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Selective L2 cognate retrieval deficit in a bilingual person with aphasia: A case report

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Abstract

Lexical access in bilinguals has been debated for the last several decades. Although a large majority of bilingual people often experience aphasia in both languages, some show language-selective disturbances. Yet, selective difficulties in retrieving words that share similar semantic and phonological forms in the two languages have seldom been reported. Here we report the case of a 45-year-old, right-handed, balanced bilingual subject (Kannada-Malayalam: two south Indian Dravidian languages) who presented with aphasia following an episode of stroke. Language evaluation revealed word-selection type of anomia with selective naming disturbance in L2 compared to L1 (in spite of having native-like fluency in L2). On further probing into his anomia, he showed inability to name cognate words in L2 even after successfully naming them in L1. These observations are discussed in the light of lexical access theories in bilinguals.

Keywords: lexical access, bilingual, cognates

Introduction

Bilinguals possess the remarkable ability to speak in a given language without mixing words from the other language. This ability would apparently necessitate a mechanism to control the lexical selection in bilinguals based on listeners' and context demands. Several hypotheses have been proposed to explain this skill in bilinguals. The two most debated hypotheses are the *language non-specific* and *language-specific* lexical selection mechanisms. The first hypothesis posits that lexical nodes in both languages are activated during the lexical selection process. However, an inhibitory mechanism suppresses the activation of lexical nodes in the non-target language (de Bot, 1992; Green, 1986, 1998), which in turn, results in greater activation of the lexical nodes in the target language. As per the tenets of this hypothesis, lexical selection is *language non-specific* since it considers the activation of all lexical nodes in the bilinguals' two languages. The language-specific hypothesis, however, assumes that the lexical selection mechanism considers only the activation of the lexical nodes in the target language, while the lexical nodes of the non-target language are ignored (Costa, Miozzo, & Caramazza, 1999; Costa & Caramazza, 1999). Previous investigations have provided empirical evidence to support both hypotheses. However, the contemporary research findings from healthy bilingual participants using various paradigms are suggestive of a language non-specific view of lexical selection (Green, 1998; Herman, Bongaerts, de Bot, & Schreuder, 1998).

Both language-specific and language non-specific hypotheses have evolved primarily from normal participants under stringent experimental conditions. The explanatory power of these two hypotheses in regard to language pathology, (such as in bilingual aphasia) have yet to be explored in detail. The validation of these hypotheses to account for bilingual lexical selection rests on their ability to also account for pathological behaviors in bilingual persons with aphasia.

In this context, Abutalebi and Green (2007) proposed the 'dynamic view' to explain selective recovery in bilinguals with aphasia. According to these authors, the cognitive control centers in the left hemisphere regulate the processing of languages in bilinguals. Later, Abutalebi, Rosa, Tettamanti, Green, and Cappa, 2009) provided clinical empirical evidence for the dynamic view of language control in a bilingual person with aphasia, which in turn was substantiated by functional neuroimaging data. The dynamic view successfully accommodates several recovery patterns in bilingual aphasia by means of the strength of intrinsic connections between the language control centers and representation centers (see Abutalebi et al., 2009).

In the context of various hypotheses on bilingual language processing, we present the case of a bilingual person with selective retrieval deficit of cognate names in one language.

Cognates are words with similar form and meaning in two languages (Robets & Deslauriers, 1999). For example, *a:me* and *a:ma* in Kannada and Malayalam, respectively (two south-Indian Dravidian languages), refer to *'tortoise'*. Generally, cognates are processed faster and more accurately than non-cognates (e.g., *gini* [Kannada] – *tatta* [Malayalam] – parrot). This processing advantage is referred to as the *cognate facilitation effect* (Costa, Caramazza, & Sebastian-Galles, 2000). Cognate facilitation effect is frequently reported in healthy bilinguals (Cristoffanini, Kirsner, & Milech, 1986) and is more pronounced in the non-dominant language (Costa et al., 2000). It has also been reported in bilingual people with aphasia (Roberts & Deslauriers, 1999). Further, cognates generalize to the non-treated language better compared to non-cognates following treatment in bilingual people with aphasia (Kohnert, 2004). However, the effect of treatment is dependent on several factors like assessment of pre and post-stroke language proficiency and language history (Kiran & Iakupova, 2011; Gray & Kiran, 2013; Muñoz & Marquardt, 2003).

The source of cognate facilitation effect has been a matter of debate among researchers. Different sources have been proposed for the origin of cognate facilitation effect, including conceptual-semantic, lexical-morphological, and phonological levels. At the conceptual-semantic level, cognate facilitation is accounted for by the priming effect as evidenced from the cross-language priming and word association paradigms (de Groot & Nas, 1991). At the lexical-morphology level, cognate words are assumed to be grouped together, which in turn leads to the repetition priming effect (Cristoffanini, Kirsner, & Milech, 1986). At the phonological level, this effect is explained to arise as a result of spread of activation from the lexical level to the phonological units of both target and non-target languages. Hence, at the level of phonology, cognate facilitation effect may be viewed as a product of neighborhood density effect (Costa, Santesteban, & Cănо, 2005). The cognate facilitation effect, therefore, arises from the shared nodes of bilinguals' two lexicons, and thus, provides evidence for a language non-specific view of bilingual lexical selection.

While the cognate facilitation effect provides evidence for a language non-specific view of bilingual lexical processing, selective deficit in the retrieval of cognate names in only one language of a bilingual provides an opportunity to examine the aptness of various hypotheses in explaining the pathological lexical retrieval in bilingual aphasia. In the following section, we present the case of a bilingual person with aphasia who exhibited deficit in the retrieval of cognate names in one of his languages. This case report is an attempt to investigate lexical access in a bilingual individual with aphasia in light of current theories.

Case Report

Mr. M, a 45-year-old, right-handed, fruit merchant was referred to the Department of Speech and Hearing (Manipal, in the southern state of Karnataka, India) for a detailed assessment of aphasia from the Department of Neurology. The neurological examination revealed right hemiparesis, right upper motor neuron facial palsy, and aphasia. He showed symptoms of finger agnosia, left-right confusion, and acalculia. The neuro-radiological examination (CT) on the third day after stroke revealed a left perisylvian infarct.

A detailed history of Mr. M.'s premorbid 'language use' revealed that his first language (L1) was Malayalam and he spoke this language, as well as Kannada (L2) equally fluently. He migrated with his parents from Kerala (a southern state of India where Malayalam is the primary language) to the adjacent Karnataka state (where Kannada is the dominant language) during his early years. Although Malayalam was his L1, he preferred Kannada to Malayalam as he frequently used the former language in social circles, as well as in his profession. The use of Malayalam was restricted within his family circle. However, he used both Malayalam and Kannada for communication on a daily basis. While Mr. M began learning Malayalam at home from birth, he began learning Kannada when he was 3 years of age. His formal education was in Kannada, though he acquired functional reading and writing skills in Malayalam in an informal context. His native fluency in Malayalam was confirmed by the second author who is also a native speaker of Malayalam. Mr. M's self-reported language proficiency pre-stroke was native like in both languages, suggesting he was a balanced bilingual.

The Kannada and Malayalam versions of Western Aphasia Battery (WAB) (Chengappa & Kumar, 2008; Jenny, 1992) were administered to Mr. M. On the basis of the test results, he was diagnosed with anomic aphasia in both languages (see Table 1). During the assessment, Mr. M. preferred Kannada to Malayalam despite his native fluency in both languages. On the naming subtest of WAB, he performed better in Kannada than in Malayalam. Further, we also noticed that in the object naming section of the WAB, Mr. M. exhibited selective difficulties in naming items in Malayalam that had cognate relations with their names in Kannada (e.g., /*pustakam*/ [Malayalam]– /*pustaka*/ [Kannada]: book). Based on this observation, we decided to probe into his naming skills in detail using a set of 100 pictures from Snodgrass and Vanderwart (1980). These pictures were individually presented through a computer monitor. Mr. M was required to initially name each picture in Kannada, followed by Malayalam. Semantic and phonemic/syllabic cues were provided during instances of failed naming attempts.

The analysis of responses further confirmed anomia in Mr. M. His performance was better in Kannada compared to Malayalam. While he could correctly retrieve 71 pictures in Kannada, only 44 pictures were correctly named in Malayalam. The naming errors comprised of semantic paraphasias, perseverations and 'I don't know' (IDK) responses. Further, he exhibited delayed retrieval in both languages though more frequently in Malayalam.

Table 1: Participant scores on various subtests of the Western Aphasia Battery (Kertesz, 1982) in the two languages

Subtests (Max Score – 10)	**Malayalam**	**Kannada**
Fluency	8	9
Comprehension	8.3	9.2
Repetition	9	10
Naming	7	7.9
Diagnosis	*Anomic Aphasia*	*Anomic Aphasia*

Cognate naming task

A cognate naming task was custom-designed by selecting a set of 28 picture stimuli having cognate names in Kannada and Malayalam (see Table 2). These cognate picture stimuli were randomly presented with 30 non-cognate stimuli (from the previously administered picture set of Snodgrass & Vanderwart, 1980). The same scheme of stimulus presentation as in the foregoing section was followed. That is, Mr. M. was required to name each picture in Kannada followed by instruction to name in Malayalam. All responses were audio-recorded for later transcription, scoring, and analysis.

Table 2: List of cognate stimuli. The English version of each stimulus item is presented, as well as the phonetic spelling of each word in Kannada and Malayalam.

Stimulus Pictures	**Kannada**	**Malayalam**
Tortoise	/a:me/	/a:ma:/
Lion	/simha/	/simham/
Tiger	/huli/	/puli/
Crane	/kokkare/	/kokkə/
Ladies finger	/benḍeka:i/	/venḍakkja:/

Horse	/kuɖure/	/kuṭira/
Mouth	/ba:i/	/va:jə/
Blue	/ni:li/	/ni:la/
Black	/kappu/	/karappə/
Teeth	/hallu/	/pallə/
Bangle	/baḷe/	/vaḷa:/
Elephant	/a:ne/	/a:na:/
Lizard	/halli/	/palli/
Book	/puṣṭaka:/	/puṣṭakam/
Hand	/kai/	/kai:/
Leg	/ka:lu/	/ka:lə/
Eyes	/kannu/	/kannə/
Nose	/mu:gu/	/mu:kkə/
Rain	/maḷe/	/maza:/
Hen	/ko:ḷi/	/ko:zhi/
Table	/medʒu/	/me:ʃa/
Leaf	/jaḷe/	/iḷa:/
Mango	/ma:vinə hannu/	/ma:ŋa:/
Ear	/kivi/	/Cevi/
Air plane	/vima:na/	/vima:nam/
Umbrella	/koḍe/	/koḍa:/
Crow	/ka:ge/	/ka:ka:/
Flower	/hu:vu/	/pu:və/

The analysis of his performance on cognate naming tasks revealed better performance in Kannada compared to Malayalam. Of the 28 cognates presented, Mr. M. retrieved the names of eight items correctly in both languages without any cues. Four items were retrieved in both languages after an apparent word-finding delay. In addition, he could retrieve the names of 14 items in Kannada with cues, and failed to retrieve their names (i.e., cognates) in Malayalam (e.gs., /*kokkare*/ (Kannada), *kokkə* (Malayalam) – crane; *a:me* (Kannada), *a:ma* (Malayalam) – turtle). Finally, he could not retrieve the names of two items in either language (i.e., /*vima:na*/ (Kannada), /*vima:nam*/ (Malayalam) – 'air plane'; /*medʒu*/ (Kannada), /*me:ʃa*/ (Malayalam) – 'table'). The distribution of Mr. M's responses on the cognate naming task is illustrated in Figure 1.

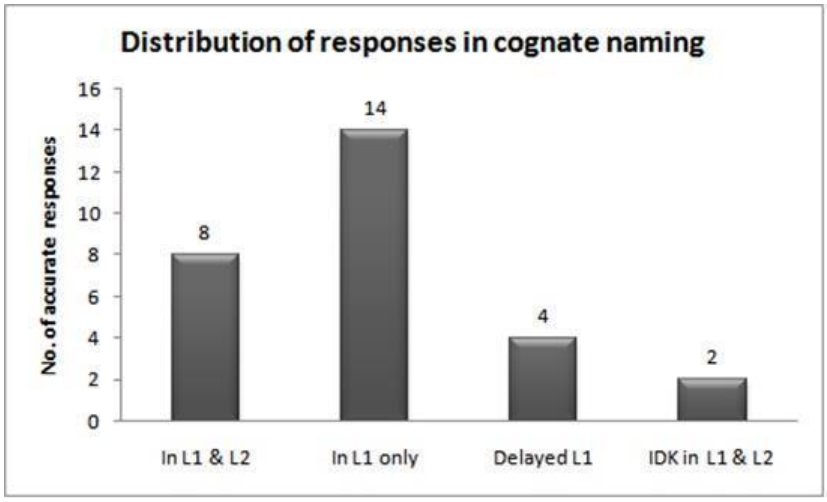

Figure 1. Participant's number of correct naming responses on cognate stimuli (28 in total). The term IDK refers to an "I don't know" response by the participant.

Discussion

The case of Mr. M. presented an interesting deficit in the retrieval of cognate names in one language following an aphasic brain injury. As mentioned in the foregoing section, Mr. M. was proficient in both languages (Kannada & Malayalam). However, he preferred Kannada to Malayalam due to social and vocational demands. His pattern of language use revealed that he was acclimatized to the use of Kannada than Malayalam. In the following section, we address the possible explanations for his selective cognate retrieval deficit in Malayalam.

According to the tenets of language-specific view of lexical access, only the lexical nodes in the target language receive activation from the activated conceptual/semantic nodes in bilinguals. That is, while naming the picture of a crane in Kannada, only the lexical form in that language (i.e., /kokkare/) receives activation from its conceptual node (see Figure 2). The language-specific view thus supports the performance of Mr. M. in Kannada. However, and

more importantly, his deficit while naming the cognate items in Malayalam poses serious challenges to the language-specific view. That is, if this view were correct, Mr. M. must have retrieved the cognate names in Malayalam when the examiner required him to name them in this language. However, he exhibited marked deficits while retrieving the names in Malayalam, leaving his deficit unexplainable by the language-specific view. In this context, below we discuss the possible explanation for his selective cognate naming deficits in Malayalam in light of the language non-specific view.

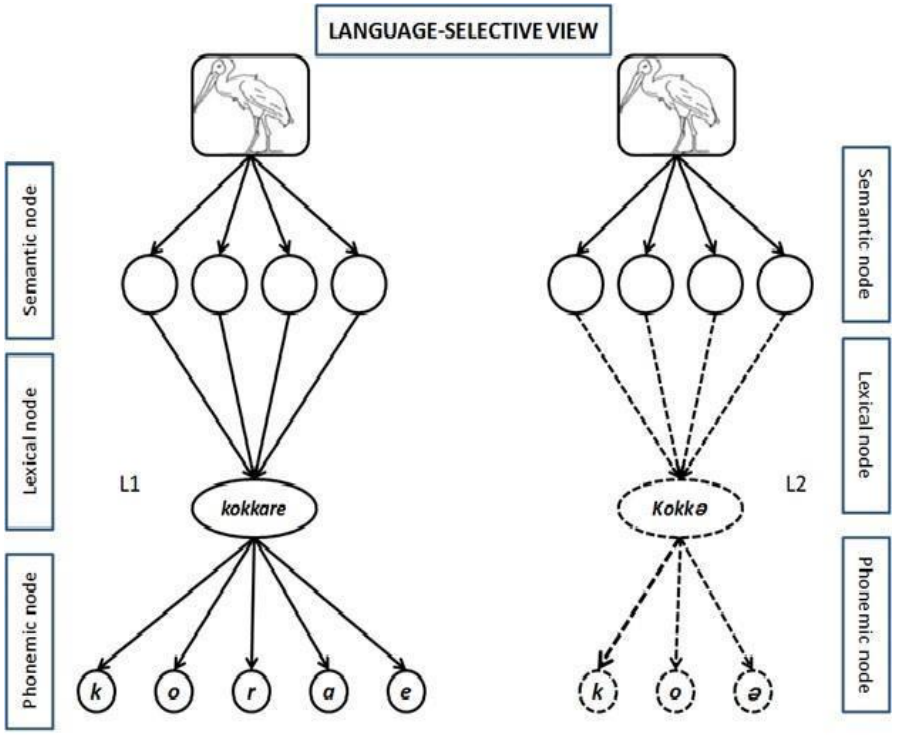

Figure 2. A depiction of language-selective lexical access according to phonemic, lexical, and semantic nodes.

According to the language non-specific view of lexical access in bilinguals, the lexical items in both languages must be activated by the conceptual/semantic nodes (Colomé, 2001; Costa, Caramazza, & Sebastian-Galles, 2000) (see Figure 3). If this were the case, the performance of Mr. M. on cognate names in Malayalam must be similar to that in Kannada. However, his performance did not endorse this view (see the cognate naming section above). We suggest that such an interpretation must viewed with caution as it is unlikely the pathological brain processes in a manner similar to an intact brain. Alternatively, it may be plausible to attribute the selective difficulty in the retrieval of cognate names in Malayalam (with comparatively preserved performance in Kannada) to the pathologically heightened inhibition of lexical items in that language (Green, 1998; Paradis, 1998) leading to an overall reduced performance in Malayalam including the cognate names.

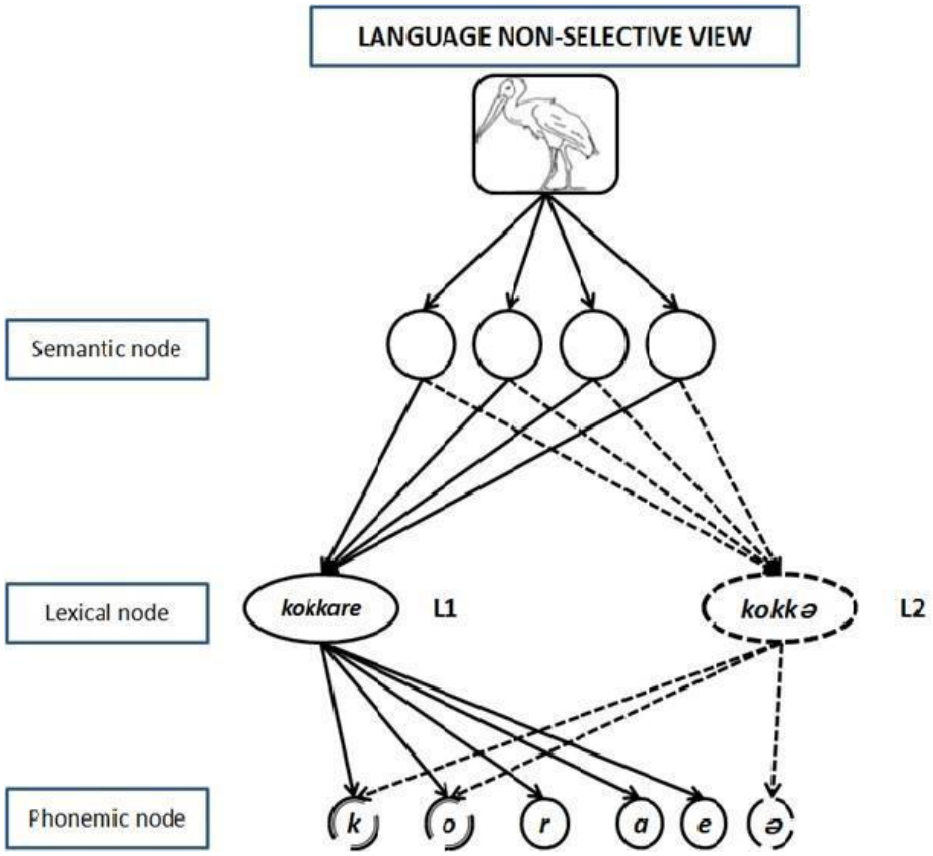

Figure 3. A depiction of language non-selective lexical access according to phonemic, lexical and semantic nodes.

Although the inhibitory control mechanism provides a plausible explanation for the current findings from Mr. M., the generalizability of this view raises some arguments. For instance, Kohnert (2004) reported of generalization of treatment effect to cognates in the non-treated language, but not to the non-cognates items in that language in bilingual aphasia. Though our case did not receive any treatment, he exhibited marked deficits while retrieving cognate names in one language, sparing the other. These seemingly contradictory observations indicate that the inhibitory control may be dynamic in bilingual people with aphasia. In this context, the 'dynamic view' of language control in bilinguals (Abutalebi & Green, 2007) may provide a viable explanation for the findings in the current study.

Applying the dynamic view to our case, the selective difficulty in retrieving the cognate names in Malayalam, a language Mr. M. did not prefer due to social and vocational demands may be attributed to stronger inhibition of that language. Further, the retrieval deficits of cognates in one language, but not in the other cannot be readily and satisfactorily accounted for by both language non-specific and language-specific views of bilingual lexical access. Thus, it may be inferred that Malayalam was under greater inhibition in Mr. M., perhaps, due to the pattern of its use compared to Kannada. It may also be noted that his performance on non-cognate items, in addition to the cognates, corroborates the heightened inhibition of Malayalam in Mr. M. irrespective of the native proficiency in this language. Thus, our case highlights the influence of preferred or frequently used language on the differential recovery of language skills in proficient bilinguals.

Conclusion

Observations from this case study therefore did not support the language-specific or language non-specific accounts of bilingual lexical access for cognates. Rather, the dynamic view of lexical access in bilinguals provided a possible explanation for his performance. In addition, findings of this study emphasize the significance of the language usage on the differential recovery of the two languages in proficient bilinguals.

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