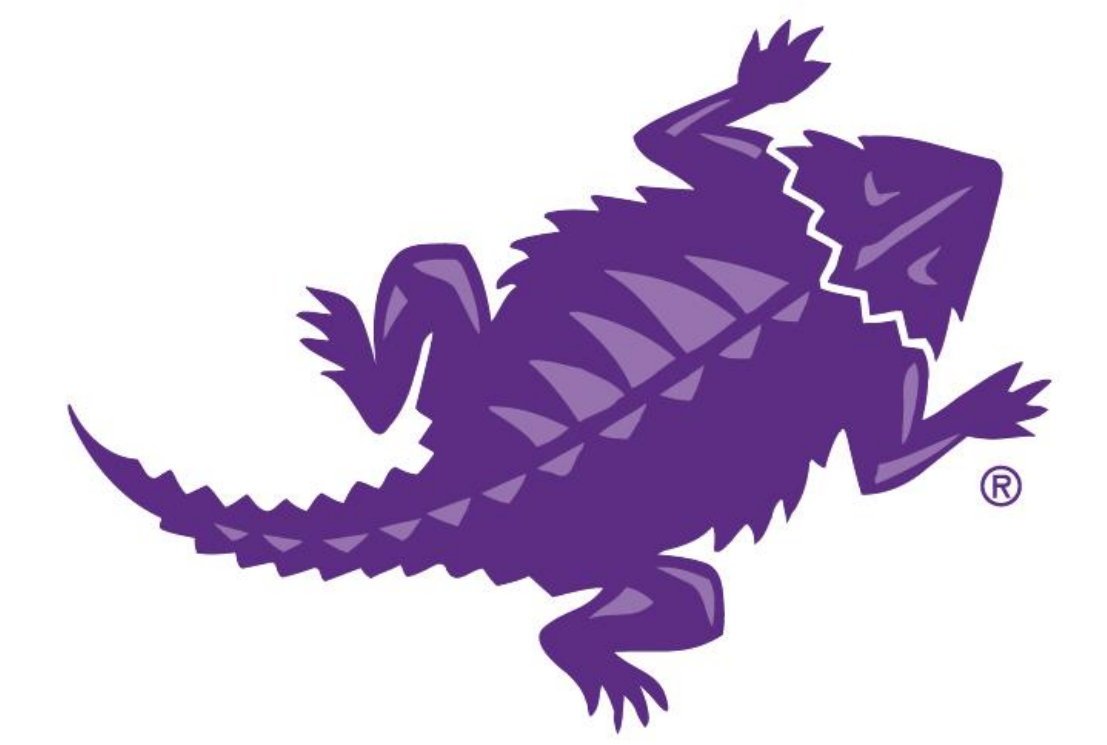




# The Effect of Speaking a Second Language on Vocal Function and Vocal Quality of Life



Zoë Thijs, M.S. • Christopher Watts, Ph.D.

Texas Christian University • Davies School of Communication Sciences and Disorders

## INTRODUCTION

Speaking a successive second language can influence voice and vocal quality of life. However, the underlying cause of these vocal changes has remained unclear. One hypothesis is that the differences in proficiency or even different neuromotor demands in the second language compared to the first language cause the change. These factors cause the speaker to feel more physiological stress when speaking in the second language, which translates to generalized laryngeal tension, raised fundamental frequency, changed vocal quality and increased perception of vocal effort (Järvinen & Laukkanen, 2015; Järvinen, Laukkanen, & Geneid, 2017; Ng, Hsueh, & Sam Leung, 2010). However, there is no consensus and the underlying mechanisms remain unclear. Moreover, few studies have investigated this phenomenon in Spanish-English bilinguals. Therefore, the **aim of this study** was to investigate how speaking a second language influences voice production in successive Spanish-English bilinguals.

## METHODOLOGY

21 female **monolingual or successive bilingual speakers** between 18 and 40 years old were recruited. The 7 monolinguals only spoke English. 7 of the bilinguals spoke English as a first language, and Spanish as the second; the other 7 had Spanish as a first language and English as the second language. All bilingual speakers were fluent in both languages, as assessed by the Language Experience and Proficiency Questionnaire (LEAP-Q; Marian, Blumenfeld, & Kaushanskaya, 2007), as well as the “Oral language expression” and “Expresión de lenguaje oral” subtests of the Woodcock-Muñoz Language Survey – Third Edition (WMLS-III; Woodcock, Alvarado, & Ruef, 2017). Phonetically similar **sentences in English and Spanish** were recorded before and after an **effortful speaking task** (speaking for 5 minutes about a familiar topic) in English and Spanish. The fundamental frequency ( $F_0$ ), cepstral peak prominence (CPP) (Awan et al., 2016), harmonics-to-noise ratio (HNR), and Cepstral Spectral Index of Dysphonia (CSID) were calculated for all samples. **Vocal effort** was assessed using a self-made questionnaire.

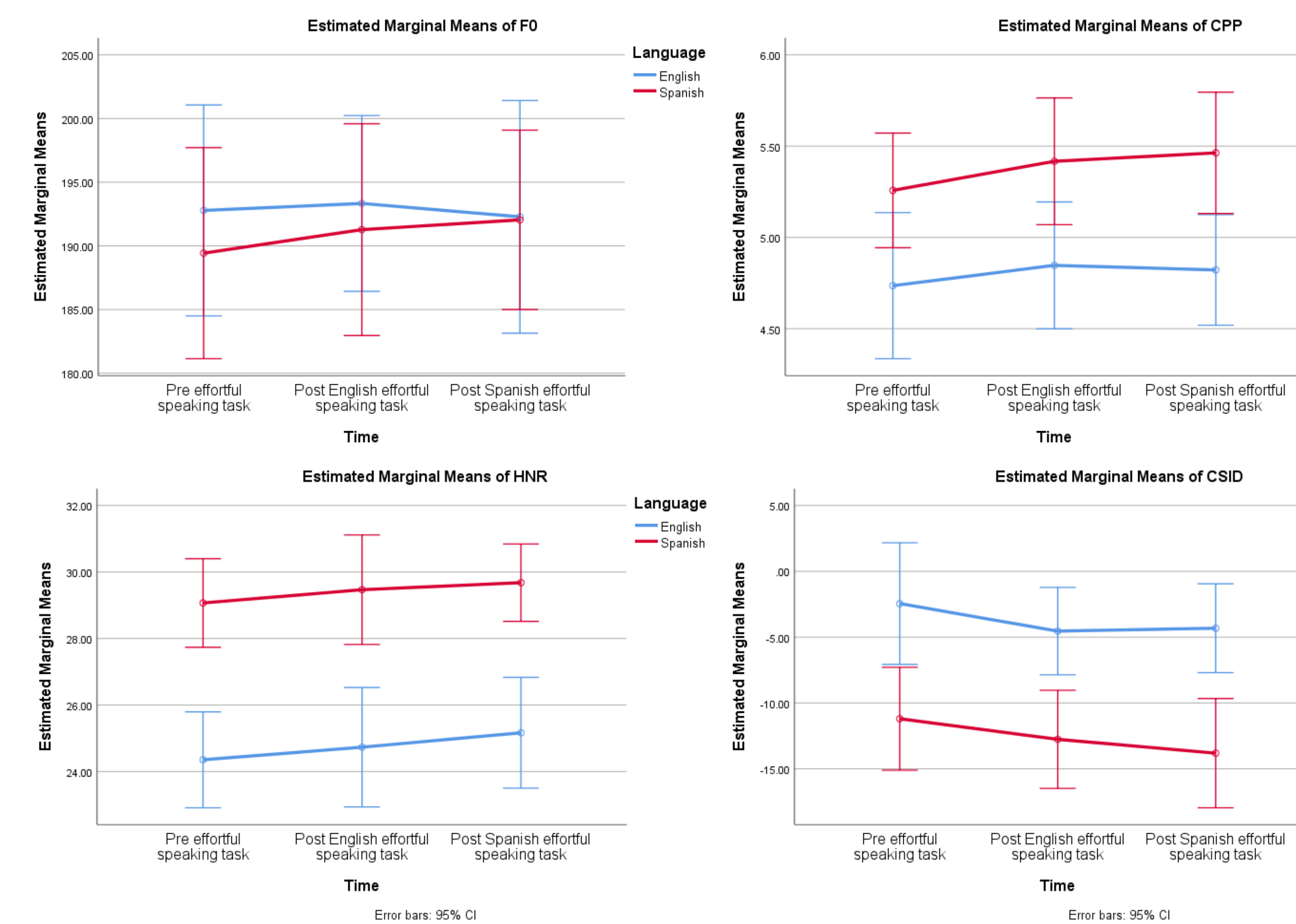
## RESULTS

### Acoustic voice measures

A repeated measures MANOVA was used with the following factors:

- **Group:** Bilinguals with either English or Spanish as first language
- **Time:** pre and post both an English and Spanish effortful speaking task
- **Language:** English or Spanish spoken sentence

The dependent variables were  $F_0$ , **CPP**, **HNR** and **CSID**. There was no significant effect of group and time, nor were there any significant interaction effects. There was a **significant effect of language** (Pillai’s trace=0.98,  $F[4]=96.91$ ,  $p<0.001$ ,  $\eta_p^2=0.98$ ). Follow-up analysis showed a significantly greater CPP ( $F[1]=100.7$ ,  $p<0.001$ ,  $\eta_p^2=0.89$ ), higher HNR ( $F[1]=256.40$ ,  $p<0.001$ ,  $\eta_p^2=0.96$ ), and lower CSID ( $F[1]=109.18$ ,  $p<0.001$ ,  $\eta_p^2=0.90$ ) for Spanish, but no differences for  $F_0$ .



A second repeated measures MANOVA was performed to compare both groups of bilinguals with the monolinguals over  $F_0$ , CPP, HNR, and CSID in English. Only the pre and post time points of the English effortful speaking task were used. There was no significant effect of group, time, or their interaction.

## RESULTS

### Vocal effort

Vocal effort was first compared across the bilingual groups for the different languages and pre/post the effortful speaking task with a repeated measure ANOVA. There was no significant effect of time, language, group, or their interactions.

Secondly, all three groups were compared for vocal effort in English before and after the English speaking task using another repeated measure ANOVA. A significant effect for time was found (Pillai’s trace=0.28,  $F[1]=7.00$ ,  $p=0.002$ ,  $\eta_p^2=0.28$ ). The scores before the effortful speaking task were lower than after the effortful speaking task.

## DISCUSSION AND CONCLUSION

The results indicate that in successive Spanish-English bilinguals proficient in both languages, acoustic correlates of voice quality change as a function of the language spoken, but vocal effort does not change. No differences were found when comparing the monolingual and bilingual groups. Acoustic indices of voice quality were better when speaking Spanish. As the sentences in Spanish and English were phonetically similar (though not identical), we can hypothesize that the found difference indicate a different mode of phonation, rather than different phonetic content. As the participants indicated no increased vocal effort, a different mechanism likely causes these changes. Therefore, more research is needed on why speaking a second language influences voice quality in bilingual speakers.

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