Lexical Processing by Fluent and Less Fluent Bilinguals.

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Running head: L2 Fluency & Lexical processing

Abstract

Some hypotheses about bilinguals' lexical and conceptual representation were investigated in two Experiments. Highly fluent and less fluent bilinguals read aloud cognate and non-cognate words in both languages, named the corresponding pictures in both languages, and translated the words from and into L2. Fluent bilinguals performed equally well in L1 and L2, while the less fluent group performed better in L1 in both picture naming and translation. Irrespective of the language of output, reading aloud was faster than picture naming for both groups. Translation was slower than picture naming for fluent bilinguals but was as fast as picture naming for less fluent bilinguals. The cognate status of words affected performance of both fluent and less fluent bilinguals only in the translation task, cognate words being faster than non-cognate words in both forward and backward translation. This pattern offers evidence for inter-language influences in bilingualism, and is discussed with reference to the shift from lexically-mediated to conceptually-mediated modes of representation.

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Two models have been proposed to account for the relationship between the conceptual system and the mental lexica of the bilingual person: The word association model and the concept mediation model (Potter, So, Eckhart, Feldman, 1984). The first model assumes a direct link between the two lexica and a direct link between the lexicon of the first language (L1) and the conceptual system. Thus, L2 words gain access to concepts indirectly, through L1 mediation. By contrast, the concept mediation model posits a direct link between the conceptual system and each of the two lexica, allowing L2 words to access concepts directly.

Kroll and her colleagues (Kroll and Curley, 1988; Kroll and Stewart, 1994) propose that both models correctly describe the bilinguals' mental representation, but that they capture patterns characterizing different degrees of fluency in L2. The word association model best describes less fluent speakers while the concept mediation model best describes proficient bilinguals. According to this view, for less fluent bilinguals there are strong associating links between the words of the L1 and the L2 lexica, but weak or no links between the L2 lexicon and the conceptual system, so that the production and comprehension of L2 words requires the mediation of L1. That is to say, to process words in L2 less fluent bilinguals rely on their lexical knowledge in L1. More fluent bilinguals, on the other hand, have developed direct connections between L2 words and the corresponding concepts, so that producing and comprehending a word in L2 can be performed without the mediation of the L1 lexicon.

The shift from one form of representation to the other is assumed to be gradual (see Kroll and Stewart, 1994), and to consist in changes in the relative weight given to the lexical and conceptual pathways: As fluency increases, the existing L2-to-L1 lexical links are complemented - rather than

substituted - by stronger additional links between the L2 lexicon and the cognitive system. The latter claim is based on the observation that there are effects of L1 in tasks requiring L2 processing (e.g. van Heuven, Dijkstra & Grainger, 1998). Although these data can also be interpreted as showing that there are no separate lexica in the bilinguals' mind, on the assumption that the lexica are indeed functionally separated, as proposed by the shift hypothesis, these data indicate that connections exist between the L1 and L2 lexica.

The empirical evidence on the issue of the conceptual and lexical representations in bilinguals has been mainly collected using a paradigm in which the bilinguals' performance in their two languages is evaluated on (a combination of) three tasks: Reading single words aloud, translating single words from one language to the other, naming pictures. The logic for using such a comparison is that these tasks tap different representation systems and thus allow to infer (some of) the relationships among such systems (Potter et al., 1984).

Using such an approach, most studies show evidence for the shift from a lexically-based to a conceptually-based form of representation (see studies reviewed in Kroll, Michael, Tokowicz & Dufour, submitted). Some studies, however, present data that are not consistent with such a view (see, e.g. La Heij, Hooglander, Kerling, & van der Velden, 1996, and Cheng & Leung, 1989).

In the present study we address this issue by focusing attention to both the degree of fluency in L2 and to the comparison among tasks.

As for the first aspect, the degree of fluency of the balanced bilinguals participating to the present study is very high in both their L1 and L2. They use both of their languages, German and Italian (Note 1), very often since they live in an environment (South Tyrol, Italy) in which the two languages are both currently spoken, and they study in an Italian university where the use of their second language is prominent. Therefore, they should be speakers for whom the conceptual mediation model would be the best approximation.

As for the comparison among tasks, we asked participants to read aloud words and to name pictures in each of their two languages, and to translate from and into L2. These tasks have been often used in studies in bilingualism, but they have rarely all been compared directly with each other. However, exactly this comparison allows investigating lexical processing within and between modalities.

Reading aloud (see Coltheart, Rastle, Perry, Langdon, & Ziegler, 2001) can be accomplished through different procedures, specifically through lexical and non-lexical procedures. The latter is based on a set of rules, operating at the sub-lexical level, which allow an orthographic string to be translated in a phonological sequence. This procedure allows to read aloud regular words and non-words. For known words, another procedure exists, consisting of a mapping from orthographic recognition units to the phonological output system where the phonological forms of known words are stored. This latter procedure comprises two routes. The direct route allows for the direct connection between the orthographic and the phonological units. The other requires the mediation of the semantic system, so that the units in the semantic system linking the orthographic and phonological units are activated during processing. Here, we endorse Caramazza's (1997) proposal that the semantic system is amodal and that it mediates among different modality-specific access and production systems in lexical processing. The semantic system, thus, is involved in picture naming, a task that relies on a procedure requiring access from the pictorial stimulus to the semantic system, activating the corresponding concepts, and from these to the phonological output system that allows retrieval of the pictures' names (e.g. Lotto, Job & Rumiati, 1999). Translation is an interesting case since, in principle, it can be accomplished either lexically, i.e. trough direct word-to-word links in the two languages or conceptually, i.e. through a mediation by the semantic system that is connected to both the L1 and L2 lexicon.

Three questions of theoretical interest are addressed in this paper. The first is whether different inter-relationships exist among the different components of the lexical processing system at various

degrees of fluency in L2. That is to say, do the relationships among the lexica and the conceptual system change over time as fluency increases (Kroll and Stewart, 1994)? On the assumption that access to the semantic system is equally fast from verbal and pictorial input, fluent bilinguals should be expected to be as fast at translating as they are at naming picture. For fluent bilinguals, in fact, the translation task would be accomplished through access to the semantic system. For less fluent bilinguals, instead, translation in L2, being lexically mediated, should be slower than picture naming in L2.

However, the assumption that pictorial and verbal stimuli require equal access time to the semantic system may not be tenable. In fact, several data seem to indicate that pictorial stimuli are faster than verbal stimuli in accessing the semantic system (Friedman and Bourne, 1976; Snodgrass and McCullough, 1986; Job, Rumiati and Lotto, 1992, but see Potter & Faulconer, 1975). So we may expect translation to be actually slower than picture naming in proficient bilinguals if it is conceptually mediated.

A second question of interest regards the role of cognate words in L2 processing. Words referring to a concept may be quite dissimilar from each other at the orthographic/phonological level in different languages (e.g. river and fiume in English and Italian, respectively), or they may be quite similar to each other (e.g. lemon and limone in English and Italian, respectively). The former are said to be non-cognate and the latter cognate (see, De Groot, 1993). Cognate words show an advantage over non-cognate words in a number of tasks such as reading and translating. In particular, cognate words are translatated into L2 faster and with higher accuracy than non-cognate words (De Groot, 1992; De Groot and Nas, 1991). These results has been interpreted in the framework of distribute conceptual memory representation byDe Groot (1992), who suggests that the advantage of the cognate words in translation is due to these words sharing more conceptual units than non-cognates words.

If the locus of the cognate words effect is indeed the semantic system, then fluent and less fluent bilinguals should be differently sensitive to the cognate manipulation, since, ex hypothesis, as fluency increases reliance on the cognitive system for translation also increases. According to this view, then, fluent bilinguals should show differences in processing cognate and non-cognate words and less fluent bilinguals should not, or should do so to a lesser degree. However, if formal aspects of words play (also) a role in processing at the level of input and output lexica, then cognate words may behave differently than non-cognate words because their formal similarity may trigger facilitatory and/or inhibitory processes that non-cognate words do not. According to this view, both fluent and less fluent bilinguals show a cognate effect, but less fluent bilinguals should show stronger cognate effects, as they rely more on the lexical pathways in translation.

A third question of theoretical interest is whether bilinguals' performance on different tasks is linked to their degree of fluency. We would expect this to be the case, since different tasks make different demand to the cognitive systems in terms of attention, mental effort, and processing procedures available for performing the tasks. Thus, only when tasks requires procedures that are not well mastered by less fluent bilinguals should this type of bilinguals not be efficient in their second language.

EXPERIMENT 1

Method

Participants

Twenty-eight German-Italian bilinguals fluent in both languages took part in the study. They were born and live in South Tyrol, a part of Northern Italy where a German dialect is spoken, and where German is systematically acquired in school. Italian is also studied starting in grade 2. They were attending the University of Padova, taking their courses in Italian for at least

one year. Their command of both languages was very high. Their mean age was 24.5. The data of four participants were discarded for equipment failures.

Material

A set of 60 pictures and their corresponding names in Italian and German was selected. Ten pictures were selected from each of the following 6 categories: Animals, Clothes, Flowers and Plants, Fruits, Households and Furniture, and Musical Instruments. The mean frequency of the Italian words was 30.61 according to the IRC (Istituto di Linguistica Computazionale, 1988). The mean frequency of the German words was 81.15 (Note 2). The mean length in letters was 6.83 and 6.47 for Italian and German words, respectively. Half of the words were cognates and half were non-cognates.

In order to determine the cognate status of the words a group of 40 German-Italian bilinguals, not participating to the main experiment, were asked to judge on a 5-point scale the degree of orthographic and/or phonological similarity of translations in the two languages. They were to mark 1 if the two words were dissimilar (e.g. cavallo-pferd (horse)) and 5 if the two words were similar (e.g. giraffa-giraffe) and to mark middle points for intermediate degrees of similarity. 124 pairs of words were used. The 30 selected cognate pairs had a mean rated degree of similarity of 4.50. The 30 selected non-cognates pairs had a mean rated degree of similarity of 1.17.

Each experimental list consisted of the 10 exemplars of a given category, i.e. it was a “categorized” list (see Kroll & Stewart, 1994). The six lists were counterbalanced across participants so that an individual saw a particular list only once in each task and in each language.

Procedure

The experiment was run in two sessions, held on two consecutive days. The language used in producing the responses differed in the two sessions: Half of the participant used L1 in the first session and L2 in the second session, while for the other half the coupling was reversed. In each

session participants were required to perform three tasks: reading aloud, translating, and naming pictures. Reading aloud was always performed as the last task, while translating and naming pictures alternated as first and second task among participants. For each task, participants were informed which category they were going to be presented with.

Each trial consisted of the following events. A fixation point in the center of the screen for 500 msec., the stimulus for 700 msec., a blank field for up to 2300 msec. The next trial started after 2000 msec. from the participant's response.

Results and Discussion

The results are reported in Table 1. The effect of very long or very short latencies were reduced by trimming to the cut-off value of two standard deviations above or below the mean for each participant. Analyses of variance (ANOVA) were performed on correct RTs. The factors considered were type of task (reading vs. translating vs. naming pictures), cognates status (cognates vs. non-cognates), and production language (L1: German vs. L2: Italian). In all analyses, the criterion for statistical significance was $p < .05$.

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Table 1 about here

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The results showed a main effect of type of task ($F(2,23) = 91.69$). Reading was the fastest task (653 msec), translating was the slowest (1170 msec), and naming was intermediate (1069 msec), differing significantly from the other two. Also cognate status was significant ($F(1,23) = 17.54$), with RTs to cognates being faster than those to non cognates (930 vs. 998 msec). The interaction between type of task and cognates status ($F(2,46) = 15.20$) was due to the fact that cognates and non-cognates did not differ in either in reading (652 vs. 654 msec, respectively) or in

naming (1081 vs. 1057 msec), but in translation cognate words were faster than non cognates (1058 vs. 1281 msec).

The patter of results for the balanced bilinguals who participated in Experiment 1 is very clear. Reading aloud is the fastest task, naming is slower than reading, and translating is slower than naming. No difference between L1 and L2 emerges in any of the tasks. Finally, there is an effect of cognate status in translation such that noncognate words take more time to translate than do cognate words.

EXPERIMENT 2

Method

Participants

A group of 28 Italian/German bilinguals took part in this study. Their L1 was Italian, and they were studying German at the University of Trento (Italy). They were less fluent than the bilinguals taking part in Experiment 1 but their school-German was quite good. Their mean age was 22.3 years. The data of four participants were not analyzed because their rate of errors exceeded 20% or because equipment failures.

Material

Sixty pictures and their corresponding names were used as stimuli. They were for the most part those used in Experiment 1. However, 19 of them were changed because their names were less familiar to this group of participants. The Italian names had a mean frequency of 19.6 (range: 0 to 155) according to the IRC (Istituto di Linguistica Computazionale, 1988). The mean length in letters was 7.10 and 7.27 for Italian and German words, respectively**.** Half of the names were cognate in the two languages and half were not. The cognate status was determined by having a group of 25

German/Italian bilingual speakers judging the degree of orthographic/phonological similarity of pairs of translations on a 5-point scale (1 = dissimilar, 5 = similar). The items selected for the study had a mean rating value of 1.22 for non-cognate words and 4.48 for cognate words.

Procedure

The procedure was the same as in Experiment 1.

Results and Discussion

Mean correct RTs and percentage of errors are reported in Table 2**.** The effect of very long or very short latencies were reduced by trimming to the cut-off value of two standard deviations above or below the mean for each participant.

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Table 2 about here

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The correct RTs data were analyzed using an analysis of variance (ANOVA). The factors considered were type of task (reading vs. translating vs. naming pictures), cognates status (cognates vs. non cognates), and production language (L1: Italian vs. L2: German). In all analyses, the criterion for statistical significance was $p < .05$.

The results showed a main effect of type of task ($F(2,23) = 82.69$). RTs in reading were the fastest (765 msec), but the difference between RTs in naming and in translating was not reliable (1495 vs. 1565 msec, respectively). Cognate status was significant ($F(1,23) = 17.01$), with RTs to cognates being faster than those to non cognates (1203 vs. 1346 msec) as was the main effect of language ($F(1,23) = 25.92$), with RTs to Italian (L1) being faster than RTs to German (L2) (1083 vs. 1466 msec, respectively). Also, three interactions reached significance. The interaction between type of task and cognates status ($F(2,46) = 16.21$) was due to the fact that

there was no difference between cognates and non cognates in both reading (743 vs. 786 msec, respectively) and naming (1503 vs. 1486 msec), while in translating cognates were faster than non cognates (1362 vs. 1767 msec). The interaction between type of task and production language ($F(2,46) = 7.18$) shows that the difference between the two languages was not significant in reading (L1: 686 msec, L2: 844), while RTs in L1 were faster than in L2 both in naming (1183 vs. 1806 msec, respectively) and in translating (1380 vs. 1749 msec, respectively). Finally, the three-way interaction ($F(2,46) = 5.54$) was due to the size of the difference between cognates and non cognates in the translation task. When language production was L1 the difference between cognates and non cognates was larger (580 msec) than when language production was L2 (230 msec).

The pattern of results suggest that for less fluent bilinguals performance in the different tasks was influenced by the language of output. For reading aloud, no reliable difference between the two languages was found, while both picture naming and translation were faster when the production language was L1

Also, the effect of the cognate status of words was apparent only in the translation task, and affected both L1/L2 and L2/L1 translation direction.

Finally, in the translation task there was the advantage of the L2/L1 condition over the L1/L2 condition generally found in the literature. In fact, translating into L2 (1749 msecs) took longer than translating into L1 (1380 msecs).

General Discussion.

The main results can be summarized as follow. Fluent, well-balanced bilinguals showed no asymmetry between their two languages in any of the three tasks used in the Experiments: Reading

aloud, picture naming, and translation. Less fluent bilinguals, instead, did show an asymmetry between languages since they performed faster in L1 than in L2 in both picture naming and translation.

For fluent, well-balanced bilinguals, reading was the fastest task, picture naming was intermediate, and translation was the slowest. For less fluent bilinguals, the reading task was also the fastest, but picture naming and translation did not differ from each other. So, the asymmetry between L1 and L2 for the less balanced bilinguals emerged in the tasks that were more difficult for both groups of participants.

Finally, for both fluent and less fluent bilinguals, the cognate status of words affected performance in the translation task, with cognate words being faster than non-cognate words in both forward and backward translation. As a consequence, the ordering of the difficulty of the tasks mentioned above was modulated by the cognates status of the words.

Referring back to the three theoretical issues presented in the introduction, we are now in the position to answer question number three. The pattern of results is consistent with the view that for some tasks, in this case reading aloud, the bilingual's two languages allow for the same level of performance independently (within the range here considered) of the degree of fluency. For more demanding tasks, instead, less proficient bilinguals perform worst in L2 than in L1. The difference among tasks may be related to different causes. On the one hand, cognitively more demanding tasks may require more resources to be performed, and this may be taxing for less fluent bilinguals whose use of L2 may be effortful (Green, 1998). On the other hand, tasks may differ in terms of the number and kind of mental procedures that are available for performing them, with some of the procedures being available to the same degree to fluent as well as less fluent L2 speakers.. The interpretation we offer for the actual pattern obtained in the present Experiments relates to both of these perspectives. Reading aloud can be accomplished without access to the semantic system, either through the non-lexical route or through the lexical non-semantic route that links the orthographic to the phonological

forms of words (see Coltheart et al., 2001). By-passing the semantic system allows even less fluent bilingual readers to read aloud in L2 as fast as in L1. For picture naming, instead, only one procedure is available, i.e. accessing the semantic system in order to retrieve the picture label, but this procedure favours fluent bilinguals since they have developed direct connections between the L2 lexicon and the semantic system. The translation task is a crucial case, since it can be accomplished either trough a conceptual or a lexical mediation.

The results show that for more fluent bilinguals - who assumedly relay on conceptual mediation - translation is the hardest task, while for less fluent bilinguals translation does not differ in term of difficulty from picture naming. This suggests that the co-activation of the two lexica, as opposed to the (possible) activation of only one lexicon (as in picture naming), affects the bilinguals' perfomance. However, since the pattern is modulated by the cognate status of words and by language of production, it will be discussed more fully later on.

As for the first theoretical question, the balanced bilinguals taking part in this study are equally fast in naming pictures in L1 (1045 msec) and L2 (1093 mesec). This means that for this group the connection between the conceptual system and the output lexicon is equally strong in both languages, given that - by assumption - a unique connection exits between the structural description and the conceptual system. If we consider this pattern the landmark for direct, conceptually-mediate processing in both languages, we should expect less fluent bilinguals to be slower in naming pictures in L2 with respect to L1. This is what happens, with a delay in naming pictures in L2 of about 600 msec. Such a pattern can be interpreted in two ways: The connections between the conceptual system and the output lexicon are less efficient for L2 than for L1; alternatively, they are not functional for L2. In the former case, it may be said that more information from the semantic system is needed to activate a word in the L2 output lexicon than the information needed to activate a word in the L1 output lexicon. In the latter case, retrieval of the picture name in L2 would only be possible though the activation of the

corresponding word in L1 and its translation in L2. Of course, this latter claim is congruent with the lexically-mediate model, and is what would be predicted by the shift hypothesis.

In Figure 1 we compare the translation and the picture naming tasks for both groups. Out of the four conditions created by the “language of output” by “degree of fluency”, three

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Figure 1 about here

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show the same patter: Picture naming is consistently faster than translation. The exception is due to the less fluent bilinguals when performing in L2, where translation and naming take about the same time. This latter pattern is considered to be diagnostic of conceptually-mediated translation (e.g. Potter et al., 1984; Sholl, Sankaranarayanan & Kroll 1995). However, it differs markedly from the pattern of balanced bilinguals for whom conceptual mediation in translation is very likely given the lack of difference between the two languages. Furthermore, for less fluent bilinguals the delay in L2 vs. L1 output is about 200 msec. longer for pictures naming than translation, a time that may be sufficient for retrieving the pictures' name in L1. These facts may be suggestive of lexical mediation in translation for less fluent bilinguals. Specifically, when asked to name pictures in L2, the less fluent bilinguals use a two-step procedure: First, they (covertly) name a picture in L1 and then they translate the name into L2.

To address the second theoretical question, let us focus on the translation task. Non-cognate words are slower than cognate words in all four conditions. And, indeed, RTs to the latter in the translation task are not different from the RTs to both cognate and non-cognate words in the picture naming task. The fact that cognate and non-cognate words behave differently in picture naming and in translation suggests that in the latter, but not in the former, cross language influences are at work.

The pattern can be explained by hypothesizing that both lexica are activated to some degree even when processing in only one language is required, a hypothesis for which both empirical evidence (e.g. Van Heuven, Dijkstra & Grainger, 1998; Hermans, Bongaerts, De Bot, & Schreuder, 1998; but see Costa, Miozzo, & Caramazza, 1999) and theoretical accounts (Dijkstra & Van Heuven , 1998; Dijkstra, Van Heuven & Grainger, 1998) are available.

Let us refer again to a dual-route framework - such as that proposed by Coltheart et al. (2001) for monolingual reading - to account for the asymmetry. In this framework, distinct input and output lexica are postulated, interconnected by pathways that allow to derive phonological forms of words from their orthographic forms. One of the pathways is non-lexical, and it operates by applying print-to sound correspondence rules to orthographic strings irrespective of their lexical status. The other pathway is lexical, in that it deals with known words, and it can be either semantic or non-semantic. In the latter case, it exploits the direct connections between the orthographic input lexicon and the phonological output lexicon. In the former, it operates through the semantic system by activating the word meaning. The two procedures are activated upon presentation of an orthographic string, are assumed to be operating in cascade, and both deliver their phonological output. In the present framework, presentation of a written word activates orthographically and phonologically similar words in both L1 and L2 lexica, activation being a function of the degree of similarity to the target word (see also Grainger & Dijkstra, 1992). Thus, cognate words are very likely to be automatically activated in both lexica by the same target word in whatever language. A different pattern should be expected for non-cognate words, given their low formal similarity. For these words, in fact, the lexical entries automatically activated by the target word do not include - by definition - its translation.

The Bilingual Interactive Activation (BIA) model (Dijkstra & Van Heuven, 1998) makes the same predictions, as it is a fully interactive and assumes different levels of representation and processing which include the “letter” and “word” levels of representation. The latter level is assumed

to be non-language selective, even if a version that is selective for language may be easily conceived (see, e.g. Dijkstra, Grainger, van Heuven, 1999).

According to both models, then, we should expect fluent and less fluent bilinguals to show the cognate effect in the translation task. And both models would explain the actual pattern obtained as arising from the conjoint effect of intra- and inter-language facilitation and inhibition. However, it may be assumed that the degree of activation and inhibition in the output lexica varies as a function of the degree of formal similarity among entries, and that such a function is linked to vocabulary size. In addition, it may be linked to the strength of the connections between sub-systems. Therefore, we should predict that the effect of cognate status to be different for fluent and less fluent bilinguals in translation. Furthermore, we should predict that it should vary with the direct of translation. The pattern produced by combining degree of fluency and language of output shows exactly this. The two groups differ in that fluent bilinguals do not show a parallel asymmetry between cognate and noncognate words irrespective of the direction of translation. For less fluent bilinguals, instead, the effect of the cognate status is much larger in the L2-to-L1 translation.

At present, it is quite difficult to disentangle the specific contribution of each of these factors, and to attribute the effect to either the slowing down of non-cognate words or the facilitation of cognate words.

Thus, on the one hand, we might argue that under our experimental conditions, any facilitation due to the pre-activation of formally similar words cannot emerge, but the slowing down due to the inhibition of formally dissimilar words does. That is to say, cognate words, though pre-activated, need to wait for the output of the cognitive system for the production of the target word translation to start. For non-cognate words, however, the output of the cognitive system concerns entries that – being phonologically dissimilar to the target – are temporally inhibited.

Alternatively, we might argue that it is indeed cognate words that are facilitated with respect to non-cognate words. This follow from the fact that they are pre-activated by orthographically and/or phonologically similar words in the other language, and thus are readily availability for the output of the cognitive system. The present data do not allow us to select between the two alternatives. However, both would predict non-cognate words to be slower than cognate words in the translation task, and this is indeed the pattern shown by both fluent and less fluent bilinguals.

Furthermore, the dual-route model may also explain a further aspect born out by our data. Recall that for less fluent bilinguals cognate words were 580 msec faster than non-cognate words in L2 to L1 translation, but were (only) 230 msec faster in L1 to L2 translation. For balanced bilinguals the advantage for cognate words was around 200 mesc in both cases. On the assumption that the degree of activation and inhibition in the output lexica varies as a function of the degree of formal similarity among entries, the different effects of cognate status of less fluent and balanced bilinguals in the translation task may be linked to vocabulary size. The L2 vocabulary of less fluent bilinguals is smaller than their L1 vocabulary, and therefore more competition, and hence more inhibition, should be expected when the output language is L1 than when it is L2 for this group of bilinguals.

Finally, let us now consider the issue of the shift from lexically-mediated to conceptually-mediated modes of representation and processes in bilinguals. Three pieces of evidence are consistent with such a shift, but one is not.

The first datum consistent with the shift is the fact that in picture naming, assumed to require access to the semantic system, fluent bilinguals perform at the same level in the two languages while less fluent bilinguals perform less efficiently when the output is in L2. This is prima facie evidence that access to the semantic system is an automatic process operating analogously in both languages only for fluent bilinguals.

Also consistent with the shift is the pattern emerging from the comparison between for- and back-ward translation. For less fluent bilinguals there is a large asymmetry between the two translation directions, with a cost of about 370 mesc for L1-to-L2 translation. For fluent bilinguals the 31 mesc difference is not significant.

Finally, the pattern of performance in picture naming and translation by less fluent bilinguals is also consistent with the shift hypothesis. In fact, the similarity between translation and naming for less fluent bilinguals is best explained by assuming that in naming pictures participants first name the figures in L1 and then translate the name into L2.

The asymmetry in processing cognate and non-cognate words by fluent bilinguals in the translation task, however, does not prima facie, support the shift hypothesis. In fact, if such a task is conceptually mediated, then cognate and non-cognate words should not behave differently, just as they do in picture naming. However, such prediction may be based on models of bilinguals processing that are not detailed enough as far as the functional architecture of the mental system is concerned. In fact, current models fail to distinguish input- and output-lexical systems, a point also raised by Green (1998); furthermore, they are under-specified as far as the processing inter-relations among the systems are concerned. With additional assumption about the functional architecture of the processing system, the asymmetry shown by fluent bilinguals between cognate and non-cognate words in translation may not be considered evidence for lexically-mediated processing. According to the framework previously outlined, a word stimuli presented in L1 for translation accesses both the conceptual system and the corresponding phonological output lexicon, where phonologically similar word will be activated and phonologically dissimilar word will be inhibited. By virtue of the link between such lexicon and the L2 output lexicon, L2 words that are phonologically similar and dissimilar to the stimulus will be activated and inhibited, respectively. This would benefit cognate words but would hinder non-cognate words, the pattern we obtained.

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Notes

(1) The first language mentioned refers to the native language (e.g. for Italian-German bilinguals Italian is the native language and German is L2).

(2) The two frequency count may not be directly comparable.

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Table 1

Response Times and Percentages of Errors (in Parenthesis) in Reading, Naming, and Translation in L1 (German) and L2 (Italian) for Fluent Bilinguals (Experiment 1)

	Reading		**Naming**		**Translating**	
	Cog	NonCog	Cog	NonCog	Cog	NonCog
L1 (German)	664	642	1016	1074	1040	1268
	(0.0%)	(0.0%)	(1.4%)	(2.0%)	(4.0%)	(9.0%)
L2 (Italian)	639	667	1145	1041	1076	1294
	(0.0%)	(0.0%)	(0.7%)	(10%)	(1.0%)	(5.0%)

Table 2

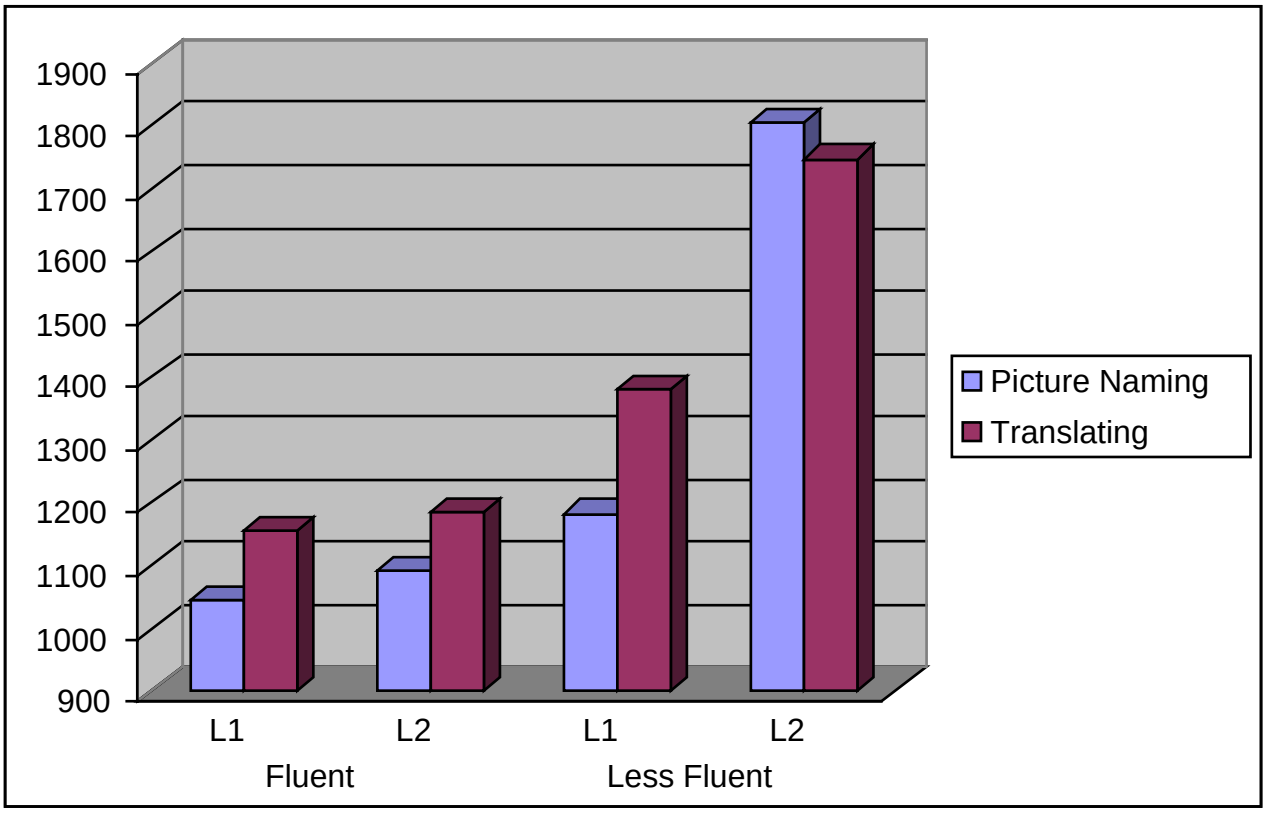
Response Times and Percentages of Errors (in Parenthesis) in Reading, Naming, and Translation in L1 (German) and L2 (Italian) for Less Fluent Bilinguals (Experiment 2)

	Reading		**Naming**		**Translating**	
	Cog	NonCog	Cog	NonCog	Cog	NonCog
L1 (Italian)	685	687	1267	1100	1090	1670
	(0.0%)	(0.0%)	(8.5%)	(16.0%)	(1.1%)	(40.6%)
L2 (German)	802	886	1740	1873	1634	1864
	(0.0%)	(0.0%)	(35.4%)	(41.6%)	(17.1%)	(39.5%)

Figure Caption

Figure 1.

Translation and Picture Naming times for fluent and less fluent bilinguals in their first and second langauge.


1900
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L1
L2
L1
L2
Fluent
Less Fluent
Picture Naming
Translating