken by EAN. This includes coordinating clinical research, promoting good clinical and research practices, contributing to the planning of EAN's annual congress, and developing guidelines to aid neurologists in their daily clinical practice (for further information on their roles, topics and structure please visit EAN´s dedicated webpage: https://www.ean.org/home/organisation/scientific-coordinating-panels).

To collect the necessary information on connectomics, all EAN SPs and CPs were sent a short poll, explaining the aim of the survey and the research context (EBRAINS 2.0, a new project facilitating connectomics research in neurology).

3.2 Co-Design Poll

Table 4: Overview of Actions for co-design activities with project-external stakeholders

Goal	Action	Responsible for Action	Time line	Indicators	Co-Design Partner Stakeholder
Delimitation of target sample and key topics of interest	Together with WP2 leadership identify the main topics to get polled among the scientific European neurological community.	WP manager (EAN, UNIPD)	M2		EAN Scientific Committee
Draft of the initial survey´s items	Together with WP2 leadership identify how to inquire about connectomics key topics and survey´s item format (e.g.,	WP manager (EAN, UNIPD)	M2		EAN Scientific Committee

	open ended questions, multiple choice, etc).				
Survey design and dissemination	Set-up the survey in a specialised online survey system and distribute it among EAN Scientific and Coordinating Panels.	EAN	M6	Reach 80% of represented neurological sub-specialities	Project external stakeholders
Data analysis and Report	Together with WP2 leadership identify the main results and content of the report	EAN			EAN Scientific Committee

3.2.1 Methods

An *ad hoc* questionnaire was distributed among EAN community in late March of 2024. This was shared via email with EAN´s SPs (n=28) and CP's (n=4).

Sample

EAN SP and CP members constitute a group of n=1.239 experts in various neurological specialities. Within these groups there are different positions and roles such as individual members, representatives from European national neurological societies, neurologists still in training and senior neurologists (see EAN´s SPs members[2]).

Instruments

The survey consisted of 18 items, starting with a socio-demographic section. The second part explored participants' interest in, familiarity with, and current use of connectomics.

Procedure

EAN SPs and CPs´ members were contacted by email. For those who did not reply, a reminder was sent on three occasions.

After the initial seven socio-demographic questions, participants were given the option to continue responding to more specific questions about connectomics or to conclude the survey. No economic or other form of compensation was offered for completing the questionnaire.

3.2.2 Results

A total of 1.239 EAN SP and CP members received an email with a link to the online survey. Of these, n= 344 panel members clicked on the link and completed the survey up to its first section (response rate of 27.9%). The SP Multiple Sclerosis provided the majority of the answers (n=50; 14.5%), followed by the SP Movement Disorders (n= 39; 11.3%). Respondents predominately came from Italy (n=60; 17.4%), Germany (n=22; 6.4%), and Portugal (n=16; 4.7%).

[2] https://www.ean.org/home/organisation/scientific-coordinating-panels

3.2.3 Section: Socio-demographics

Table 5 below summarises the first section of the survey, displaying various descriptive measures. Percentages are presented for the entire sample and are also broken down into groups: those who continued to section 2 (group1), those who did not (group 2), SP Multiple Sclerosis (SP with the highest participation rate).

Table 5: Sociodemographic characteristics of the sample

	Whole sample	Group1[a]	Group2 [b]	SP Multiple Sclerosis [c]
Participants [n, (%)]	344 (100)	238 (69.2)	106 (30.8)	50 (14.5)
Age [Mean (SD)]	48.6 (12.1)	47.7 (11.6)	50.5 (13.1)	48.6 (13.5)
Most frequent country of practice [(n, (%)]				
- Italy	60 (17.4)	49 (20.6)	11 (10.3)	8 (16.0)
- Germany	22 (6.4)	11 (4.6)	11 (10.3)	1 (2.0)
Institution type (n, %):				
- University Hospital	275 (79.9)	200 (84.0)	76 (71.0)	39 (78.0)
- Public Hospital	79 (23.0)	50 (21.0)	29 (27.1)	13 (32.0)
- Research Facility	31 (9.0)	22 (9.2)	9 (8.4)	4 (8.0)
- Private Hospital	25 (7.3)	16 (6.7)	9 (8.4)	2 (4.0)
- Private Practice	25 (7.3)	20 (8.4)	5 (4.7)	5 (10.0)
- Outpatient Service	21 (6.1)	17 (7.1)	4 (3.7)	4 (8.0)
Monthly hours dedicated to research [Mean, (SD)]	48.1 (38.7)	51.5 (39.6)	40.3 (35.5)	53.4 (43.1)
Importance of connectomics in research [n, (%)]				
Highly important	94 (27.3)	83 (34.9)	11 (10.3)	14 (28.0)
Important	137 (39.8)	101 (42.4)	36 (33.6)	22 (44.0)
Neutral	88 (25.6)	45 (18.9)	43 (40.2)	12 (24.0)
Not important	25 (7.3)	9 (3.8)	17 (15.9)	2 (4.0)

a Participants interested in completing the whole Survey.
b Participants completing until item 8.
c SP with highest response rate (14.5%).

As can be seen in table 5, a high proportion of the sample works at a university hospital (80.0%, n =276) and considered the new methods in connectomics as important (39.7%, n= 137).

For a complete overview of the 10 panels with the most replies, please see figure 5 below.

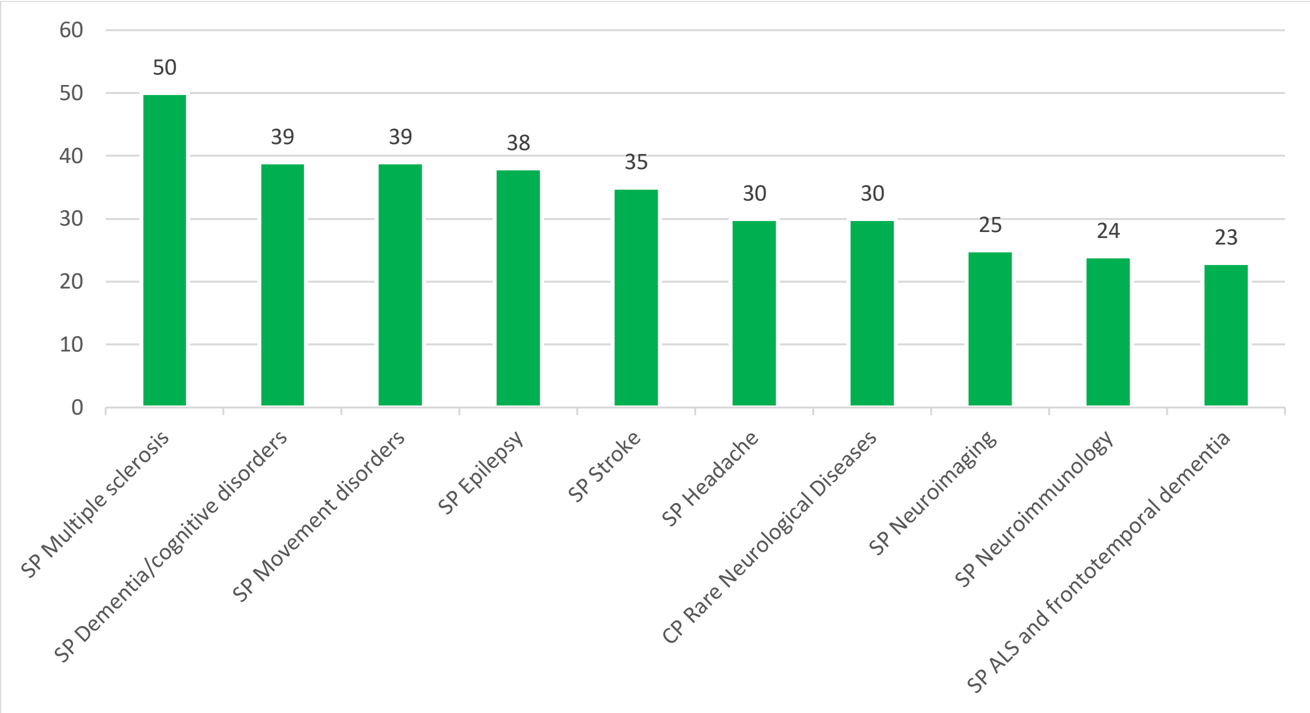

Figure 4: Ten most respondent EAN Scientific Panels

When participants were asked to describe their neurological speciality, open ended responses were provided. These were grouped by thematic categories. The most frequent ten categories were identified as follows: Movement Disorders (n= 49); Dementia (n= 31); Epilepsy (n= 30); Neuromuscular Disorders (n= 22); Stroke (n= 21); Clinical Neurophysiology (n= 14); Neuroimmunology (n= 14); Amyotrophic Lateral Sclerosis (n= 11); Multiple Sclerosis (n= 11) and Vascular Neurology (n= 10). For a full overview please see figure 6 below.

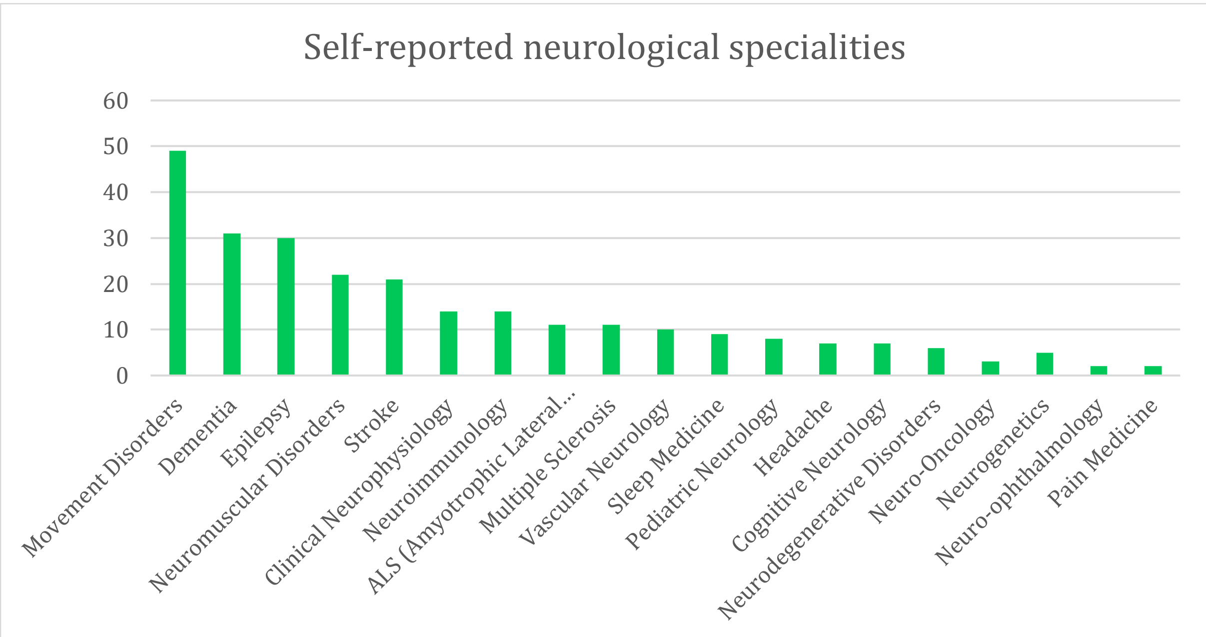

Figure 5: Most frequent neurological speciality as reported by the respondents

After the first socio-demographic questions, participants were asked whether they wished to continue with the questionnaire or preferred to conclude it (in case they were not interested in the topic of connectomics). A total of 69.0% (n=238) of the sample chose to proceed to the second section (connectomics related items).

To further understand these first results, we subdivided the sample in two groups (continue/finalize).

Group1 members (those who chose to complete the entire survey) were significantly younger and were more likely to work at a university hospital (84.0%). Additionally, they invested significantly more hours in research per month (see table 6).

Table 6: Socio-demographic differences between group1 and group2

Socio- demographics	Groups			
	Group1	Group2	df	p-value
Age [mean (SD)]	47.7 (11.6)	50.5 (13.1)	185	0.03
Research in hours per month [mean (SD)]	51.5 (39.6)	40.3 (35.5)	223	0.004

[a] *t-Test: Two-Sample Assuming Unequal Variances*

3.2.4 Section: Connectomics

Table 7 presents a summary of the responses provided by the group of participants who consented to complete the entire survey (group1).

Table 7: Reported interests and types of data used in connectomics.

	Yes [n, (%)]
Interest in the connectomics research methods in neurology	171 (83.8)
Experience with connectomics methods	57 (27.9)
Type of data used	
Clinical	129 (63.2)
Structural/Diffusion MRI	109 (53.4)
PET	64 (31.4)
Electrophysiological data	33 (16.2)
Neuropsychological data	93 (45.6)
Genetic	40 (19.6)
None	44 (21.6)
Use of AI / machine learning methods for data analysis	66 (32.4)
Existent challenges within the field of connectomics	101 (49.5)
Willingness to share data on connectomics	135 (66.2)
Interest in receiving training in the field of connectomics	159 (77.9)
Interest in receiving training on data sharing	163 (79.9)
Interest in standardising acquisition protocols	170 (83.3)

As can be seen in table 7, only 27.9% reported having previous experience with connectomics methods. A high proportion of group 1 also reported interest in standardising acquisition protocols (83.3%) and receiving training on data sharing (79.9%).

Additionally, clinical (63.2%) and structural/diffusion MRI (53.4%) data were the most frequent types of inputs with which respondents reported working with, followed by PET images (31.4%). Further details on the percentage of answers are shown in figure 7.

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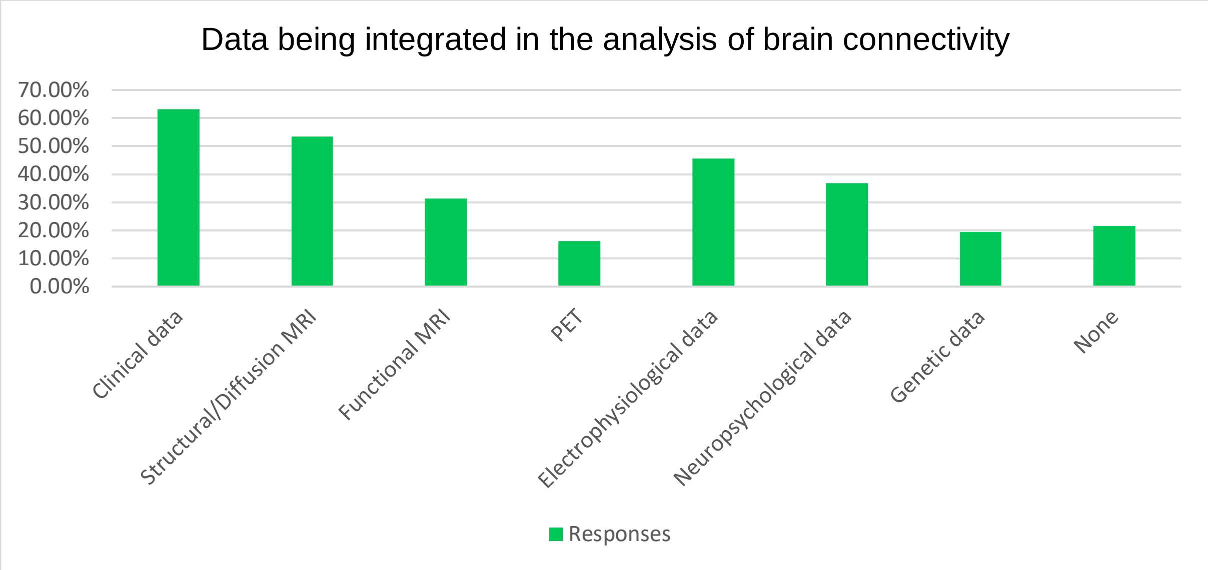

Figure 6: Type of data being integrated in the analysis of brain connectivity

3.2.5 Qualitative content analysis

For the open-ended responses, a qualitative analysis was implemented. Main thematic categories were identified for each question. A summary of the most frequent topics raised per item is presented below.

3.2.5.1 Interest in the connectomics research methods in neurology

From the n=238 participants (group1), only n=118 provided further qualitative input to this item. Responses reflect a diverse range of interests in connectomics research methods in neurology, spanning from basic science exploration to clinical applications, with a focus on understanding disease mechanisms, improving diagnostics, and developing targeted therapies. There was a strong emphasis on utilising advanced imaging techniques and computational methods to study structural and functional connectivity in various neurological disorders. The 10 main identified categories can be described as follows:

- Research Focus on Specific Neurological Disorders
- Interest in Connectomics in Disease Diagnosis, Classification, and Progression
- Research Methods and Techniques
- Clinical Applications of Connectomics
- Connectomics in Neurodevelopment and Plasticity
- Basic Science and Methodological Interests
- Interest in Specific Techniques and Modalities
- Impact of Connectomics on Clinical Practice and Research
- Focus on Brain Connectivity in Functional and Structural Terms
- Interest in Non-Invasive Neuromodulation Techniques

3.2.5.2 Experience with methods for generating connectomes from imaging data and how to integrate connectomes with other sources of data (clinical, genetics, etc.)

A total of n=41 participants provided open-ended responses. Thematic clusters capture the diversity of experiences with methods for generating connectomes from imaging data and integrating them with other sources of data. Emerging categories identified from the content analysis are:

- Experience with Imaging Methods for Connectome Generation
- Integration of Connectomes with Other Data Sources
- Specific Research Focus and Applications
- Analysis and Methodological Approaches
- General Research Experience
- Limited Experience or Non-Imaging Methods

3.2.5.3 The type of data being integrated in the analysis of brain connectivity

For this item, only n=9 participants provided open ended input. Different types of data were mentioned as being integrated into the analysis of brain connectivity, along with some responses indicating limited or no experience in this area. Main categories identified from the provided responses are:

- Imaging Data Integration
- Biological Data Integration
- Methodological Approaches
- Limited or No Experience with Data Integration

3.2.5.4 Do you use AI / machine learning methods for data analysis

A total of n=42 responses were provided. For this item, answers mention the various levels of involvement and expertise in utilizing AI/ML methods for data analysis, along with some responses indicating limited or no experience in this area. Main thematic categories identified are:

- Use of AI/ML Methods
- Limited or No Experience with AI/ML Methods

3.2.6 Perceived current challenges within the field of connectomics

For this question, n= 71 participants provided their input which is an overview of the current challenges in the field of connectomics, covering technical, regulatory, interpretational, and translational aspects, as well as the need for collaboration, training, and regulatory compliance. Main identified clusters are:

- Data Collection and Standardisation
- Technical and Computational Challenges
- Interpretation and Clinical Utility
- AI and Machine Learning
- Translational Challenges
- Collaboration and Training
- Reproducibility and Validation
- Regulatory and Legal Challenges

3.2.6.1 Willingness to share data on connectomics

In this case, n=62 participants provided input to this item. Overall, this item provides insights into respondents' willingness to share data on connectomics, their considerations, the types of data they are willing to share, and the conditions or uncertainties associated with data sharing. Main categories can be described as follows:

- Willingness to Share Data
- Specific Types of Data for Sharing
- Data Sharing Considerations
- Availability and Access to Data
- Potential Data Sharing Conditions
- Interest in Sharing Future Data
- Unfamiliarity with Data Sharing
- Uncertainty and Conditions for Sharing

3.2.6.2 Interest in receiving training in the field of connectomics

A total of n=62 answers were obtained for this item. In general, participants positively responded to receiving training in connectomics. They also expressed their desired topics of training, uncertainties concerning the training, interest on behalf of others, desired training formats, and interest in specific fields or applications. Main identified categories are:

- Interest in Training
- Specific Topics of Interest
- Uncertainties
- Interest on Behalf of Others
- Interest in Specific Fields or Applications
- Desired Training Formats
- Interest in Basic and Advanced Training
- Interest in Data Analysis and Visualisation
- Interest in Understanding Connectivity and Pathology
- Interest in Various Aspects of Connectomics

4. Outlook

This deliverable outlines the context, objectives, and activities of WP2, central to the project's aims. Regular meetings facilitate WP2, integrating various stakeholders and addressing the dynamic needs of the scientific community to maintain a high-end, effective research infrastructure.

A study assessing European experts' knowledge and interest in connectomics methods, advocating for increased standardisation and training is highlighted These enhancements are vital for their broader integration into clinical and research settings. It recommends future efforts focus on fostering collaboration across Europe to address the identified technical and educational needs.

WP2's co-design activities engage various academic institutions and research consortia, involving all categories of EBRAINS users. This inclusive approach is critical for continuous feedback, essential for developing a research infrastructure that meets and adapts to diverse user needs. The processes are strategically designed to effectively identify and remedy any overlooked needs.

Overall, WP2 aims to establish a robust and responsive infrastructure that aligns with scientific demands and is integrated within the EBRAINS ecosystem. This strategy is intended to exceed user expectations, ensuring the developed research infrastructure is comprehensive, forward-thinking, and fully compatible with EBRAINS.

Through sustained collaboration and adaptation, WP2's co-design efforts are expected to yield a research infrastructure that superbly supports both science and technology within the EBRAINS framework.

Furthermore, a survey by the European Academy of Neurology involving 1,239 members from 32 panels revealed significant interest in connectomics, with 344 responses received. Results indicate that 80% of respondents work at university hospitals, about 40% see the importance of new connectomics methods, yet only 28% have prior experience. There's a strong inclination towards standardising protocols and enhancing training on data sharing. Commonly used data types include clinical data, MRI, and PET images.

Responses highlight connectomics as a relevant field. Results emphasise the use of imagining techniques and computational methods to study structural and functional connectivity. Likewise, EAN panel members anticipate significant advancements, particularly with the application of Artificial Intelligence (AI) methods to interpret increasing levels of data on brain connectivity, in both healthy and non-healthy individuals. Additionally, challenges to be approached imply technical, regulatory and translation aspects as well as the need for collaboration, training, and regulatory compliances.

In conclusion, the position for WP2 is one of growth, innovation, and collaboration. Moving forward, the continual integration of new data, technologies, and collaborative efforts will be essential in achieving our ambitious goals and setting new standards in the field of neuroscience.