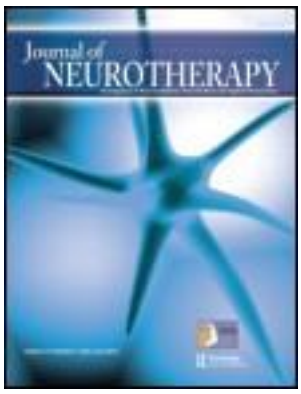

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Editorial

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EDITORIAL

One aspect of neurofeedback we often hear discussed is, What is the level of evidence required to support the use of a given protocol for a specific disorder? Some argue that the efficacy of neurofeedback is self-evident by the number of patients who have demonstrated significant improvement in their problems and have gone on to refer friends for treatment. At the other end of the spectrum are those who will acknowledge nothing less than a randomized, double-blind, placebo-controlled trial as the only acceptable level of evidence for efficacy of a treatment. A few years ago, Barkley (2003) stated, ''If neurofeedback were to be classified as a medical intervention (which it arguably could), the evidence to date would not meet FDA standards for approval as such'' (p. 7). So who is right in this debate? What is the level of evidence that we need to be striving for?

Certainly in academic circles, there is increasing discussion surrounding the design of studies that utilize randomization, blinding, and placebo-control arms. So what are each of these and why are they important? Randomization is by far the easiest to achieve. This simply refers to the allocation of subjects to each condition or treatment group in a nonbiased way. This can be achieved as simply as tossing a coin or pulling subject numbers out of a hat, although it is typically performed by the use of random number generators. Randomization can also be more complex to account for equal distribution between groups of demographic variables that may influence treatment and clinical outcomes including sex, age, and duration of illness. It is important to note that protocols that appoint each alternate subject to a different group are not providing randomization of participants. The purpose behind randomization is to make sure that the investigator is not directly or possibly subtly, without his or her conscious awareness, selecting subjects to be in a specific group. It is possible that an investigator may have a preconceived belief that a participant will perform better in one group over another and want that person in a specific group to artificially optimize outcomes. Randomization stops this from happening.

Blinding refers to the degree of protocol knowledge available to the researcher and participants. In a single blind study, participants do not know if they are in the active or placebo condition but the researcher does. In a double-blind study, neither the participant nor the researcher knows which group is the active or placebo group. In medication studies this is achieved by the research being given two sets of identical-looking tablets that are labeled with a nonidentifying marker, which is revealed only after the study is complete. The final level of blinding that may occur is triple blinding. This is where a statistician is given the data for each group to analyze without knowing which group was the active or placebo condition. Only once the statistics have been performed are the subjects, researchers, and statistician told which group was the active condition. Blinding is theoretically easy to achieve in a medication study, but there is ongoing debate over whether this can be achieved in any psychological intervention including neurofeedback. Within psychological interventions levels of blinding can be introduced by having raters and statisticians who are blind to the treatment participants received. However, by the very nature of a psychological intervention more often than not the participant and certainly the administering clinician will be aware of group allocation.

The final component is the placebo control. A placebo is anything that is believed by the subject to be an active treatment but in fact

lacks the active treatment component. A placebo control is important because many people will spontaneously improve by virtue of thinking they are receiving treatment even though they are not (the placebo effect). The comparison with a placebo determines whether the intervention is more efficacious than no change in the participant's treatment. Many treatments that were thought to be efficacious for certain disorders have been found to have no benefit when tested against a placebo control condition. The placebo effect is recognized to occur in antidepressant as well as antipsychotic trials, with as many as one in three antidepressants leading to improvements that are not significant over and above placebo conditions. The use of a placebo condition is easily achieved in a pharmacological study; an inert substance such as a sugar pill will work as an effective placebo. However, much debate continues over the use of a placebo condition in neurofeedback studies.

Although the randomized, double-blind, placebo-controlled trial may be the standard in pharmacology, it does not necessarily mean that it is either feasible or necessary to demonstrate the efficacy of neurofeedback as an intervention. If Barkley (2003) was correct in saying that no neurofeedback studies would meet approval standards, then it should also be noted that almost every intervention used in psychological practice would not meet these standards either. To the best of our knowledge, there are no randomized, double-blind, placebo-control trials of cognitive behavior therapy, acceptance and commitment therapy, general counseling, systematic desensitization, hypnosis, cognitive remediation, or eye movement desensitization and reprocessing. However, all of these approaches are routinely used in clinical practice, and many are widely accepted as best practice. Indeed the National Institute for Clinical Excellence recommends the use of cognitive behavioral and family interventions as best clinical practice in England and Wales in the treatment of depression, substance use, obsessive-compulsive disorder, and early psychosis, to name but a few. There are alternative approaches to achieving the integration of psychological interventions into mainstream clinical practice other than placing an emphasis on achieving regulatory authorities' approval. However, questions concerning the level and quality of the evidence necessary to achieve this integration of neurofeedback into clinical practice still needs to be considered and are still relevant even if regulatory body requirements are set to one side.

It should also be noted the randomized, double-blind, placebo-control trial has a number of inherent problems. These have been discussed in detail elsewhere. However, a brief consideration of some of the concerns are highlighted here. Regulatory bodies place the randomized, double-blind, independent-groups, placebo-controlled trial as the only appropriate level of evidence for the safety and efficacy of a drug. Yet often the clinical use of the drug is not determined until it is approved and widely used in clinical practice in a broad demographic of patients. The inclusion criteria for clinical trials are necessarily stringent to protect the safety of the patients concerned. However, this leads to a highly homogeneous and often less clinically severe group of patients representing a particular psychological disorder, which, by their very nature, are heterogeneous and complex in clinical presentation in reality. This raises issues concerning whether clinical trials merely demonstrate high internal reliability, given their scientific rigor, but are lacking in validity and generalizability, given the small, clearly defined cross section of patients included (Möller & Broich, 2010).

There is debate concerning whether, in an age where pharmacological interventions are plentiful, we should be determining whether new molecules are more efficacious than the best current treatment administered at a recognized therapeutic dose. Given the general disappointment in clinical efficacy of many ''new miracle drugs'' this argument does have some merit. However, this approach is recognized to stifle the development of compounds with alternative mechanisms and places an emphasis on treatment outcomes over possible improvements in side-effect profiles, which are often only secondary outcomes in clinical trials.

Despite the use of double-blinding, often the side effects and the subjective effects of ingesting a pharmacological substance offer clues to both the participant and researcher about which drug a participant has received. That an inert placebo could produce similar changes in bodily states is not achievable.

In an age where there is increasing emphasis being placed on tailored and personalized medicine, including pharmacogenetics (even if only pertinent to side effects expression on a conservative level), the randomized clinical trial offers only a narrow window into the pragmatics of pharmacological interventions. However, it does provide us with a rigorous, objective, ''clean,'' and highly standardized view on whether a molecule is better than providing no treatment to a patient. Möller and Broich (2010) stated that ''there is no single, generally valid, ideal experimental design'' (p. 3). Rather, an emphasis needs to be placed on good quality accumulating evidence leading to the recognition of an intervention as not only being better than placebo but also providing additional benefit over existing treatments within a real-world clinical setting.

So what does this mean for neurofeedback? Although there is debate to be had concerning what level of evidence is necessary for the recognition of neurofeedback as a clinically relevant and valid intervention, there are lessons to be learned from our drug development colleagues. An attention to detail and standardization within our studies are paramount to improving the quality of the evidence accumulating concerning the efficacy of neurofeedback. How are we identifying and defining our patients? What is an optimal number of patients to include in a trial? What are we using as outcome measures in studies? Are they reliably, replicable, valid across sites? How do we determine whether neurofeedback provides gains over and above that of practice effects? From the wider psychological community perhaps there are lessons to be learned from the studies concerning the use of cognition remediation, particularly in considerations needed in defining placebo conditions. Although case studies provide tentative clinically relevant glimpses into the potential for neurofeedback as an intervention, as a field we need to determine the standards that we wish our own evidence be held to. We need to determine the standards, practices, and rigor to which we want to be held accountable, so future researchers and clinicians are provided with evidence which is of high quality, even to the objective, critical eyes of the nonbelievers. These are not simple questions to answer, and there is a need for open public debate over what we should be striving to achieve in our research and how to best progress knowledge in our field.

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REFERENCES

Barkley, R. (2003). Editorial commentary. *The ADHD Report*, *11*(3), 7–8.

Möller, H. J., & Broich, K. (2010) Principle standards and problems regarding proof of efficacy in clinical pharmacology. *European Archives of Psychiatry and Clinical Neuroscience*, *260*, 3–16.