Toward understanding the influence of the experimenter on BCI performance

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The influence of the experimenter has been suspected but not yet studied in the field of Neurofeedback/BCIs. Further researches would be interesting to:

- Diagnose how experimenters may bias results, or potentially identify attributes that could positively impact user's experience or performance in line with recommendations about BCIs and Human Learning Principles [3].
- Extend the range of collected (and published) data about experimenters (e.g., biosocial and psychological characteristics), thus improving the replicability of experiments and the quality of meta-analyses.
- Suggest several solutions to prevent potential experimenter-related biased comparisons of the results, in line with recommendations from other fields [11].

By reviewing the literature, we extracted several potential factors of the influence of experimenters (see figure). First, their characteristics (e.g., expertise, gender, expectations) may directly affect the results (e.g., biasing the design of the protocol, data collection, or interpretation) [8]. Experimenters may also affect the responses and behavior of the subject, consciously or unconsciously, via direct or indirect interactions. Such an influence was observed in teacher-student relationship [9], researcher-subject interaction in business ethics [8] or "experimenter demand effect" in social [13] or economical [7] researches. In addition, studies suggest that the perceived characteristics (e.g., gender [12]) of both experimenters and subjects can influence their behavior. Social context and trainer-trainee relationship could benefit subjects' mood, psychology, stress, confidence [5], and motivation [10] which are significant elements improving the quality of their involvement [2; 6] but may as well be a source of bias [4].

Given that the presence of a human worker is nearly inevitable, the influence of experimenters should be considered carefully while designing experiments, for instance through a better rationalization of social bias and emotional feedback [1]. This could lead to a conjoint progress of the global performance, validity and understanding of the Neurofeedback/BCI studies.

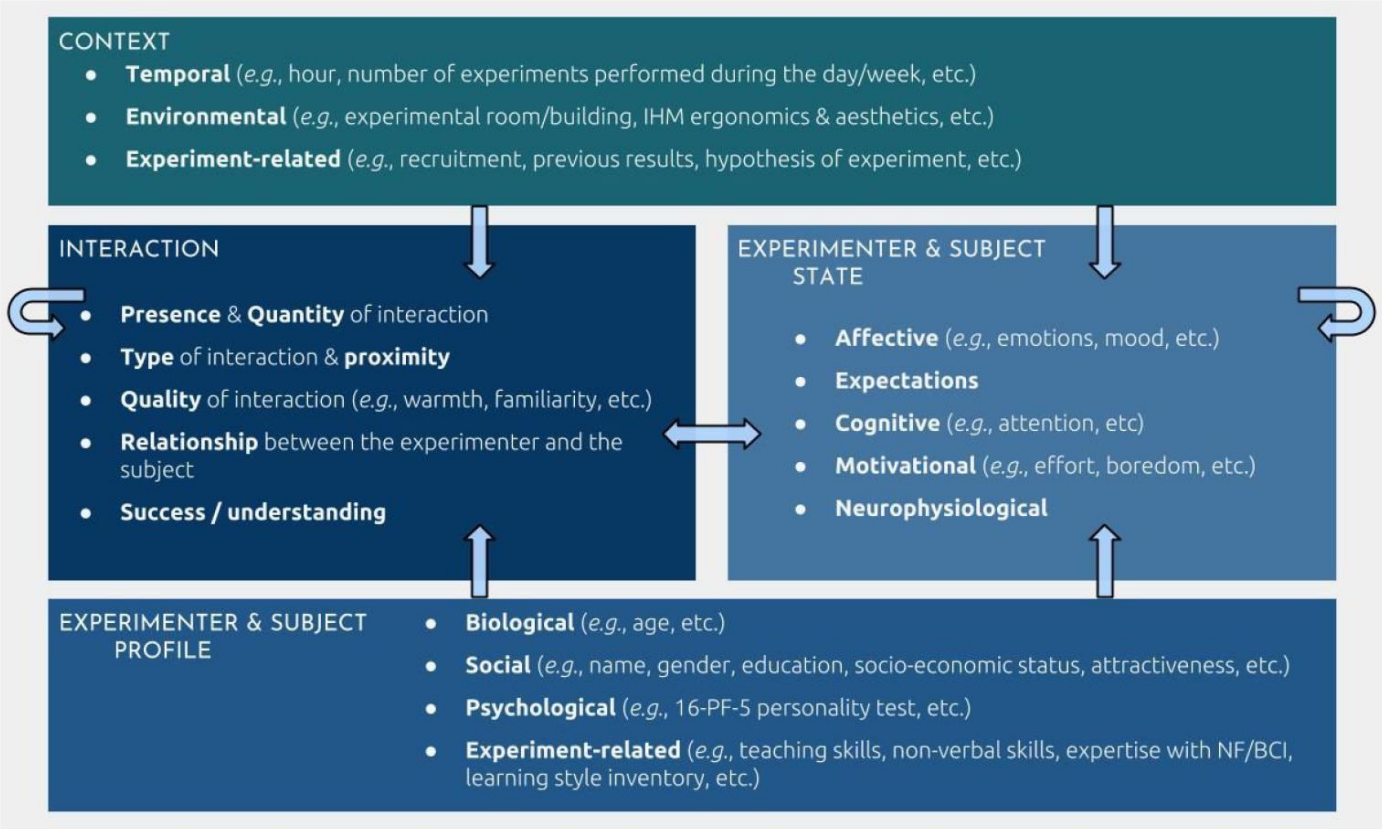

Figure Summary of under-investigated factors in NF/BCI studies, and how they could influence each other.

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