Published in final edited form as:
Int J Billing. 2016 December ; 20(6): 714–731. doi:10.1177/1367006915586586.

Cognate identification methods: Impacts on the cognate advantage in adult and child Spanish-English bilinguals

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Abstract

Objectives—The purpose of this study was to determine whether four different cognate identification methods resulted in notably different classifications of cognate status for *Peabody Picture Vocabulary Test-Third Edition (PPVT-III)* test items and to investigate whether differences across criteria would impact findings of cognate effects in adult and preschool-aged Spanish-English bilingual speakers.

Methodology—We compared four cognate identification methods: an objective criterion based on phonological overlap; two subjective criteria based on a translation elicitation task; and a hybrid criterion integrating objective and subjective standards. We then used each criterion to investigate cognate effects on the *PPVT-III* in 26 adult and 73 child Spanish-English bilinguals.

Data and analysis—The test items identified as cognates by each criterion were compared (Experiment 1). Then, cognate advantage magnitudes, cognate accuracy rates, non-cognate accuracy rates, and number of individuals demonstrating the cognate advantage were investigated in both adult (Experiment 2) and child bilinguals (Experiment 3).

Conclusions—Objective and subjective cognate identification methods were found to select notably different subsets of test items as cognates. Further, the methods led to differences in cognate effects, as well as in cognate and non-cognate accuracy rates, for both child and adult bilinguals.

Originality—Although the cognate advantage has been widely studied in adult bilinguals, research on the cognate advantage in child bilinguals is limited and methods of identifying cognates are inconsistent across studies. The present study provides information about cognate effects in a young population and is the first comparison of objective and subjective approaches to cognate identification.

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Implications—This study extends previous work on cognate word processing in both child and adult bilinguals. Further, results offer an evaluation of methodologies that are critical for investigating the cognate advantage. This both facilitates interpretation of previous findings and can be used to guide methodological decisions in future research.

Keywords

Spanish-English bilinguals; adult bilinguals; child bilinguals; cognate advantage; cognate identification

Introduction

Bilingual speakers provide unique opportunities to examine the mental lexicon, in particular regarding the influence of experience in one language on processing in another language. One topic that has been particularly well-researched is adult bilinguals' processing of cognate words—cross-linguistic translation equivalents that are similar in phonology, orthography, or both (e.g. *triangle*/*triángulo* in English and Spanish). The term "cognate advantage" refers to bilinguals' relative ease in processing these words as compared to non-cognates, translation equivalents that lack cross-linguistic form overlap (e.g. *apple/manzana* in English and Spanish; see Sánchez-Casas & García-Albea, 2005, for a review). Although the distinction between cognates and non-cognates may appear self-evident, operational criteria for assigning cognate status differ considerably across studies. Thus, it is important to evaluate whether these methodological differences impact findings of cognate effects in bilinguals. This may be especially important for young bilinguals, who show cognate effects less consistently than adult bilinguals.

The cognate advantage is well-attested in adult bilinguals. Bilingual adults respond to cognates with greater accuracy and speed on various linguistic tasks, including categorization (Dufour & Kroll, 1995), translation (De Groot & Poot, 1997), word association (Van Hell & De Groot, 1998), and word learning (De Groot & Keijzer, 2000; Van Assche, Duyck, & Brysbaert, 2013). Performance on the *Boston Naming Test* also indicates enhanced naming ability for cognate relative to non-cognate items (Gollan, Fennema-Notestine, Montoya, & Jernigan, 2007; Rosselli, Ardila, Jurado, & Salvatierra, 2012). Although adult bilinguals consistently demonstrate a cognate advantage, there are fluctuations in the effect. For example, cognate effects appear to be greater for non- balanced than balanced bilinguals and when speakers are tested in their weaker language (Caramazza & Brones, 1979; Gollan et al., 2007; Rosselli et al., 2012, but see Davis et al., 2010).

Much less is known about cognate sensitivity in child bilinguals—there are relatively few studies, and not all age groups are yet represented. Nevertheless, some research suggests that children show similar patterns to adults. For example, Dutch-speaking fifth- to ninth-grade English Language Learners (ELLs) showed a cognate advantage in both reaction times and accuracy on an English lexical decision task (Brenders, Van Hell, & Dijkstra, 2011).

However, many studies in children have found limited cognate effects. These studies have frequently been in the context of standardized language assessments—perhaps because such measures are routinely administered to large groups of children. For example, 8–13-year-old

Spanish-speaking ELLs were found to have higher accuracy rates for cognate than non-cognate test items on the *Peabody Picture Vocabulary Test-Third Edition* (*PPVT-III*, Kelley & Kohnert, 2012). Despite these group-level effects, only 60% (18 of 30 participants) demonstrated the advantage and older children were more likely to show cognate effects. These findings suggest that the cognate advantage may be weaker in child than adult speakers, and that the advantage may develop over time. Nevertheless, initial findings do suggest that cognate effects emerge even in young children. Pérez, Peña, and Bedore (2010) found higher accuracy rates for cognate items on the Picture Vocabulary Subtest of the *Test of Language Development-Primary, Third Edition* in Spanish-English bilingual kindergarteners and first graders, but only for those with high Spanish exposure (60–80%). These results are consistent with adult research indicating greater cognate effects for unbalanced bilinguals tested in their weaker language (e.g. Rosselli et al., 2012). These findings also support the idea that the cognate advantage is more tenuous in children than adults.

In fact, some argue that child bilinguals do not demonstrate cognate effects, as revealed in two studies of first-grade (Umbel, Pearson, Fernández, & Oller, 1992) and first-, third-, and sixth-grade Spanish-English bilinguals (Umbel & Oller, 1994) on the *PPVT-Revised* and the *Test de Vocabulario en Imágenes Peabody—Adaptación Hispanoamericana* (*TVIP*; Dunn, Padilla, Lugo, & Dunn, 1986). Due to the limited number of studies addressing cognate effects in children, it is difficult to determine the reason behind these discrepant findings. It is likely that a number of factors mediate the presence of cognate effects. Pérez et al.’s (2010) findings suggest the presence of cognate effects in children may be a matter of relative exposure; yet, Umbel et al.’s (1992) sample included children in the same age range with arguably similar language profiles, with exposure to Spanish at home and English in school. Kelley and Kohnert’s (2012) study suggests an important factor may be age; yet, cognate effects have also been reported in younger children (Pérez et al., 2010) and were not reported for sixth-grade bilinguals by Umbel and Oller (1994).

In summary, much is left to be understood about the factors that determine cognate effects in child bilinguals. There are also practical applications to understanding cognate processing in children. For example, successful cognate identification (subsequent to cognate awareness training) has been associated with greater English reading comprehension in fifth- and sixth-grade Spanish-English bilinguals (Nagy, García, Durgunoglu, & Hancin-Bhatt, 1993) and in deducing English word meanings (Dressler, Carlo, Snow, August, & White, 2011). It would be beneficial to learn to what extent such strategies may be available to bilingual children prior to explicit training. Finally, for clinical purposes, it is important to learn if bilingual speakers are impacted by the cognate status of items on standardized measures.

To methodically pursue this line of research, it is essential that we reflect on how cognate status is assigned. Although it is widely agreed that cognates are translation equivalents with similar phonology and orthography, the exact criterion for sufficient similarity varies considerably. Objective methods of assigning cognate status have included using a cognate dictionary and a minimum criterion of three shared phonemes (Pérez et al., 2010), as well as more fine-grained phonological comparisons, such as the *Crosslinguistic Overlap Scale for Phonology* (COSP; Kohnert, Windsor, & Miller, 2004; also see DeGroot & Keijzer, 2000).

Although objective approaches provide an efficient and consistent method of determining cognate status, it is possible that factors beyond phonology ought to be considered, especially in the context of investigating the cognate advantage. Namely, it may be valuable to include a measure that reflects cross-linguistic similarities that are salient to speakers. This is possible with subjective methods of cognate identification, which have also been widely used (e.g. Brenders et al., 2011; Friel & Kennison, 2001; Gollan et al., 2007; Nagy et al., 1993; Rosselli et al., 2012). For example, monolingual English speakers could be asked to provide similarity ratings for translation equivalents in English and another language or to guess the English meaning of a foreign word. High ratings or successes in translations would suggest that the cross-linguistic overlap is salient (Friel & Kennison, 2001). Such prominent similarity may ultimately be what is reflected in behavioral findings of cognate advantages. In fact, theoretical accounts of cognate processing posit stronger associative links between form-similar translation equivalents, with bilinguals' translation of cognates faster and more accurate than for non-cognates (Boada, Sanchez-Casas, Gavilan, Garcia-Albea, & Tokowicz, 2013; Friel & Kennison, 2001; Kroll & Stewart, 1994). Despite these potential advantages of subjective approaches, speaker judgment tasks are more time intensive relative to objective approaches. They may also be less stable, as similarity ratings or translation elicitations may change as different individuals are surveyed and when local variations in vocabulary are encountered.

Thus, while vast methodological variability is present in the current literature on the cognate advantage, little is known about the differences between these approaches (cf. Friel & Kennison, 2001). Crucially, it is not yet clear whether objective and subjective approaches assign cognate status to the same sets of words or if different methodologies may impact findings of cognate effects. Comparing approaches is particularly important for child bilinguals, who show relatively attenuated and inconsistent cognate effects, as differences in methodology may impact whether or not a cognate advantage is found.

Present study

In Experiment 1, we compare four cognate identification methods that represent both objective and subjective approaches. In Experiments 2 and 3, we compare the implementation of these criteria in evaluations of cognate effects in adult and child bilinguals, respectively. Both groups completed the *PPVT-III* (Dunn & Dunn, 1997), a task that is appropriate for children and adults and has been previously used in examining Spanish-English cognate effects (Kelley & Kohnert, 2012; Umbel et al., 1992). To our knowledge, this is the first study of cognate effects to include both adult and child speakers, as well as the first cognate processing study in children that are preschool-aged. In summary, we ask the following:

1. Are there differences in the quantity and quality of *PPVT-III* test items selected by objective and subjective cognate identification criteria? (Experiment 1)
2. Do cognate identification criteria influence the magnitude and consistency of cognate effects for adult bilinguals? (Experiment 2)

3. Do cognate identification criteria influence the magnitude and consistency of cognate effects for child bilinguals? (Experiment 3)

Experiment 1

In our first experiment, we compared four approaches of determining cognate status, including one objective criterion, two subjective criteria, and one hybrid criterion, in order to ascertain if these methods select notably different subsets of *PPVT-III* test items as cognates. The objective selection criterion consisted of the previously used COSP scale (Kelley & Kohnert, 2012). To implement the subjective cognate identification criteria, English monolingual participants were asked to back-translate Spanish translation equivalents of the English *PPVT-III* test items (described in detail below), with accurate back-translations only possible in the presence of salient form overlap between English and Spanish translations (e.g. Friel & Kennison, 2001). It was predicted that the four cognate selection criteria would identify quantitatively and qualitatively different sets of cognate words from among the 204 *PPVT-III* test items.

Method

Participants—Students in a large undergraduate class were offered extra credit to complete a translation elicitation task together with a brief language background questionnaire. Out of 118 participating students, the 12 monolingual native English speakers with no reported experience in any other spoken language were selected for the subjective cognate identification task. These selected students (mean age = 21.25 years, age reported by 67%) rated their proficiency in Spanish on a scale from 0 (*none*) to 10 (*perfect*), with a mean proficiency rating of 0.19 (*SD* = 0.39), suggesting minimal familiarity with Spanish.

Materials—To examine the influence of cognate identification criteria on the selection of cognate and non-cognate word sets, items on the *PPVT-III* were examined. The *PPVT-III* is a measure of receptive vocabulary that asks individuals to match pictures to target items. The 204 targets are divided into 17 sets, with each subsequent set designed to increase in difficulty. Following testing protocol, participants' age determines their starting set, and individuals continue until eight errors are made in a single set. Thus, even adult participants are typically not familiar with all words presented within the last 2–3 sets of the test.

To identify cognate items on the *PPVT-III*, four Spanish-English bilingual research assistants independently translated each item from English into Spanish. Translation equivalents were selected from the pooled responses, with preference first given to Spanish words that also appeared on the *TVIP*. For the remaining items, preference was given to translations that faithfully represented the corresponding test image (e.g. the noun *mosca* instead of the verb *volar* for the English noun *fly*) and to translations that were provided by multiple translators. Translations with orthographic overlap with the target word were also given preference (e.g. selecting *vehículo* instead of *coche* for *vehicle*).

Procedure and analyses—The established English-Spanish translation equivalents of items on the *PPVT-III* were then analyzed for cognate status in four different ways:

Firstly, we adopted the COSP (Kohnert et al., 2004) as an *objective criterion* of cognate status. Degree of overlap was measured in four domains: word-initial sound, number of syllables, percentage of overlapping consonants, and percentage of overlapping vowels. Total COSP scores ranged from 0 (e.g. *knight/caballero*) to 10 (e.g. *cupola/cúpula)*. Words that received scores of six or higher (e.g. *selecting/seleccionar)* were considered cognates (Kelley & Kohnert, 2012).

We also used two *subjective criteria*, a *50% Translation criterion* and a *75% Translation criterion*. Using a translation task similar to that described by Friel and Kennison (2001) (see also De Groot & Nas, 1991; Kroll & Stewart, 1994), the English monolingual participants in the current experiment received a typed list of words containing Spanish translation equivalents of the *PPVT-III* items and were asked to guess each word's meaning. Participants were instructed to write an English word alongside each Spanish word. Successful back-translations by the English monolingual participants indicated salient similarities between the Spanish and English translation equivalents (i.e. cognate status). Test items were printed in a randomized order to avoid a gradual increase in difficulty across the task, and each participant back-translated only half of the test items.

Successful back-translations included exact matches, root matches (e.g. *decorate* for target *decorated*, from Spanish translation equivalent *decorado*), and synonyms (e.g. *video camera* for target *camcorder*, from Spanish translation equivalent *videocámara*). For each test item, the percentage of successful translations was calculated. Words were classified as cognates by the 50% Translation criterion if half or more of the monolinguals produced a successful response (Friel & Kennison, 2001). A higher subjective standard—the 75% Translation criterion—was also established to select particularly transparent cognates.

Finally, we combined objective and subjective components to create a *Hybrid criterion*. With this method, a word qualified as a cognate if (1) at least 50% of the monolingual speakers back-translated the word correctly AND the word received a COSP score of 6 or higher, *or* (2) at least 75% of the speakers back-translated the word correctly AND the word received a COSP score of 4 or higher. The first condition selected words that are highly similar phonologically with a relatively low speaker recognition requirement (*painting/pintar*, COSP = 9, correctly back-translated by 50%); the second criterion lowers the objective requirement to accommodate words that are relatively more salient for speakers (*gigantic/gigante*, COSP = 4, correctly back-translated by 83%). The goal was to select words that are both objectively similar and subjectively recognizable.

Results and discussion

Of the 204 test items, 30 words were identified as cognates by all four definitions (e.g. *closet*/*clóset, accident*/*accidente*) and 90 were selected by none (e.g. *drinking*/*tomar, empty*/*vacío*, see Table 1). Potentially, these 120 items are particularly clear exemplars of cognates and non-cognates. The remaining 84 words were selected either by one, two, or three of the available criteria (see Table 2). These items may be more ambiguous in their cognate status, as they fail to meet at least one objective or subjective criterion. The disagreements across criteria suggest that the four methods do select different subsets of test items as cognates.

Indeed, the approaches differed in the quantity of test items selected as cognates (see Table 3). The COSP criterion selected a significantly higher proportion than the next most generous approach, the 50% Translation criterion, $\chi^2(1) = 17.174$, $p < .001$. The 50% Translation and the Hybrid criteria did not differ in the proportion of cognates selected, $p > .5$. In turn, the Hybrid criterion identified significantly more cognates than the 75% Translation criterion, $\chi^2(1) = 4.09$, $p = .04$. Thus, the COSP criterion selected more, and the 75% Translation criterion selected fewer, cognates than any other approach, and quantitative analyses revealed that the four cognate selection criteria differ in their assignment of cognate status.

Further, qualitative observations also revealed important differences across cognate identification criteria. The COSP method is advantageous in that any word pair can be analyzed by any trained individual with high reliability across scorers. However, lacking human intuition, the COSP criterion both overlooked important similarities (e.g. *camcorder*/*videocámara*, COSP = 3, correctly back-translated by 83% of English monolinguals; *helicopter/helicóptero*, COSP = 4, correctly back-translated by 100%) and imposed correspondences where speakers did not perceive them (e.g. *measuring*/*medir*, COSP = 8, no correct back-translations). The objective COSP criterion identified significantly more cognates than any other approach. It also selected more test items from latter test sets than the subjective criteria did, which, given the test's design, reflects that the objective criterion selected more high-difficulty words. In the final three sets of the *PPVT-III*, 20 of 36 words were identified as cognates by the COSP criterion (e.g. *dromedary*/*dromedario*, COSP = 8, no correct back-translations). In contrast, only two words in those sets met even the 50% Translation criterion.

Relative to objective measures, subjective approaches require more time and resources, and they may produce less consistent results. In this study, speaker judgments occasionally resulted in surprising evaluations of cognate status. Monolingual speakers sometimes failed to recognize words with high objective similarities (e.g. *cascade*/*cascada*, COSP = 9, no correct back-translations). They also successfully back-translated three Spanish words that lack phonological overlap with their English counterparts but are apparently familiar even to monolinguals (e.g. *heart*/*corazón*, COSP = 2, correctly back-translated by 67%). These differences suggest that unlike the objective approach, speaker judgments are sensitive to factors like word frequency. For example, while the COSP criterion treated *closet*/*clóset* and *dromedary/dromedario* as equivalent (COSP = 8), more English speakers successfully back-translated the former than the latter. Potentially, this ability to reflect subjectively salient—as opposed to objective—overlap is an advantage of speaker-based approaches.

The Hybrid criterion successfully combined both objective and subjective factors in selecting cognates. For example, both *measuring*/*medir*, which met the COSP criterion, and *heart*/*corazón*, which met both subjective criteria, were classified as non-cognates by the Hybrid criterion. Thus, words that were similar in terms of only phonology or only speaker judgment were deemed non-cognates. Words that fell slightly short of the COSP cognate identification threshold but were highly recognizable (e.g. *helicopter*/*helicóptero*) were identified as cognates.

Because differences across criteria were established, their potential impact on behavioral cognate advantage measurements needed to be evaluated. We addressed our second and third research questions by implementing the four methods to investigate cognate effects in adult (Experiment 2) and child (Experiment 3) Spanish-English bilinguals.

Experiment 2

Because the cognate advantage has been so widely demonstrated in adult bilinguals, this population provides a good initial opportunity to compare different cognate identification methods. Adult Spanish-English bilinguals were administered the *PPVT-III*, and responses across test items were grouped and analyzed according to each of the four cognate selection criteria. It was expected that, given the robust nature of the cognate advantage in adults (e.g. Sánchez-Casas & García-Albea, 2005), all four cognate identification criteria would yield cognate effects in this population. In addition, we predicted that cognate identification criteria would modulate the magnitude of cognate effects.

Method

Participants—Twenty-six Spanish-English adult bilinguals (two males; mean age = 21.77 years, *SD* = 3.17) were selected from a sample of 75 bilinguals. Selection criteria were that participants had early language histories that were highly similar to the child bilinguals in Experiment 3, with Spanish reported as their native language, English acquired after Spanish but before age 6, and with no knowledge of other spoken languages. Language histories, including when participants were first exposed to each language and their current exposure and proficiency in each language, were collected based on participants' self-reports using the *Language Experience and Proficiency Questionnaire* (Marian, Blumenfeld, & Kaushanskaya, 2007). At the time of testing, participants reported being exposed to Spanish 37.08% of the time (*SD* = 15.34, Range = 5–65) and to English 62.65% of the time (*SD* = 15.08, Range = 35–95). Participants reported an average spoken Spanish proficiency of 8.56 (*SD* = 1.26, Range = 5–10) and an average spoken English proficiency of 8.6 (*SD* = .84, Range = 7–10) on a proficiency scale of 0 (*none*)–10 (*perfect*). Mean matrix reasoning *t*-scores from the *Wechsler Abbreviated Scale of Intelligence* were 51.25 (*SD* = 9.69, Range = 23–66) and mean raw scores from Subtest 7 ("Numbers Reversed") of the *Woodcock-Johnson III Tests of Cognitive Abilities* were 16.92 (*SD* = 3.47; Range = 13–25). Scores were thus within the normal range, and no participants reported a history of language, learning, or hearing disabilities. At the time of testing, participants had completed 15.29 years of education (*SD* = 3.41, Range = 6–20). Average standard *PPVT-III* scores were 101.65 (*SD* = 10.39, Range = 66–126).

Procedures and analyses—Participants completed Form A of the *PPVT-III* (see *Materials* in Experiment 1). The adult bilinguals were administered the *PPVT-III* in a laboratory setting as part of an English-only session of a larger study. Although the test was administered according to published guidelines for most participants, eight adult participants completed the entire *PPVT-III* for research purposes and all responses contributed to analyses.

The 204 *PPVT-III* test items were each classified as either a cognate or non-cognate using each of the four cognate identification criteria developed in Experiment 1. Then, participants' responses for all completed test items were coded as correct or incorrect. This provided mean accuracy rates for cognate and non-cognate test items for each participant under each criterion. Because the approaches differed in their cognate assignment, each participant had different accuracy rates and cognate advantage magnitudes under each criterion. The cognate advantage for each criterion was calculated by subtracting the non-cognate accuracy rate from the corresponding cognate accuracy rate (e.g. Kelley & Kohnert, 2012). A positive number indicated that the speaker demonstrated a cognate advantage. We investigated whether each method led to findings of a cognate advantage, and then examined underlying differences in cognate accuracy rates, non-cognate accuracy rates, magnitude of the cognate advantage, and number of individuals demonstrating the effect.

Results

Cognate versus non-cognate performance—As expected, adults performed significantly more accurately on cognate than non-cognate *PPVT-III* items under all four criteria: COSP: $t(25) = 4.78$, $p < .001$, $d = .94$; 50% Translation: $t(25) = 9.07$, $p < .001$, $d = 1.78$; 75% Translation: $t(25) = 6.20$, $p < .001$, $d = 1.22$; Hybrid: $t(25) = 8.68$, $p < .001$, $d = 1.70$. To investigate underlying differences across criteria, we examined both the magnitude of the detected cognate advantages and the number of individuals demonstrating the effect.

Magnitude of the cognate advantage—Larger differences between cognate and non-cognate accuracy rates indicate greater cognate advantages. Cognate advantage magnitudes captured by the four methods (see Figure 1) differed significantly according to a Friedman test: $\chi^2(3) = 35.90$, $p < .001$. Planned post hoc analyses were conducted using Wilcoxon signed-rank tests with a Bonferroni correction, resulting in a significance level threshold of $p < 0.008$. The cognate advantage detected with the COSP criterion was significantly smaller than that detected by any other approach: 50% Translation ($z = -3.59$, $p < .001$); 75% Translation ($z = -2.91$, $p = .004$); Hybrid criteria ($z = -3.59$, $p < .001$). Differences between the magnitudes detected by the 50% and 75% Translation criteria approached significance ($z = -2.63$, $p = .009$). The remaining comparisons did not differ significantly (ps > .012). Overall, the COSP criterion detected the smallest cognate advantage for the adult bilinguals.

Recall that the cognate advantage is calculated by subtracting the non-cognate accuracy rate from the cognate accuracy. Thus, one potential explanation for the observed differences in cognate advantage magnitudes is underlying differences across criteria in cognate and/or non-cognate accuracy rates (see Figure 1). Indeed, significant differences across criteria were found for cognate accuracy rates: $\chi^2(3) = 44.30$, $p < .001$. Post hoc analyses revealed that the cognate accuracy was significantly lower with the COSP than with the 50% Translation ($z = -3.98$, $p < .001$), 75% Translation ($z = -3.78$, $p < .001$), or the Hybrid criteria ($z = -3.98$, $p < .001$). Significant differences were also found for non-cognate accuracy rates: $\chi^2(3) = 30.35$, $p < .001$. The 75% Translation criterion resulted in significantly higher non-cognate accuracy than the COSP ($z = -3.24$, $p = .001$), 50% Translation ($z = -4.46$, $p < .001$), or Hybrid criteria ($z = -4.18$, $p < .001$). Thus, the least selective criterion (COSP) resulted in relatively low cognate accuracy rates while the most selective criterion (75% Translation) resulted in relatively high non-cognate accuracy rates.

Number of individuals demonstrating a cognate advantage—To examine the consistency of cognate effects, we considered the number of individuals that presented a cognate advantage. Under the COSP criterion, 20 of 26 participants showed cognate effects. Under the remaining three criteria, 25 of 26 adult bilinguals demonstrated a cognate advantage. Both proportions were found to be greater than chance levels with a combined sign test: $p = .005$ and $p < .001$, respectively. However, the proportion of individuals found to show a cognate advantage under the COSP criterion was significantly lower than any of the remaining criteria's proportions: $\chi^2(1) = 4.13$, $p = .04$.

Discussion

Adult Spanish-English bilinguals demonstrated higher accuracy rates for cognate than non-cognate *PPVT-III* test items. This held true with all four approaches of assigning cognate status. The 50% Translation and the Hybrid criteria yielded the most similar results, with no differences in cognate advantage magnitude, cognate accuracy rates, non-cognate accuracy rates, or number of individuals demonstrating the cognate advantage. However, the COSP and 75% Translation criteria generated distinctive results.

Using the COSP criterion resulted in lower cognate accuracy rates relative to the remaining criteria, which may explain the relatively small cognate advantage captured by this approach. Potentially, both patterns were a result of the criterion identifying half of the test items as cognates, including many of the more challenging and lower-frequency items in the latter test sets. Participants likely struggled more with these higher-difficulty items, resulting in lower cognate accuracy rates, and thereby decreasing the difference between cognate and non-cognate performance. The relatively low cognate accuracy rate and cognate advantage magnitude under this criterion suggest that *PPVT-III* test items were over-identified as cognates. This is further supported by the significantly lower proportion of individuals found to demonstrate the cognate advantage under this approach.

In contrast, the 75% Translation criterion, which selected the fewest cognates, resulted in relatively high non-cognate accuracy rates. This finding suggests that some test items labeled as non-cognates were actually saliently similar across languages to at least some adult speakers, as this would explain the enhanced non-cognate accuracy rate. Like over-identification of cognates, under-identification could decrease cognate advantage magnitudes. In fact, magnitude differences between the 50% and the 75% Translation criteria approached significance. It is possible that the 75% Translation criterion was too restrictive in its assignment of cognate status.

Despite differences in cognate advantage magnitudes and underlying accuracy rates, all four methods detected cognate advantages for adult bilinguals. These findings attest to the robustness of cognate effects in adult bilinguals. Extending this investigation to child bilinguals provides an opportunity to examine the influence of cognate identification criteria on cognate advantages in a population where these effects appear less robust.

Experiment 3

Research on the cognate advantage in children suggests that the effects may be less robust than in adult speakers, with not all children demonstrating the effect (e.g. Kelley & Kohnert, 2012; Pérez et al., 2010). Moreover, there is some disagreement in the literature over whether children show a sensitivity to cognates. In Experiment 3, we address whether findings of cognate effects in child bilinguals can vary as a result of methodological decisions. Age-appropriate sets of the *PPVT-III* were administered to children, and it was expected that, as in Experiment 2, cognate identification criteria would modulate the magnitude of the cognate effect.

Method

Participants—Child participants included 73 Spanish-English bilinguals (40 males; mean age = 54.12 months, *SD* = 7.28). Questionnaires were sent home and completed by the children's parents. Parents were asked to detail the child's percentage of exposure to Spanish and English, and reported that the children were exposed to Spanish 70.08% of the time (*SD* = 20.32, Range = 33–100), and to English 29.90% of the time (*SD* = 20.31, Range = 0–67).[1] Selection criteria required that the child's home language was Spanish and that the child was exposed to Spanish at least 30% of the time (see Pearson, Fernandez, Lewedeg, & Oller, 1997). Thus, the adult bilinguals in Experiment 2 and the child bilinguals in the current experiment had highly similar early-life language exposure profiles. In addition, via the same questionnaire, parents reported that average maternal education, available for 56 participants, was 10.55 years (*SD* = 3.07, Range = 3–16). Scores from the Figure Ground and Form Completion subtests of the *Leiter International Performance Scale–Revised*, available for 72 participants, were in the normal range, with an average score of 11.73 (*SD* = 2.53, Range = 4–21). Parents and teachers reported that all children were developing typically. Consistent with previous findings that English-learning children perform below monolingual norms on the *PPVT-III* (e.g. Bialystok, Luk, Peets, & Yang, 2007; Gutiérrez-Clellen, 1999; Millett, Atwill, Blanchard, & Gorin, 2008, Umbel et al., 1992), the average *PPVT-III* score for this sample was 73.56 (*SD* = 18.03, Range = 40–108).

Procedure and analyses—Child participants were administered Form A of the *PPVT-III* (see *Materials* in Experiment 1), according to testing guidelines, at a local elementary school during an English-only session as part of a larger research project. As in Experiment 2, each participant's responses were coded as correct or incorrect. Cognate and non-cognate accuracy rates were calculated for each participant under all four cognate identification criteria. As in Experiment 2, we investigated whether each method detected a cognate advantage for the sample and then examined differences in cognate accuracy rates, non-cognate accuracy rates, magnitude of the cognate advantage, and number of individuals demonstrating the effect.

[1]One family did not report exposure percentages but listed Spanish as the language the child heard and used in the home. The child's teacher confirmed English use in the classroom.

Results

The child bilinguals showed higher accuracy rates for cognates than non-cognates with three of the cognate selection criteria (see Figure 2): 50% Translation criterion: $t(72) = 3.46$, $p = .001$, $d = .41$; 75% Translation criterion: $t(72) = 3.01$, $p = .003$, $d = .35$; Hybrid criterion: $t(72) = 2.056$, $p = .043$, $d = .24$. Under the COSP criterion, no significant difference was found between cognate and non-cognate accuracy rates ($p > .25$, $d = .13$).

Further, cognate advantage magnitudes differed significantly across criteria, according to a Friedman test: $\chi^2(3) = 9.85$, $p = .02$. Post hoc analyses with Wilcoxon signed-rank tests were conducted with a Bonferroni correction, resulting in a significance level threshold of $p < 0.008$. The 50% Translation criterion resulted in a significantly higher cognate advantage magnitude than the Hybrid ($z = -2.94$, $p = .003$), and the remaining pairs were not significantly different from each other (ps > .03).

Because the cognate advantage is the difference between cognate and non-cognate accuracy rates, those accuracies were also analyzed. Cognate accuracy rates did not differ across criteria. However, non-cognate accuracy rates did: $\chi^2(3) = 14.22$, $p = .003$. Post hoc analyses revealed that accuracies for non-cognates were significantly higher for the Hybrid than the 50% Translation criterion ($z = -3.42$, $p = .001$). Potentially, this pattern contributes to the larger cognate advantage found with the 50% Translation criterion relative to the Hybrid.

Number of child bilinguals showing a cognate advantage—The four cognate identification methods found differing numbers of children as showing a cognate advantage. Under the COSP criterion, 35 of 73 children had a higher cognate than non-cognate accuracy rate; under the 50% Translation, 48; under the 75% Translation, 44; and the Hybrid, 41. However, these proportions only differed significantly between the 50% Translation and COSP criteria ($\chi^2(1) = 4.72$, $p = .03$). Only the 50% and 75% Translation criteria found a proportion of children showing the cognate effect that differed from chance, according to a combined sign test: 50% Translation, $p = .005$; 75% Translation, $p = .04$.

Discussion

Although the COSP criterion failed to detect a cognate advantage, the remaining three criteria did yield cognate effects for preschool-aged Spanish-English bilinguals. Thus, it appears that methodological decisions regarding cognate identification methods may impact findings of cognate effects in young bilinguals. Specifically, subjective criteria—which selected fewer test items as cognates—detected larger and more consistent cognate effects in young bilinguals. Of the four approaches, only the 50% and 75% Translation criteria identified a proportion of child bilinguals with cognate effects that differed from chance. Potentially, introducing objective phonological criteria may mask cognate effects in child bilinguals. Not only did the COSP criterion lead to no significant differences between cognate and non-cognate accuracy rates (i.e. no cognate advantage), but the introduction of an objective standard alongside a subjective one with the Hybrid criterion also appeared to attenuate cognate effects. For example, the cognate advantage detected by the Hybrid criterion was significantly smaller than that detected by the subjective 50% Translation criterion.

Recall that the objective criterion selected significantly more test items than any other approach, and effectively cast a wider net for what qualifies as a cognate. The difference in findings of cognate effects for the COSP and the subjective approaches in child bilinguals suggests that young bilinguals may need more than pure phonological overlap to make use of cross-linguistic similarities. In other words, it appears that young bilinguals have not yet learned to make use of all available cues of cross-linguistic similarity and are especially reliant on salient perceptual similarities.

Overall, these results largely align with previous work on cognate effects in child bilinguals. Relative to reported findings of cognate effects in adults, cognate effects in these young bilinguals appeared to be present but were inconsistent—only subsets of the sample demonstrated the advantage, and effects were captured with varying degrees of success by different cognate identification criteria. Interestingly, effects were found despite this sample's young age.

General discussion

In Experiment 1, we compared four methods of determining cognate status: an objective phonological criterion (COSP), subjective 50% and 75% Translation criteria, and a Hybrid criterion that combined objective and subjective elements. We found that these methodological differences gave rise to differing assignments of cognate status for *PPVT-III* test items. In our second and third experiments we found that, in turn, differences emerged in cognate accuracy rates, non-cognate accuracy rates, and in the magnitudes of cognate advantages across the four cognate selection criteria. Unlike prior research on the cognate advantage, we investigated effects in both child and adult participants. Inclusion of data from adults and children allowed us to examine cognate identification criteria and cognate effects in two populations that appear to differ in the robustness of the cognate effect.

Findings from our first experiment suggested that the COSP criterion identified more cognates than any other approach (102 of 204) and the 75% Translation criterion selected the fewest (37). There was also substantial disagreement between methods: Only 30 of the 204 test items were unanimously selected as cognates, but 84 words were selected by one, two, or three of the available criteria (see Table 2). Objective and subjective criteria differed markedly, as evidenced by the fact that 53 words selected as cognates by the COSP were selected as non-cognates by the remaining methods. Differences were particularly pronounced in the final *PPVT-III* test sets, which include the most challenging items.

The goal of our second experiment was to test whether these detected differences between cognate selection criteria would impact findings of cognate effects in adult bilinguals. Indeed, the COSP criterion resulted in a lower cognate accuracy rate, a smaller cognate advantage, and a smaller proportion of individuals with a cognate advantage than the remaining methodologies. These patterns can be explained by the large number of cognates identified by this approach, including high-difficulty items that may have lacked easily recognizable cross-linguistic overlap or that the speakers may not have recognized in one or either language (e.g. *incarcerating*/*encarcelar*, COSP = 6, no correct back-translations). In contrast, the highly selective 75% Translation criterion resulted in particularly high *non*-cognate accuracy rates. Test items with partial cross-linguistic form overlap that were classified as cognates by the remaining criteria appeared in this criterion's non-cognate subset, potentially inflating adult speakers' non-cognate accuracy rate. Although the COSP and 75% Translation criterion may be less optimal for measuring the cognate advantage in adults, cognate effects were robust in this group and were found under each criterion.

Finally, in our third experiment, we extended the investigation to young bilinguals. While the cognate advantage was consistently present in adults, cognate effects in children were found with three criteria but not with the COSP criterion. Further, in children, an important new distinction emerged: only the subjective criteria identified a substantial proportion of individuals with a cognate advantage that differed from chance. The lack of cognate effects with the COSP criterion and the overall lower proportions of individuals who showed the advantage suggest that the children in this sample were limited in their sensitivity to cross-linguistic overlap relative to the adult bilinguals. In interpreting these findings, it is important to recall the specific profiles of our bilingual groups (see *Method* sections for Experiments 2 and 3). As illustrated in the current sample, young bilingual children, who are at various stages of learning English, may by definition show a wide range of English proficiencies. These individual differences pose challenges for language assessment. Further examination of cognate effects, and their relation to language development, may open another avenue for determining typical language development in these young bilinguals. Specifically, future work can consider why some, but not all, child bilinguals demonstrated a cognate advantage, and can search for relationships between the cognate advantage and bilingual profile characteristics (e.g. relative exposure) or measures of language development (e.g. standardized language performance, language sample measures). Additional work with other young bilingual populations (e.g. a sample with relatively high English exposure) would be needed to help determine whether the relatively attenuated cognate sensitivity found in this sample is a dependable pattern.

Overall, these findings support and add to previous research on the cognate advantage. Consistent with previous work, adults consistently demonstrated higher cognate than non-cognate accuracy rates (e.g. Sánchez-Casas & García-Albea, 2005). Because a cognate advantage was present under all four criteria, it appears that adult bilinguals showed facilitated processing both for near-identical cognates (those selected by all four criteria; for example, *closet*/*clóset*) and for cognates with less cross-linguistic overlap (those selected by only one criterion; for example, *confiding*/*confiar*). In contrast, cognate effects in child bilinguals were less resilient to methodological differences, as indicated by the absence of a cognate advantage under the COSP criterion. Consistently, prior work on the cognate advantage in children has used objective cognate selection criteria and found limited effects (e.g. Kelley & Kohnert, 2012; Pérez et al., 2010). Our findings suggest that perhaps the advantage would be more consistent across child participants if a subjective criterion for cognate status were used.

In addition to informing methodological considerations, examination of child and adult performance also provided for exploratory considerations of cognate effects across the lifespan. We acknowledge that the current data provide only a preliminary developmental comparison since our child and adult participants differ in current exposure to Spanish and English (with child bilinguals being Spanish-dominant and adult bilinguals being English-dominant), but this difference actually reflects common developmental trajectories of heritage Spanish speakers in the United States. After spending years in an English school system, the child bilinguals in this study will likely become more balanced in their language exposure and will thus resemble the current adult sample. Importantly, only Spanish-English bilingual adults whose early language profiles resembled those of the current child participants were included in this study. Thus, considering the two groups' patterns of cognate effects suggests that cognate sensitivity may emerge and become more robust over time. This finding is further supported by comparing across previous studies of cognate effects in adult and child bilinguals.

The identified differences in cognate effects in children and adults also indicate that not all assumptions about adult bilingual lexical processing may extend to child speakers. Current models of adult bilingual lexical processing (e.g. *Bilingual Language Interaction Network for Comprehension of Speech*, Shook & Marian, 2013; the *Bilingual Interactive Activation Model*, Dijsktra & Van Heuven, 2002; Dijkstra, Van Heuven, & Grainer, 1998) all posit a partially integrated lexicon in which high cross-linguistic overlap—as seen in cognates—explains advantages in performance. However, if child bilinguals show different patterns of performance, models may need to be adapted to account for child behavior and the developmental trajectory of cognate effects. For example, distinctions may be drawn between translation pairs with high and low phonological overlap and between high- and low-frequency words (that may or may not be known in both languages). Consistent with the assumption of an integrated lexicon, we predict that children initially show processing advantages for highly form-similar cognates that are frequent in both languages, thus providing robust cross-linguistic scaffolding. As children's overall vocabulary and metalinguistic awareness expand, they may learn to make use of phonological overlap with less frequent cognate pairs, and they may become more sensitive to cognate pairs with incomplete cross-linguistic form overlap. Additional research is needed to address these predictions, to control for patterns of language exposure across age groups where possible, and to plot the developmental trajectory of the cognate advantage.

Limitations of this study include working with a predetermined word list, precluding us from controlling for word frequency or difficulty. Potentially, the COSP criterion would not have diverged from the remaining criteria as strongly if there were fewer high-difficulty items. Further, due to test administration protocol, not all participants completed the same sets or number of items. Both of these factors may have impacted child bilinguals in particular, whose vocabularies are not yet fully developed and who therefore completed fewer items than the adults. Nevertheless, this method offered the opportunity to conduct initial investigations of methodological impacts on cognate effects in child and adults bilinguals using a format appropriate to both age groups. Further, the current findings can inform interpretation of performance on the *PPVT-III* in Spanish-English bilinguals. To better investigate cognate effects, factors like word frequency and phonological overlap would need to be experimentally manipulated. Carefully designed cognate probes would be an exciting way to explore why some, but not all, children demonstrate a cognate advantage.

Conclusions

The present work may be used to guide methodological decisions in future research on the cognate advantage. For example, when working with high-difficulty, low-frequency words (as in the latter *PPVT-III* test sets), objective phonological criteria may over-identify cognates. In this study, the COSP criterion detected the weakest effects in adult speakers and failed to identify cognate effects in child speakers. Thus, we concluded that this objective approach is not the most advantageous for assessing cognate effects, especially for child bilinguals or when difficult items are included as stimuli. This is useful information for those investigating the cognate advantage in languages such as English and Spanish, for which many cognates are lower-frequency words (Schepens, Dijkstra, Grootjen, & Van Heuven, 2013). Participants' age should also play a role in methodological decisions. For child speakers in particular, subjective criteria may be valuable, as we found that an objective criterion overlooked cognate effects. For adult speakers, however, the 75% Translation criterion seemed to under-identify cognates. In future work, we recommend either setting a lower threshold (i.e. 50%), or using the higher threshold but refining the non-cognate set to filter out near-cognates (e.g. *inhale*/*inhalar*, correctly back-translated by 67%).

Ultimately, a balance between objective and subjective cognate identification approaches is desired. The weak cognate effects with the COSP criterion suggest that the cognate identification process is well-served by a subjective component. However, objective analysis is necessary to ensure that speaker judgments reflect true form similarities and not other factors, like familiarity (e.g. *heart*/*corázon*). Thus, we expected the Hybrid criterion to emerge as the superior cognate identification method. In fact, this was a suitable approach for adult bilinguals, as evidenced by the lack of extreme accuracy rates like those found with the COSP and the 75% Translation criteria. However, for child bilinguals, even this limited inclusion of phonological criteria appeared to dilute cognate effects.

To conclude, although the general characterization of a cognate word is widely known, this study provides compelling evidence that the operational criteria for cognate status warrant attention. The use of different methods can yield meaningful differences in stimulus selection. Further, the criteria can impact bilinguals' performance on cognates, especially in the case of child speakers. Our findings also attest to the robustness of cognate effects in adult speakers and suggest that some preschool-aged bilinguals are also sensitive to cross-linguistic overlap, particularly for highly transparent translation equivalents.

Acknowledgments

The authors would like to thank Alaina Kelley and Kathryn Kohnert for sharing their COSP rating criteria, as well as members of the Language Development, Disorders and Diversity Lab and the Bilingualism and Cognition Lab at San Diego State University for research assistance and helpful discussions of this work.

Funding

The first author was supported by an NIH training grant [grant number T32 DC007361]. In addition, funding for the project was provided by San Diego State University Grants Program Grant [grant number 242338] and an ASH

Foundation New Investigator Grant awarded to the second author and an NIH NIDCD RO3 [grant number DC012141] and a Price Charities research grant awarded to the third author.

References

Bialystok E, Luk G, Peets KF, Yang S. 2009; Receptive vocabulary differences in monolingual and bilingual children. Bilingualism: Language and Cognition. 13:525–531.

Boada R, Sanchez-Casas R, Gavilan JM, Garcia-Albea JE, Tokowicz N. 2013; Effect of multiple translations and cognate status on translation recognition performance of balanced bilinguals. Bilingualism: Language and Cognition. 16:183–197.

Brenders P, Van Hell J, Dijkstra T. 2011; Word recognition in child second language learners: Evidence from cognates and false friends. Journal of Experimental Child Psychology. 109:383–396. [PubMed: 21507422]

Caramazza A, Brones I. 1979; Lexical access in bilinguals. Bulletin of the Psychonomic Society. 13:212–214.

Costa A, Santesteban M, Caño A. 2005; On the facilitatory effects of cognate words in bilingual speech production. Brain and Language. 95:94–103.

Davis C, Sánchez-Casas R, García-Albea JE, Guasch M, Molero M, Ferré P. 2010; Masked translation priming: Varying language experience and word type with Spanish-English bilinguals. Bilingualism: Language and Cognition. 13:137–155.

De Groot AMB, Keijzer R. 2000; What is hard to learn is easy to forget: The roles of word concreteness, cognate status, and word frequency in foreign-language vocabulary learning and forgetting. Language Learning. 50:1–56.

De Groot AMB, Nas GLJ. 1991; Lexical representation of cognates and noncognates in compound bilinguals. Journal of Memory and Language. 30:90–123.

De Groot AMB, Poot R. 1997; Word translation at three levels of proficiency in a second language: The ubiquitous involvement of conceptual memory. Language Learning. 47:215–226.

Dijkstra A, Van Heuven WJB. 2002; The architecture of the bilingual word recognition system: From identification to decision. Bilingualism: Language and Cognition. 5:175–197.

Dijkstra T, Van Heuven W, Grainger J. 1998; Simulating cross-language competition with the bilingual interactive activation model. Psychologica Belgica. 38:177–196.

Dressler C, Carlo M, Snow C, August D, White C. 2011; Spanish-speaking students' use of cognate knowledge to infer the meaning of English words. Bilingualism: Language and Cognition. 14:243–255.

Dufour R, Kroll JF. 1995; Matching words to concepts in two languages: A test of the concept mediation model of bilingual representation. Memory & Cognition. 23:166–180. [PubMed: 7731362]

Dunn, L, Dunn, L. Peabody picture vocabulary test. 3. Circle Pines, MN: American Guidance Service; 1997.

Dunn, L, Padilla, E, Lugo, D, Dunn, L. Test de vocabulario en imágenes peabody—adaptación hispanoamericana. Circle Pines, MN: American Guidance Service; 1986.

Friel BM, Kennison SM. 2001; Identifying German–English cognates, false cognates, and non-cognates: Methodological issues and descriptive norms. Bilingualism: Language and Cognition. 4(3):249–274.

Gollan TH, Fennema-Notestine C, Motoya RI, Jernigan TL. 2007; The bilingual effect on Boston Naming Test performance. Journal of the International Neuropsychological Society. 123:197–208.

Gutierrez-Clellen VF. 1999; Language choice in intervention with bilingual children. American Journal of Speech-Language Pathology. 8:291–302.

Kelley A, Kohnert K. 2012; Is there a cognate advantage for typically developing Spanish-speaking English language learners? Language, Speech, and Hearing Services in Schools. 43:191–204.

Kohnert K, Windsor J, Miller R. 2004; Crossing borders: Recognition of Spanish words by English-speaking children with and without language impairment. Applied Psycholinguistics. 25:543–564.

Kroll JF, Stewart E. 1994; Category interference in translation and picture naming: Evidence for asymmetric connections between bilingual memory representations. Journal of Memory and Language. 33:149–174.

Marian V, Blumenfeld KH, Kaushanskaya M. 2007; The Language Proficiency and Experience Questionnaire (LEAP-Q): Assessing language profiles in bilinguals and multilinguals. Journal of Speech, Language, and Hearing Research. 50:940–967.

Millett J, Atwill K, Blanchard J, Gorin J. 2008; The validity of receptive and expressive vocabulary measures with Spanish-speaking kindergarteners learning English. Reading Psychology. 29(6):534–551.

Nagy W, García G, Durgunoglu A, Hancin-Bhatt B. 1993; Spanish-English bilingual students' use of cognates in English reading. Journal of Literacy Research. 25:241–259.

Pearson BZ, Fernandez SC, Lewedeg V, Oller DK. 1997; The relation of input factors to lexical learning by bilingual infants. Applied Psycholinguistics. 18:41–58.

Pérez A, Peña E, Bedore L. 2010; Cognates facilitate word recognition in young Spanish-English bilinguals' test performance. Early Child Services. 4:55–67.

Rosselli M, Ardila A, Jurado M, Salvatierra J. 2012; Cognate facilitation effect in balanced and non-balanced Spanish–English bilinguals using the Boston Naming Test. International Journal of Bilingualism. 0:1–14.

Sánchez-Casas, R, García-Albea, JE. The representation of cognate and noncognate words in bilingual memory: Can cognate status be characterized as a special kind of morphological relation?. In: Kroll, JF, De Groot, AMB, editors. Handbook of bilingualism; psycholinguistic approaches. New York, NY: Oxford University; 2005. 226–250.

Schepens J, Dijkstra T, Grootjen F, Van Heuven WJB. 2013; Cross-language distributions of high frequency and phonetically similar cognates. PLoS ONE. 8(5):1–15.

Shook A, Marian V. 2013; The Bilingual Language Interaction Network for comprehension of speech. Bilingualism: Language and Cognition. 16:304–324.

Umbel V, Oller DK. 1994; Developmental changes in receptive vocabulary in Hispanic bilingual school children. Language Learning. 44:221–242.

Umbel V, Pearson B, Fernández M, Oller DK. 1992; Measuring bilingual children's receptive vocabularies. Child Development. 63:1012–1020. [PubMed: 1505238]

Van Assche E, Duyck W, Brysbaert M. 2013; Verb processing by bilinguals in sentence contexts: The effects of cognate status and verb tense. Studies in Second-Language Acquisition. 35:237–259.

Van Hell J, De Groot A. 1998; Conceptual representation in bilingual memory: Effects of concreteness and cognate status in word association. Bilingualism: Language and Cognition. 1:193–211.

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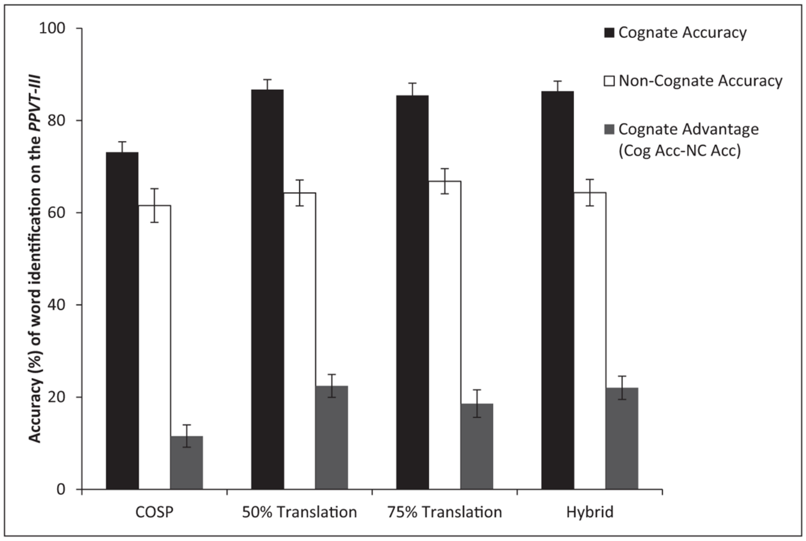

Figure 1.
Adult Spanish-English bilinguals' cognate accuracy rates, non-cognate accuracy rates, and cognate advantages (cognate minus non-cognate accuracy) for the four cognate identification criteria.

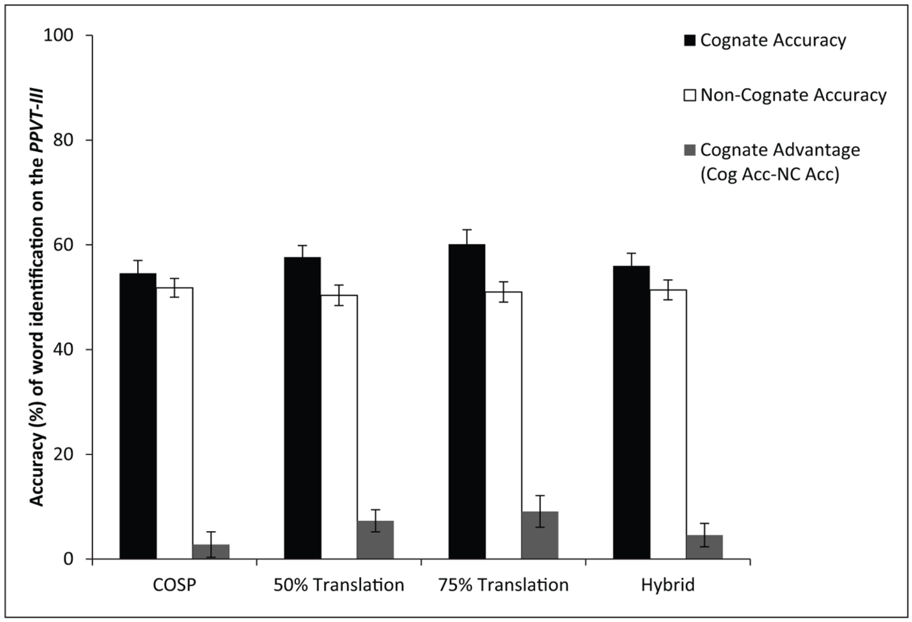

Figure 2.
Child Spanish-English bilinguals' cognate accuracy rates, non-cognate accuracy rates, and cognate advantages (cognate minus non-cognate accuracy) for the four cognate identification criteria.

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Table 1

Number of *Peabody Picture Vocabulary Test-Third Edition* items selected by cognate identification criteria.

Number of criteria	Number of cognates selected	Examples
1	58	*island*/*isla*
2	2	*bus*/*autobus*
3	24	*helicopter*/*helicóptero*
4	30	*fragile*/*frágil*

Note: Of the 204 test items, 90 were not selected as cognates by any criteria.

Table 2

Number of criteria that identified each item as a cognate.

PPVT-III Form A item	Number of criteria that selected the item as a cognate	*PPVT-III* Form A item	Number of criteria that selected the item as a cognate	*PPVT-III* Form A item	Number of criteria that selected the item as a cognate
1	2 (50%, 75%)	86	3 (C, 50%, H)	148	1 (C)
6	1 (50%)	87	3 (C, 50%, H)	149	4 (C, 50%, 75%, H)
7	4 (C, 50%, 75%, H)	88	1 (C)	150	3 (C, 50%, H)
9	3 (C, 50%, H)	89	4 (C, 50%, 75%, H)	151	1 (C)
10	3 (50%, 75%, H)	90	1 (C)	153	1 (C)
17	3 (C, 50%, H)	91	3 (C, 50%, H)	154	3 (C, 50%, H)
24	1 (C)	92	3 (50%, 75%, H)	155	1 (C)
28	1 (C)	94	4 (C, 50%, 75%, H)	156	1 (C)
29	1 (C)	96	1 (C)	158	3 (C, 50%, H)
31	1 (C)	97	4 (C, 50%, 75%, H)	159	1 (C)
32	1 (C)	98	1 (C)	160	4 (C, 50%, 75%, H)
33	4 (C, 50%, 75%, H)	100	1 (C)	162	1 (C)
34	4 (C, 50%, 75%, H)	101	1 (50%)	163	1 (C)
35	4 (C, 50%, 75%, H)	102	4 (C, 50%, 75%, H)	164	4 (C, 50%, 75%, H)
37	1 (C)	103	3 (C, 50%, H)	165	3 (C, 50%, H)
38	1 (C)	104	1 (C)	168	3 (50%, 75%, H)
39	3 (C, 50%, H)	106	4 (C, 50%, 75%, H)	169	1 (C)
42	1 (C)	109	1 (C)	171	1 (C)
43	4 (C, 50%, 75%, H)	110	3 (C, 50%, H)	172	4 (C, 50%, 75%, H)
51	4 (C, 50%, 75%, H)	111	3 (C, 50%, H)	174	1 (C)
53	4 (C, 50%, 75%, H)	114	1 (C)	175	1 (C)
55	1 (50%)	116	4 (C, 50%, 75%, H)	176	1 (C)
59	4 (C, 50%, 75%, H)	117	4 (C, 50%, 75%, H)	177	1 (C)
61	4 (C, 50%, 75%, H)	120	4 (C, 50%, 75%, H)	179	1 (C)
62	3 (C, 50%, H)	121	3 (C, 50%, H)	180	1 (C)
65	3 (50%, 75%, H)	124	1 (C)	181	1 (C)
67	4 (C, 50%, 75%, H)	125	4 (C, 50%, 75%, H)	184	1 (C)
68	1 (C)	126	1 (C)	185	1 (C)

***PPVT-III* Form A item**	**Number of criteria that selected the item as a cognate**	***PPVT-III* Form A item**	**Number of criteria that selected the item as a cognate**	***PPVT-III* Form A item**	**Number of criteria that selected the item as a cognate**
70	4 (C, 50%, 75%, H)	127	1 (C)	187	1 (C)
71	4 (C, 50%, 75%, H)	129	3 (C, 50%, H)	188	3 (C, 50%, H)
73	3 (50%, 75%, H)	131	1 (C)	192	1 (C)
75	4 (C, 50%, 75%, H)	135	1 (C)	195	1 (C)
79	4 (C, 50%, 75%, H)	138	3 (C, 50%, H)	196	1 (C)
80	3 (C, 50%, H)	139	4 (C, 50%, 75%, H)	197	1 (C)
81	1 (50%)	140	1 (C)	199	1 (C)
82	2 (50%, 75%)	141	1 (C)	200	1 (C)
83	1 (50%)	143	1 (C)	203	1 (C)
85	4 (C, 50%, 75%, H)	146	4 (C, 50%, 75%, H)	204	1 (C)

In parentheses: (C) = *Crosslinguistic Overlap Scale for Phonology*; (50%) = 50% Translation criterion; (75%) = 75% Translation criterion; (H) = Hybrid.

PPVT-III: Peabody Picture Vocabulary Test-Third Edition.

Table 3

Number of cognates and non-cognates identified by each of four cognate identification criteria.

Criterion	Number of cognates	Number of non-cognates
COSP	102	102
50% Translation	61	143
75% Translation	37	167
Hybrid	54	150

COSP: *Crosslinguistic Overlap Scale for Phonology.*