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Research Article

New insights on what leads bilinguals to be able to name some pictures only in their nondominant language: Immersion, dominance reversal, and balanced bilingualism

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Abstract

Objective: The present study asked if bilinguals who are immersed in their nondominant language are more likely to know some words only in their nondominant language. **Method:** The either-language scoring benefit (ELSB) reflects how many more points bilinguals get when credited for pictures named regardless of which language is used. We asked if the ELSB varies with self-rated proficiency level of the nondominant language in young English-dominant ($n = 68$) compared to Spanish-dominant ($n = 33$) bilinguals, and in older English-dominant ($n = 36$) compared to Spanish-dominant ($n = 32$) bilinguals. All bilinguals were immersed in English (in the USA) at the time of testing. **Results:** Spanish-dominant bilinguals showed a larger ELSB than English-dominant bilinguals (in both young and older groups), but simple correlations showed that the degree of Spanish dominance was associated with a higher ELSB only in young bilinguals. Additionally, the ELSB was larger for bilinguals with more years of immersion and for more balanced bilinguals, whether measured by naming scores or self-rated balance (in both age groups). Nearly half ($n = 14/33$) of the young bilinguals who said they were Spanish-dominant scored higher in English than in Spanish, and on average these participants had similar naming scores in English and Spanish. **Conclusions:** Either-language scoring benefits bilinguals with higher proficiency level in the nondominant language, which is more likely in bilinguals with extended immersion in the nondominant language, who also tend to be more balanced bilinguals, and for young adult bilinguals who may be in the process of a switch in which language is dominant.

Keywords: bilingualism; language dominance; self-rated proficiency; immersion; either-language scoring; age group

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Introduction

The word bilingual often suggests the idea of a person who is equally proficient in their two languages, that is, a *balanced bilingual*. However, most bilinguals have one language that is dominant, namely in which they are more proficient, for most purposes and in most contexts although even this common reality has exceptions (Birdsong, 2014; Treffers-Daller & Silva-Corvalán, 2016). Language dominance can also change over different points of a bilingual's lifetime, a phenomenon that is common for bilinguals who speak a minority language at home but then become immersed in a majority language when they go to school (e.g., Gathercole & Thomas, 2009). Most bilinguals will know some words only in the language that is otherwise usually nondominant, resulting in a vocabulary that is distributed across two languages (Sheppard et al., 2016). A small number of studies suggested that bilinguals with balanced proficiency or higher levels of self-rated proficiency in the nondominant language might be most likely to have a distributed vocabulary, but possible causes have not been identified (Gollan et al., 2007, 2023; Kohnert et al., 1998).

Bilinguals with distributed vocabulary knowledge score higher on picture naming tests if credited for pictures named correctly in at least one, but not necessarily in both languages. We will call the number of points gained with this approach to scoring compared to the highest score in any one language the *either-language scoring benefit* (ELSB). To note, the either-language scoring method takes place after testing in each language separately. It is different from allowing bilinguals to answer in either language during testing, which might lead bilinguals to switch back and forth between languages and could incur switch costs (Gollan & Ferreira, 2009).

Most studies on ELSB have used the Boston Naming Test (BNT: Kaplan et al., 1983). In the first study to examine the ELSB, balanced Spanish–English bilingual college students benefitted from either-language scoring, but unbalanced bilinguals did not (Kohnert et al., 1998). In this study, degree of bilingualism was determined using a circular measure, that is, based on whether BNT scores across languages differed from more than one standard deviation (SD) from the sample mean. When the difference was over one SD, bilinguals were classified as unbalanced, otherwise, they were classified as balanced. However because both the predictor (balance) and the measure (the size of the ELSB) were derived from BNT scores these were not independent and the ELSB may therefore have been spurious or inflated by the circularity (but see Rosselli et al., 2014).

Similarly, in older Spanish–English bilinguals, either-language scoring led to improvement in scores in balanced but not

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unbalanced bilinguals (Gollan et al., 2007). This study used difference scores (e.g., dominant minus nondominant language naming scores) to classify bilinguals into types and used both a circular measure (the BNT) and three independent measures (verbal fluency scores, self-rated speaking ability, and percentage of daily language use). Only BNT scores and reported daily use of each language predicted the ELSB. A commentary on the Gollan et al. (2007) study suggested that the ELSB might have been driven by systematic differences between balanced and unbalanced bilinguals that are not necessarily related to the extent to which proficiency differed in the two languages (Bialystok & Craik, 2007). Specifically, most bilinguals with similar proficiency in the two languages had arrived in the USA after completing schooling in Spanish and so had to learn English to function in daily life. In contrast, bilinguals with one clearly much more dominant language had arrived in the USA at an earlier age, went to school in English and Spanish fluency was not as pivotal in daily life for this group (Acevedo & Loewenstein, 2007, commentary on Gollan et al., 2007). Therefore, rather than reflecting degree of balanced or dominance, the ELSB might have been especially large in bilinguals who were not dominant in the language of immersion.

However, this was not supported by an additional study that separately examined the ELSB on the BNT in English-dominant and Spanish-dominant bilinguals who were living in the USA (Gollan et al., 2010). In this study, language dominance was self-reported and included both cognitively healthy older bilinguals (controls), and bilinguals diagnosed with Alzheimer's disease (AD). Within self-reported English-dominant bilinguals, both AD and control groups exhibited an ELSB, and bilinguals with AD benefited significantly more than controls (Gollan et al., 2010, but see Gollan et al., 2023). Within self-reported Spanish-dominant bilinguals, both AD and control groups also showed an ELSB, and both groups benefitted to a similar extent.

Similarly, a more recent study measured the ELSB on the Multilingual Naming Test (MINT: Gollan et al., 2012) and used bilingual index scores to classify degree of bilingualism (Gollan et al., 2023). Index scores were calculated by taking bilinguals' self-rated language proficiency in four modalities (speaking, reading, writing, and understanding) and dividing the average rating for the nondominant language by the average rating for the dominant language. Index scores closer to 1 indicate more balanced bilingualism. In both cognitively healthy older Spanish–English bilinguals and bilinguals with AD, individuals with index scores closer to 1 benefited more from either-language scoring. The size of the ELSB was similar across dominance groups; English-dominant bilinguals gained on average (across AD and control groups) 1.25 points using the ELSB, and similarly Spanish-dominant bilinguals gained 1.1 points (Gollan et al., 2023).

An additional study suggested that the ELSB depends on how bilingualism is defined but also found that both balanced and unbalanced bilinguals benefited from either-language scoring on the BNT (Rosselli et al., 2014). Groups of balanced and unbalanced Spanish–English bilinguals were created through a median split on absolute score difference between the English and Spanish versions of the BNT, again creating circularity. This split may have placed bilinguals who would have been balanced based on the one standard deviation split method (Kohnert et al., 1998) in the unbalanced group, and vice versa. Participants in this study were on average about 30 years younger than in Gollan et al. (2007) and ranged in age from approximately 20 to 60 years old, all cognitively healthy.

In clinical settings, bilinguals are often asked to self-report which language is dominant. Given known problems with use of self-report measures (bilinguals sometimes perform better on objective tests in the language they say is not dominant; Garcia & Gollan, 2022; Gollan et al., 2012; Tomoschuk et al., 2019), in the present study, we asked if self-reported language dominance and proficiency can predict which bilinguals will benefit most from either-language scoring. Additionally, most previous studies focused on older bilinguals and used a variety of methods to classify bilinguals into proficiency subgroups. We examined the either-language scoring benefit separately within four different subgroups of bilinguals using the same methods in all groups.

Method

Participants

Participant characteristics are summarized in Table 1. Data were compiled from language history questionnaires and MINT scores obtained from several previous studies. Most older bilinguals were tested during their annual evaluation as part of the longitudinal study at the Alzheimer's Disease Research Center (ADRC) at University of California, San Diego (UCSD), and were diagnosed as cognitively unimpaired by two neurologists, based on medical, neurological, and neuropsychological exams conducted in the same year as the current study participation. Ten were tested as part of a different study (Gollan & Goldrick, 2016), and were classified as cognitively intact based on Dementia Rating Scale (DRS; Mattis, 1988) scores.

The young bilinguals were sampled from a total of thirteen different studies which were completed for course credit by undergraduates at UCSD. For the older bilinguals, age ranged from 49 to 89 (Median = 69) and education ranged from 6 to 20 years (Median = 14). For the young bilinguals, age ranged from 18 to 31 (Median = 21) and education ranged from 12 to 24 (Median = 14). Study procedures were approved by the Institutional Review Board at UCSD, and the research was completed in accordance with the Helsinki Declaration.

We determined language dominance by comparing average self-rated proficiency in speaking, understanding, reading, and writing in each language. A minority had identical self-ratings in the two languages (4 older and 17 younger bilinguals). For these, we used current percent of English use to classify dominance (those who reported using English more than Spanish were classified as English-dominant, and vice versa for Spanish-dominant). Two bilinguals (one older and one younger) reported using each language 50% of the time, and we classified them as English-dominant due to life-long immersion in the USA.

Older bilinguals had higher naming scores in the language they said was dominant whether they were English- or Spanish-dominant (see Table 1). For young bilinguals, this was true only for the English-dominant group. In young self-reported Spanish-dominant bilinguals, MINT scores were on average higher in English than in Spanish (i.e., they tended to score higher in the language they said was not dominant). In these same bilinguals, naming scores were more balanced (i.e., similar in the two languages) compared to bilinguals who said they were English-dominant who tended to score much higher in English than in Spanish (see Table 1).

Materials

Participants completed the Multilingual Naming Test (MINT; Gollan et al., 2012) individually in English and Spanish, with no delay between the two tasks. The test has 68 black-and-white pictures with

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Table 1. Participant characteristics, divided by language dominance

Characteristic	Older bilinguals: English-dominant[a] ($n = 36$) M	(SD)	Older bilinguals: Spanish-dominant[a] ($n = 32$) M	(SD)	t-test[b] t	p-value	Younger bilinguals: English-dominant[a] ($n = 68$) M	(SD)	Younger bilinguals: Spanish–dominant[a] ($n = 33$) M	(SD)	t-test[b] t	p-value
Gender (female/male)	24/12		23/9		0.04	.84	50/18		22/11		0.23	.63
Age at MINT	72.5	(9.5)	73.8	(7.8)	0.60	.55	20.3	(1.7)	20.4	(2.5)	0.30[d]	.77
Education in years	14.7	(2.6)	12.5	(3.6)	−2.83	.01	14.0	(1.8)	13.7	(1.3)	−0.65	.52
Age of acquisition dominant language	3.3[c,f]	(2.9)	0.0[c]	(0.0)	−5.81[d]	< .001	3.7[f]	(2.8)	0.3	(1.2)	8.27[d]	< .001
Age of acquisition nondominant language	0.4[c]	(1.7)	12.9[c]	(6.7)	7.06[d]	< .001	0.5	(1.8)	5.9	(3.0)	−9.46[d]	< .001
Age of regular use dominant language	5.9	(6.0)	1.3	(1.3)	−4.50[d]	< .001	5.0[c]	(2.8)	1.6	(1.7)	7.27[d]	< .001
Age of regular use nondominant language	1.3[e]	(2.6)	24.6[c]	(13.9)	8.89[d]	< .001	2.1[c]	(2.3)	9.7	(3.8)	−10.42[d]	< .001
Years immersed nondominant language	3.3	(5.3)	37.2	(19.9)	−9.39[d]	< .001	2.3	(4.7)	11.9[e]	(5.7)	−8.83	< .001
Percent of lifetime immersed in the nondominant language	4.6	(7.1)	49.7	(24.3)	10.16[d]	< .001	11.1	(22.5)	58.7	(27.8)	−9.13	< .001
Percent current use nondominant language	12.2	(13.4)	25.8	(22.0)	−3.03[d]	.004	20.0	(17.4)	53.8	(21.9)	−8.41	< .001
MINT score in self-rated dominant language	64.4	(3.3)	61.4	(3.5)	−3.53	< .001	62.0	(3.7)	56.8	(6.1)	−4.50[d]	< .001
MINT score in self-rated nondominant language	45.4	(14.5)	47.1	(15.4)	0.49	.63	49.7	(9.5)	57.4	(4.7)	5.41[d]	< .001
Highest MINT score	64.4	(3.2)	61.7	(3.2)	−3.44	< .01	62.3	(3.0)	60.0	(3.4)	−3.53	< .001
Lowest MINT score	44.9	(14.4)	46.7	(15.2)	0.49	.62	48.7	(10.1)	54.2	(5.6)	3.51	< .001
Either-language MINT score	65.0	(2.5)	62.9	(3.4)	−2.90	.01	63.2	(2.6)	61.8	(3.0)	2.40	.02
Either-language scoring benefit	0.6	(1.2)	1.2	(1.5)	1.92	.06	0.9	(1.1)	1.8	(1.5)	3.63	< .001
Self-rated proficiency dominant language[a]	6.8	(0.5)	6.8	(0.4)	0.27	.79	6.7	(0.5)	6.7	(0.5)	−0.06	.95
Self-rated proficiency nondominant language[a]	4.9	(1.4)	4.5	(1.7)	−1.11	.27	5.9	(0.8)	5.9	(0.7)	0.45	.66

[a]Defined by average self-rated dominance (across reading, speaking, writing, and understanding, on a scale) from 1 (lowest) to 7 (highest). Six participants were taken from a study that had used a proficiency scale ranging from 1 to 10, therefore, to make the scores comparable we converted the scores to a 7-point scale.[b]For the variable of gender, Pearson's chi-squared test was run instead as the data are categorical.[c]For AoA, data available for $n = 27$ for English-dominant older bilinguals in both languages, $n = 18$ for Spanish-dominant older adults in the dominant language and $n = 15$ for Spanish-dominant older bilinguals in the nondominant language. For age of regular use, data available for $n = 29$ in the nondominant language for Spanish-dominant older bilinguals, and for $n = 57$ for English-dominant younger bilinguals in both languages.[d]Welch's *t*-test was used as the variances between groups are unequal.[e]One missing data point.[f]These participants reversed their dominance over their lifetime.

noncognate names arranged in increasing difficulty level. An item was scored as correct by the psychometrist during administration if the name was orally produced with or without a semantic cue (which were rarely administered), and incorrect if the name was not produced or was produced only after provision of a phonetic cue. A discontinue rule was applied; all items after 6 consecutive incorrect responses were considered incorrect. "Correct" was defined based on a list of acceptable alternatives and a procedure for identifying regional variants.

Procedure

In 58 older bilinguals, testing took place in the participant's preferred language first and then in the other language, and for 10 older bilinguals, order of testing was counterbalanced (half completed English first, half Spanish first). In 79 young bilinguals, testing order was counterbalanced, and the remaining 22 young bilinguals completed the test in English first (the dominant language for most young bilinguals at UCSD). A previous study showed that MINT test scores are not influenced by language of testing order (Garcia & Gollan, 2022, but verbal fluency tests did exhibit order effects; Van Assche et al., 2013).

Analyses

To calculate the either-language scoring benefit, we took whichever language had the higher naming test score and subtracted it from the either-language score. We then created a binary variable such that any either-language scoring benefit > 0 was coded as 1, and an either-language scoring benefit equal to 0 was coded as 0. Within each age group, we used logistic regression to examine whether average self-rated proficiency in the language with the lower naming score (centered around the mean) and language dominance group (−0.5 for Spanish-dominance and 0.5 for English-dominance) predict the probability of an either-language scoring benefit (binary), and whether these interacted. Older Spanish-dominant bilinguals had significantly fewer years of education (see Table 1; *range*: [6–20 years]) than English-dominant older bilinguals (*range*: [11–20 years]); therefore, we controlled for education level (centered around the mean) in the older bilingual group analysis.

We checked for violations of the linearity assumption between self-rated proficiency in the nondominant language and the logit values of the outcome variable by visually inspecting a scatterplot of both variables. The relationship was linear in both younger and older bilinguals, and we found the same with the education variable in the older participants. There were no influential values in either model (i.e., no data point had an absolute standardized residual above 3). Finally, there was no multicollinearity in either model (variance inflation factors < 5). We provide the odds ratio (ORs) as an indicator of effect sizes. All ORs were < 3.47, corresponding to small effects (Chen et al., 2010).

Results

Results are plotted in Figure 1[1] and summarized in detail in Table 2.

[1]For visualization purposes, the data are graphed based on linear modeling. Results from the linear models were the same as reported above, except that the main effect of self-reported proficiency in younger adults was not significant, and the main effect of dominance group in older bilinguals was significant at $p < .05$ rather than marginal. We did not report these models however as several assumptions were violated due to the limited range of the outcome variable.

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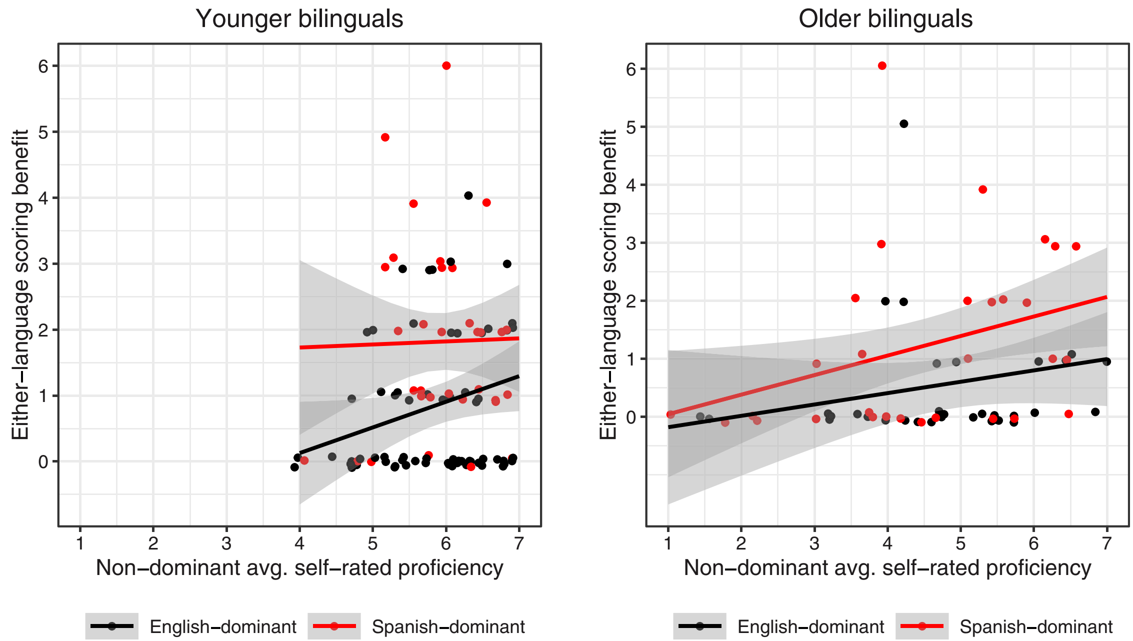

Figure 1. Predicted benefit from application of either-language scoring as a function of self-rated proficiency in the nondominant language, and language dominance in a linear model. Note that no young bilingual self-rated their proficiency in the nondominant language as less than a 4 (on the 17 scale).

Younger bilinguals

In the younger group, self-reported Spanish-dominant bilinguals benefited more from either-language scoring than English-dominant bilinguals ($b = -1.89$, $SE = 0.57$, $\chi^2(1) = 14.10$, $OR = 0.15$, $p < .001$). Overall, bilinguals with higher self-rated proficiency in the nondominant language showed larger either-language scoring benefits ($b = 0.93$, $SE = 0.41$, $\chi^2(1) = 6.04$, $OR = 2.53$, $p < .05$), and self-ratings were equally predictive of the likelihood of showing an ELSB in the two groups, that is, the interaction was not significant ($b = -0.76$, $SE = 0.81$, $\chi^2(1) = 0.95$, $OR = 0.47$, $p = .35$).

Older bilinguals

In the older group, while controlling for education, Spanish-dominant bilinguals tended to benefit more from either-language scoring than English-dominant bilinguals ($b = -1.09$, $SE = 0.66$, $\chi^2(1) = 2.89$, $OR = 0.34$, $p = .10$). The effect of self-rated proficiency in the nondominant language on the either-language scoring benefit was highly robust, such that at higher self-ratings, bilinguals benefitted more from either-language scoring ($b = 1.17$, $SE = 0.34$, $\chi^2(1) = 19.45$, $OR = 3.22$, $p < .001$). As with young bilinguals, self-rated proficiency was equally predictive of the ELSB across language dominance groups (i.e., the interaction was not significant, $b = -0.19$, $SE = 0.54$, $\chi^2(1) = 0.13$, $OR = 0.83$, $p = .72$). There was also a main effect of education (which was added as covariate) such that bilinguals with lower education level benefited significantly more from either-language scoring than more educated bilinguals ($b = -0.26$, $SE = 0.12$, $\chi^2(1) = 5.14$, $OR = 0.77$, $p < .05$).

Although the effects of education were significant, the size of the difference was small. In Spanish-dominant bilinguals, those with relatively higher education level gained 1.07 points ($SD = 1.21$) and those with lower education level gained 1.33 points ($SD = 1.71$) after applying the either-language scoring procedure – a nonsignificant difference ($t\ (30) = 0.48$, $p = .63$). Similarly, in English-dominant bilinguals, those with relatively higher education level gained 0.45 points ($SD = 1.10$) and those with lower education level gained 0.79 points ($SD = 1.42$) after applying the either-language scoring procedure – again, a nonsignificant difference ($t\ (34) = 0.78$, $p = .44$). Tables 3 and 4 show bivariate correlations to further explore the nature of the relationship between education level and the ELSB, along with other variables of possible interest from Table 1. These revealed no significant education effects. Instead, variables more directly related to bilingual proficiency level exhibited robust effects on the ELSB in both young and older bilinguals. Additionally, in both young ($r = .22$, $p = .03$), and older bilinguals ($r = .27$, $p = .03$), more years of education were associated with higher naming scores in the nondominant language. We speculate that lower education might reduce the opportunity to learn translation equivalents for lexicalized concepts (which could increase the ESLB) while also reducing the likelihood of attaining balanced bilingualism (which could decrease the ELSB). Given the small size of the effects in the logistic regression model and the absence of significant correlations, we do not discuss education effects further.

In both Tables 3 and 4, years of immersion seemed to have as great or greater influence on the ELSB than self-rated proficiency level. As such, we repeated our comparison of Spanish- to English-dominant participants replacing self-rated proficiency by years of immersion in predicting ELSB across dominance groups. In young bilinguals, the effect of dominance group became nonsignificant (from $p < .001$ to $p = .32$) and in older bilinguals, the effect of dominance group went from marginal to nonsignificant (from $p = .10$ to $p = .21$). However, when divided by language dominance group, the years of immersion effects patterned in opposite directions in unexpected ways; in young bilinguals, English-dominant (but not self-reported Spanish-dominant) bilinguals with more years of immersion benefited more from either-language scoring (a group by immersion interaction, $p < .01$), whereas in older bilinguals it patterned in the opposite direction

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Table 2. Predicted proportion of either-language scoring benefit on the MINT from dominance group (English- or Spanish-dominant) and self-rated proficiency in young and older bilinguals, with education added as covariate for older bilinguals

	Either-language scoring benefit			
	b	(*SE*)	χ^2	*p*–value
		Younger bilinguals		
Intercept	0.71	(0.29)	–	.01
Self-rated dominance group (English-/Spanish-dominant)	−1.89	(0.57)	14.10	<.001
Self-rated proficiency (nondominant language)	0.93	(0.41)	6.04	.02
Dominance group × Self-rated proficiency	−0.76	(0.81)	0.95	.35
		Older bilinguals		
Intercept	−0.51	(0.32)	–	.12
Self-rated dominance group (English-/Spanish-dominant)	−1.09	(0.66)	2.89	.10
Self-rated proficiency (nondominant language)	1.17	(0.34)	19.45	<.001
Education	−0.26	(0.12)	5.14	.03
Dominance group × Self-rated proficiency	−0.19	(0.54)	0.13	.72

Table 3. Pearson's correlations between main participant characteristics and either-language scoring benefit in older bilinguals ($n = 68$)

	ELSB	1	2	3	4	5	6	7
1. Education in years	−.16							
2. Percent of lifetime immersed in the nondominant language	.44***	−.31**						
3. Years immersed in the nondominant language	.41***	−.35**	.99***					
4. Percent current use nondominant language	.34**	.16	.46***	.41***				
5. Self-rated proficiency nondominant language	.26*	.51***	.08	.04	.49***			
6. Index of self-rated proficiency (lower score/higher score)	.26*	.48***	.08	.05	.51***	.99***		
7. MINT index (lower score/higher score)	.51***	.20†	.39***	.36**	.53***	.72***	.73***	
8. MINT dominance score (English minus Spanish)	−.08	.35**	−.47***	−.46***	−.15	.11	.13	−.12

†$p < .10$.
*$p < .05$.
**$p < .01$.
***$p < .001$.

Table 4. Pearson's correlations between main participant characteristics and either-language scoring benefit in young bilinguals ($n = 101$)

	ELSB	1	2	3	4	5	6	7
1. Education in years	.05							
2. Percent of lifetime immersed in the nondominant language	.37***	.02						
3. Years immersed in the nondominant language	.36***	.08	.99***					
4. Percent current use nondominant language	.37***	.02	.56***	.56***				
5. Self-rated proficiency nondominant language	.18†	.38***	.09	.13	.23*			
6. Index of self-rated proficiency (lower score/higher score)	.22*	.26**	.22*	.23*	.26**	.77***		
7. MINT index (lower score/higher score)	.57***	.22*	.38***	.39***	.42***	.40***	.50***	
8. MINT dominance score (English minus Spanish)	−.49***	−.21*	−.45***	−.45***	−.49***	−.39***	−.43***	−.89***

†$p < .10$.
*$p < .05$.
**$p < .01$.
***$p < .001$.

(i.e., Spanish-dominant but not English-dominant bilinguals showed a greater ELSB with more years of immersion, although in this analysis the effect of immersion was significant overall while the interaction was not). Because these patterns were not expected and are difficult to interpret, we do not discuss them further, but the results are shown in the Supplemental Materials.

Discussion

The present study revealed several possible factors that increase the likelihood of observing an either-language scoring benefit (ELSB). In both young and older groups, bilinguals who self-rated as Spanish-dominant benefitted more from the either-language scoring method than English-dominant bilinguals, confirming hypotheses from Bialystok and Craik (2007) and Acevedo and Loewenstein (2007). Additionally, self-rated proficiency in the nondominant language was equally predictive of the ELSB regardless of which language bilinguals chose as dominant. In both young and older bilinguals, more years of immersion in the nondominant language and greater percent use of the non-dominant language were associated with a higher ELSB (see Tables 3 and 4). Additionally, more balanced bilingualism (defined by index scores calculated as whichever language score was lower divided by the higher language score) was also associated with larger either-language scoring benefits, especially with the circular MINT-based bilingual index score, but also with the independent and subjective self-rated bilingual proficiency index.

With a few possible exceptions, the above analyses largely revealed similar effects in young and older bilinguals (but note that we did not compare across age groups in our analyses). Most young

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self-rated Spanish-dominant bilinguals (81.8%), but less than half of English-dominant bilinguals (44.1%) exhibited an ELSB. Among young bilinguals, no participant reported less than a 4 (functional) level of proficiency in the nondominant language, and the vast majority reported at least a 5 (good); with many 6s (very good), and 7s (like a native speaker). The older bilinguals, however, included some participants with very low self-rated proficiency level in the nondominant language, corresponding to 1 (almost none), 2 (very poor), and 3 (fair). This may have weakened the simple correlations between self-rated proficiency level and the extent of ELSB in the young group (see Table 4, though note that logistic regressions did show a significant effect of self-rated proficiency level for classifying which young bilinguals would *vs.* would not exhibit an ELSB). Additionally, young self-reported Spanish-dominant bilinguals were objectively balanced in their naming scores (see Table 1), and on average even scored slightly higher on the MINT in English, the language they said is nondominant (this was not true for older bilinguals; see also; Gollan et al., 2012; Tomoschuk et al., 2019). Finally, degree of English versus Spanish dominance determined by the MINT (English minus Spanish score) was correlated with the ESLB, but only in young bilinguals (see Tables 3 and 4).

To further explore the relationship between self-reported proficiency level and naming scores, we examined correlations between self-ratings and naming scores in the nondominant language within each bilingual subgroup. In young self-reported Spanish-dominant bilinguals, self-reported English proficiency level was not significantly correlated with English naming scores ($r = .21, p = .25$). By contrast, in all other five subgroups (including older bilinguals in both dominance and education groups), self-ratings and naming scores in the nondominant language were strongly correlated (in young English-dominant bilinguals, $r = .46$, $p < .001$, and older bilinguals in both dominance and education groups, $rs \geq .70$, $ps < .001$). Young self-reported Spanish-dominant bilinguals may have been experiencing a gradual shift from Spanish-dominance to English-dominance. Looking at Table 1, this may have been caused by extended immersion in the nondominant language (in line with Acevedo & Loewenstein, 2007; on average these bilinguals spent more than half their lives immersed in English), immigration at a particular time in childhood (before puberty but not in infancy), and/or frequent use of the nondominant language.

Our choice to use nondominant language proficiency rather than balance, or relative proficiency in the two languages, leaves an open question as to which is critical. In the present study, these were highly correlated in all 6 bilingual subgroups (all $rs \geq 71$ in the two younger bilingual groups, and $rs > 98$ in older bilinguals (with high and low education, based on a median split), $ps < .001$). The results reported above revealed the same patterns when we reran the models replacing self-rated proficiency in the nondominant language with the bilingual index (self-rating of the nondominant language divided by self-rating of the dominant language). Thus, more balanced bilinguals tend to have higher proficiency in their nondominant language and to benefit more from either-language scoring.

Limitations and conclusions

A main limitation of the present study was that the ELSB was relatively small in all subgroups (see Table 1). The MINT has 68 items but across all $n = 169$ bilinguals tested, six was the maximum number of additional points gained. To better understand what leads bilinguals to know some names only in the nondominant language, it may be best to design a test specifically for this purpose that can test hypotheses about which types of names might be more likely to benefit. The Appendix shows which items benefitted most in the present study. Surprisingly, the ELSB was not limited exclusively to very difficult items, though items that benefitted did have a significantly lower frequency count ($M = 9.6$ per million, $SD = 12.6$) than those that did not ($M = 111.3.6$, $SD = 120.4$, $p < .001$), and were also longer ($M = 4.2$ phonemes, $SD = 1.4$) than those that did not, ($M = 3.4$, $SD = 1.2$, $p = .03$[2]).

Another important topic for future study is whether bilinguals can benefit similarly from either-language scoring when switching is encouraged during testing. In the present study, bilinguals only switched languages once (after completing the entire test in one language). Active language switching might interfere with the either-language benefit but note that one study found costs in time but not in accuracy for young and older bilinguals in a voluntary switching paradigm (Gollan & Ferreira, 2009). Additional research is needed to investigate if bilinguals in different patient populations might suffer a greater cost when switching languages during testing if allowed to name pictures in whichever language comes to mind first. This may be a more ecologically valid procedure and may be equally useful for discriminating patients from controls (for further discussion, see Gollan et al., 2023).

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S1355617724000067.

Data availability. The data and script that support the findings of this study are openly available on OSF at https://osf.io/6y7xt/?view_only=bdc0e857a7b84e528804c88583f432bd.

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[2]For these comparisons, we excluded words for which only one bilingual exhibited an either-language scoring benefit (since such words might reflect idiosyncratic properties specific to only the one person). Additionally, we relied on English frequency count and length (CELEX2 database; Baayen et al., 1996), which should be positively correlated with but not directly comparable to Spanish frequency and even less so length.

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