EVALUATION OF BRAIN ACTIVITY AND UPPER LIMB MOVEMENT, AND VERIFICATION OF LINGUISTIC FLUENCY DURING THE EXECUTION AND INTERPRETATION OF A UNIVERSAL SIGN IN LIBRAS

Paulo Sérgio de Jesus Oliveira [1]
Lorraine Barbosa Cordeiro [2]
Giovana Lima Silva [3]
Saulo Xavier de Souza [4]
Claudia Santos Oliveira [5]

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INTRODUCTION

The process of deafness occurs with the structural damage of the outer/middle ear, which functions to carry sound to the inner ear, and can be conductive, sensorineural, mixed, or central. The most common type of hearing loss can be temporary or permanent[1].

One of the ways deaf people communicate is through Brazilian Sign Language (LIBRAS)[2], which uses the visual, cognitive, and upper limb systems to produce words. The electroencephalogram is used in the deaf[3] population as a model of neurodynamic

[1] Master's in Education, Federal University of Uberlândia, Brazil. Doctoral student. PPMHR, UniEVANGÉLICA. E-mail: paulimjesus@yahoo.com.br

[2] Master's student, Evangelical University of Goiás- UniEVANGÉLICA, Brazil. fisiolorraine@gmail.com

[3] Student of the physiotherapy course, Evangelical University of Goiás-UniEVANGÉLICA, giovanalms13@hotmail.com

[4] PhD in Translation, UFSC. Educational sign language translator-interpreter, PPMHR, UniEVANGÉLICA. E-mail: prof.sauloxavier@gmail.com

[5] Faculty member of the Stricto Sensu Graduate Program in Human Movement and Rehabilitation (PPGMHR) and the Undergraduate Physiotherapy Course at the Evangelical University of Goiás - UniEVANGÉLICA. csantos.neuro@gmail.com

assessment with results in multi-scale neuro-physical that maps the late brain responses to the effort exerted[4].

It is known that there is movement of the upper limbs (ULs) such as the shoulder, arm, elbow, forearm, wrist, hands, and fingers in the process of translating and interpreting signs. Given this, there is information being transmitted directly by the brain during interpretation. However, there are no studies that correlate the evaluations, which justifies the objective of the present study, which is to evaluate fluency, cerebral electrical activity, and upper limb movement during the execution of the universal sign - Jesus - in Brazilian Sign Language.

METHODOLOGY

The research is being prepared for submission to the Ethics and Research Committee (ERC) of the Evangelical University of Goiás - UniEVANGÉLICA.

Sample

The participants will be selected according to the criteria below: Inclusion criteria will be considered: (1) Profoundly deaf individuals with an audiology report; (2) adequate understanding and cooperation during procedures; (3) age between 18 and 55 years; (4) post-lingual; and (5) confessionally Protestant. Exclusion criteria will include: (1) associated neurological pathologies (for example: Autism Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD)); (2) bone deformity in the upper and lower limbs; (3) uncorrected visual impairment.

Evaluation protocol

The evaluations will take place in up to 3 sessions, with each session averaging forty minutes in accordance with the protocol below:

Language Proficiency Classification - Common European Framework of Reference for Languages

The Common European Framework of Reference for Languages (CEFR) for learning, teaching, and assessment. The CEFR is applied for the establishment of levels for teaching Libras as L2. The established levels are six, defined by different linguistic activities that are fundamental for communicative competence: reception

(listening comprehension and reading), interaction, and production (oral production and written text production)[5].

The CEFR presents three levels of language proficiency - and six sub-levels. The A level represents the speaker/user as a "basic user," referring to a learner at a basic level. At level A, there are two sub-classifications: A1 ("beginner") and A2 ("elementary"). Next, there is level B, that of the "independent user." This level is divided into two sub-levels: B1 ("threshold" or "intermediate") and B2 ("vantage" or "upper intermediate"). Finally, there is level C, which qualifies the speaker/user as a "proficient user" and is subdivided into C1 ("independent" or "advanced") and C2 ("mastery" or "proficient")[5].

Evaluation of upper limb movement during the interpretation and execution of the universal sign in Brazilian Sign Language - in the analysis of three-dimensional movement

The kinematics of the universal sign movement - Jesus - in sign language will be evaluated using the SMART-D 140 system (BTS, Milan, Italy), with eight cameras sensitive to infrared light, a sampling frequency of 100 Hz, and a video system synchronized with the SMART-D system. Reflective markers that will be positioned on anatomical reference points directly on the skin with specific adhesive tape, following the SMARTup protocol: the experimental setup. A total of 21 markers measuring 15 mm in diameter will be used to identify the position of the head, trunk, and upper limbs (arm, forearm, and hand).

Evaluation of brain activity during the interpretation and execution of the universal sign in Libras - Electroencephalogram

The brain activity will be investigated at three moments while the deaf person watches the video and performs the interpretation, reads the paper and performs the interpretation, and watches the simultaneous interpretation and performs the interpretation. For this, the volunteer will be seated in an upright position in a chair in

front of the table where the data collection will be conducted. The BrainNet BNT36 device with 36 configurable channels (32 AC and four DC) and a 16-bit analog-to-digital converter will be used for the acquisition of the electroencephalogram (EEG) signal (figure 1). The signal analysis will be carried out with the help of the EEGLab tool implemented in Matlab, which is also capable of providing a topographic map of brain activity over time. The electrodes will be positioned according to the guidelines of the 10/20 EEG system (figure 2)[6].
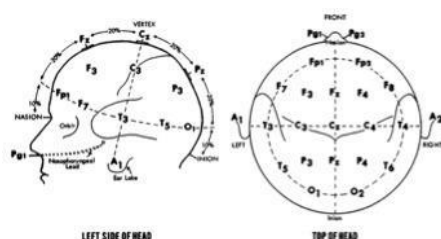
Figure 1: Phase Relationships.

(A) Synchronized - phase differences between both signals are stable (constant); and (B) Unsynchronized signals - phase differences are variable.
Source: manual

Figure 2: Positioning of electroencephalography electrodes based on the 10-20 system.

Source: manual

EXPECTED RESULTS

The impact of the presented study refers to the potential of this innovative research in the context of the dissemination of the translation process for this population, standing out for its originality involving innovative techniques in the fields of clinical practice, research, and advancement in the translation process of the involved population.

THANKS

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