Neural Signatures of Non-Vision Visual Perception: An Empirical Investigation

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Abstract:

This study explores the phenomenon of perceiving objects without direct visual input. We term this phenomenon Non-Vision Visual Perception (NVVP). While often dismissed as trickery, our investigation suggests that NVVP may be a genuine perceptual phenomenon.

We conducted an empirical study involving children trained in this technique across three cities in India. The study examined their ability to recognize objects while blindfolded and analyzed corresponding neural activity.

Methodology:

A total of ten children who had undergone training in NVVP were recruited. The experimental protocol involved presenting 30 randomly selected images, equally distributed among three categories: simple geometric shapes, emojis, and complex natural images.

The baseline condition consisted of standard visual perception with open eyes, followed by imagination with closed eyes. The experimental condition involved blindfolded perception of images and subsequent imagination of the perceived objects.

Key Findings:

1.Temporal Characteristics: Subjects required significantly more time to recognize objects in the NVVP condition, typically ranging from a few seconds to a few minutes in some cases.

2. Perceptual Progression: Initial object identification involved recognizing high-level structural features, followed by the gradual discernment of finer details such as color, texture, textual information, etc.

3. Neurophysiological Correlates: EEG recordings revealed a statistically significant increase in beta and gamma frequency bands, indicative of heightened cognitive processing, such as deep reflection and contemplation.

4. Electroretinogram (ERG) Analysis: ERG testing conducted on one subject in a clinical setting showed retinal electrical activity consistent with occluded vision, ruling out any light transmission through the eyes and thereby eliminating the possibility of trickery.

5. High-Frequency Electromagnetic Probing: Using high-frequency probes dodecanogram (DDG) being developed at IIT Mandi, MHz-range electromagnetic signals were detected in some subjects. This novel observation warrants further investigation to elucidate its validity and significance in NVVP.

6. Performance Variability: While all subjects claimed complete blindfolded visual perception, empirical results varied. Two subjects exhibited negligible performance, while two others achieved approximately 80% accuracy. The remaining participants demonstrated an accuracy exceeding 90% in object recognition.

Based on the subjective feedback from the subjects, we find a correlation between the accuracy of object identification during NVVP and the duration and regularity of practice of this art.

7. Future Experimental Research:

In future studies, we aim to explore dependencies of the level of object identification accuracy in NVVP under various controlled conditions such as distance from the object, ambient lighting conditions, objects screened by an obstacle, etc. Also, further exploration involving a larger sample size is underway.

Conclusion:

From this preliminary exploratory study, NVVP seems to be a learnable skill, especially for children whose brain connectivity is still developing actively.

We also find that multiple training methods exist that can potentially leverage this ability to various degrees. Our findings suggest that NVVP is also a measurable phenomenon that merits rigorous scientific scrutiny. The observed neural and physiological markers indicate the involvement of higher cognitive processes in NVVP.

Further interdisciplinary research may contribute to a deeper understanding of alternative perceptual mechanisms and their implications for neuroscience and consciousness studies.