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MEETINGIO

ON BASIC COGNITIVE PROCESSES



ACÚSTICA APLICADA

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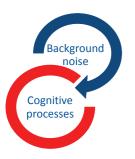
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Abstract

The attention processes in people is affected by background noise produced by many different sources. Beta (13-30 Hz) and Theta (4-7 Hz) waves are directly related to attention and memory processes. Volunteers were asked to perform an attention test with and without background noise and their cerebral activity was recorded through electroencephalography (EEG). Results shows significant decreases in both beta and theta frequency bands (beta 13-30 Hz and theta 4-7 Hz) under background noise exposure. The attentional improvement is related to increases of the beta and theta waves, and we have observed that those decreases are directly related to a lack of attention caused by the exposure to background noise.

Objective

The main objective of this research is to prove the negative influence of background noise on the brain waves related to basic cognitive processes as attention and memory.



Methods (I)

- 1. Acoustic characterization
- 1.1 Survey
- 1.2 Noise exposure
- 1.3 Noise annoyance
- 2. Psychological evaluation
- 2.1 Attention tests Background
- 2.2 Memory tests + noise
- 3. Electrophysiological

assesment

Electroencephalogram

+ Noise exposure

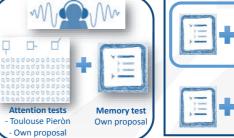
2. Psychological characterization

2.1 Attention tests

2.2 Memory tests

3. Electrophysiological assesment

3.1 Electroencephalogram + Noise exposure





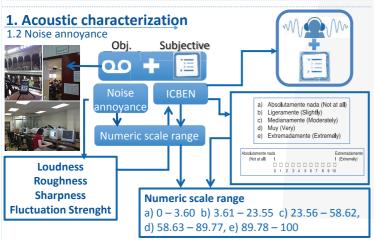
▶ Basal EEG	► EEG recording + Toulouse-Pieròn test	Pause	► EEG recording + Toulouse-Pieròn test	► Basal EEC
2.5 Minutes	10 Minutes	2 Minutes	10 Minutes	2.5 Minutes
Without background noise			With background noise	With background noise
		27 Minutes		

Methods (II)

1. Acoustic characterization

1.1 SURVEY: perception about noise

	Participants	Mode		Educational level		
# Questions*		Online	Face- to-face	Bachelor	Master	PhD
8	454	50%	50%	85%	10%	5%



1. Acoustic characterization

1.3 Noise Exposure

Measurement strategy design UNE-EN ISO 9612:2000 Measurement campaign

Dataloggers

Analysis of the results

L_{Aeq, T} LEX_{8h} ANSI S12.60-2010 40 dBA interior 60 dBA exterior

Results

Noise exposure

Noise Annoyance

Psychological evaluation

Promoto CENY

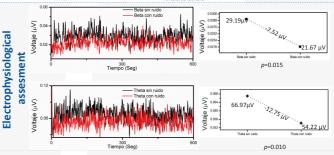
Annother Esponsory

Noise Annoyance

Psychological evaluation

Annother Esponsory

Promoto CENY



Conclusions

- Survey: Sound environments studied are aggressive.
- **Levels of noise:** Excessives and not appropriate for concentration activities and the environmentes are considerated very annoying.
- Psychometric evaluation: Unreliable data.
- **EEG:** β y Θ decrease with influence of backround noise. We can relate it with attention and memory reductions.

Papers at Journals & Conferences

- Tristán E., Pavón G., López, J.M (2015). "Characterization of sound environments of university students". Int. J. Occupational Safety and Ergonomics (JOSE).
- Tristán E., Pavón G., López, J.M. (2016) "Evaluation of psychoacoustic annoyance and perception of noise annoyance inside university facilities". International Journal of Acoustics and Vibration (IJAV).

