

## Neurofeedback: the power of psycho- social therapeutics

In response to our Comment,<sup>1</sup> Jean-Arthur Micoulaud-Franchi and Thomas Fovet<sup>2</sup> argued that more time and research might confirm the clinical promise of electroencephalography (EEG) neurofeedback. This common stance, however, seems to stem more from an allegiance to a technique—EEG neurofeedback—than from measured scientific reasoning. In a way, the science is clear: power analyses tell us how big a sample we need to detect an expected effect; experimental design dictates how we must control for psychosocial influence; and nearly 60 years of research have yielded surprisingly little evidence to support claims of regulatory brain-based mechanisms, which supposedly drive EEG neurofeedback outcomes. How much longer should one wait before coming to a conclusion? How many more experiments do we need?

Proponents of EEG neurofeedback reason that many experiments cannot possibly support their view because of inadequate designs; moreover, they often cherry-pick positive results—reminiscent of pseudoscientific

domains—to justify their claims. After 58 years of research and over 3000 relevant publications [eg, query “(neurofeedback or biofeedback) and (EEG or electroencephalogr\*)” in Scopus], Micoulaud-Franchi and Fovet cite only one study<sup>3</sup> wherein neural changes occurred in the direction of training. But even in this study, as in the rest of the literature, little evidence supports a correlation between the neural signal trained and behavioural outcomes—the purported foundation on which the pillar of neurofeedback has been erected since its inception in 1958.

Micoulaud-Franchi and Fovet state that even arguably the best double-blind EEG neurofeedback study<sup>4</sup> uses ineffective methods. This experiment omits reporting changes in neural activity while documenting large behavioural improvements for both veritable and sham feedback. Thus, neurofeedback was actually effective: as effective as mock neurofeedback. Psychosocial factors—perceived success, for example—correlate directly with behavioural improvements regardless of feedback contingency.<sup>5</sup>

EEG neurofeedback works; we are just trying to determine how. Given the well documented behavioural benefits of EEG neurofeedback

alongside the overarching equivalence between genuine and fake feedback, placebo explanations seem plausible. Exponents of EEG neurofeedback claim that this technique wields its effects by self-regulating brain function; however, the burden of proof continues to linger in their court.

We declare no competing interests.

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