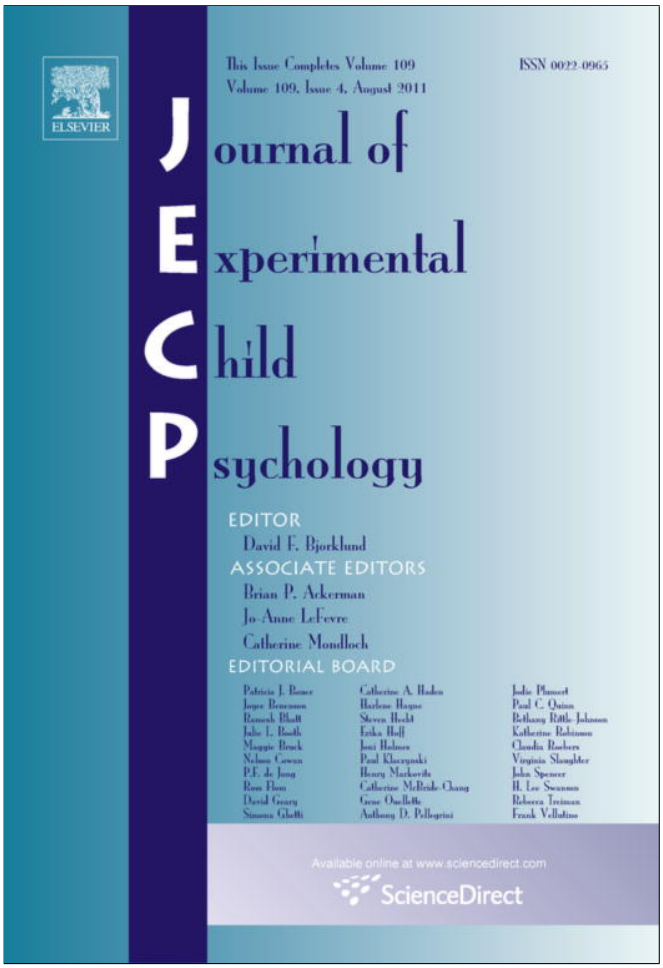

Journal of Experimental Child Psychology 109 (2011) 383–396

Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp

Word recognition in child second language learners: Evidence from cognates and false friends

Pascal Brenders [a,b,*], Janet G. van Hell [a,c], Ton Dijkstra [b]

[a] Behavioural Science Institute, Radboud University Nijmegen, 6525 HR Nijmegen, The Netherlands
[b] Donders Institute for Brain, Cognition and Behaviour, Radboud University Nijmegen, 6525 HR Nijmegen, The Netherlands
[c] Department of Psychology, Pennsylvania State University, University Park, PA 16802, USA

ARTICLE INFO

Article history:
Received 19 February 2010
Revised 14 March 2011

Keywords:
Bilingual
L2 learning
Child
Cognates
False friends
Task demands
Language development
Cross-sectional

ABSTRACT

We studied how Dutch children learned English as a second language (L2) in the classroom. Learners at different levels of L2 proficiency recognized words under different task conditions. Beginning learners in primary school (fifth and sixth grades) and more advanced learners in secondary school (seventh and ninth grades) made lexical decisions on words that are similar for English and Dutch in both meaning and form ("cognates") or only in form ("false friends"). Cognates were processed faster than matched control words by all participant groups in an English lexical decision task (Experiment 1) but not in a Dutch lexical decision task (Experiment 2). An English lexical decision task that mixed cognates and false friends (Experiment 3) led to consistently longer reaction times for both item types relative to controls. Thus, children in the early stages of learning an L2 already activate word candidates in both of their languages (language-nonselective access) and respond differently to cognates in the presence or absence of false friends in the stimulus list.

Introduction

A letter string may turn out to be a word in one of many languages, for instance, in English (*car*) or in Dutch (*huis*). The letter string can even be a word from more than one language. Words such as *garage, bed,* and *bal* are written in (nearly) the same way in English and Dutch and even have the same

* Corresponding author at: Behavioural Science Institute, Radboud University Nijmegen, 6525 HR Nijmegen, The Netherlands.
E-mail address: p.brenders@bsi.ru.nl (P. Brenders).

0022-0965/$ - see front matter © 2011 Elsevier Inc. All rights reserved.
doi:10.1016/j.jecp.2011.03.012

meanings. Such words are called "cognates." Other words share their form across languages but have different meanings, such as *boot,* which means 'boat' in Dutch, and *angel,* which means 'stinger' in Dutch. Because of their deceiving make-up, such words are known as "false friends."

Some 30 years of bilingual research have been devoted to finding out whether bilinguals activate possible words in both languages when they are reading in one of them. Thus, do they activate both the English and Dutch readings of *garage* and *boot*? According to the language-nonselective access view, they do—even in a single-language context (Altenberg & Cairns, 1983). In contrast, according to the language-selective access view, only items from the target language are activated on word presentation (Scarborough, Gerard, & Cortese, 1984). These theoretical views have been contrasted in many adult studies involving cognates and false friends. We used such stimuli to investigate whether language-nonselective access occurs in the word recognition of young and beginning learners of a second language (L2) (i.e., Dutch speakers learning English). Surprisingly enough, this has hardly been studied. In addition, we examined to what extent stimulus list composition and task demands modulate language-nonselective access in these novice learners.

Cognates in adult bilingual word recognition

Cognates have been useful stimuli in studies testing the language-selective and language-nonselective access views. If cognates are processed differently from matched control words that exist in only one language (e.g., *bike,* which is a word in English but not in Dutch), researchers have assumed that both readings of the cognate are activated during recognition (finding no difference between cognates and controls has been considered as evidence for language-selective access). Evidence in support of language-nonselective access has been collected with respect to words presented in bilinguals' L2 by means of a wide range of experimental paradigms: lexical decision (Altenberg & Cairns, 1983; Caramazza & Brones, 1979; Dijkstra, Grainger, & Van Heuven, 1999; Gerard & Scarborough, 1989; Lemhöfer & Dijkstra, 2004; Lemhöfer, Dijkstra, & Michel, 2004; Van Hell & Dijkstra, 2002), progressive demasking (Dijkstra et al., 1999), semantic categorization (Sánchez-Casas, Davis, & García-Albea, 1992), word translation (De Groot, Dannenburg, & Van Hell, 1994), masked translation priming (Gollan, Forster, & Frost, 1997), word association (Van Hell & De Groot, 1998; Van Hell & Dijkstra, 2002), word learning (Lotto & De Groot, 1998), and picture naming (Costa, Caramazza, & Sebastián-Gallés, 2000; Kroll, Dijkstra, Janssen, & Schriefers, 2000). Almost without exception (Gerard & Scarborough, 1989), these studies found that cognates were processed faster and with fewer errors than control words that exist in only one language. This pervasive cognate facilitation effect in an L2 has been interpreted as evidence for language-nonselective access to the bilingual lexicon.

With respect to the processing of cognates in the native language (L1), the empirical evidence is not so clear-cut. For instance, Caramazza and Brones (1979) studied lexical access to cognates in adult Spanish–English bilinguals. In their study, English (L2) lexical decisions to cognates were faster than to English control words, but Spanish (L1) lexical decisions to cognates did not lead to any reaction time (RT) differences. Van Hell and Dijkstra (2002) observed cognate effects with trilinguals in the L1 only when proficiency in the weaker language(s) was relatively high. They tested Dutch–English–French trilinguals, all of whom were Dutch native speakers with a higher proficiency in their L2 (English) than in their third language (L3) (French). In Experiment 1, participants did an L1 (Dutch) lexical decision task and showed facilitation effects for Dutch–English cognates but not for Dutch–French cognates. In Experiment 2, Dutch–English–French trilinguals with a much higher level of French proficiency were recruited (i.e., university students of French). For these trilinguals, cognate facilitation effects in Dutch were obtained for both Dutch–English (L1–L2) and Dutch–French (L1–L3) cognates. These results suggest that for adults, relative proficiency in another language (L2 or L3) affects the size of the cognate facilitation effect in L1. This observation led us to investigate L1 and L2 cognate facilitation in children at different stages of L2 learning.

False friends in adult bilingual processing

Many researchers have investigated whether false friends, like cognates, are processed differently from matched control words (see Dijkstra, 2009, for a review). Analogous to the case for cognates, the

finding of inhibition and facilitation effects for false friends, relative to matched control words, has been considered as support for language-nonselective lexical access in bilingual word recognition. Studies have used experimental paradigms such as lexical decision (De Groot, Delmaar, & Lupker, 2000; Dijkstra, Van Jaarsveld, & Ten Brinke, 1998; Gerard & Scarborough, 1989; Haigh & Jared, 2007; Lemhöfer & Dijkstra, 2004; Von Studnitz & Green, 2002), primed lexical decision (Beauvillain & Grainger, 1987; French & Ohnesorge, 1995; Schulpen, Dijkstra, Schriefers, & Hasper, 2003), language decision and go/no-go tasks (Dijkstra, De Bruijn, Schriefers, & Ten Brinke, 2000; Dijkstra, Timmermans, & Schriefers, 2000), word naming (Jared & Szucs, 2002; Schwartz & Kroll, 2006; Smits, Martensen, Dijkstra, & Sandra, 2006), translation recognition (De Groot et al., 2000), and long-term priming (Lalor & Kirsner, 2001).

The result patterns observed in these studies have been shown to depend on stimulus list composition. In a lexical decision study with Dutch–English bilinguals, Dijkstra and colleagues (1998) found that false friends were recognized as fast as or slower than control words depending on this factor. When Dutch bilinguals performed an English lexical decision task that included Dutch–English false friends, cognates, and control words, their responses to false friends did not differ from those to controls. However, when the cognates were excluded from the stimulus list and Dutch words, requiring a "no" reaction, were added, strong inhibition effects arose.

In line with these results, Dijkstra and colleagues (1999, Experiment 2) found that adult Dutch–English bilinguals processed false friends as fast as their matched control words when cognates were included in the stimulus list, whereas Van Heuven, Schriefers, Dijkstra, and Hagoort (2008) found inhibition effects for false friends presented without cognates in a functional magnetic resonance imaging (fMRI) study with a comparable group of Dutch–English bilinguals. In sum, the finding of slower RTs to false friends than to matched controls in these studies supports the view of language-nonselective access in adult bilinguals. However, the observed pattern of facilitation and inhibition effects for false friends appears to be affected by whether or not cognates are included in the stimulus list.

Beginning and intermediate L2 learners

Nearly all studies mentioned above involved adult participants (typically university students) who were highly proficient in both L1 and L2. Although some word recognition studies investigated L2 proficiency differences in adults (e.g., Schulpen, 2003; Schwartz & Kroll, 2006; Van Hell & Dijkstra, 2002), only a few involved children at various stages of learning an L2. Because children learning an L2 are in the process of developing their lexicons in both languages, the study of L2 word processing by children may provide a unique contribution to our knowledge of cross-linguistic bilingual processing. Studying children can inform us on how their bilingual processing depends on varying amounts of instruction in L2 and on how they handle cross-linguistic inhibition and task demands (e.g., Nation & Snowling, 1999; Schulpen, 2003). These issues are, of course, linked to the fact that children have less mature cognitive systems than the adults who are usually studied (see Ullman, 2004, for a discussion of the neurological/maturational factors underlying the acquisition of lexical and grammatical knowledge).

Cognates in children learning an L2

Few studies investigated how children learning an L2 process cognates or false friends (e.g., Cunningham & Graham, 2000; Hancin-Bhatt & Nagy, 1994; Nagy, García, Durgunoğlu, & Hancin-Bhatt, 1993). Nagy and colleagues (1993) showed that Spanish–English bilingual children in elementary school were able to search for and identify cognates in L2 after they had received specific instructions. The children were given Spanish and English vocabulary tests from Spanish (L1) and English (L2) text passages containing cognates and one-language control words. On both tests, they had more difficulty in recognizing cognates than control words. However, after seeing examples of cognates and being informed that the text passages contained such items, they were able to identify cognates when they knew the Spanish word. Nevertheless, the findings by Nagy and colleagues do not necessarily generalize to on-line tasks such as lexical decision. For instance, cognates could be problematic for beginning L2 learners when they are combined in one stimulus list with false friends. Thus, it must be

clarified how cognate representation and cognate processing change over time when L2 proficiency increases.

False friends in children learning an L2

To the best of our knowledge, no empirical study has examined the processing of false friends in children during the earliest stage of L2 learning. On the basis of studies on adult L2 learners (e.g., Sunderman & Kroll, 2006; Talamas, Kroll, & Dufour, 1999), we expect that children learning an L2 will find it difficult to process false friends in a stimulus list. We also expect that their difficulty will persist even when they become more proficient in their L2. These expectations are based on the finding by Kroll and colleagues (2000) that older L2 learners are particularly sensitive to words that are form related to targets, a sensitivity that persists as learners become more proficient in their L2. For instance, in the translation recognition task, English learners of Spanish have difficulty in rejecting a form-related word such as *fact* (English) as a translation of *cara* (meaning 'face' in Spanish) relative to an unrelated word such as *book* (Sunderman & Kroll, 2006).

We know of one study that provides indirect evidence supporting these expectations, but it involved high school students at later stages of L2 learning. Schulpen (2003) conducted a cross-sectional study with four Dutch–English participant groups: high school students of 15 and 17 years of age (i.e., grades 9 and 11), university students, and university staff members. All groups performed one of three lexical decision tasks with false friends and one-language control words. These involved English lexical decision without Dutch words, English lexical decision that included Dutch words, and a generalized Dutch–English lexical decision task. In the first two tasks, participants pressed a "yes" button if a presented item was an English word and pressed a "no" button if a presented item was a nonword or a Dutch word; in the last task, they pressed a "yes" button if the item was either an English word or a Dutch word. The result patterns were comparable across the age groups, showing that a larger L2 proficiency led to faster and less error-prone responses. At the same time, all participant groups showed slower responses to false friends in English lexical decision when Dutch items were included in the stimulus lists. Schulpen concluded that the word identification and cognitive control processes change quantitatively with increasing L2 proficiency (faster and fewer errors) but do not change qualitatively (same patterns across tasks and stimulus lists). However, it could be argued that Schulpen's participants were not really beginning L2 learners. The 15-year-olds already had several years of experience with English, having started their learning process when they were 10 years of age. Therefore, it is essential to study word identification and task effects in children learning an L2.

The current research

In the current study, young Dutch learners of English performed a lexical decision task with cognates. In Experiment 1, an English lexical decision study was conducted with cognates (presented in lists without false friends) as the critical stimuli. The performance of beginning L2 learners in fifth grade (seventh grade in Dutch primary school), seventh grade (first grade in Dutch secondary school), and ninth grade (third grade in Dutch secondary school) was studied cross-sectionally. On the basis of adult studies, we expected that all L2 learners would show L2 cognate facilitation effects of a magnitude depending on their L2 proficiency.

In Experiment 2, new participants from the same populations performed L1 lexical decision on cognates (in lists without false friends) as the critical stimulus materials. Our predictions were that cognate facilitation effects in L1 would be harder to obtain and that the presence of such L1 cognate effects would depend on the learners' L2 proficiency (Van Hell & Dijkstra, 2002). An effect of the weaker L2 on the stronger L1 might arise only if L2 lexical representations have become strong enough, that is, when a relatively high level of proficiency in L2 has been reached.

In Experiment 3, we combined cognates and false friends in a mixed list administered to beginning and more advanced classroom L2 learners in an English lexical decision task. With this manipulation, we directly examined the effect of stimulus composition on L2 learner performance. Also new was that both a cross-sectional perspective (by testing fifth, seventh, and ninth graders) and a longitudinal perspective (by testing fifth graders after 6, 10, and 20 months of L2 instruction) were taken. In this way, we could examine whether the identification procedure and processing strategies used by begin-

ning L2 learners develop over time with increasing L2 experience. More advanced beginning L2 learners should show a cognate facilitation effect and a false friend null effect if their processing becomes more comparable to that of adult proficient bilinguals (see Dijkstra et al., 1998; Dijkstra et al., 1999).

Rating study prior to Experiments 1 and 2

Method

Participants

A total of 28 fifth- and sixth-grade primary school students with normal or corrected-to-normal vision participated. At the time of testing, the fifth graders had approximately 3 months of formal English instruction and the sixth graders had approximately 13 months of formal English instruction.

Materials

For the rating study, 219 Dutch words with cognate-like properties were selected from stimulus materials used by Dijkstra and colleagues (1999), by Van Hell and Dijkstra (2002), and from vocabulary lists of English school methods such as "Bo Bubbles," "Mammoet," "Hello World," and "The Castle." The Dutch–English translations overlapped in semantics, orthography, and/or phonology. Furthermore, 181 Dutch noncognate control words were selected from the same corpora, leading to 400 words to be rated.

Procedure

All items were presented in a printed English subjective frequency task. We instructed the children to rate each word in a list of English words with respect to how often they had seen, heard, or used the word on a scale from 1 (*never*) to 7 (*very often*); the instruction was based on that by De Groot and colleagues (1994) but was adapted for children. Next, 80 items (40 English–Dutch cognates and 40 English control words) were selected for inclusion in Experiment 1, and 80 other items were used as a basis for English pseudoword construction (as discussed below).

Experiment 1

Method

Participants

Three groups of Dutch-speaking children learning English as an L2 participated: 28 fifth graders (primary school, mean age = 10.5 years, SD = 0.6, 9 girls and 19 boys), 32 seventh graders (secondary school, mean age = 12.6 years, SD = 0.5, 18 girls and 14 boys), and 31 ninth graders (secondary school, mean age = 14.3 years, SD = 0.6, 15 girls and 16 boys), all with normal or corrected-to-normal vision. These three age groups had received English lessons for approximately 5 months ("Hello World"), 3 years, and 5 years, respectively. A language background questionnaire was administered to screen the children prior to their participation. Selection criteria were that they had Dutch as their mother tongue, spoke Dutch at home, and had not lived abroad for longer than 3 months. Furthermore, we collected the age and gender of participants; their self-ratings in reading, writing, speaking, and listening in English; and their number of years of English experience.

Materials

On the basis of the rating studies, 160 items were selected (see Appendix). Half of them were existing English words, and half were English-like pseudowords. Of the 80 English words, half were cognates and half were noncognate control words. Cognates and noncognate controls were matched on English subjective frequencies, word length in letters, and number of orthographic English neighbors. Paired t tests showed no significant differences among critical conditions (all p values >.05): English subjective frequency (cognates: M = 5.71, SD = 0.59; controls: M = 5.86, SD = 0.57), word length in letters (cognates: M = 5.23, SD = 1.61; controls: M = 5.60, SD = 1.58), and number of orthographic English

neighbors (cognates: $M = 2.93$, $SD = 4.01$; controls: $M = 2.85$, $SD = 4.26$). Finally, 80 pseudowords were constructed by changing one letter of a new set of English words following rules of English word formation.

Procedure

Participants were seated in front of a computer screen. We instructed them in Dutch to carefully read the letter string on the screen, and we trained them to make English lexical decisions on cognates and control words during a practice session of 25 trials emphasizing both speed and accuracy. They pressed the right button when they saw an English word and pressed the left button when they saw a nonexisting English word (instructions were inverted for left-handers). After the practice session, participants saw four blocks of 40 words, with each block followed by a resting period. Each block started with 2 filler items. Each trial started with a fixation point at the center of the computer screen for 700 ms, followed by a blank screen for 300 ms, and immediately followed by a word (presented for a maximum of 3 s). Next, a blank screen appeared for 500 ms, followed by the next trial.

Results

RT analysis was performed on the correct responses only. RTs were trimmed below or above 2.5 *SD* of participant or item means, and RTs longer than 2.5 s were excluded from analysis. Outliers and errors for the data of fifth graders, seventh graders, and ninth graders were 3.2% and 17.9%, 2.8% and 13.0%, and 3.2% and 8.5%, respectively. The respective mean RTs and errors to nonwords were 1033 ms and 14.5% for fifth graders, 831 ms and 13.6% for seventh graders, and 791 ms and 8.4% for ninth graders.

Comparisons across L2 learner groups

To test whether participants became faster and made fewer errors on cognates and control words as their L2 proficiency increased, planned two-factor analyses of variance (ANOVAs) with proficiency group (fifth graders, seventh graders, or ninth graders) and cognate status (cognates or controls) were performed on the mean RTs with participant (F_1 analysis) and item (F_2 analysis) as random variables. The same ANOVAs were performed with errors as the dependent measure. Mean RTs and error rates are presented in Table 1.

For the RTs, we found main effects of group, $F_1(2, 88) = 27.26$, $p < .001$, $\eta_p^2 = .38$, $F_2(2, 77) = 215.51$, $p < .001$, $\eta_p^2 = .85$, and cognate status, $F_1(1, 88) = 14.78$, $p < .001$, $\eta_p^2 = .14$, $F_2(1, 78) = 13.37$, $p < .001$, $\eta_p^2 = .15$. For the errors, we also found main effects of group, $F_1(2, 88) = 13.79$, $p < .001$, $\eta_p^2 = .24$, $F_2(2, 77) = 19.55$, $p < .001$, $\eta_p^2 = .34$, and cognate status, $F_1(1, 88) = 12.66$, $p < .001$, $\eta_p^2 = .13$, $F_2(1, 78) = 3.81$, $p = .05$, $\eta_p^2 = .05$. As Table 1 indicates, the main effect of group reflected that all words (both cognates and controls) were processed faster and with fewer errors as L2 proficiency increased. The size of the cognate effect in different participant groups can be found in Table 1. The interaction between cognate status and participant group was not significant for RTs or for error rates.

Table 1
Mean RTs (ms) and percentages of errors in Experiment 1.

Word type	Fifth grade: Primary school	Seventh grade: Secondary school	Ninth grade: Secondary school
RTs			
Cognates	925 (182)	741 (152)	666 (111)
Controls	977 (189)	751 (143)	691 (121)
Cognate effect	52	10	25
Errors			
Cognates	18.7 (12.9)	15.8 (9.3)	7.6 (4.5)
Controls	23.6 (14.2)	17.0 (9.5)	11.1 (4.5)
Cognate effect	4.9	1.2	3.5

Note. Standard deviations of RTs and error rates are given in parentheses. Cognate effect is controls minus cognates.

Experiment 1 indicates that a cognate facilitation effect already appears in the L2 lexical decision times of children who are in the early stages of learning an L2. This is evidence that they already have established representations for cognates in two languages and activate both of these in on-line processing. In the next experiment, we examined to what extent children who are beginning and intermediate L2 learners also show these effects in an L1 lexical decision task on Dutch–English cognates and Dutch matched control words. We hypothesized that the cognate facilitation effect should disappear because the children's level of L2 proficiency will not yet be sufficient to affect the L1 processing of the cognates.

Experiment 2

Method

Participants

Three new participant groups of 29 fifth graders (mean age = 10.9 years, *SD* = 0.4, 9 girls and 20 boys), 32 seventh graders (mean age = 13.0 years, *SD* = 0.2, 17 girls and 15 boys), and 30 ninth graders (mean age = 15.0 years, *SD* = 0.3, 14 girls and 16 boys) were drawn from the same populations as in Experiment 1. These three age groups had received English lessons for approximately 6 months, 3 years, and 5 years, respectively.

Materials and procedure

Materials and procedure were the same as in Experiment 1 except for the following changes. Cognates and controls were translated into Dutch. Dutch-like pseudowords were constructed by changing one letter of a new set of Dutch words following rules of Dutch word formation. We instructed the participants to perform a Dutch lexical decision task.

Results

We used the same outlier procedure as in Experiment 1. Outliers and errors for the data of fifth graders, seventh graders, and ninth graders were 2.0% and 6.7%, 3.0% and 5.0%, and 2.7% and 5.7%, respectively. The respective mean RTs and errors to nonwords were 1037 ms and 9.3% for fifth graders, 713 ms and 7.3% for seventh graders, and 672 ms and 3.1% for ninth graders.

Comparisons across L2 learner groups

The same two-factor ANOVAs as in Experiment 1 were performed on the mean RTs and errors in the current experiment. Mean RTs and error rates are presented in Table 2. For the RTs, we found a main effect of group, $F_1(2, 88) = 13.68$, $p < .001$, $\eta_p^2 = .24$, $F_2(2, 77) = 185.53$, $p < .001$, $\eta_p^2 = .83$. For the errors, we found a main effect of group in the participant analysis only, $F_1(2, 88) = 3.72$, $p < .05$, $\eta_p^2 = .08$. Both cognates and control words were processed faster and more accurately as participants'

Table 2
Mean RTs (ms) and percentages of errors in Experiment 2.

Word type	Fifth grade: Primary school	Seventh grade: Secondary school	Ninth grade: Secondary school
RTs			
Cognates	757 (152)	666 (116)	599 (73)
Controls	763 (161)	662 (119)	602 (82)
Cognate effect	6	–4	3
Errors			
Cognates	4.1 (4.2)	3.5 (4.1)	2.1 (2.9)
Controls	4.1 (3.7)	3.0 (3.1)	2.2 (1.9)
Cognate effect	0.0	–0.5	0.1

Note. Standard deviations of RTs and error rates are given in parentheses. Cognate effect is controls minus cognates.

L2 proficiency increased. More important, we found no significant differences in mean RTs and error rates between cognates and controls in the Dutch lexical decision task. The interaction between cognate status and participant group was not significant for the RTs or for the error rates.

In the next experiment, children who were beginning or intermediate L2 learners performed an L2 lexical decision task with cognates and false friends. This manipulation enabled us to assess the influence of stimulus list composition effects and the robustness of cognate effects on L2 word recognition. Prior to this experiment, we performed a rating study to calibrate the new stimulus materials.

Rating study prior to Experiment 3

Method

Materials

In this rating study, 583 English words were selected from vocabulary lists of English school methods, from Dijkstra and colleagues (1999), and from Van Hell and Dijkstra (2002). Words were divided into cognates, control words for cognates, false friends, and control words for false friends by using the categories defined by Dijkstra and colleagues (1999).

Procedure

All words were administered in three rating tasks assessing English subjective frequency, orthographic similarity, and phonological similarity. In the English subjective frequency rating task, we presented printed lists of English words to 14 fifth graders and 14 sixth graders. As before, children rated how often they had seen, heard, or used the words on a scale from 1 to 7. Pearson correlations between fifth graders' and sixth graders' results were calculated. Because the correlation between both groups was high ($r = .83$, $p < .001$), we combined the rating data of children in grades 5 and 6. In the orthographic similarity rating task, 25 sixth graders were presented with pairs of English and Dutch translations on paper. We instructed the children to rate the word pairs with respect to their orthographic similarity on a scale from 1 (*not similar in spelling*) to 7 (*similar in spelling*), emphasizing how these words should be written. The ratings of 23 participants could be used because 2 participants did not follow the instruction. In the phonological similarity task, the same participants rated the same word pairs on a scale from 1 (*not similar in pronunciation*) to 7 (*similar in pronunciation*). They were explicitly instructed to pronounce the words silently, and 24 participants complied with this instruction.

Experiment 3

Method

Participants

A total of 32 primary school students, drawn from the same population as in Experiments 1 and 2, participated and were tested three times (mean age at first test = 11.2 years, $SD = 0.5$, 16 girls and 16 boys). Measurement 1 took place after 6 months of English instruction (''Bo Bubbles'') in fifth grade, Measurement 2 took place after 10 months of English instruction in fifth grade (1 participant was not tested because of illness), and Measurement 3 took place after 20 months of English instruction in sixth grade. Furthermore, 30 seventh graders and 33 ninth graders (both in secondary school) participated. They had received English lessons for approximately 3 and 5 years, respectively.

Materials

We selected 192 critical items on the basis of the English subjective frequency rating task, the orthographic and phonological similarity tasks, word length in letters, and English orthographic neighbors. Half of these items were used as English test words (see Appendix), and half were turned into

English-like pseudowords by changing one letter. The 96 test words consisted of 27 cognates, 21 false friends, and 48 matched control words. Cognates and false friends were matched to control words with respect to English subjective frequency in occurrences per million, word length in letters, and English orthographic neighbors. Paired *t* tests showed no significant differences between cognates and controls (all *p* values >.05) on subjective frequency (cognates: $M = 4.78$, $SD = 0.89$; controls: $M = 4.74$, $SD = 0.90$), word length (cognates: $M = 4.63$, $SD = 0.88$; controls: $M = 4.63$, $SD = 1.18$), and orthographic neighbors (cognates: $M = 0.41$, $SD = 0.64$; controls: $M = 0.82$, $SD = 1.33$). Likewise, paired *t* tests showed no significant differences between false friends and controls (all *p* values >.05) on subjective frequency (false friends: $M = 4.70$, $SD = 0.78$; controls: $M = 4.66$, $SD = 0.85$), word length (false friends: $M = 4.05$, $SD = 0.67$; controls: $M = 4.19$, $SD = 0.81$), and orthographic neighbors (false friends: $M = 0.67$, $SD = 1.07$; controls: $M = 0.43$, $SD = 0.68$).

More important, paired *t* tests showed significant differences between cognates and controls (all *p* values <.001) on orthographic similarity (cognates: $M = 5.94$, $SD = 1.07$; controls: $M = 2.30$, $SD = 0.98$) and phonological similarity (cognates: $M = 5.83$, $SD = 0.70$; controls: $M = 1.97$, $SD = 0.84$). Similar differences were found for false friends and controls (all *p* values <.001) on orthographic similarity (false friends: $M = 5.41$, $SD = 1.38$; controls: $M = 1.98$, $SD = 0.64$) and phonological similarity (false friends: $M = 5.50$, $SD = 0.78$; controls: $M = 1.90$, $SD = 0.80$).

Procedure

We used the same procedure as in Experiment 1 except that participants saw 30 trials containing cognates, false friends, and control words in the practice session. We used eight blocks of 24 trials in the experimental session.

Results

The outlier procedure was the same as in Experiment 1. Outliers and errors for the data of Measurements 1, 2, and 3 in primary school were 2.1% and 21.8%, 1.6% and 22.4%, and 1.6% and 19.1%, respectively. In the secondary school students, there were 1.6% outliers and 11.1% errors for the seventh graders and 2.0% outliers and 7.0% errors for the ninth graders. The mean RTs and errors to nonwords were 1149 ms and 39.8% for the fifth graders (Measurement 1), 1010 ms and 34.9% for the fifth graders (Measurement 2), 900 ms and 32.0% for the fifth graders (Measurement 3), 907 ms and 16.0% for the

Table 3
Mean RTs (ms) and percentages of errors in Experiment 3.

Word type	Primary school			Secondary school	
	M1	M2	M3	Grade 7	Grade 9
RTs					
Cognates	964 (182)	925 (194)	824 (136)	844 (167)	786 (130)
Controls	891 (166)	825 (146)	756 (118)	761 (111)	710 (101)
Cognate effect	–73	–100	–68	–83	-76
False friends	945 (203)	914 (216)	811 (168)	800 (162)	769 (150)
Controls	846 (143)	801 (160)	732 (128)	742 (93)	693 (100)
False friend effect	–99	–113	–79	–58	–76
Errors					
Cognates	35.1 (16.3)	34.0 (11.5)	26.3 (13.7)	15.2 (11.1)	8.3 (6.0)
Controls	11.9 (9.7)	15.0 (10.2)	9.5 (8.5)	8.3 (8.2)	4.4 (5.3)
Cognate effect	–23.2	–19.0	–16.8	–6.9	–3.9
False friends	35.2 (14.4)	37.7 (10.0)	33.6 (14.0)	15.9 (20.2)	12.4 (20.7)
Controls	13.4 (11.6)	12.9 (10.9)	9.8 (8.6)	6.4 (6.6)	3.8 (5.5)
False friend effect	–21.8	–24.8	–23.8	–9.5	–8.6

Note. Standard deviations of RTs and error rates are given in parentheses. M is Measurement (time). Cognate effect is controls minus cognates. False friend effect is controls minus false friends.

seventh graders, and 943 ms and 11.9% for the ninth graders. Mean RTs and error rates for words are presented in Table 3.

Comparisons across L2 learner groups

Latencies and errors for cognates and controls (factor: cognate status) were analyzed for separate grades (fifth grade, seventh grade, or ninth grade) in mixed ANOVAs. In latency analyses, we found a main effect of group, $F_1(2, 92) = 15.48$, $p < .001$, $\eta_p^2 = .25$, $F_2(2, 51) = 67.73$, $p < .001$, $\eta_p^2 = .73$, reflecting that participants recognized words faster as L2 proficiency increased. The main effect of cognate status was also significant, $F_1(1, 92) = 66.84$, $p < .001$, $\eta_p^2 = .42$, $F_2(1, 52) = 5.16$, $p < .05$, $\eta_p^2 = .09$, but the interaction effect was not. Remarkably, as can be seen in Table 3, cognates were recognized *more slowly* than control words. For cognate errors, we found main effects of group, $F_1(2, 92) = 35.00$, $p < .001$, $\eta_p^2 = .43$, $F_2(2, 51) = 23.70$, $p < .001$, $\eta_p^2 = .48$, reflecting that the L2 learners made fewer errors as they became more proficient in their L2. The main effect of cognate status was also significant, $F_1(1, 92) = 95.92$, $p < .001$, $\eta_p^2 = .51$, $F_2(1, 52) = 15.10$, $p < .001$, $\eta_p^2 = .23$. Parallel to the RT analysis, the mean error rates for cognates were higher than those for control words. The interaction between cognate status and group was also significant, $F_1(2, 92) = 27.21$, $p < .001$, $\eta_p^2 = .37$, $F_2(2, 51) = 8.02$, $p < .01$, $\eta_p^2 = .24$. As can be seen in Table 3, the cognate effect decreased as L2 proficiency increased.

Latencies and errors for false friends and controls (factor: false friend status) were analyzed for separate grades (fifth grade, seventh grade, or ninth grade) in mixed ANOVAs. Latencies varied with grade, $F_1(2, 92) = 14.37$, $p < .001$, $\eta_p^2 = .24$, $F_2(2, 39) = 40.93$, $p < .001$, $\eta_p^2 = .68$, and item status, $F_1(1, 92) = 39.36$, $p < .001$, $\eta_p^2 = .30$, $F_2(1, 40) = 5.26$, $p < .05$, $\eta_p^2 = .12$, but the interaction was not significant. Word recognition of L2 learners at all proficiency levels was slower for false friends than for controls. In the error analyses, we found main effects of group, $F_1(2, 92) = 28.02$, $p < .001$, $\eta_p^2 = .38$, $F_2(2, 39) = 10.51$, $p < .001$, $\eta_p^2 = .35$, and item status, $F_1(1, 92) = 138.69$, $p < .001$, $\eta_p^2 = .60$, $F_2(1, 40) = 5.53$, $p < .05$, $\eta_p^2 = .12$. In line with the RT analyses, L2 learners made fewer errors as their L2 proficiency increased, and they made more errors on false friends than on control words. The interaction between item status and group reached significance in the participant analysis only, $F_1(2, 92) = 5.17$, $p < .01$, $\eta_p^2 = .10$, reflecting that the magnitude of the false friend inhibition effect decreased as L2 proficiency increased.

Longitudinal analysis child L2 learners

Latencies and errors were analyzed in 3 (Time of Testing: first, second, or third) $\times$ 2 (Item Status) repeated measures analyses. The analyses for cognate RTs yielded main effects of time, $F_1(2, 29) = 9.62$, $p < .001$, $\eta_p^2 = .40$, $F_2(2, 51) = 58.70$, $p < .001$, $\eta_p^2 = .70$, and cognate status, $F_1(1, 30) = 55.42$, $p < .001$, $\eta_p^2 = .65$, $F_2(1, 52) = 6.33$, $p < .05$, $\eta_p^2 = .11$, but no significant interaction effect. For cognate errors, we found main effects of time, $F_1(2, 29) = 5.16$, $p < .05$, $\eta_p^2 = .26$, $F_2(2, 51) = 10.06$, $p < .001$, $\eta_p^2 = .28$, and cognate status, $F_1(1, 30) = 228.90$, $p < .001$, $\eta_p^2 = .88$, $F_2(1, 52) = 24.68$, $p < .001$, $\eta_p^2 = .32$, but no significant interaction effect. L2 learners' performance was slower and less accurate for cognates than for noncognate controls words. Their performance improved over time, but the magnitude of the cognate inhibition effect remained similar across the three measurement times.

In the analyses for false friend RTs, we found main effects of time, $F_1(2, 29) = 6.03$, $p < .01$, $\eta_p^2 = .29$, $F_2(2, 39) = 54.76$, $p < .001$, $\eta_p^2 = .74$, and false friend status, $F_1(1, 30) = 65.00$, $p < .001$, $\eta_p^2 = .68$, $F_2(1, 40) = 6.37$, $p < .05$, $\eta_p^2 = .14$, but no significant interaction effect. The error data yielded a main effect of time in the item analysis only, $F_2(2, 39) = 3.41$, $p < .05$, $\eta_p^2 = .15$. The main effect of false friend status was also significant, $F_1(1, 30) = 231.62$, $p < .001$, $\eta_p^2 = .89$, $F_2(1, 40) = 5.86$, $p < .05$, $\eta_p^2 = .13$, but time did not interact with false friend status. As in the cognate data, L2 learners' performance was slower and less accurate for false friends than for control words. Over time, their performance improved, but the magnitude of the false friend inhibition effect did not change.

General discussion

In three lexical decision experiments, we investigated the processing of cognates and false friends in Dutch-speaking children who were beginning and intermediate learners of English. Participants

were from fifth grade (seventh grade of Dutch primary school) and from seventh and ninth grades (first and third grades of Dutch secondary school, respectively). In Experiment 1, the children processed cognates faster and more accurately than control words in an L2 English lexical decision task. In Experiment 2, no difference in processing cognates and noncognate controls was found in an L1 Dutch lexical decision task. The results of Experiments 1 and 2 are consistent with predictions based on the empirical literature for adult bilinguals. First, the observed L2 cognate facilitation effects for children learning an L2 (Experiment 1) are comparable to those for adults (e.g., Dijkstra, Miwa, Brummelhuis, Sappelli, & Baayen, 2010) and support a language-nonselective lexical access mechanism. Second, the absence of cognate facilitation effects in L1 (Experiment 2) is also in line with adult studies, which generally reported small or null effects for cognates processed in L1 (e.g., Caramazza & Brones, 1979). This pattern of cognate processing in L1 and L2 suggests that the stronger L1 is less easily affected by the weaker L2. In adults, the cognate effect in L1 was observed only in L2 learners who are highly proficient in the L2 (Van Hell & Dijkstra, 2002). The children in the current research were presumably much less proficient in L2 than adults tested in previous studies. In sum, cognate facilitation effects in L1 and L2 lexical decision appear to be highly stable across participant groups varying in L2 proficiency and age.

We varied stimulus list composition in Experiment 3, involving an L2 lexical decision task with cognates and false friends. The mixing of cognates and false friends resulted in inhibition effects in RTs and error patterns for both item types for all participant groups (see Siyambalapitiya, Chenery, & Copland, 2009, who reported a reversal of the cognate effect in adult bilinguals). The evidence is strengthened by the fact that we studied the fifth and sixth graders (primary school) in a longitudinal design and studied the seventh and ninth graders (secondary school) in a cross-sectional design.

The combined results indicate that stimulus composition effects affect L2 word identification in beginning and intermediate L2 learners. A comparison with the English (L2) lexical decision results by Dijkstra and colleagues (1998, 1999) reveals that both their Dutch–English adult proficient bilinguals and the young L2 learners in Experiment 3 showed inhibition effects for false friends. However, whereas the adult bilinguals displayed cognate facilitation effects, the children learning a second language experienced cognate inhibition effects.

An explanation for this difference can be sought in the way beginning learners are affected by stimulus list composition (cognates vs. cognates and false friends) in the L2 lexical decision task. If beginning L2 learners activate both L1 and L2 word representations when they encounter false friends in an L2 lexical decision task (in line with the language-nonselective access hypothesis), they will have trouble in sorting out how to respond. Is the correct response in the task "yes" because the English (L2) representation is active? Or is it "no" because the (stronger) Dutch (L1) representation is also active? As a result, response competition and inhibition effects will arise for false friends relative to matched one-language control words.

If beginning L2 learners encounter a cognate item in the same list as the false friend, such an item will be treated rather cautiously because it is also ambiguous with respect to language membership and will activate both L1 and L2 word form representations. Therefore, like false friends, cognates may elicit slower RTs than control words. More proficient bilinguals, however, might not suffer from this problem for two reasons. First, their L2 representation of a cognate will be activated more strongly at both the word form and meaning levels (due to their extended experience with L2), which will reduce the influence of the L1 on L2 processing. Second, having more experience with cognates, more proficient bilinguals will be better able to "tap into" the meaning representation to arrive at a "yes, it is an English word" response for cognates.

Interpretation in terms of bilingual word recognition models

Our findings can be considered in the light of the Bilingual Interactive Activation Plus (BIA+) model and the Revised Hierarchical Model (RHM). According to BIA+ (Dijkstra & Van Heuven, 2002), the bilingual lexicon is integrated and accessed in a language-nonselective way. As a consequence, in a lexical decision task, both readings of a cognate are activated. For L2 lexical decision, this results in faster

responses to cognates than to control words, in both beginning and more advanced L2 learners, because the stronger L1 representations can affect the processing of the weaker L2 representations. This account is in line with the cognate facilitation in Experiment 1.

For L1 lexical decision, however, the model predicts that the weaker L2 word candidates will have less effect on the processing of the L1 word candidates because L2 word candidates are activated less strongly or more slowly than the L1 word candidates. Therefore, L2 on L1 effects will arise only if the L2 proficiency of the bilinguals is high enough, which has resulted in a relatively strong L2 representation due to a higher frequency of use (Van Hell & Dijkstra, 2002). This account is in line with the null effect for cognates in L1 lexical decision (Experiment 2).

The model is also able to account for the pattern of results in Experiment 3 by assuming that beginning L2 learners and more proficient bilinguals have a slightly different way of resolving problems of ambiguous words. Beginning L2 learners are confused by the word form ambiguity that exists for both cognates and false friends. They realize that there is some lexical activation that does not correspond to the target language, which slows their response for both false friends and cognates. More proficient bilinguals, however, have learned that their "yes" response to cognates can be unambiguously based on the semantic representation. For cognates, this strategy will always lead to a correct response, which will be even faster than to controls due to semantic co-activation from the two cognate readings. For false friends, however, the strategy leads to slower responses than to one-language control words. Because the two meanings of false friends do not converge, a correct response requires the time-consuming derivation of their language membership. In sum, the BIA+ model has all of the ingredients necessary to account for the result pattern of the three experiments in the current study.

According to the explanation we propose, bilinguals distinguish orthographic and semantic representations to solve the ambiguity present in false friends and cognates. This distinction also plays a role in the developmental account that the RHM (Kroll & Stewart, 1994) might provide of the inhibition effects for cognates and false friends in Experiment 3. According to this model, beginning L2 learners are more focused on word form representations than on meaning representations. As a consequence, they may become more confused than adult bilinguals by the presence of two word form representations in the case of both false friends and cognates. As argued above, if proficient bilinguals pay relatively more attention to meaning representations, they may use the semantic co-activation of cognates to facilitate their "yes" decision even when false friends are also present in the stimulus list.

We conclude that both the BIA+ model and the RHM can be reconciled with the presented data by assuming that beginning L2 learners and more proficient bilinguals resort to different strategies in order to resolve ambiguity problems during the recognition of false friends and cognates. Whereas beginning L2 learners are confused by orthographic ambiguity, more proficient bilinguals can use semantic co-activation to speed up their response to cognates.

Future studies should confirm and extend the current finding of cognate ambiguity problems in young and beginning L2 learners to different task situations and for differently composed stimulus lists. Our evidence indicates that lexical access is language nonselective in beginning and intermediate L2 learners but that bilinguals at different L2 proficiency levels have more or less developed skills to deal with the lexical ambiguity of cognates.

Acknowledgments

The authors express their gratitude to Jo-Anne LeFevre and three anonymous reviewers for their helpful feedback on earlier versions of this article. They thank Martina van Uum, Loes Wulms, and Jorita Bruining for their help in collecting the data. Funding for this research was provided by Grant 400-03-463 of the Netherlands Organization for Scientific Research (NWO) awarded to Janet van Hell and Ton Dijkstra.

Appendix A

Experimental items of Experiments 1, 2, and 3.

Experiment 1: English lexical decision
Cognates
ankle, apple, ball, bed, block, boat, book, bus, cat, circle, clock, coffee, computer, concert, dance, father, finger, foot, garage, hamburger, hobby, hockey, information, lunch, modern, name, park, pizza, radio, rose, school, silver, soup, station, teapot, toilet, water, week, weekend, wind
Controls
air, animal, attic, aunt, bathroom, beach, beautiful, bike, bird, black, blackberry, boy, building, chair, church, cinema, cooker, crash, desk, doctor, dog, duck, eyebrow, farm, flower, fridge, garden, girl, horse, kitchen, leg, microwave, rabbit, rain, roof, saucer, spoon, towel, tower, uncle
Experiment 2: Dutch lexical decision
Cognates
enkel, appel, bal, bed, blok, boot, boek, bus, kat, cirkel, klok, koffie, computer, concert, dans, vader, vinger, voet, garage, hamburger, hobby, hockey, informatie, lunch, modern, naam, park, pizza, radio, roos, school, zilver, soep, station, theepot, toilet, water, week, weekend, wind
Controls
lucht, dier, zolder, tante, badkamer, strand, mooi, fiets, vogel, zwart, braam, jongen, gebouw, stoel, kerk, bioscoop, fornuis, ongeluk, bureau, arts, hond, eend, wenkbrauw, boerderij, bloem, koelkast, tuin, meisje, paard, keuken, been, magnetron, konijn, regen, dak, schotel, lepel, handdoek, toren, oom
Experiment 3: English lexical decision
Cognates
bank, beast, better, blond, code, cool, cord, foot, here, hope, jury, karate, land, news, post, prince, salad, ship, sofa, soup, squash, sticker, trend, water, west, wild, young
Controls
bird, boy, brother, champion, city, coin, dark, dog, duck, exit, flight, fun, hill, horse, jumper, money, month, page, read, sheep, smoke, snake, song, time, tower, own, turkey
False friends
angel, back, belt, boot, brief, cook, dear, feel, hate, mind, need, nut, pace, road, room, safe, say, spin, stream, tree, two
Controls
beach, bike, black, bowl, egg, face, fly, game, gold, happy, head, home, lady, little, old, pretty, real, sale, same, slow, zero

References

Altenberg, E. P., & Cairns, H. S. (1983). The effects of phonotactic constraints on lexical processing in bilingual and monolingual subjects. *Journal of Verbal Learning and Verbal Behavior, 22*, 174–188.

Beauvillain, C., & Grainger, J. (1987). Accessing interlexical homographs: Some limitations of a language-selective access. *Journal of Memory and Language, 26*, 658–672.

Caramazza, A., & Brones, I. (1979). Lexical access in bilinguals. *Bulletin of the Psychonomic Society, 13*, 212–214.

Costa, A., Caramazza, A., & Sebastián-Gallés, N. (2000). The cognate facilitation effect: Implications for models of lexical access. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 26*, 1283–1296.

Cunningham, T., & Graham, C. (2000). Increasing native English vocabulary recognition through Spanish immersion: Cognate transfer from foreign to first language. *Journal of Educational Psychology, 92*, 37–49.

De Groot, A. M. B., Dannenburg, L., & Van Hell, J. G. (1994). Forward and backward word translation by bilinguals. *Journal of Memory and Language, 33*, 600–629.

De Groot, A. M. B., Delmaar, P., & Lupker, S. J. (2000). The processing of interlexical homographs in translation recognition and lexical decision: Support for non-selective access to bilingual memory. *Quarterly Journal of Experimental Psychology A, 53*, 397–428.

Dijkstra, T. (2009). The multilingual lexicon. In D. Sandra, J.-O. Östman, & J. Verschueren (Eds.). *Cognition and language use: Handbook of pragmatics highlights* (Vol. 3, pp. 369–388). Amsterdam: Benjamins.

Dijkstra, T., De Bruijn, E., Schriefers, H., & Ten Brinke, S. (2000). More on interlingual homograph recognition: Language intermixing versus explicitness of instruction. *Bilingualism: Language and Cognition, 3*, 69–78.

Dijkstra, T., Grainger, J., & Van Heuven, W. J. B. (1999). Recognition of cognates and interlingual homographs: The neglected role of phonology. *Journal of Memory and Language, 41*, 496–518.

Dijkstra, T., Miwa, K., Brummelhuis, B., Sappelli, M., & Baayen, H. (2010). How cross-language similarity and task demands affect cognate recognition. *Journal of Memory and Language, 62*, 284–301.

Dijkstra, T., Timmermans, M., & Schriefers, H. (2000). On being blinded by your other language: Effects of task demands on interlingual homograph recognition. *Journal of Memory and Language, 42*, 445–464.

Dijkstra, T., & Van Heuven, W. J. B. (2002). The architecture of the bilingual word recognition system: From identification to decision. *Bilingualism: Language and Cognition, 5*, 175–197.

Dijkstra, T., Van Jaarsveld, H., & Ten Brinke, S. (1998). Interlingual homograph recognition: Effects of task demands and language intermixing. *Bilingualism: Language and Cognition, 1*, 51–66.

French, R. M., & Ohnesorge, C. (1995). Using non-cognate interlexical homographs to study bilingual memory organization. In J. D. Moore & J. Fain Lehman (Eds.), *Proceedings of the 17th annual conference of the Cognitive Science Society* (pp. 31–36). Hillsdale, NJ: Lawrence Erlbaum.

Gerard, L. D., & Scarborough, D. L. (1989). Language-specific lexical access of homographs by bilinguals. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 15*, 305–315.

Gollan, T. H., Forster, K. I., & Frost, R. (1997). Translation priming with different scripts: Masked priming with cognates and noncognates in Hebrew–English bilinguals. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 23*, 1122–1139.

Haigh, C. A., & Jared, D. (2007). The activation of phonological representations by bilinguals while reading silently: Evidence from interlingual homophones. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 33*, 623–644.

Hancin-Bhatt, B., & Nagy, W. E. (1994). Lexical transfer and second language morphological development. *Applied Psycholinguistics, 15*, 289–310.

Jared, D., & Szucs, C. (2002). Phonological activation in bilinguals: Evidence from interlingual homograph naming. *Bilingualism: Language and Cognition, 5*, 225–239.

Kroll, J. F., Dijkstra, T., Janssen, N., & Schriefers, H. (2000). *Selecting the language in which to speak: Experiments on lexical access in bilingual production.* Paper presented at the 41st annual meeting of the Psychonomic Society, New Orleans, LA.

Kroll, J. F., & 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.

Lalor, E., & Kirsner, K. (2001). The representation of "false cognates" in the bilingual lexicon. *Psychonomic Bulletin & Review, 8*, 552–559.

Lemhöfer, K., & Dijkstra, T. (2004). Recognizing cognates and interlingual homographs: Effects of code similarity in language-specific and generalized lexical decision. *Memory & Cognition, 32*, 533–550.

Lemhöfer, K., Dijkstra, T., & Michel, M. C. (2004). Three languages, one ECHO: Cognate effects in trilingual word recognition. *Language and Cognitive Processes, 19*, 585–611.

Lotto, L., & De Groot, A. M. B. (1998). Effects of learning method and word type on acquiring vocabulary in an unfamiliar language. *Language Learning, 48*, 31–69.

Nagy, W. E., García, G. E., Durgunoğlu, A. Y., & Hancin-Bhatt, B. (1993). Spanish–English bilingual students' use of cognates in English reading. *Journal of Reading Behavior, 25*, 241–259.

Nation, K., & Snowling, M. J. (1999). Developmental differences in sensitivity to semantic relations among good and poor comprehenders: Evidence from semantic priming. *Cognition, 70*, B1–B13.

Sánchez-Casas, R., Davis, C. W., & García-Albea, J. E. (1992). Bilingual lexical processing: Exploring the cognate/non-cognate distinction. *European Journal of Cognitive Psychology, 4*, 311–322.

Scarborough, D. L., Gerard, L., & Cortese, C. (1984). Independence of lexical access in bilingual word recognition. *Journal of Verbal Learning and Verbal Behavior, 23*, 84–99.

Schulpen, B. (2003). *Automaticity and cognitive control in bilingual word recognition.* PhD thesis, Radboud University Nijmegen.

Schulpen, B., Dijkstra, T., Schriefers, H. J., & Hasper, M. (2003). Recognition of interlingual homophones in bilingual auditory word recognition. *Journal of Experimental Psychology: Human Perception and Performance, 29*, 1155–1178.

Schwartz, A. I., & Kroll, J. F. (2006). Bilingual lexical activation in sentence context. *Journal of Memory and Language, 55*, 197–212.

Siyambalapitiya, S., Chenery, H. J., & Copland, D. A. (2009). Bilingualism and aging: Reversal of the cognate advantage in older bilingual adults. *Applied Psycholinguistics, 30*, 531–554.

Smits, E., Martensen, H., Dijkstra, T., & Sandra, D. (2006). Naming interlingual homographs: Variable competition and the role of the decision system. *Bilingualism: Language and Cognition, 9*, 281–297.

Sunderman, G., & Kroll, J. F. (2006). First language activation during second language lexical processing. *Studies in Second Language Acquisition, 28*, 387–422.

Talamas, A., Kroll, J. F., & Dufour, R. (1999). From form to meaning: Stages in the acquisition of second-language vocabulary. *Bilingualism: Language and Cognition, 2*, 45–58.

Ullman, M. T. (2004). Contributions of memory circuits to language: The declarative/procedural model. *Cognition, 92*, 231–270.

Van Hell, J. G., & De Groot, A. M. B. (1998). Conceptual representation in bilingual memory: Effects of concreteness and cognate status in word association. *Bilingualism: Language and Cognition, 1*, 193–211.

Van Hell, J. G., & Dijkstra, T. (2002). Foreign language knowledge can influence native language performance in exclusively native contexts. *Psychonomic Bulletin and Review, 9*, 780–789.

Van Heuven, W. J. B., Schriefers, H., Dijkstra, T., & Hagoort, P. (2008). Language conflict in the bilingual brain. *Cerebral Cortex, 18*, 2706–2716.

Von Studnitz, R. E., & Green, D. (2002). Interlingual homograph interference in German–English bilinguals: Its modulation and locus of control. *Bilingualism: Language and Cognition, 5*, 1–23.