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LETTER TO THE EDITOR

Critical Analysis: Challenges in the Standardization of the Binaural Interaction Component in Cortical Potentials Using Speech Stimuli

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The growing interest in investigating auditory neurophysiological mechanisms and their relationship with behavioral measures is evident. In particular, the study of the Binaural Interaction Component (BIC) has garnered attention for its potential as a complementary objective measure in the assessment of central auditory processing (CAP) and cognitive functions across various clinical populations.

In this context, the article entitled *"Binaural Interaction Component of Long-Latency Auditory Evoked Potentials Using Speech Stimuli: Descriptive Values in Typical Young Adults"* by Moreira and colleagues presents relevant and well-founded contributions. However, some methodological considerations could be incorporated in future studies to enhance the diagnostic accuracy of BIC in assessing binaurality.

The BIC is an electrophysiological biomarker that reflects neural activity resulting from the binaural integration of auditory stimuli, originating from the brainstem up to the auditory cortex. The main finding of the study involves the description of absolute latency, amplitude, and duration values of BIC in Long-Latency Auditory Evoked Potentials using speech stimuli (LLAEP-speech), aiming to support its standardization in healthy adults. The use of complex speech stimuli aligns with the current trend of exploring not only auditory skills but also the role of language in everyday communication.

As the authors suggest, the BIC involves the functional activation of thalamocortical auditory pathways, which are essential for abilities such as attention, memory, recognition, and discrimination of speech sound patterns. Robust evidence in literature supports this hypothesis and indicates that BIC may be a useful tool for identifying suspected central auditory processing disorders.

Although the findings are promising, the proposal for standardization still requires further evidence. The reported results may serve as a preliminary reference, as certain methodological aspects were not fully addressed. Among them:

1) **Interindividual variability** – Measures with lower between-subject variability have greater discriminatory power. The lack of inferential statistical analyses, such as multiple regressions, limits the identification of performance predictors. Additionally, variations in wave latency and morphology may have been influenced by uncontrolled external factors, such as fatigue and attention. Even amplitude, which demonstrated less variability and is promising for clinical applications, still requires further investigation.
2) **Sample size** – Normative studies require sufficiently large samples to ensure representativeness and narrow confidence intervals. A recent study involving 108 unilateral cochlear implant users, for example, enabled robust estimates for speech adjustments based on cortical responses.
3) **Control of demographic factors** – The inclusion of different age groups and both sexes

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needs statistical adjustments. Evidence shows increased P3 wave latency with age and amplitude differences between men and women, which may influence BIC outcomes.

4) **Wakefulness state** – The clinical utility of BIC may be limited, particularly for brainstem responses in the awake state, due to greater susceptibility to myogenic activity and external artifacts that can affect its detection. This factor should also be explored in cortical responses.
5) **Reliability and repeatability** – The absence of such analyses, along with the lack of control groups due to the descriptive nature of the study, lowers the level of evidence and limits the applicability of the findings. Previous studies have shown that P300 amplitude is more reliable than latency, particularly when using speech stimuli, underscoring the importance of such verification for BIC.

Therefore, adopting the aforementioned methodological criteria would significantly enhance the accuracy, reliability, and clinical applicability of BIC reference values. This would support the development of evidence-based protocols to expand the use of BIC in LLAEP-speech paradigms and strengthen its contribution to human communication health.

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