

Empowering brain health: science-based communication strategies in GetBrainHealthy

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I. The concept of brain health

The importance of brain health.

As longevity and a knowledge-based society become increasingly prominent, maintaining brain health is more crucial than ever. Our cognitive functions influence every aspect of our lives, from learning and working to emotional well-being and social interactions. Despite its importance, brain health often remains overlooked and misunderstood.

Challenges in promoting brain health.

Promoting brain health involves overcoming several challenges (Illes et al., 2010): The **complexity** of the functioning of the brain and cognitive aging can be overwhelming, especially for younger generations who may not recognize the long-term impact of their current habits. Furthermore, the **stigma** surrounding mental health and cognitive issues remains a barrier. Many individuals hesitate to address their concerns due to fear of judgment or misunderstanding, making it difficult to foster open dialogue. Additionally, effectively communicating brain health science requires navigating **personal, philosophical, and religious beliefs** while also addressing the brain's intricate nature. Lastly, one should not forget the challenges that bring the current **fast-paced, dopamine-driven world** of screens and social media, as well as the segregated spaces of exchange and news consumption that limit exposure to diverse viewpoints and information.

II. Principles of science communication in GetBrainHealthy

Our mission.

To address these challenges, GetBrainHealthy incorporates scientifically validated strategies into our outreach efforts. Our goal is to make brain health accessible and understandable through interactive, science-based, in-person workshops and other outreach activities. GetBrainHealthy aims to raise awareness and educate individuals, particularly those aged 18 to 50, on the importance of brain health and to spark curiosity to further explore and enhance their cognitive function.

Development of the workshops.

To complement our getbrainhealthy.org website, we develop workshops in collaboration with user representatives from our partner companies and organizations, as well as end-users and participants. This co-design approach is crucial for tailoring methods to the target audience, ensuring our workshops address each partner's unique challenges and requirements, and making brain health education relevant and impactful. By clearly identifying the personas that make up this audience, and recognizing the drivers and barriers to change, we can create more effective and engaging workshops.

Research-based, theory driven and transparent.

Our science communication is research-based and theory-driven, using clearly stated and traceable sources. We rely on peer-reviewed journals, textbooks, expert-informed reports, and expert opinions for reliable information. On controversial topics, we use multiple sources and diverse experts to reduce echo chambers and confirmation bias, thereby enhancing critical thinking. We also commit to open science whenever available and commit to clearly communicate the uncertainty around neuroscience (Bertemes et al., 2024; ENJOI - ENGagement and JOurnalism Innovation for Outstanding Open Science Communication, 2023; Olesk et al., 2021; QUality and Effectiveness in Science and Technology communication, 2021).

Accessibility and inclusion.

Our science communication efforts aim to be accessible to all, including less science-educated, hesitant, or disadvantaged groups. Furthermore, we believe it is essential to ensure our workshops accommodate people with physical disabilities. Additionally, to make our workshops as accessible as possible regarding the multilingual aspect of Luxembourg, we aim to keep our slides and material as text-free as possible (mainly visual communication) and adapt the spoken information to the preferred language of the audience (DE, FR, ENG, LUX).

III. Characteristics of the GetBrainHealthy workshops

Communicating urgency with empowerment: Applying positive emotion strategies and cognitive-emotional learning.

Emotions play an important role in learning and memory. Information that is emotionally relevant is more likely to be remembered (Ghanbari et al., 2019; LeBlanc et al., 2015; Mahan & Stein, 2014; Nationales Institut für Wissenschaftskommunikation (NaWik), 2021; Tyng et al., 2017). While some researchers suggest that positive emotions can enhance cognitive function and improve the learning experience through the release of dopamine, and that negative emotions such as anxiety can inhibit cognitive activity through the release of stress hormones, the evidence remains inconsistent regarding the overall impact of emotional valence on learning (LeBlanc et al., 2015). We nevertheless chose to follow the recommendations from a recent publication highlighting the importance of using **positive, proactive and action-oriented language** in brain health communication, and avoiding solely negative fear-inducing communication (Booi et al., 2025). Especially for middle-aged men, it is recommended to frame mental/brain health promotion as a journey of personal development or skill-building. Using action-oriented language such as *'improving your mental fitness'* or *'sharpening your mental edge'* makes the concept of mental health more about empowerment and growth, rather than a sign of weakness or vulnerability (Sharp et al.,

2024). Additionally, we chose to use **positive wording** like *'brain health'* instead of negative terms such as *'dementia prevention'*.

All in all, we aim to emphasize the importance of taking action now for long-term brain health, highlighting the need for early intervention and prevention. We frame brain health as a continuous process of building habits and skills, encouraging the mindset of *'train your brain like you train your body'*. This approach underscores that brain health is an ongoing effort and reflects scientific knowledge on neuroplasticity.

Meaningful learning strategy.

At GetBrainHealthy, we prioritize meaningful learning strategies to ensure participants gain a deep understanding of the material and can integrate it with their existing knowledge. This approach is reflected in their ability to apply what they learn to new situations, making **the information practical and relevant to their daily lives**.

As recommended by the Centre for Disease Control and Prevention (CDC) in their effective health education curriculum, it is important to **build on previously learned concepts** and skills and provide opportunities to reinforce health-promoting behaviours (Centre for Disease Control and Prevention, 2019). Our goal is to teach information that can be easily incorporated into participants' routines to maintain or improve brain health, with a focus on immediate benefits. When developing actions to drive behavior change, we aim to apply the **SMART method**—Specific, Measurable, Attainable, Relevant, Timely—to ensure that participants can set and achieve realistic goals that support their brain health journey.

Additionally, we leverage **health psychology insights on habit formation** and maintenance, emphasizing the importance of creating and sustaining positive habits through cues, routines, and rewards. This approach helps participants develop lasting behaviors that support their brain health.

Inspired by the **neuroeducational approach**—an interdisciplinary field that combines insights from neuroscience, psychology, and education to enhance teaching and learning practices—we aim to provide learners with a foundational understanding of brain function principles and concepts. Each workshop begins with the "Know Your Brain" module, offering a brief and simplified overview of brain basics such as anatomy, neuronal communication, plasticity, cognitive reserve, habit formation and breaking, and the influence of social and emotional factors on learning. This foundational knowledge sets the stage for more advanced topics and practical strategies (Ghanbari et al., 2019; Mahan & Stein, 2014; Pradeep et al., 2024).

Recognizing that adults prefer to learn "here and now," we ensure that the concepts presented can be immediately and easily integrated into their daily lives. This approach not only enhances engagement but also empowers participants to take actionable steps towards improving their brain health (Mahan & Stein, 2014).

Apply relatable language, visuals and metaphors.

Our messages and applied **language** should be both simple and original enough for the audience to remember. When scientific or technical terms are necessary, we define or reword them in plain language, specifying the scientific term and providing **visual analogies** to illustrate abstract concepts (e.g., sulci and gyri as brain wrinkles) (Bertemes et al., 2024; Borowiec, 2023; Nationales Institut für Wissenschaftskommunikation (NaWik), 2021; Olesk et al., 2021; Public Health Communication Collaborative, 2023; Sharp et al., 2024; Visser et al., 2021; World Health Organisation, 2017). Furthermore, when dealing with particularly large or small numbers, we aim to give readers a sense of scale by using analogies and comparisons (Bertemes et al., 2024). For example, the 86 billion neurons in the human brain can be compared to approximately 10 times the current world population. Furthermore, we aim to adapt the communication strategy to each workshop group, reduce the complexity of neuroscience into straightforward language, and focus on essential information needed to understand each concept (Nationales Institut für Wissenschaftskommunikation (NaWik), 2021). However, we recognize the challenge of avoiding oversimplification, which can lead to inaccuracies (ENJOI - ENGagement and JOurnalism Innovation for Outstanding Open Science Communication, 2023; Olesk et al., 2021).

A powerful way to optimize learning is by using **visual messages**, by using pictures, images, infographics or graphics interchange formats (GIFs) (Bertemes et al., 2024; Ghanbari et al., 2019; Martinez Escobedo et al., 2024; Nationales Institut für Wissenschaftskommunikation (NaWik), 2021; QQuality and Effectiveness in Science and Technology communication, 2021; Visser et al., 2021; World Health Organisation, 2017). The use of visuals in health communication has been shown to positively influence attention, comprehension, recall, and behavior (Houts et al., 2006). Based on recommendations (Riera et al., 2023; Visser et al., 2021), we chose numerical communication over nominal communication. For example, saying *'If you exercise for 30 minutes a day, you can reduce your risk of heart disease by 20%'* is more effective than *'Regular exercise is good for your heart'*. When using numbers, natural frequencies (e.g., *'3 out of 10'*) are preferred over percentages (*'30%'*). Additionally, absolute risk, the actual chance of an event happening, such as *'4 out of 100 people will develop a disease'*, is more informative than relative risk, which compares risk between groups, such as *'smokers are twice as likely to develop a disease as non-smokers'*.

Furthermore, we make use of conceptual and visual **metaphors**. They are an effective strategy to communicate about a complex health topic such as the brain and mental health (Kendall-Taylor et al., 2013; Lazard et al., 2016; Mohanty & Ratneshwar, 2015; Sopory & Dillard, 2002). Messages that use metaphors, visually or linguistically, have the ability to attract the viewers' attention, spark their curiosity, and stimulate elaboration about the issue (Mahan & Stein, 2014; Mohanty & Ratneshwar, 2015). However, we are aware that their effectiveness in improving comprehension can vary due to cultural differences and the cognitive effort required to interpret them. Combining visual metaphors with text can help mitigate these challenges and enhance overall message clarity (Lazard et al., 2016). The use of metaphors and masculine associations has been recommended especially for promoting brain/mental health to middle-aged men, a hard to reach population in public health communication (Sharp et al., 2024). For instance, phrases like *'recharge your battery'* tap into familiar concepts of physical energy and recovery, making the idea of mental rest easier to accept.

All in all, we strongly believe that using language, metaphors and visuals that connect with people's daily experiences, will make our messages more engaging and accessible.

Engagement and interactivity.

Learning and retention improve when learners actively engage with the material, as functional changes in neural circuitry associated with learning occur best under these conditions. We aim to achieve **interactivity** by breaking the learning sessions with polls, quizzes, challenges, games, discussions, and hands-on activities (Ghanbari et al., 2019; Mahan & Stein, 2014; Olesk et al., 2021; Pradeep et al., 2024).

We aim to apply **multimedia learning** tools, such as Mentimeter, in diverse settings. For example, we use it to evaluate participants' beliefs on brain health and collect feedback. Additionally, we use it in a **gamification** setting for our neuromyth game as a voting tool to enhance critical thinking to debunk misinformation in brain science. This neuromyth game not only aims to debunk - explaining why a piece of information is untrue and demonstrating what is true - also aims to prebunk - warning individuals in advance about manipulation attempts, misleading strategies and equipping them with tools to recognize possible misinformation. For debunking, we follow the recommendations summarized in the The Debunking Handbook (Bruns et al., 2024; Lewandowsky et al., 2020; Organization for Economic Cooperation and Development (OECD), 2022).

Furthermore, we apply **multimodal learning strategies** to enhance the learning process. Multimodal teaching involves using multiple approaches to present the same information through different sensory channels. The more varied the methods, the more effective they become, as engaging multiple senses leads to better encoding of information (Ghanbari et al., 2019; Mahan & Stein, 2014; Olesk et al., 2021).

We use this method in several modules. For instance, in our default module 0 "Know your Brain", we will introduce the brain using multimodal descriptions that connect it to everyday items (QUality and Effectiveness in Science and Technology communication, 2021). We will illustrate the brain's texture and neutral scent by comparing it to tofu, and its weight to a 1kg bag of flour. We may use mindfulness exercises that involve deliberate attention to sensory stimuli. Recent findings suggest that participants who physically enact the concepts learn more effectively than those who only observe (Stull et al., 2018). To enhance the sensory experience, we will provide 3D brain models and encourage participants to actively engage with them, exploring the different brain lobes.

Distributed/spaced learning and repetition.

The human brain only has a limited capacity for attention and information processing. To spread study effort over multiple smaller sessions and to maximize learning in small doses, we have planned activities to loosen up the workshop and avoid cognitive overload (Cutting & Saks, 2012; Ghanbari et al., 2019). Information can be best consolidated with cognitive **breaks**, therefore we additionally plan ahead downtime from the teaching with longer coffee breaks.

Furthermore, to use the power of intrinsic motivation and maintain engagement, breaks are announced with a progress bar on each presentation slide. This visual cue enhances the sense

of accomplishment and progress, which helps keep participants motivated. We also try to align these breaks with the well-known **Pomodoro technique** (25 minutes of work followed by a 5 min break/activity, repeated four times, followed by a longer break of 15-30 minutes). This learning method promotes concentrated learning, by scheduling intervals long enough to learn new content while ensuring breaks when focus needs to be restored. Splitting learning time into small intervals with regular breaks improves and sustains the attention span.

Every module has at least one **cumulative review**, so called ‘learning objectives’, where we summarize and repeat the most important points of that module (Centre for Disease Control and Prevention, 2019; Ghanbari et al., 2019; Mahan & Stein, 2014; Nationales Institut für Wissenschaftskommunikation (NaWik), 2021). Reviewing a summarized version of the previously learned material has been shown as an efficient learning method (Ghanbari et al., 2019).

To optimize knowledge retention and skill acquisition we encourage participants staying **offline**, if possible, and to leave their laptops closed during the workshop. If they need to take notes, we encourage them to use paper and pen. Research shows that writing by hand creates more elaborate brain connectivity patterns compared to typing on a keyboard. These patterns are crucial for memory formation and encoding new information, making them beneficial for learning (Van der Weel & Van der Meer, 2023). This approach helps minimizing constant distractions from emails and group chats on a connected laptop, thereby improving attention span.

At the end of the workshop, if the time allows, we may make use of the **self-testing effect**. The participants are asked to submit via Mentimeter what they have gained from the learning activities, this “blank-page-selftesting” is an excellent application of the testing principle (Mahan & Stein, 2014).

IV. Impact evaluation

We continuously develop our workshops based on principles of **impact evaluation**, although we recognize the challenges inherent in this process (Bertemes et al., 2024). Measuring impact in science communication, particularly in brain health promotion, is complex and requires significant resources and longer term evaluation windows which may not easily pinpoint the impact of our specific offers. Therefore, while collecting quantitative data on motivation to change lifestyle, confidence and skills around brain health, we also focus on gathering descriptive data to gain important insights about our participants and their experiences. This includes **process evaluation** to assess the extent to which the intervention was implemented with the planned content, accuracy, coverage, and quality. **Feedback surveys** help us evaluate our workshops, reconsider learning strategies, and define further topics of interest. Additionally, we will evaluate the workshops with stakeholders and partner organizations to ensure their effectiveness and relevance.

V. Conclusion

By applying these science-driven communication strategies, GetBrainHealthy aims to empower individuals to take control of their brain health, fostering a healthier, more informed society. Our approach not only emphasizes the importance of early intervention and prevention but also promotes a continuous process of building habits and skills. By framing brain health as an ongoing effort, we encourage individuals to make brain health a part of their daily routine. Through our workshops, we strive to create a supportive environment where participants feel motivated and equipped to make positive changes, ultimately contributing to a community that values and prioritizes brain health.

Together, let's elevate the conversation about brain health!

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> Comments, questions and feedback are welcome: GetBrainHealthy@uni.lu

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