**Understanding Covert Speech: Experiences with and Usability of Covert Speech for AAC Systems**

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*Abstract –* **Augmentative and alternative communication (AAC) systems are communication options for individuals who cannot reliably communicate verbally. The use of AAC systems allows individuals to grow relationships and enhance participation in societal activities. The use of covert, or inner, speech has the potential to be an intuitive communication method when decoded with a brain computer interface (BCI) and used as an AAC method. However, the most prominent theories on the development of inner speech neglect populations with disabilities. The purpose of this study is to gain insight into covert speech experiences of individuals with motor and communication disabilities or who use augmentative and alternative communication devices as their main form of communication. Through surveying, we seek to understand whether individuals with motor and communication disabilities use covert speech when processing commands and if covert speech can be decoded from BCI interface signals and used for AAC systems.**

*Keywords –* **Covert Speech Experiences, Inner Speech, Motor and Communication Disabilities, Augmentative and Alternative Communication Technology.**

1. INTRODUCTION

Augmentative and alternative communication (AAC) technology is a classification of systems that aim to improve the functional abilities of individuals who cannot reliably communicate through natural communication forms [1]. The use of brain computer interfaces (BCIs) as AAC systems allows individuals to interact with an external device via brain signals without the need for neuromuscular output [2]. Although there are multiple input modalities for BCIs, the use of covert speech could offer an intuitive and natural alternative. Covert speech is the internalized process of hearing one’s voice, sometimes known as inner speech or an internal monologue [3]. Previous research has shown that when decoding neural activity data recorded with electroencephalography (EEG), neural signals from letters, words, and even sentences produced through covert speech can be successfully identified with greater-than-chance success rates, indicating that covert speech has the possibility to be integrated into AAC systems [4]. However, research into the neural correlates of covert speech and covert speech theory is significantly more limited for individuals with motor and communication disabilities, despite the use of covert speech having substantial potential for this population [5]. The purpose of this research is to understand covert speech experiences of individuals with motor and communication disabilities and to expand theory on covert speech development for these populations. This study will then be used to inform subsequent research on the ability of decoding inner speech to be used with AAC systems.

1. MATERIALS AND METHODS

Qualitative data will be collected through a survey conducted through Qualtrics XM management and survey software. Participants will be asked about their use of AAC systems as well as their ability to produce covert speech, what they hear internally during covert speech production, if they can remember a time when they could not produce covert speech, and if covert speech production feels intuitive and natural. Data collection will begin on January 1st, 2024, and will be open until January 1st, 2025.

1. FINDINGS

Data from surveys collected by May 1st, 2024, will be presented at the CMBES/SCGB joint conference. Findings from this study will help researchers create more inclusive covert speech theories and help determine if covert speech is a viable communication method for AAC systems.

References

1. Taherian, S, et al. Disability and Rehabilitation: Assistive Technology, 12(2), 165-174, 2015.

2. A. Moslehi, Dissertation, Queen’s University, 2021.

3. Nieto, N. et al. Nature, 9(52), 2022.

4. Cooney, C, et al. iScience, 8, 103-125, 2018.

5. M. C. M. de Guerrero. Language Teaching, vol. 51, no. 1, pp. 1–35, 2018.