Vocabulary and verbal fluency of bilingual and monolingual college students
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Abstract

We assessed the English vocabulary and verbal fluency of college students who were either bilinguals who were born abroad and spoke English or monolingual speakers of English. We examined the relationship between age of arrival to the U.S. of bilinguals and their English vocabulary. The bilinguals’ performance on English vocabulary was in the average range. However, despite arriving to the U.S. at a relatively young age, and having sufficient command of English to attend a competitive university, the bilinguals had lower receptive and expressive English vocabularies than their monolingual peers. Age of arrival was moderately correlated with English vocabulary scores. The younger the bilingual students were when they arrived to the U.S., the better their English vocabulary. Both groups had similar performance on phonetic fluency. However, the bilingual group performed significantly lower in semantic fluency. This pattern of performance in verbal fluency is consistent with that found in previous studies.

Keywords: Bilingualism; Vocabulary; Verbal Fluency; Cross-cultural; Neuropsychology

Bilingualism is defined in many different ways (Romaine, 1995). According to Haugen (1953), bilingualism emerges when a speaker of one language is able to reproduce meaningful utterances in another language. In contrast, Bloomfield (1933) states that bilingualism is only present when the speaker has acquired “native-like” control of both languages. Researchers also classify bilinguals in terms of how competent the speaker is in each language. For example, the term “balanced” bilingual refers to those individuals who are equally proficient in both languages. In contrast, “non-balanced” bilingual refers to those who are more proficient in one language than the other (Romaine, 1995).

To adequately assess the abilities of an individual, the norms for the tests used should be from a population of similar demographic characteristics to those of the individual being tested (Stricks, Pittman, Jacobs, Sano, & Stern, 1998). However, given the rise of non-native bilingual speakers of English in the U.S., many bilingual individuals are being tested with English language measures that were normed with native monolingual speakers. This practice puts into question the validity of test findings and recommendations made by the examiner. In order to provide more appropriate services to the increasing bilingual population in the U.S., it is crucial that we learn about the performance of bilinguals on standardized language measures that were normed using native monolingual English speakers.

Studies have found factors that affect second language proficiency. For example, studies have found a significant relationship between age of arrival to the host country and second language proficiency in bilinguals who were born abroad. Specifically, the earlier the age of arrival, the greater the second language proficiency (Krashen, Long, &...
Most studies assessing this relationship have measured language proficiency using non-standardized language measures (Johnson & Newport, 1989; Oyama, 1978; Patkwoski, 1980). Studies have also found performance differences on verbal fluency between monolingual and bilingual individuals (Gollan, Montoya, & Werner, 2002; Rosselli et al., 2000). Assessment of verbal fluency usually includes phonetic and semantic fluency tasks. Studies have found similar performance on phonetic fluency between monolinguals and bilinguals. However, bilinguals have performed relatively worse on semantic fluency (Gollan et al., 2002; Rosselli et al., 2000). Gollan et al. and Rosselli et al. offer several explanations for the discrepancy between phonetic and semantic fluency. They suggest that cross-language interference occurs when there is competition between alternative items in each language, thereby delaying the retrieval of a single item in one language. Specifically, Rosselli et al. point out that some categories of semantic fluency (e.g., animals) include only the recall of concrete words (e.g., tiger), whereas phonetic fluency is not limited to concrete words. They further hypothesize that concrete words possibly share more elements in their representations across the two languages than non-concrete words. Thus, cross-language interference could be greater in semantic fluency than in phonetic fluency. Ignoring these patterns of performance when assessing bilinguals could have a negative impact on the test interpretation and recommendations made by the examiner. Verbal fluency is a widely used neuropsychological measure and it is sensitive to various forms of cognitive impairment (Kempler, Teng, Dick, Taussig, & Davis, 1998; Roberts & Le Dorze, 1997). Phonetic and semantic fluency tasks have shown to be differentially affected by various neurological disorders ranging from schizophrenia (Rossell, Rabi-Hesketh, Shapleske, & David, 1999), to alcohol dementia (Saxton, Munro, Butters, Schramke, & McNeil, 2000), and Parkinson’s disease (Azuma et al., 1997).

In the current study, we assessed how non-native bilingual college students who speak English performed on standardized measures of English vocabulary and verbal fluency that were normed with monolingual samples. We also compared the bilinguals’ performance to that of monolingual college students. Further, we divided the bilingual sample into those individuals who either arrived “early” (before the age of 10) or “late” (at age 10 or later), and assessed if the English performance of early bilinguals differed from that of native monolingual speakers. In addition, we also examined the relationship between age of arrival to the U.S. of bilingual students and their performance on the measures of English vocabulary. We used the Peabody Picture Vocabulary Test-III (PPVT-III) and Expressive Vocabulary Test (EVT) to assess receptive and expressive vocabularies, respectively. To measure verbal fluency in English, we administered the phonetic and semantic fluency tasks of the Controlled Word Association Test (COWA).

In the current study, we define bilinguals as individuals who were born abroad, moved to the U.S. after the age of 5, and spoke various non-English native languages (for complete criteria, see Section 1). We acknowledge that the languages that were represented in this study differ in their degree of commonality with English (Obler, Zatorre, Galloway, & Vaid, 1982). We used language rating scales and socio-linguistic questionnaires to assess degree of bilingualism and gather demographic information of participants.

1. Method

1.1. Participants

There were two groups in this study: monolingual (n = 39) and bilingual (n = 39) undergraduate college students. These participants were enrolled in the introductory psychology course and were given credit for their participation. Participants were included in the monolingual group if they met the following criteria: (a) they rated themselves as monolingual, (b) they were born in the U.S., (c) English was their native (first) language, (d) English was their parents’ native language, and (e) they had not lived in a non-English speaking country for longer than 1 month. Participants were included in the bilingual group if they met the following criteria: (a) they rated themselves as bilingual, (b) they were born abroad, (c) English was not their native (first) language, (d) English was not their parents’ native language, (e) they had not lived in another English-speaking country prior to moving to the U.S. for longer than 1 month, (f) they moved to the U.S. after the age of 5, and (g) English had to be one of the two languages that they knew. Participants chosen for participation were scheduled for approximately 1½ h of testing in the Environmental Neuropsychology Laboratory.

1.2. Measures

The current study was part of a larger project in which other cognitive measures were administered. Participants were administered the following measures in the following order: Socio-linguistic Questionnaire (administered during
the departmental mass testing). Language rating scales, Controlled Word Association Test (COWA), California Verbal Learning Test (CVLT), Standard Progressive Matrices (SPM), Peabody Picture Vocabulary Test-III (PPVT-III), and the Expressive Vocabulary Test (EVT). Following is a description of the measures that are discussed in the current paper.

The Socio-linguistic Questionnaire was used to gather demographic and language information of participants. They were asked to provide information such as their place of birth, international travel history, age of arrival to the United States (for bilingual participants), native language, and parents’ native language. Participants were also asked to rate themselves as monolingual, bilingual (i.e., knowing two languages), or multilingual (i.e., knowing three or more languages). Based on their self-rating, participants were divided into monolingual and bilingual groups. The self-rated multilingual group was excluded from the study.

Monolingual and bilingual participants were administered the language rating scales to assess their self-perceived ability for their first and second languages. Given that the learning of a second language is common for native speakers of English in the U.S., we assessed their perceived ability in the second language. Specifically, these scales were used to assess how competent an individual was in one language relative to the other. All participants were asked to rate their language ability across the four following domains: ability to understand (aurally), read, speak, and write (Macnamara, 1967; Romaine, 1995; Valdes & Figueroa, 1994). Participants rated themselves on 9-point Likert scales (ranging from 1 to 9) in which a score of 1 indicated “very poor” ability, a score of 5 indicated “moderate” ability, and a score of 9 indicated “excellent” ability. An “average” score for the four domains was obtained for each language and subtracted from the other language. Following Romaine’s (1995) approach to interpret scales, if the difference was zero or “close” to zero, we considered the individual to have equal proficiency in both languages (i.e., balanced). In contrast, if the difference was “far” from zero, we considered the individual to be more proficient in one of the two languages (i.e., unbalanced). It is important to clarify that the scores on these scales were not part of the criteria for participation in the study; rather, it was to assess the participants’ perceived ability in one language relative to the other.

Using the COWA, phonetic and semantic fluency was measured. In phonetic fluency, the letters used were “F,” “A,” and “S.” In semantic fluency participants were asked to name words belonging to the following categories: Animals, Kitchen (i.e., things found in the kitchen), and Actions (i.e., things that people do). Allowed time for each individual category was 1 min (Spreen & Strauss, 1998). We used PPVT-III (Dunn & Dunn, 1997) and EVT (Williams, 1997) to measure receptive and expressive vocabularies, respectively.

### 1.3. Data Analysis

Differences in performance between the monolingual and bilingual groups on the PPVT-III, EVT, and COWA were assessed by conducting two-tailed independent sample t-tests. Scores on the PPVT-III and EVT are presented in standard scores, with a mean of 100 and a standard deviation of 15. These scores were derived using the normative data provided by each of the tests’ manuals. For the bilingual group, the relationship between age of arrival to the U.S. and performance on the measures of English vocabulary was assessed by conducting two-tailed Pearson’s r correlations.

For phonetic fluency of the COWA, standard scores were derived from Tombaugh, Kozak, and Rees (1996), as cited in A Compendium of Neuropsychological Tests (Spreen & Strauss, 1998). Out of the three semantic categories assessed in this study, Animals is the only category known to these investigators for which normative data exist for the same age group as the one in the current study. Standard scores for the Animals category were derived from Spreen and Strauss (1998). Although research has been conducted to assess Action fluency, this has been primarily done in elderly populations (Piatt, Fields, Paolo, & Troster, 1999) and thus could not be used as a viable comparison group with the college sample in the current study. Thus, for the Kitchen and Action categories, raw scores (i.e., number of words generated) were used in the analysis.

In order to minimize the distorting effects of extreme cases in the data, a criterion was set to exclude data points that were significantly different from the mean at $p < .01$, i.e., 2.575 standard deviations. The decision to exclude individual data points versus excluding all the scores of a given individual was made because no participant had extreme scores across several tests. In total, two individual data points were excluded from the data set. Due to administrator error (i.e., failure to appropriately establish the basal rule), two data points on the EVT were excluded from the monolingual group. In total, the data points that were excluded from the analysis account for less than 1% of the data set. To assess for normality, the skewness and kurtosis of the scores were examined. All variables of both groups had a level of skewness and kurtosis between ±1.5, which is an acceptable range for normality (George & Mallery, 2001).
2. Results

2.1. Participant characteristics

The self-reported races for the monolingual group were Caucasian/White ($n = 34$, 87%), African American ($n = 4$, 10%), and Biracial ($n = 1$, 2.6%). The self-reported races for the bilingual group were Asian ($n = 19$, 49%), Caucasian/White ($n = 13$, 33%), Hispanic ($n = 6$, 15%), and Black Haitian ($n = 1$, 3%). Participants in the bilingual group were born in various European, Asian, and Latin American countries. Their native languages were Russian, Korean, Chinese, Spanish, Japanese, Creole, Polish, and Portuguese. A limitation in the current study is that the bilingual participants did not all speak the same native language, and that these languages differed in their degree of commonality with English. The average age of participants in the two groups was about 19 years old. There was an approximately equal representation of males and females in each group.

The average age at time of arrival for the bilingual group was 9.5 years. Their average length of residency in the U.S. was also 9.5 years. Most participants in the bilingual sample ($n = 29$, 74%) were first exposed to English when they arrived to the U.S. For those who were exposed to English prior to arrival to the U.S. ($n = 10$), the mean age of arrival was 14.1 years. On average this group was exposed to English at age 10.7 (range = 5–18) and received instruction for 3.4 years (range = 1–6 years).

2.2. Language rating scales

Using language rating scales, monolingual and bilingual participants were asked to rate their perceived abilities for their first and second languages (see Section 1 for detailed explanation). These scales were used to assess how competent participants were in one language relative to the other. For the monolingual group, the average language rating scores were: English = 8.5 and second language = 3.3. As expected, the monolingual participants rated their English ability as greater than that of their second language. For the bilingual group, the average language rating scores for each language were: native language = 6.6, and English = 7.6. That is, on average, participants in the bilingual group rated themselves as equally proficient in both languages.

2.3. English vocabulary (PPVT-III and EVT)

Although the monolingual and bilingual groups performed within the average range in expressive and receptive vocabularies, there were significant differences in performance between the two groups. On the PPVT-III (receptive vocabulary), the mean standard scores for the monolingual and bilingual groups were 109.8 and 98.7, respectively, $t (74) = 5.1$, $p < .001$. On the EVT (expressive vocabulary), the mean standard scores for the monolingual and bilingual group were 107.3 and 94.9, respectively, $t (74) = 3.8$, $p < .001$. See Table 1 for measures of central tendency and variability on the PPVT-III and EVT.

We also split the bilingual group and examined differences between those individuals that arrived to the U.S. “early” versus those who arrived “late.” Specifically, we split up the group between those who arrived at age 9 or younger versus those who arrived at age 10 or older. We chose age 9 because that was the average age of arrival for the bilingual group as a whole. We found significant differences between the bilinguals who arrived early ($n = 22$) compared to those who arrived late ($n = 17$). The mean scores for the early and late bilinguals on the PPVT-III were 103.9 and 93.2,

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**Table 1**

<table>
<thead>
<tr>
<th></th>
<th>Monolingual</th>
<th>Bilingual</th>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>PPVT-III</td>
<td>109.8</td>
<td>7.9</td>
</tr>
<tr>
<td>EVT</td>
<td>107.3</td>
<td>12.3</td>
</tr>
</tbody>
</table>

$^a$ Two subjects were identified as outliers and excluded from analysis.

$^b$ Two subjects were excluded due to a misadministration of EVT. Basal rule was not met.
respectively, \( t (35) = 2.9, p < .01 \). The mean scores for the early and late bilinguals on the EVT were 99.3 and 89.3, respectively, \( t (37) = 2.1, p < .05 \). Consistent with the age of acquisition hypothesis (Johnson & Newport, 1989), this finding indicates that the earlier the language is learned, the better the ability.

We were also interested in assessing differences in English vocabulary between the bilingual individuals who arrived early to the U.S. and the native monolingual speakers. We found significant group differences on both the PPVT-III, \( t (58) = 3.3, p < .01 \); and EVT, \( t (57) = 2.2, p < .05 \). On both tests, the monolingual group performed about \( \frac{1}{2} \) standard deviations higher than the early bilingual group. Thus, even for bilinguals who arrived to the U.S. at a relatively young age (mean = 6.6 years), we still see significant differences in English vocabulary when compared to the native monolingual group.

As stated earlier, 10 bilingual individuals were exposed to English prior to arriving to the U.S. On average, this sub-sample arrived to U.S. at the age of 14.1 years, was first exposed to English at age 10.5, and studied it for 3.5 years prior to U.S. arrival. Out of these 10 participants, 8 reported being taught English in primary school, 1 in junior high school, and 1 was self-taught in the library. We examined if this sub-group of bilinguals had performed better on measures of English vocabulary relative to those who were not exposed to English prior to arrival. We found that the average scores for the sub-group that was exposed to English prior to arrival were much lower (i.e., 84 for both PPVT-III and EVT) than those of the rest of the group (i.e., PPVT-III = 103.2, EVT = 98.6). As stated before, the bilinguals who were first exposed to English arrived at the mean age of 14.1 years. This is 6.3 years later the average of those bilinguals who were not exposed to English prior to U.S. arrival. In addition, all bilinguals who were exposed to English prior to U.S. arrival form part of the “late” arriving group, whose members came to the U.S. after the age of 9. Thus, it appears that the poorer vocabulary of the group that had formal instruction prior to U.S. arrival (with the exception of one individual) was because they moved to U.S. later in life than those who were not exposed to English prior to arrival.

2.4. Verbal fluency – Controlled Word Association Test (COWA)

Despite the differences in receptive and expressive vocabularies for the two groups, there was no difference in mean standard scores for total number of words produced in phonetic fluency, \( t (76) = .97, p = .33 \). The mean total word production for each letter of the monolingual group was: \( F = 12, A = 10.7, S = 14 \). The mean sum of the three letters was 36.9. For the bilingual group, the mean total word production for each letter was: \( F = 11.6, A = 10.5, \) and \( S = 12.8 \). The mean sum of the three letters was 35. Both groups performed similarly on each of the letters and performance was within the average range. In contrast, significant group differences were found in the three categories of semantic fluency. See Table 2 for standard scores and Table 3 for number of words produced. As stated earlier, Rosselli et al. (2000) discussed the hypothesis that cross-language interference is greater when retrieving concrete words versus non-concrete words. We set out to test if the ability to recall concrete words would be worse for bilinguals than for monolinguals. Since the Animals and Kitchen categories involve the recall of concrete items and the Actions category does not, we hypothesized that the difference in mean performance between the monolingual and bilingual groups would be greater on the Animals and Kitchen categories than it would be in the Actions category. To test this hypothesis, we conducted three independent \( 2 \times 2 \) ANOVAs with participant type (monolingual and bilingual) as a between-subjects factor and semantic category (i.e., Animals, Kitchen, Animals) as repeated-measures factors. Thus, we compared differences in mean performance between monolinguals and bilinguals among the three following semantic categories: (a) Animals and Action, (b) Kitchen and Action, and (c) Animals and Kitchen. As hypothesized, there was significant interaction between participant type and category when we compared the Animals and Actions

<table>
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<th>Table 2</th>
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</thead>
<tbody>
<tr>
<td>Standard scores for phonetic fluency (FAS) and Animal category of COWA</td>
</tr>
<tr>
<td><strong>Monolingual</strong> (( n = 39 ))</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
</tr>
<tr>
<td>FAS</td>
</tr>
<tr>
<td>Animals</td>
</tr>
</tbody>
</table>

*** \( p < .001 \).
Table 3
Numbers of words produced on phonetic and semantic fluency (COWA)

<table>
<thead>
<tr>
<th>Category</th>
<th>Monolingual</th>
<th>Bilingual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>FAS</td>
<td>36.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Animals</td>
<td>21.9</td>
<td>4.6</td>
</tr>
<tr>
<td>Kitchen</td>
<td>16</td>
<td>3.9</td>
</tr>
<tr>
<td>Actions</td>
<td>17.3</td>
<td>4.1</td>
</tr>
<tr>
<td>Category total</td>
<td>54.8</td>
<td>10.6</td>
</tr>
</tbody>
</table>

Note. t-tests for FAS and Animals were computed for standard scores only. See Table 2 for standard scores.

a Measure not administered to seven participants. This measure was added to the experiment after several subjects had been run.
b Measure not administered to five participants. This measure was added to the experiment after several subjects had been run.

** p < .01.
*** p < .001.

categories (F (1, 64) = 4.9, p < .05). That is, the difference in mean performance between monolinguals and bilinguals was greater for the Animals category (monolingual mean = 21.9, bilingual mean = 17.2) than it was for the Actions category (monolingual mean = 17.3, bilingual mean = 15.2). However, we did not find a significant interaction between participant type and category when we compared Kitchen (monolingual mean = 16, bilingual mean = 13.2) and Actions (monolingual mean = 17.3, bilingual mean = 15.2) (F (1, 64) = 0.16, p = .9). That is, there was no significant difference in mean performance between monolinguals and bilinguals when we compared the Kitchen and Actions categories. Thus, the results only partially support our hypothesis that the ability to recall concrete words would be worse for bilinguals than for monolinguals. Interestingly, there was a significant interaction when we compared the Animals and Kitchen categories (F (1, 76) = 4.2, p < .05), indicating that the difference in mean performance between monolinguals and bilinguals was greater in the Animals category (monolingual mean = 21.9, bilingual mean = 17.2) than it was in the Kitchen category (monolingual mean = 16, bilingual mean = 15.2).

We also examined the frequency of rule violations in phonetic and semantic fluency and assessed for group differences. That is, we assessed for perseverations, phonetic intrusions (e.g., in letter F, said “phone”), proper names, non-words, cross-language errors (i.e., intrusions from another language), and using the same word with a different ending (e.g., eat and eating). These rule violations occurred infrequently and we found no group differences in any of the violations assessed. In the monolingual and bilingual groups, rule violations occurred in less than 1% of total responses for each category. We also looked at the individual performance of individuals and found no significant patterns or frequency in manner of responding.

2.5. Age of arrival

The relationship between age of arrival and PPVT-III and EVT were \( r = -.59 \) (\( p < .001 \)) and \( r = -.55 \) (\( p < .001 \)), respectively. That is, the younger these individuals were when they arrived to the U.S., the better they performed on these vocabulary measures. Our findings indicate that age of arrival is significantly correlated with English vocabulary.

3. Discussion

Our findings indicate that the bilingual group’s performance on standardized measures of English vocabulary was in the average range. However, their performance was significantly lower than that of their monolingual peers. This was not surprising, since we can expect the monolinguals to have had a longer and probably richer exposure to English than the bilinguals, who were not born in the U.S. This finding suggests that some non-native-speakers, although arriving to the U.S. before puberty and being able to achieve a high level of English vocabulary, do not have as large an English vocabulary as their monolingual peers. Although this difference in English vocabulary diminished when we looked only at the performance of early bilinguals (those who arrived to the U.S. before the age of 10) and native-speaking monolinguals, the early bilinguals still performed about \( \frac{1}{2} \) standard deviations below the mean performance of their monolingual peers. However, having a smaller English vocabulary does not necessarily outweigh the benefits of knowing another language and being familiar with another culture.
In addition, if able to express themselves in both languages, the bilinguals probably would have a larger linguistic repertoire than their monolingual peers. Nonetheless, when conducting neuropsychological evaluations of non-native speakers using monolingual norms, it is critical that we take into account these performance differences in English vocabulary, even for those individuals who have lived in the U.S. for a number of years and have a good command of the English language. Consistent with the literature, our findings indicate that the younger the individual is upon arrival to the U.S., the higher their eventual English vocabulary.

The monolingual and bilingual groups had similar performance on phonetic fluency. However, the bilingual group performed significantly lower on semantic fluency when compared to the monolingual group. This pattern of performance where relative to monolinguals, bilinguals perform worse on semantic fluency but not on verbal fluency, has been found in other studies (Gollan et al., 2002; Rosselli et al., 2000). Among the possibilities for this pattern of performance, some researchers (e.g., Rosselli et al.) hypothesize that this may be due to an increase of cross-language interference for bilinguals when recalling concrete words versus non-concrete words. Thus, we hypothesized that the difference in mean performance between the monolingual and bilingual groups would be greater on the Animals and Kitchen categories than it would be on the Actions category. Our hypothesis was only partially supported, as we found significant mean performance differences between the Animal and Action categories but not between the Kitchen and Actions categories. An alternative explanation for the differential pattern of performance in verbal fluency between monolinguals and bilinguals is also mentioned by Rosselli et al. They suggest that semantic fluency is associated with lexical knowledge whereas phonetic fluency is associated with tasks of executive functioning. Given that the bilinguals in our sample had a smaller English vocabulary, it is possible that they were not able to generate as many words on the semantic tasks as the native monolinguals. Another explanation for this differential performance between groups is that of culture. Given the different cultural background of the bilinguals in our sample, it is possible that they did not know the English translations of some of the items. In regards to the Kitchen category, it is possible that some cultural groups use fewer items in the kitchen than are used in American culture, and thus produce relatively fewer words than do the native monolinguals. Interestingly, we found that the difference in mean performance between monolingual and bilinguals in the Animals category was significantly greater (favoring the monolinguals) than that found in the other two categories. It is possible that the bilinguals did not know the English translations for some animals, or that they have been exposed to some animals unique to their countries of origin for which no translation exists.

There are several limitations in the current study. For example, the bilingual participants did not all speak the same native language. We did not directly measure the native language proficiency of bilingual participants. Although on average they rated themselves as equally proficient in both languages, we cannot be certain of their actual abilities in their native language. Also, the results from this study come from a select sample of bilinguals (e.g., college students) and may not generalize to other bilingual groups.

In conclusion, non-native speaking bilinguals of English in the U.S. are increasingly being referred for neuropsychological evaluations. Many of these bilingual individuals are being tested with measures that were normed with native monolingual English speakers. Findings from the current and other studies indicate performance differences between non-native bilinguals and native monolinguals. To better serve this growing population of non-native speaking bilinguals of English, it is crucial that we take into account these differences when interpreting test results and making recommendations. Lastly, these differences in performance between monolinguals and bilinguals point to the importance of developing normative data for bilingual populations.

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