

# The Influence of English as a Second Language on Verbal Fluency Performance

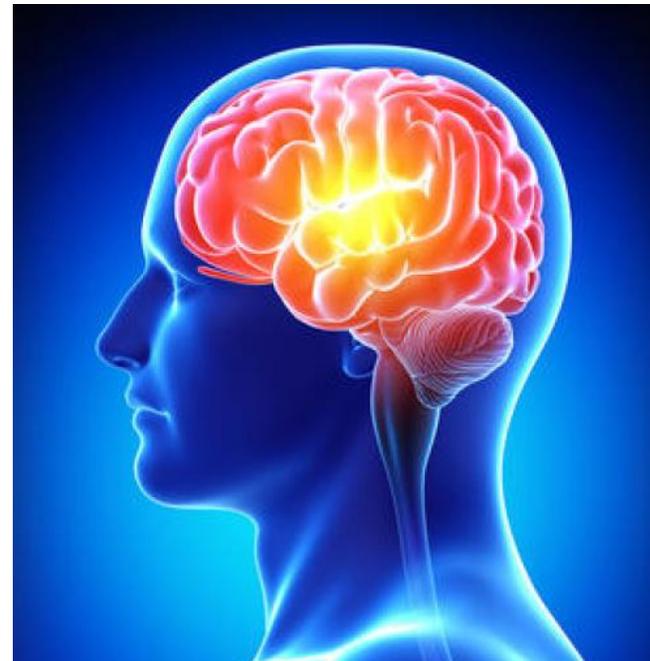
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# Overview of Study

- ▶ Background
- ▶ Hypotheses
- ▶ Methods
- ▶ Results
- ▶ Discussion



# Background

- ▶ Bilingualism is extremely prevalent, with more than 50% of the world's population being bilingual or multilingual (Grosjean, 2008; Taler et al., 2013).
- ▶ In 2011, 21% of the US population spoke a language other than English at home (Ryan, 2013).
- ▶ Recent studies found that bilinguals perform differently than monolinguals on tests of neuropsychological functioning (Bialystok, 2009; Gollan et al., 2002; Taler et al., 2013).

# Neuropsychological Assessment

- ▶ Assesses brain and behavioral relationships to assist in diagnosis and treatment planning.
- ▶ Cognitive Domains Assessed:
  - ▶ Attention
  - ▶ Language
  - ▶ Processing Speed
  - ▶ Executive Functioning
- ▶ Many neuropsychological tests actually measure multiple cognitive domains

# Verbal Fluency Tasks

- ▶ Frequently used to assess *both* language and executive function (Bialystok, 2009; Troyer, 2000).
- ▶ Generate as many words as possible in a time limit
  - ▶ Score = total words generated
- ▶ Other characteristics of performance:
  - ▶ Clustering
  - ▶ Switching



# Verbal Fluency Tasks (cont.)

## ▶ Two types of clustering:

### 1. Phonemic

e.g. (category) letter **“W”** → (subcategory) **“wallet, walrus, wander”**

### 2. Semantic

e.g. (category) **animals** → (subcategory: domesticated) **“cat, dog, rabbit”**

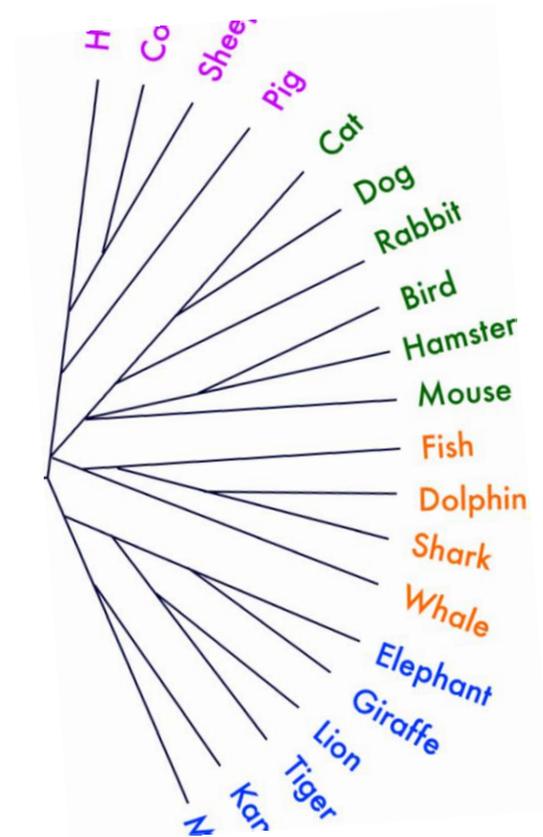
## ▶ Two types of switching:

### 1. Phonemic

e.g. **“walrus, wander”** → **“willing”** and **“willow”**

### 2. Semantic

e.g., **“hamster, mouse”**  
(domesticated) → **“fish, dolphin”**  
(animals in ocean)



# The Bilingual Experience

- ▶ Language: Bilinguals < Monolinguals

- ▶ Bilinguals have lower levels of vocabulary than monolinguals (Bialystok, et al., 2009; Luo, et al., 2010).

- ▶ Executive Function: Bilinguals > Monolinguals

- ▶ Bilinguals have two co-existing languages that are both active and competing, forcing them to inhibit one language (Crinion et al., 2006; Luo, Luk & Bialystok, 2009).
- ▶ The bilingual must constantly shift back and forth between languages (Bialystok, 2009; Pen et. al., 2010).

# Verbal Fluency Tests and Bilingualism

- ▶ Bilinguals < Monolinguals on verbal fluency tasks for total words  
(Portocarrero et. al.,2007; Troyer, 2000).
- ▶ No differences in switching and clustering performances between monolinguals and bilinguals (Taler, 2013).
- ▶ Suggests that when assessing bilinguals, a closer look at performance strategies, not just total words, should be considered, to better understand the bilingual brain.

# Present Study

- ▶ Goal: Further explore the performance discrepancies found between individuals for monolinguals and bilinguals on verbal fluency tasks.
  - ▶ Total words
  - ▶ Clustering and switching



# Hypotheses

- ▶ Hypothesis 1: EFL will outperform ESL speakers on the verbal fluency task when only total words generated is scored, cross-validating previous findings.
- ▶ Hypothesis 2: ESL will more effectively use clustering and switching compared to EFL, to the extent these scores reflect executive functioning.

# Methods

- ▶ Participants: 139 neurologically and psychologically healthy undergraduate students were used for study:
  1. Monolinguals: EFL (n=83)
  2. Bilinguals: ESL (n=56)
  
- ▶ Exclusion Criteria: participants who had history of the following ailments were excluded from the study:
  1. Epilepsy
  2. Loss of consciousness (TBI)
  3. Stroke
  4. Cancer
  5. Multiple Sclerosis
  6. HIV/AIDS
  7. Psychiatric Disorders
  8. Substance Abuse

# METHODS (continued)

- ▶ Participants were administered two measures of verbal fluency:
  - ▶ Controlled Oral Word Association Test (COWAT): Generate as many words as possible for a given letter within a minute. Three trials using three different letters (phonemic fluency).
  - ▶ Category Naming: Generate as many words as possible for a particular category within a minute (semantic fluency).

# Sample of Verbal Fluency Measure

T

- Together
- To
- Target
- Tangible
- Tassel
- Toe

O

- Open
- Organize
- Oral
- Oat
- Otter

P

- Play
- Plate
- Pilgrim
- Pill
- Picture

Vegetables

- Carrot
- Peas
- Squash
- Spinach
- Pickles

# Table 1. Demographics of sample.

	EFL (n=80)	ESL (n=48)	t/x2	p	Differences
Age (yrs; M, SD)	19.9 (2.5)	20.1 (3.0)	-.428	.669	None
Education (yrs; M, SD)	12.6 (1.1)	12.7 (1.3)	-.555	.580	None
Female (%)	70%	71%	.039	.844	None

# Table 2. Neuropsychological Performance by Group

	EFL	ESL	t	P	Difference
COWAT Total Words	36.82 (8.88) n=83	32.46 (9.82) n=56	2.72	.007*	EFL>ESL
Phonemic Switches	25.44 (7.21) n=79	21.92 (5.81) n=49	2.89	.005*	EFL>ESL
Phonemic Clusters	.37 (.18) n=79	.36 (.15) n=49	.36	.72	
Semantic Switches	10.24 (3.28) n=80	10.08 (2.71) n=48	.27	.78	
Semantic Clusters	.88 (.42) n=80	.86 (.43) n=48	.26	.80	

Notes: \*p<.05; EFL = English as a first language; ESL= English as a second language; COWAT = Controlled Oral Word Association Test

# Results

- ▶ Hypothesis 1: Supported
  - ▶ Analysis revealed that there was a significant difference between groups for total words generated in the expected direction (EFL > ESL).
- ▶ Hypothesis 2: Not Supported
  - ▶ An unanticipated difference was found in phonemic switching (EFL > ESL).
  - ▶ No differences between groups on clustering or semantic switching were found.

# Discussion

- ▶ The results further support previous findings on the effects of bilingualism on verbal fluency scores with respect to total scores.
  - ▶ Previous research: bilinguals < monolinguals for vocabulary (Bialystok, et al., 2009; Luo, et al., 2010)
- ▶ However, it was unexpected that EFL>ESL on phonemic switching
  - ▶ Previous research found that the number of switches decreases in a dual-task condition (Raboutet et al., 2010). Bilinguals are constantly in a dual-task situation because they must deal with their competing languages.

# Discussion (continued)

- ▶ This study contributes to the literature by helping to characterize the bilingual brain (Troyer, 2000).
  - ▶ Help avoid misrepresentation of bilinguals' performance
  - ▶ Performance needs to be compared to the corresponding reference group.

# Limitations of this study

## ▶ Threats to external validity

- ▶ The use of a convenience sample size
- ▶ Decreased generalizability of our findings

## ▶ Threats to internal validity

- ▶ Small sample size decreases power
- ▶ Disproportionate sample size between groups
- ▶ Subjective nature of scoring performance characteristics
- ▶ Retrospective self-reporting

# Future Research

- ▶ Future research should continue to investigate the influence that language, culture, and other life experiences have on neuropsychological test performance (Romero et al., 2009; Teng & Manly, 2005).
  - ▶ Designed for detection of brain injuries and disease, but are sensitive to other unanticipated variables.
  - ▶ We need to understand what these influences are to help guide a more accurate interpretation of test results.

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