

Symposia (detailed program)

Campus Biotech, Geneva, Switzerland · 4–7 October 2026

Monday, October 5th

Afternoon Symposia · Three Parallel Tracks · 15:00 – 17:00

Parallel sessions in three rooms · coffee break 16:00 – 16:15 in H8 Hall · Talk summaries are condensed from the submitted symposium abstracts.

Track A · Mechanisms, predictors & causal inference · Auditorium H8

Defining neurofeedback success in real-time fMRI: What, when, and for whom? (ID24)

Chairs: **Meghan E. Martz** & **Stefanie Russman Block** (Univ. Michigan)

What counts as neurofeedback “success”, when should it be measured, and for whom should it be defined? Four complementary perspectives on target engagement, learning, transfer and clinical endpoints in rt-fMRI-NF. Introduced by Scott J. Peltier (Univ. Michigan); discussant and Q&A moderator: Kymberly Young (Univ. Pittsburgh).

Meghan E. Martz (Univ. Michigan) — *Directional and developmental success metrics in rt-fMRI-NF targeting the nucleus accumbens*

Single-session nucleus accumbens neurofeedback was used to compare reward-related self-regulation in healthy adolescents (n=60) and young adults (n=75). Both groups up-regulated NAcc activity with an early boost that was harder to sustain across runs, especially in adolescents, while down-regulation effects were small. Within-session learning and direction-specific modulation are proposed as interpretable success metrics for developmental neurofeedback research.

Stefanie Russman Block (Univ. Michigan) — *Markers of success in rt-fMRI-NF targeting the prefrontal cortex and alternate region controls during emotion regulation*

In a reappraisal-based pilot in healthy adults (n=29) and adults with anxiety (n=23), participants received veritable prefrontal feedback, veritable feedback from non-reappraisal regions, or yoked sham. Which group looked “successful” depended on the chosen metric: prefrontal feedback maximized online NF performance, whereas alternate-region feedback showed the largest learning slopes due to lower baseline activity. vIPFC training slopes best predicted changes in negative affect, underscoring how metric choice and ceiling effects complicate alternate-ROI control designs.

Stephen LaConte (Virginia Tech) — *Classifier-based rt-fMRI-NF as a target engagement framework: From brain-state decoding to experimental medicine*

Classifier-based neurofeedback decodes distributed brain states with supervised learning and is framed here as a principled definition of target engagement within the NIH Experimental Medicine Framework. Success metrics include prediction accuracy, reproducibility of the decoded pattern, separation of brain states, and participant-level modulation of the decoded signal, illustrated with default-mode-network neurofeedback.

Cherie Marvel (Johns Hopkins Univ.) — *Defining feasibility and responder success in rt-fMRI-NF for cerebellar ataxia*

Sixteen individuals with neurodegenerative cerebellar ataxia completed a single-session motor-imagery paradigm driven by an individualized whole-brain classifier. Group-level tapping improvement was not significant, yet 9 of 16 participants improved, and gains correlated with activation in frontal, insular, parietal, basal ganglia and cerebellar regions — independent of impairment severity. In early clinical work, feasibility, target engagement and responder profiles may constitute meaningful success even without group-level symptom change.

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Track B · Multivariate decoding, AI & next-gen feedback signals · Room H8-01-D
Decoding the brain in real-time: Multivariate approaches to fMRI-neurofeedback (ID134)

 Chair: **Nitzan Lubianiker** (Yale / Princeton)

Beyond single-ROI regulation: new-generation protocols use machine learning to decode and reshape multivariate patterns of brain activity in real time, with converging evidence for the feasibility and clinical promise of decoding-based neurofeedback.

Coraline Rinn Jordan (Univ. Rochester) — *Sculpting new visual categories into the human brain*

Over ten days of closed-loop rt-fMRI, participants (N=10) were rewarded whenever neural representations of viewed shapes resembled one side of an arbitrary, undisclosed category boundary. Training reliably reshaped multivariate representations of the “sculpted” categories and induced corresponding categorical perception, with neural and behavioral changes strongly correlated. This provides causal evidence that distributed patterns are sufficient for categorical perception — and that neurofeedback can build categories that did not previously exist in the brain.

Vincent Taschereau-Dumouchel (Univ. de Montréal) — *Using closed-loop image evolution to probe the neural basis of fear*

In participants with animal fears, AI-generated images were iteratively “evolved” in real time to maximize decoded activity in specific brain targets (synthetic image evolution). Images evolved with medial prefrontal and ventral temporal decoders elicited the strongest subjective fear, but only medial prefrontal activity was directly linked to fear reports — dissociating the subjective component of fear from perceptual and arousal-related processes, with implications for decoded neurofeedback in anxiety.

Nitzan Lubianiker (Yale / Princeton) — *Reduction of negative attentional bias in depression with fMRI-neurofeedback*

In a double-blind randomized controlled study, 48 patients with MDD completed three sessions of closed-loop neurofeedback in which decoded attentional states controlled the opacity of negative faces overlaid on neutral scenes. Real neurofeedback reduced the probability of getting “stuck” in the most negative attentional state (moderate-to-large effect) and decreased ventromedial prefrontal responses to negative faces relative to sham, supporting mechanism-based interventions for depression.

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Track C · Acquisition, signal quality, real-time tooling & BCI · Room H8-01-F
Advancing multimodal neurofeedback: Opportunities and challenges of simultaneous EEG-fMRI (ID25)

 Chair: **Frédéric Grouiller** (Univ. Geneva / HUG)

Simultaneous EEG-fMRI combines high temporal and spatial resolution for neurofeedback, but remains challenging due to MRI-related artifacts, motion-induced noise and real-time processing constraints. Recent advances in artifact correction and emerging multimodal applications, from basic neuroscience to attention and ADHD.

Gracia Khoury (Univ. Rennes) — *Characterizing motion-induced artifacts in simultaneous EEG-fMRI using carbon wire loops*

Carbon-wire loops are widely used to regress motion-induced artifacts from EEG recorded in the scanner, yet what they actually capture — and whether neuronal information is lost in the regression — remains unclear. A dedicated protocol with specific head movements in the MR environment is used to better characterize the movement-related noise recorded by the loops.

Riccardo Galli (Univ. Geneva) — *Mapping functional and oscillatory correlates of visuospatial attention via EEG-fMRI multimodal imaging*

Bridging fMRI-based and alpha-oscillation-based neurofeedback for spatial attention, simultaneous EEG-fMRI with EEG “fingerprinting” identified oscillatory signatures of interhemispheric visual-cortex modulation during fMRI-NFB. This links fMRI-derived mechanisms to scalable EEG biomarkers, paving the way for accessible EEG-based therapies for unilateral spatial neglect.

Carole Guedj (Univ. Geneva) — *Neurofeedback for ADHD: A multimodal approach combining virtual reality and EEG-fMRI*

EEG-neurofeedback is embedded in an immersive virtual classroom with adaptive auditory and visual distractors to train attention regulation in children with ADHD in an ecologically valid, engaging setting. Preliminary findings show high acceptability, sustained motivation and promising modulation of EEG markers, while simultaneous EEG-fMRI links successful regulation to task-related deactivation of default-mode regions.

Camille Muller (Univ. Toulouse) — *From EEG-fMRI to EEG-fNIRS: Towards more ecological multimodal neurofeedback*

Combining EEG with fNIRS offers a portable alternative to the constraints of the fMRI environment for simultaneously monitoring electrophysiological and hemodynamic brain activity. A real-time EEG-fNIRS platform providing continuous unimodal or multimodal neurofeedback during upper-limb motor imagery was shown to be feasible in healthy participants, with successful online regulation across EEG-only, fNIRS-only and combined conditions — a step toward more naturalistic and clinically relevant multimodal paradigms.