



Cortical Activation in Spoken and AAC-Based Verb Production: An fNIRS Pilot Study



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Objective

- Exploring the differences in cortical activity during AAC production and spoken production of verbs.

Introduction

AAC has been shown to improve behavioral outcomes for single words and discourse [1, 2, 3], but we don't know anything about neural differences. This study explores how spoken language changes cortical activation in the neurotypical population.

- It's hypothesized that differences in cortical activation will be seen due to alternative motor control and language processing differences.

Methods

Participants: Thirty healthy adults, 18-55 years old, were recruited (female=19; male=10), all used English as their first language (English only=18; bilingual= 12

Design: within-groups analysis with block design

Outcome Measures: Satori's GLM model was used to analyze oxygenated and deoxygenated blood data in 29 channels based on modality [4]

Materials: PsychoPy and Satori

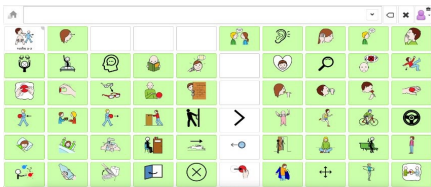


Fig. 1: CoughDrop- AAC used on 11.9-inch iPad [6]



Fig. 2: fNIRS- NIRSport2 (8x8 left hemisphere montage) [5]

Results

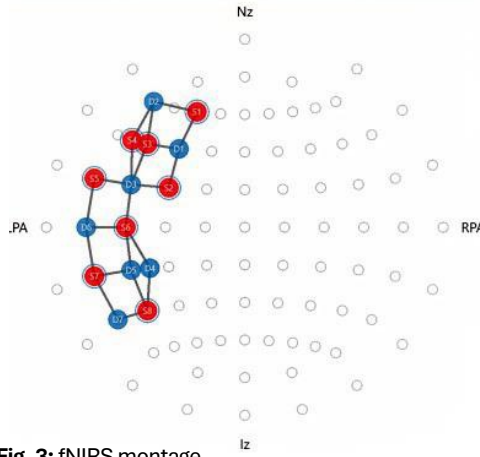


Fig. 3: fNIRS montage

- Contrast comparing AAC to spoken language.
- Statistical difference was shown in 20/29 channels.
- 14 channels = lower oxy levels in the temporal lobe.
- 6 channels = higher oxy levels in the left anterior prefrontal cortex, specifically Broca's area.

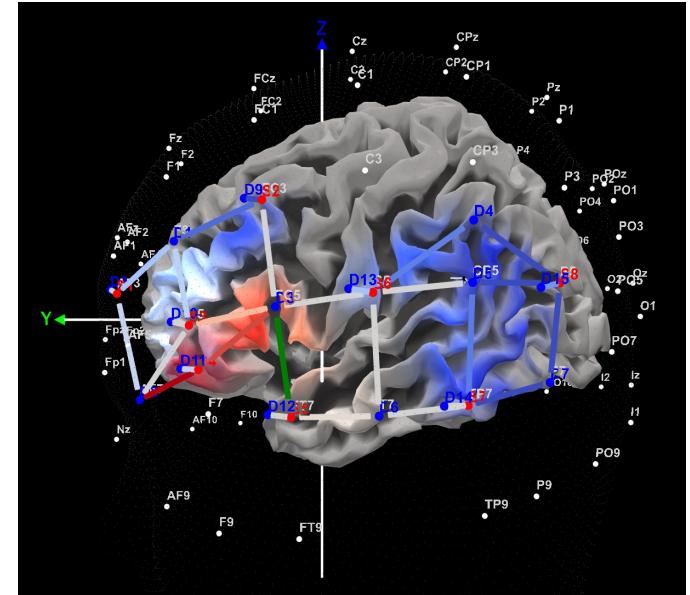


Fig. 5: Satori analysis image comparing AAC to speech: Blue = deoxygenated blood (less activation) Red = oxygenated blood (more activation)

Procedure

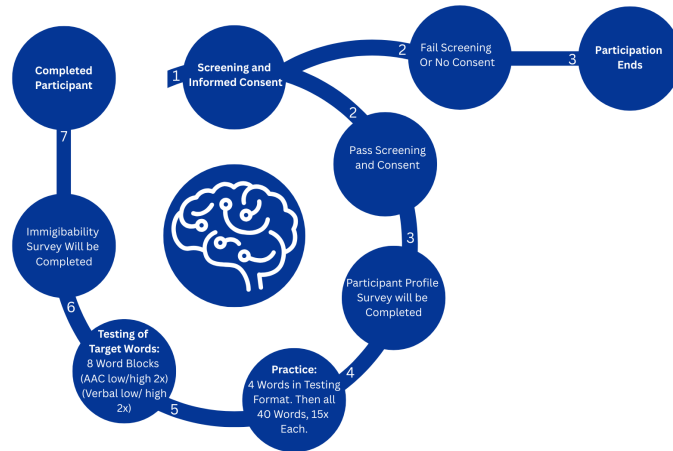


Fig. 4: Flowchart of study procedures

Discussion and Future Directions

- The results show that when AAC is used instead of spoken language, there are differences in the specific areas of activation, specifically targeting the left anterior prefrontal cortex.
- Further analyses should include: how the frequency and imageability of the verbs impact cortical activation.
- These results provide a foundation for further studies involving fNIRS and the neurological mechanisms of AAC with both healthy and clinical populations

References

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[2] Chen, S.-H. K., O'Donnell-Nolin, J., & Morgan, M. (2026). Person-centered augmentative and alternative communication with Verb Network Strengthening training: A case study in Broca's aphasia. *Aphasiology*, 1-22. <https://doi.org/10.1080/02687038.2026.2618699>

[3] Edmonds, L. A., & Babb, M. (2011). Effect of Verb Network Strengthening Treatment in Moderate-to-Severe Aphasia. *American Journal of Speech-Language Pathology*, 20(2), 131-145. <https://doi.org/10.1044/1058-0360/2011/10-0036>

[4] Satori Neuroimaging Software (n.d.). Satori user's guide. Brain Innovation BV

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[6] CoughDrop—Every voice should be heard. (2014, January 1). <https://www.mycoughdrop.com/>