Strenuous Sequencing: Exploring the Effect of Bilingualism on Executive Functioning in the Human Brain

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The purpose of this project is to assess executive functioning in the human brain and determine if there are qualitative differences between bilingual and monolingual students. I believe that due to a bilingual student having practiced translation between languages, that student's executive functioning skills are enhanced. A monolingual student does not have this extra translation practice, so I believe there is no similar cognitive functioning enhancement. To carry out my project, I first learned how to write basic computer code using batch-file commands to mimic a pencil-and-paper cognitive sequencing instrument known as the Trail-Making Test. I then generated three Spanish test questions for students to answer, to determine bilingualism or not. These questions were presented to students to translate. Then I created my version of the Trail-Making Test, using batch-file coding. I tested the batch application repeatedly to troubleshoot any errors and to ensure it collected the necessary information. When the batch file was properly prepared, I downloaded it onto flash drives to carry out testing by having each student use his/her own device (thereby respecting pandemic protocols). I then tested nearly 500 middle school students. The results support my hypothesis that executive functioning skills in a bilingual student are greatly enhanced when compared to a monolingual counterpart. Although task accuracy is similar between the subjects, there is a significant difference in completion time. Bilingual students complete the sequencing task more efficiently than their monolingual counterparts. I believe this is due to their enhanced executive functioning skills.

Awards Won:

Fourth Award of $500