



VOCAL EFFORT AMONG BILINGUAL ENGLISH-SPANISH COLLEGE PROFESSORS

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ABSTRACT

This study aimed to investigate the relationship between vocal effort, background noise, and the language spoken by college professors while teaching online classes. Eight bilingual teachers were recruited, and each received a professional recording kit to use in their homes during the pre- and post-assessment and to monitor during the class. The study used the Zoom platform to control participants' laptops and record voice samples directly on their computers. Participants read two texts (one in English and one in Spanish) under two conditions (with and without background noise), randomized among participants to control for any cumulative effect. Participants indicated their effort level using the Borg CR100 Vocal Effort Scale after each production. Results indicated that vocal effort perception was increased when production was produced under noisy conditions (Beta= 28.9; p-value= 0.01). However, the language spoken did not have a measurable effect on vocal effort within a condition. The study concludes that while different work-related factors increase the likelihood of developing voice disorders among college professors, the effect of noise on vocal effort among bilingual teachers did not have a measurable effect. The study adds to the understanding of the impact of noise and language on vocal effort among bilingual teachers.

Keywords: *vocal effort, teachers, voice disorders, background noise, bilingualism*

1. INTRODUCTION

There is a well-established relationship between vocal effort and high background noise levels in various work environments, including among teachers. High background noise levels can result in increased vocal effort [1-2], which can lead to vocal fatigue and voice disorders. Teachers often work in noisy environments, such as classrooms, which can contribute to the development of vocal problems. Thus, it is crucial to investigate the relationship between vocal effort and background noise levels among teachers to understand the potential impact on their vocal health.

Speaking a second language may require increased vocal effort due to the need to focus more on pronunciation, the use of different articulatory patterns, and the use of unfamiliar sounds [3]. Previous research has shown that bilingual speakers may experience more vocal fatigue, hoarseness, and other voice-related problems, especially when speaking their non-native language [4]. This increased vocal effort may be exacerbated by other factors such as high background noise levels, which can lead to an increased risk of vocal strain and potential voice disorders among teachers who need to speak loudly and clearly to be heard over the noise. Therefore, investigating the relationship between vocal effort, background noise, and the language spoken can provide important insights for improving bilingual teachers' vocal health.

2. METHODS

The Corporación Universitaria Iberoamericana Institutional Review Board (IRB) approved adult participation in this cross-sectional correlational study, which aimed to investigate changes in voice production and vocal effort among Spanish-English bilingual teachers (native Spanish speakers) teaching online classes in English. Eight participants (66% females and 34% males) with an average age of 35 years old were recruited, and all signed an online

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informed consent form before their participation. Each participant was provided with a kit consisting of AKG K72 professional headphones, an AKG-P220 Condenser microphone and supporting phantom power and cables, a digital noise meter, and a decibel meter.

Additionally, participants were instructed to download the software Praat and Zoom onto their computers. The equipment provided allowed us to accurately measure background noise levels and capture voice recordings before and after the monitored online class.

Participants measured the background noise of their lecturing environment for their online course, performed a hearing screening, and recorded four voice samples of a standardized text in English and Spanish under two background noise conditions (with and without background white noise). After each reading, they reported their perceived vocal effort level using the Borg centiMax® vocal effort scale. Analysis was conducted using Generalized Estimating Equations.

3. RESULTS AND DISCUSSION

Table 1 illustrates the overall results and significance of the mean vocal effort levels for the different conditions. This is represented graphically in Figure 1 where the mean vocal effort levels for Spanish and English productions with and without white background noise. The results suggest that participants reported higher mean vocal effort levels when speaking Spanish (15-33) compared to English (13-23) both with and without white background noise.

Table 1. The effect of language spoken and background noise conditions on the vocal effort level.

Variable	Beta	SE	P-Value
Intercept	33.34	9.64	0.00
Spanish (L1)	Reference Category		
English (L2)	-4.06	4.62	0.38
Noise	Reference Category		
No Noise	-28.93	11.67	0.01

The study's results demonstrated a statistically significant increase in perceived vocal effort level when productions were produced under noisy conditions. The beta coefficient of 28.9 revealed a strong positive relationship between background noise levels and perceived vocal effort level.

The highly significant p-value of 0.01 suggested that the result was not due to chance.

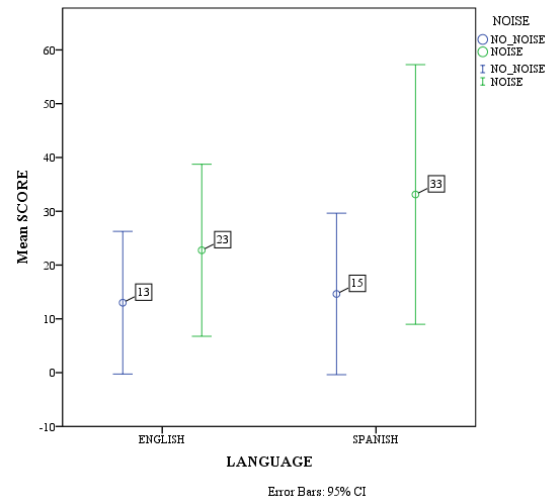


Figure 1. BORG Scores in English and Spanish with and without background noise

This finding corroborates previous research, indicating that background noise can have a substantial impact on the effort required for vocal production. Notably, the effect of noise on vocal effort was observed regardless of the language spoken by participants. Moreover, the language spoken did not have a significant effect on the perception of vocal effort.

These findings have significant implications for educators and individuals who frequently speak in noisy environments, emphasizing the need to minimize background noise levels to reduce vocal strain and prevent voice disorders.

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