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â??The Future of Brainâ??Computer Interfaces Will Be Measured by Independence, Not Laboratory Performanceâ?•

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At BIOPLUS-INTERPHEX KOREA 2026 in Seoul, Possibility Neurotechnologies discusses the transition of brainâ??computer interfaces from research laboratories into everyday life, highlighting personalisation, accessibility, neural data privacy and the milestones that could define clinical progress by 2030.

Brain–computer interfaces (BCIs) are entering a new phase of technological development, moving beyond experimental demonstrations towards practical applications that could transform communication, independence and quality of life for people with severe physical disabilities.

While advances in implantable neural interfaces and artificial intelligence have significantly improved the ability to interpret brain activity, translating these scientific achievements into dependable, accessible technologies remains a major challenge.

At BIOPLUS-INTERPHEX KOREA (BIX) 2026, held at COEX in Seoul under the theme *Connecting the Global Biopharma Value Chain*, BioSpectrum Asia explored these developments with Possibility Neurotechnologies, a Canadian neurotechnology company developing non-invasive brain–computer interfaces.

The discussion examined the growing importance of personalised neural interfaces, the challenges of clinical adoption, the responsibilities associated with neural data protection and the evolving definition of success in neurotechnology.

Central to the conversation was a clear message: the next generation of BCIs must be judged not simply by how accurately they decode brain signals, but by how effectively they enable individuals to participate independently in everyday activities.

1. Brain–computer interfaces are moving rapidly from experimental systems towards potential real-world applications. What do you see as the most important scientific milestone the field has reached recently?

I think one of the most significant milestones has been demonstrating that we can reliably translate complex neural activity into meaningful communication and control, even for individuals with profound paralysis. Recent advances in speech decoding and implantable BCIs have demonstrated capabilities that would have seemed almost unimaginable a decade ago.

But what I find equally exciting is the convergence of technologies that is making BCI more accessible. Advances in machine learning, wearable EEG and mobile computing mean that sophisticated brain-signal processing no longer necessarily requires specialised equipment typically accessed only in research or clinical environments.

We are increasingly able to build systems that operate on devices people already own, using commercially available hardware.

When I began my doctoral research, we were working with specialised EEG systems and developing custom hardware and software to enable children with severe physical disabilities to interact with their environments.

Today, through Possibility Neurotechnologies, we have translated much of that research into a non-invasive BCI platform that operates on an iPhone or iPad.

After more than 50 years of research and development, BCIs are transitioning out of the laboratory and into homes, which is a significant milestone.

2. What are the biggest technical barriers that still need to be overcome before BCIs can move from highly controlled research environments into routine clinical use?

One of the biggest challenges is that brain signals are incredibly variable. They differ between individuals, fluctuate from day to day and can be affected by fatigue, attention, movement and environmental conditions.

A system that performs exceptionally well in a controlled laboratory does not necessarily perform the same way in someone's home.

Calibration is another significant barrier. Traditionally, many BCIs have required extensive training, specialised equipment and technical expertise. That is simply not practical for someone who wants to independently communicate with their family, participate in school or control something in their environment.

I think the field has also historically placed too much emphasis on technical performance metrics, such as classification accuracy and information transfer rates, without giving equal consideration to usability.

A BCI can achieve 95 per cent accuracy in a research study, but if it takes an hour to set up or requires a researcher to operate it, its real-world utility is limited.

At Possibility, we have spent years working directly with children with severe physical disabilities and their families, and that experience has fundamentally shaped how we approach these challenges.

We have learned that the most sophisticated technology is not necessarily the most useful. Sometimes, enabling someone to independently turn on a toy, activate a communication device or make a choice is far more meaningful than achieving another incremental improvement in decoding accuracy.

The next major challenge is making BCIs reliable, intuitive and accessible enough that people can use them without prior technical experience.

3. Recent research has demonstrated the potential of implantable BCIs for communication and computer interaction among people with severe paralysis. What advances are still required to make these systems reliable and practical for everyday use?

The progress in implantable BCIs has been extraordinary, particularly in restoring communication for individuals who have lost the ability to speak or move.

These systems are demonstrating just how much information we can extract from neural activity, and I think they are going to play an incredibly important role in the future of assistive technology.

However, demonstrating successful control in a research environment is very different from delivering a system that someone can depend on every day.

Long-term reliability is one of the biggest challenges. Neural signals can change over time, and implanted electrodes must remain functional and biocompatible over many years.

There are also practical considerations around wireless communication, power consumption, device maintenance and the ability to update decoding algorithms as neural signals evolve.

Beyond the technology itself, we need to consider the entire user experience.

Can someone independently start and operate their BCI? What happens when something goes wrong? Can caregivers troubleshoot problems without specialised training? Is there a sustainable pathway for clinical support and long-term maintenance?

I also think it is important to recognise that implanted and non-invasive BCIs serve different needs.

Implantable systems may offer capabilities that are not achievable with scalp-recorded EEG, particularly for high-bandwidth communication and fine-grained control. But non-invasive approaches can offer advantages in accessibility, cost and ease of adoption.

Ultimately, I do not believe there is going to be one BCI technology that works for everyone. The goal should be to develop a spectrum of solutions that people can choose from based on their abilities, needs and preferences.

4. How important will personalisation be in the next generation of BCIs, particularly in adapting systems to differences in neural signals, disease progression and individual patient needs?

I think personalisation will be one of the defining features of the next generation of BCIs. In fact, I would argue that it is essential if we want these technologies to become widely accessible.

Your brain is like your fingerprint — every person's brain is different, and neural signals can vary significantly between individuals and even within the same person over time.

Historically, BCI systems have often required users to learn specific mental strategies to produce recognisable brain patterns. But that approach can exclude people who have difficulty performing those tasks, particularly children or individuals with complex neurological conditions.

Rather than expecting people to adapt to the technology, we need to build technology that adapts to them.

That is a principle we have incorporated into Think2Switch from the beginning. Our system allows users to train personalised mental commands, rather than relying exclusively on a predetermined brain pattern.

We are also developing more advanced machine learning approaches to improve calibration and account for variability in neural signals.

Personalisation also extends well beyond the algorithms. It includes how someone interacts with the interface, what activities they want to participate in and how their needs may change over time.

For someone with a progressive neurological condition, that might mean adapting to changes in their abilities. For a child, it could mean designing an interface that evolves with their development, interests and communication needs.

Ultimately, successful personalisation means recognising that there is no single definition of what a successful BCI interaction looks like.

The technology should support the individual's goals, rather than requiring everyone to achieve the same technical benchmark.

5. As commercial interest in neurotechnology grows, how should the field balance rapid innovation with questions around safety, privacy, informed consent and ownership of neural data?

I think we have a responsibility to build these considerations into neurotechnology from the very beginning, rather than treating them as regulatory obstacles to address after a product has been developed.

Neural data is uniquely sensitive. Even though current BCIs cannot simply read someone's thoughts, advances in machine learning may allow increasingly sophisticated inferences from brain activity.

That raises important questions about how neural data is collected, stored, used and shared, and who ultimately controls it.

At Possibility, we have taken a privacy-by-design approach. Think2Switch processes brain signals directly on the user's iPhone or iPad, without requiring cloud-based processing.

We believe people should be able to benefit from neurotechnology without unnecessarily surrendering sensitive information about their brain activity.

Informed consent is equally important, particularly when developing technologies for children and individuals with significant communication disabilities.

Consent needs to be meaningful and ongoing, and we need to create opportunities for users to express their preferences, assent or dissent wherever possible.

I do not believe responsible innovation and rapid progress are mutually exclusive.

In fact, building trust, protecting autonomy and involving end users in development are essential to achieving sustainable adoption.

The question should not be "what can we decode from the brain", but what we should decode, why we are doing it and who ultimately benefits.

6. Looking towards 2030, what do you believe will distinguish a genuine clinical breakthrough in BCI technology from an impressive laboratory demonstration?

For me, the distinction comes down to whether the technology creates meaningful, sustained improvements in people's everyday lives.

We have spent decades demonstrating that brain signals can be used to control computers, robotic devices and communication systems.

Those achievements are scientifically remarkable, but a successful laboratory demonstration does not necessarily mean someone can use that technology independently at home, at school or in their community.

By 2030, I hope we are evaluating BCI success through a much broader set of outcomes: independence, participation, communication, quality of life and the extent to which technology reduces the burden on individuals and their caregivers.

I also think we will need to look beyond short-term feasibility studies towards longitudinal evidence.

7.Can someone use a BCI consistently over months or years? Does it remain reliable as their needs change? Can it be deployed affordably and supported sustainably outside specialised research centres?

One of the most meaningful experiences in my career has been watching children who have extremely limited opportunities for independent interaction discover that they can influence the world around them using their brain activity.

Something as seemingly simple as activating a toy or making a choice can represent an enormous shift in autonomy.

That is what motivates our work at Possibility Neurotechnologies.

We are not trying to build the most technically impressive BCI in a laboratory. We are trying to make brain–computer interfaces practical, accessible tools that people can integrate into their everyday lives.

By 2030, I hope the biggest BCI breakthroughs are not measured by what researchers can demonstrate, but by what people can independently accomplish.