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The Multilingual Community: Introduction

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To become a member of a language community, a speaker must master an impressive array of cognitive processes. However, the benefits of community membership are considerable: the speaker can share knowledge, acquire and reflect upon culture and participate more effectively in social intercourse. Entry to a multilingual community confers even greater advantages—the range of opportunities to broaden one's scope and the variety of experiences are increased substantially. However, full membership necessitates the mastery of a formidable additional set of skills and knowledge.

The papers which have entered this "Multilingual Community", as we have entitled this special issue on aspects of bilingualism, have been selected to reflect the diversity of approaches taken by researchers on bilingualism and the range of theoretical issues they have addressed. We have selected papers which cover 10 languages in seven different combinations. Although of reasonable size, this sample surprisingly covers only 0.25% of the world's languages, which is estimated at 4000 (Comrie, 1989), and thus an even smaller proportion of all possible bilingual permutations. Nevertheless, some coherence emerges from the papers selected, which may permit some theoretical generalisations.

Ever since Weinreich (1953/1968) published his well-known review of studies on bilingualism, bilingual word representation has been a popular

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research topic. Five of the studies reported in this special issue testify to the undiminished interest in bilingual lexical representation. Before introducing them, Weinreich's views on the bilingual lexicon will be presented, because they provide a convenient framework for the discussion of the majority of these studies.

Weinreich discusses three possible organisations of word knowledge in bilinguals: "coordinate", "compound" and "subordinate". He calls a bilingual word representation "coordinate" if the L1 and L2 "signifiers" are associated with separate "signifieds", that is, a word in one of the bilinguals' languages and its translation in their second language, have two conceptual representations, one for each language. He calls a word representation "compound" if the L1 word and its translation in L2 share the same conceptual representation. A word representation of the subordinate type is one in which a to-be-learned L2 word is linked with its translation in L1 rather than directly onto a conceptual representation. Thus, as in compound representations, in subordinate representations L1 words and their translations share a conceptual representation. Weinreich associates a subordinate representational structure with a relatively low level of L2 proficiency—the L2 word is in the process of being learned—although he also considers the possibility that "some speakers acquire fluency in a language while continuing to interpret all its signs by reference to signs in their first language" (Weinreich, 1953/1968, p. 11). Another aspect of Weinreich's views on the bilingual lexicon that deserves to be stressed here—because it seems to have been ignored in many of the ensuing studies—is that bilingual word representation may differ, not only across individual bilinguals or across different groups of bilinguals, but also across individual words. Different words may be represented differently within one and the same bilingual's mental lexicon: some words may be represented in a compounded fashion, some coordinate, and yet others in a subordinate way.

Five contributions in this issue (Abunuwara; Grainger and O'Regan; Keatley and de Gelder; Sánchez-Casas, Davis and García-Albea; Tzelgov and Eben-Ezra) deal with various aspects of bilingual word representation. The authors approach the questions they tackle from different angles, and together they use a large variety of experimental tasks. Although the representational models that they test are referred to by labels different from those employed by Weinreich, the descriptions of these models are often strongly reminiscent of the classification of bilingual lexical structures that he suggested. Tzelgov and Eben-Ezra's "separate codes" and "common code" hypotheses and Keatley and de Gelder's "separate store" and "shared store" (or "hierarchical") models are similar to, and may even be the same as, Weinreich's coordinate and compound structures. The reason we are cautious in our wording here and do not claim bluntly they *are* in fact the same is that, unlike Weinreich, Tzelgov and Eben-Ezra, and

Keatley and de Gelder, explicitly distinguish between two types of representations within the bilingual (and, for that matter, monolingual) lexicon, namely the representations of word forms and those of word meanings (see also, e.g. Potter *et al.*, 1984).[1] But Weinreich may have also accepted this distinction, albeit implicitly. Indeed, it is difficult, if not impossible, to conceive of access to the meaning representation without assuming some more superficial representational code that a word must first contact and pass through before being comprehended. Therefore, it is quite implausible not to assume these different layers in a word's lexical representation. (The label "hierarchical" refers to this bipartition of form and meaning representations.) Abunuwara uses Weinreich's terms "coordinate" and "compound". In addition, he refers to this distinction as the "independence" and the "interdependence" hypotheses, respectively. Like Weinreich, he does not explicitly divide word representations into form and meaning representations. In summary, although the diversity of terms used in this volume, and indeed elsewhere in the literature, suggests that many different bilingual lexical structures have been proposed, their actual number is rather restricted. Therefore, grasping the essentials of the main questions that have been posed with respect to bilingual lexical representation is a relatively undemanding enterprise, and the proliferation in terminology should thus not put off the potentially interested but busy reader.

The present contributions by Keatley and de Gelder, and by Tzelgov and Eben-Ezra, focus on exactly the same issue. Indeed, they also approach this issue in rather similar ways, and yet, ironically, arrive at opposite conclusions. Both studies explore the robustness of the between-language semantic priming effect (see below) either in lexical decision by Dutch–French bilinguals (Keatley and de Gelder) or both in lexical decision and in word pronunciation by Hebrew–English bilinguals (Tzelgov and Eben-Ezra). The lexical decision task involves the categorisation of letter strings as words or nonwords. In the pronunciation task, the subjects read aloud the presented stimuli. In the priming versions of these tasks, the stimuli to be responded to (i.e. the targets) are preceded by a context stimulus (i.e the prime) and the effect of the prime on target processing is assessed. In most studies (as in the priming studies in this issue), individual words have served as primes, but in some studies larger

[1] In the past, proposals have been put forward to distinguish between some core meaning of words (their definitions) and other knowledge we may possess concerning the referents of words, e.g. encyclopaedic knowledge. In the literature on the bilingual lexicon, this distinction is seldomly made, and "meaning" representations are referred to interchangeably as "meaning representations", "semantic representations" or "conceptual representations". The structures in which they often are assumed to be embedded are referred to as "semantic" or "conceptual" networks.

linguistic structures have been presented as context stimuli. In *semantic* priming studies,[2] semantically related and unrelated prime–target combinations are contrasted. (Other prime–target relations may also be varied, e.g. their spelling and sound relations.) Both in lexical decision and in pronunciation studies of this type, semantic priming effects are usually obtained—responding is faster following a semantically related prime than following an unrelated prime.

The semantic priming technique has been used extensively in monolingual investigations on the mental lexicon (for a review, see Neely, 1991) and was adopted later by the bilingual research community. In monolingual priming studies primes and targets are presented in the same language, whereas in their bilingual counterparts the language of primes and targets differs within individual trials. Priming effects obtained in the latter experiments are referred to as "cross-language", "interlingual" or "between-language" semantic priming effects. The corresponding monolingual effects are labelled "within-language" or "intralingual" semantic priming effects.

One of the sources of the semantic priming effect is postulated to be "automatic spreading activation" within conceptual memory. The representations in conceptual memory are assumed to be organised according to semantic relatedness, with links connecting the representations of semantically related words. When a word (the prime) is presented, it subsequently contacts its conceptual representation (presumably via its form representation), thus activating it. This activation then spreads out along the paths of the network, activating the encountered representations. If a word that corresponds to one of these activated representations is subsequently presented as the target, it will be responded to relatively quickly. In other words, whenever a semantic priming effect occurs, and it could be attributed unmistakebly to spreading activation, something is revealed about the underlying representational structure—if word A primes word B, the two must be connected in the underlying network. This is the rationale underpinning the use of this technique in studies on the monolingual and the bilingual lexicon. For instance, if a between-language effect is obtained and it is equally large as the corresponding within-

[2]Often the term "associative priming" studies would have been more appropriate for the studies concerned, because the prime–target pairs presented as stimuli are derived from word-association norms, with the prime and target occurring as stimulus word and response word. In the majority of cases, the stimulus and response terms in word association share a semantic relation. This relation is generally (albeit implicitly, and maybe unjustly) thought to cause the priming effect in priming studies in which these word-association materials are used. This explains why these studies are called "semantic priming" studies.

language effect, one might conclude that a word and its translation have a common representation in conceptual memory.

Unfortunately, automatic spreading activation is often not the only source of the semantic priming effect. It has been argued (for references, see Keatley and de Gelder; Tzelgov and Eben-Ezra) that under favourable circumstances two other processes/mechanisms may contribute to the effect. Tzelgov and Eben-Ezra refer to one of them as an "expectancy (or 'attentional') mechanism" that "focuses the subject's attention on a specific zone of the semantic network, thereby facilitating processing in that zone". Keatley and de Gelder refer to this same process as a "pre-lexical strategy". The second process is what Tzelgov and Eben-Ezra call a "post-lexical checking process", whereas Keatley and de Gelder refer to it as "post-lexical meaning integration". It concerns an attempt by the subjects to relate the meanings of both prime and target after both have been recognised. Depending upon the outcome of this process, responding may be either speeded up or slowed down. The main aim of the studies by Keatley and de Gelder and by Tzelgov and Eben-Ezra is to assess the contribution of spreading activation to the between-language priming effect, either by "disabling" the expectancy mechanism and post-lexical checking or by comparing the priming effect under circumstances assumed to optimise the effectiveness of one of them with the effect obtained when the circumstances are not optimal.

Tzelgov and Eben-Ezra manipulate subjects' language expectations by blocking presentation of the language of the prime and presenting the majority of the targets in the language of the prime. In addition, they vary the stimulus onset asynchrony (SOA) between prime and target, the reason for this being that expectancies take a relatively long time to develop. To the extent that priming effects are due to expectancy strategies, they should arise only with long prime–target SOAs and when the target appears in the expected language. But if spreading activation underlies the effects, they should be insensitive to the language expectancy manipulation (because spreading activation is an automatic process) and should also occur with shorter SOAs (because spreading activation has a relatively short rise time). In a second experiment, Tzelgov and Eben-Ezra use the pronunciation task, for which it has been suggested that post-lexical checking is not used or is not effective. They found between-language semantic priming for the non-expected target language, also with a short SOA, for both lexical decision and pronunciation. This suggests that spreading activation is the most likely source of the priming effect. The authors conclude that in bilingual memory, words and their translations share the same conceptual representations.

Keatley and de Gelder focus on post-lexical meaning integration as a possible source of between-language semantic priming in lexical decision,

which may confound the priming effects due to spreading activation. They use a very brief SOA (of 200 msec) in all four of their experiments in order to reduce the likelihood of any expectancy mechanism contributing to the results. The main and new manipulation in their study is that, instead of switching to a pronunciation task, they attempt to invalidate post-lexical meaning integration by speeding up the subjects. This was achieved by asking them to respond before a particular deadline. When this technique was applied, the between-language semantic priming effect disappeared, although they found it when no deadline was imposed. However, the instruction to respond within a set deadline did not affect the within-language effect. Because both pre-lexical expectancy strategies and post-lexical meaning integration were assumed to be disabled, the authors attribute the within-language effects to spreading activation. If there were common conceptual representations, then between-language priming effects should also have been obtained. Because they were not, the authors conclude that "the meanings of words expressed in different languages are represented separately", and that, in studies that *do* show the between-language effects, they are caused by post-lexical meaning integration. However, on the basis of the results of a final experiment, investigating translation priming (where the prime and target are translation equivalents), they moderate their claim concerning bilingual lexical representation somewhat. The speed instruction did not eliminate the translation priming effect, suggesting that the two language stores of these bilinguals are not completely segregated.

Keatley and de Gelder's results clearly challenge Tzelgov and Eben-Ezra's account of their data. A first step to clarify the controversy could be to replicate the latter authors' pronunciation study but using the speed instructions by Keatley and de Gelder. If the between-language effects were to disappear, this would suggest that the usual belief that post-lexical meaning integration is not effective in the usual, unspeeded, pronunciation task is flawed. More importantly here, it would provide support for the separate storage view.

Another approach in trying to reconcile the findings of these two studies would be to look for more fine-grained, but possibly critical, differences between them, e.g. differences between the populations from which the subjects were drawn and differences between the experimental materials. Recall that Weinreich has alerted us to the possibility that bilingual word representation may differ across individual bilinguals and groups of bilinguals, and that even within one bilingual's lexicon various types of representational structures may co-exist. In other words, bilingual memories may distribute themselves along a continuum from a pure separate-storage system to a pure common-storage system. It may therefore be the case that both Keatley and de Gelder and Tzelgov and Eben-Ezra are right, but for different groups of subjects or materials. Two of the remaining contribu-

tions in this issue, those by Abunuwara and by Sánchez-Casas, Davis and García-Albea, both attest to the viability of this view.

Few studies on the bilingual lexicon have looked at the effects of manipulating particular word characteristics on task performance (for a review, see de Groot, in press). In fact, many studies have used only concrete, relatively high-frequency words. That mainly concrete words have been presented is presumably a consequence of the frequent use of the paradigm introduced by Potter et al. (1984), namely, the comparison between translating in L2 and picture naming in L2, which obviously restricts one to object names. Such restrictions in the use of stimulus materials may make it inappropriate to generalise the conclusions concerning lexical representation obtained in these studies to bilingual word representation in general.

In contrast to most others, the study by Sánchez-Casas and co-workers of Spanish–English bilinguals *does* systematically manipulate a word characteristic. They compare two types of translation equivalents: *cognates*, where the L1 and L2 words are orthographically and/or phonologically similar, as they tend to derive from a common root (e.g. "rico"–"rich"); and *non-cognates*, where the L1 and L2 words are very different structurally (e.g. "luna"–"moon"). One of the tasks they use is "semantic categorisation", in which the subjects had to decide whether target words are instances of the category named in immediately preceding questions. In between the question and the target, a prime was presented that was masked in such a way that it could not be identified by the subjects. The relation between primes and targets was varied. The most relevant outcome of this study is that, as compared to a control condition, priming was obtained for cognate but not for non-cognate translations of the primes. Sánchez-Casas et al. explain this effect in terms of differences between the representations of cognate and non-cognate translations in bilingual memory. They suggest that cognates share a common lexical representation, whereas non-cognates do not. They gather converging evidence to support this claim in two further experiments. In one of them, employing the "repetition-blindness" paradigm, they rule out an interpretation of the cognate status effect in terms of superficial stimulus processing like feature integration. In their second experiment, they use the "cued translation task" (de Groot, 1992), in which subjects were presented with words in one language and the first letter of their translation (the "cue") and were required to produce the translations. Again an effect of cognate status was obtained, cognates being translated faster than non-cognates. A model that assumes shared representations for cognates and separate representations for non-cognates could easily account for these data.

A further noteworthy result of Sánchez-Casas and co-workers' translation experiment was that translating from L1 to L2 took longer than translating from L2 to L1, but only significantly so when the words to be

translated were non-cognates. As the authors point out, the differential sensitivity of cognates and non-cognates to translation direction again suggests the existence of shared representations for cognates and of separate representations for non-cognates. The effect of translation direction, here only observed for non-cognates, has been obtained in a number of other recent studies (for a review, see Kroll & Stewart, submitted). Its magnitude may depend on the level of L2 proficiency of the subjects (Snodgrass, in press) and, as suggested by Sánchez-Casas et al., on word type. The effect calls to mind another asymmetry that has been observed in studies on the bilingual lexicon, namely, the finding that between-language semantic priming effects are often larger with L1 primes and L2 targets than vice versa. Both Tzelgov and Eben-Ezra (who indeed find such an effect) and Keatley and de Gelder discuss this asymmetry. Kroll and Stewart (in press) provide a unified account of both the effect of translation direction and the asymmetrical between-language semantic priming effects. In doing so, they modify the hierarchical model of bilingual lexical representation to propose that connections are assumed (a) not only between each of the L1 and L2 word-form representations on the one hand and a conceptual representation shared by the L1 and L2 words on the other hand (Potter et al., 1984), but (b) also directly between the L1 and L2 word-form representations (see also de Groot & Nas, 1991). The model so far can be regarded as a composite of Weinreich's compound and subordinate structures. But Kroll and Stewart add a new feature to the model. They assume that the links have a directionality to them. The direct links between the form representations of the two languages are stronger from L2 to L1 than in the reverse direction, whereas the indirect links between them, through the conceptual representations, are stronger from L1 to L2. Kroll and Stewart discuss a number of possible causes of these directional differences in link strength.

The experiments by Sánchez-Casas et al. suggest that the bilingual lexicon is a mixed system, containing different types of structures for different types of words. That the mental lexicon of multilinguals may contain different kinds of structures is substantiated further by Abunuwara's study, which, as far as we know, is the first cognitive psychological study of the *trilingual* lexicon to be published. Abunuwara's subjects were Arabic–Hebrew–English trilinguals, all with Arabic as their first language and having acquired Hebrew and English in a school setting. Ervin and Osgood (1954) related Weinreich's compound and coordinate representational structures to the way in which second (and third) languages are acquired. They suggested that learning another language in a traditional school setting, in which a word from the new language is typically associated with a word and its meaning in the native language, results in a compound relation between L1 and the new language. If this contention is correct, then Abunuwara's subjects' lexicons should have a compound

relation between Arabic and Hebrew and between Arabic and English. Instead, a coordinate relation should exist between Hebrew and English, because it is very unlikely that translation equivalents in these two languages will have been directly associated often, if at all. Abunuwara subsequently refines these broad views by considering the possibility of a gradual development from a compound structure between L1 and a non-native language to a coordinate structure with increased proficiency in the non-native languages. His subjects were not equally proficient in their two additional languages, and so these languages should differ in the extent to which they have a compound relation with the first language, Arabic. More specifically, the weaker of the two foreign languages should be most "compounded" with the native language.

The tools with which Abunuwara addresses these issues are a trilingual version of the familiar Stroop ink-colour naming task, and Potter and co-workers' (1984) picture naming *vs* translation paradigm. The predictions for performance in the Stroop task all derive from the general assumptions that the more coordinate the system, (1) the smaller the between-language Stroop interference effects will be, and (2) the larger the difference between the sizes of the within-language and between-language interference effects. So when two languages are fully compounded the within- and between-language effects should be equally large, and in the case of two fully coordinate languages, only within-language interference should be obtained. A mixed system should show a pattern of results in between these two extremes. Abunuwara's Stroop data indeed support the view of a coordinate relation between the trilinguals' two non-native languages, a compound relation between L1 and their weakest non-native language, and an intermediate structure for the language pair consisting of L1 and the strongest non-native language. The data from his second experiment, employing Potter and co-workers' paradigm, also suggest different relations between pairs of a trilingual's three languages.[3]

The last of the present five articles on the bilingual lexicon focuses on the "language priming" effect, which should not be confused with the semantic priming effect discussed above. It refers to the finding that a word is harder to recognise for bilinguals when it is immediately preceded by a word in their other language rather than when preceded by a word in the same language. Grainger and O'Regan contrast two accounts of this effect, one in terms of a bilingual adaptation of Forster's (1976) search model of

[3]Abunuwara appears to equate the "word-association" model and the "concept-mediation" model of Potter et al. (1984) with Weinreich's compound (= interdependent) and coordinate (= independent) models, respectively. However, it may be more appropriate to equate the word-association and concept-mediation models with Weinreich's subordinate and compound models, respectively.

visual word recognition, and the second in terms of a bilingual adaptation of McClelland and Rumelhart's (1981) interactive-activation model. In its original, monolingual form, the latter model consists of three layers of nodes in a network: feature nodes, letter nodes and word nodes. Grainger and O'Regan add a fourth layer above the level of the word nodes. This layer consists of two nodes only, one for each of the bilingual's two languages. A language node is connected to each of the word nodes of the corresponding language. They refer to the complete representation structure as the bilingual interactive activation (BIA) model. The language priming effect is attributed to inhibition from the language node activated by the prime. Thus, a prime in one language would activate its language node, which would then inhibit all the word nodes of the other language. Grainger and O'Regan test this model using techniques often used in psychophysical research, in which the same materials are repeatedly presented to only a few subjects, in this case the two authors themselves. This procedure may hold promise for the study of higher-level processes as well as for low-level perceptual processes, for which it has typically been used. A particularly interesting finding of Grainger and O'Regan is that the language priming effect did in fact occur, despite the massed repetition. The authors conclude that it must be a highly automatised effect.

The last two contributions in this special issue could be designated "acquisition studies". Introducing a distinction between studies of "representation" and "acquisition" entails the danger that an innocent reader of a "representation" study of adult bilinguals may assume that the subjects have acquired an L2 proficiency comparable to their L1 proficiency and so are no longer L2 learners. However, the term "representation study" is neutral as to the level of L2 proficiency of the subjects. Indeed, in none of the representation studies to be reported in this issue will it be the case that the bilinguals' and trilinguals' languages are equally strong. What distinguishes the two classes of studies is that one focuses on the acquisition process and the second on the representations and the nature of their organisation. Although such a distinction is often not clear-cut, an operational definition could be that all investigations in which the number of years of experience with L2 serves as an independent variable may be regarded as acquisition studies. In this sense, both Hulstijn and Bossers' and Mägiste's studies are "acquisition" studies.

Hulstijn and Bossers note that learners' proficiency in a second language does not have to be determined solely by their knowledge of this second language, but may also be determined in part by their general language skills, as evidenced by proficiency in their native language. In two experiments, they attempted to separate the effects of L2-specific factors (e.g. knowledge of L2 vocabulary and L2 grammar) and "non-L2-specific" factors (e.g. reading comprehension in L1) on reading aloud in L2 and on

reading comprehension in L2. In one of the experiments, Dutch learners of English served as subjects; in the second, the subjects were Turkish learners of Dutch. Note that in the context of a representation study, these subjects might have been called Dutch–English and Turkish–Dutch bilinguals, respectively. The results of both experiments showed that L2 proficiency can indeed partly be accounted for by general language skills.

It has often been claimed that young children have a special facility for learning languages. In the last paper of this issue, Mägiste joins this "optimal-age" discussion, the outcome of which has clear practical implications for second-language instruction. Ideally, instruction should coincide with the optimal age for learning. Mägiste addresses this question by comparing younger and older German learners of Swedish on the number of years it took them to reach a "language balance" between their L1 and L2. Language balance is assumed to be reached when performance on a given task is as good in the subjects' second language as it is in their first language. According to the optimal-age hypothesis, it should take younger learners fewer years to reach this point of balance than older learners. The tasks she had her subjects perform were picture naming and number naming both in German and in Swedish. On the picture-naming task, the younger learners reached the point of balance after 4 years of residence in Sweden, whereas the older learners reached this point after 6 years. On the number-naming task, no age effect was obtained, and both groups of learners reached the point of balance after 4 years of residence in Sweden. Mägiste discusses a possible cause for this null-effect, and concludes that her picture-naming data, but not her number-naming data, support the optimal-age hypothesis.

All in all, the studies reported in this special issue address topics which are relevant to our understanding of both the acquisition of second languages and the nature of bilingual representation. However, the studies are also relevant to more general issues central to the study of all language processing. These include the functional relationship between a word's form and its semantic/conceptual representation, and the nature of such underlying representations of meaning. Studies on bilingualism speak to such issues and, of course, speak to them in a variety of ways.

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