

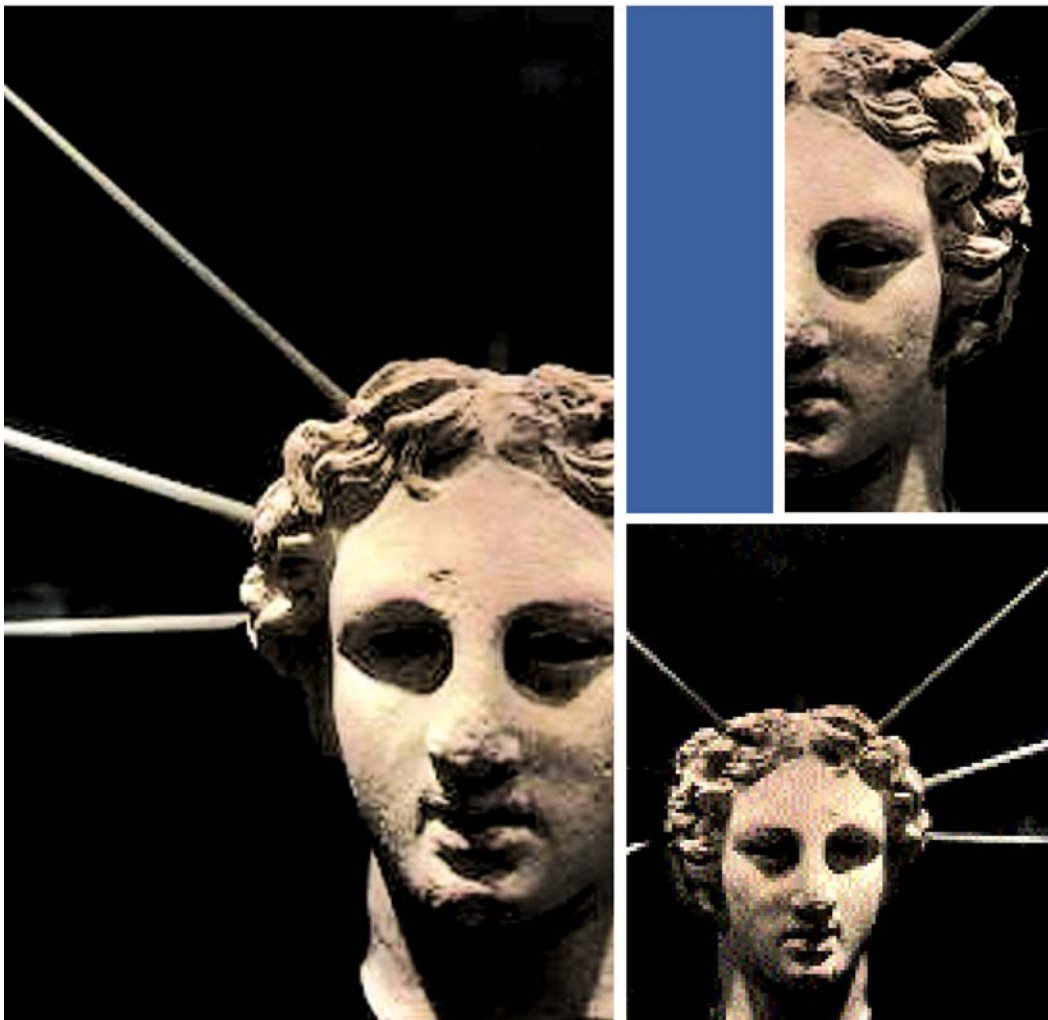
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## **Bilingual Knowledge and Cognitive Ability**

**Dr. Christo Moskovsky**



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# **Bilingual Knowledge and Cognitive Ability**

**Dr. Christo Moskovsky**

## **Introduction**

Nowadays there is general recognition of the huge role that language plays in a wide range of cognitive operations. Language is the principal medium for representing knowledge: it is the basic instrument for acquiring, storing and retrieving knowledge. A substantial part of our conscious thinking is carried out in verbal form. Language may be especially important for reasoning, particularly abstract reasoning: I am referring to those mental processes which Piaget described as 'formal operations' (Sutherland 1992) and which Vygotsky described as 'higher mental functions' (Williams 1989). It seems that such mental processes are propositional in nature and cannot be conducted without a set of basic predicative structures together with a rich coding system of signifiers. While for some specialised cognitive domains (e.g. mathematics, music) this coding system may involve some non-verbal (numerical or tonal) code, for most cognitive domains it will be language.

There is another crucially important aspect of the role of language in thinking which will be considered here in some more detail, that is, the close interrelation between lexical semantics and the individual's conceptual system. It will be contended that at least some of the cognitive advantage associated with bilingualism arises from the interplay between the bilingual speaker's conceptual system and his two lexico-semantic complexes of meaning.

The paper will also argue that the most effective way of attaining high levels of competence in a second language (SL) would be through substantial exposure to the SL very early in life.

## **The Interdependency of Conceptual and Lexical Meaning**

A very substantial part of cognition is devoted to learning about the world around us. It is a standard assumption that people translate the real world into a system of concepts. Concepts are linguistically coded into lexical meaning, and there is a complex relationship between the meaning of the word, the concept and an actual real-world object or event. Significantly, the meaning of a word is linked to a concept, not to a specific object. Thus the word 'table' is linked to the concept of table that we have, not to a specific table. This enables the speaker to use the same word to refer to a range of objects all of which share some basic properties (e.g. flat top, ...). This is one of the important functions of language in relation to thinking: lexical items effectively serve as labels for different concepts.

Of course, the conceptual system of the individual exists independently of the language: this is supported by clinical evidence from patients suffering from global aphasia (complete loss of language). Research has shown that even in the complete absence of language, individuals retain a rich and complex conceptual system (e.g. Paradis 1990). However, whether global aphasics retain the ability to reason at the same level as a normal individual is an open question (and one which is likely to remain open as it would be extremely hard to test higher levels of reasoning through non-verbal instruments).

Also, it is not the case that ALL concepts in the individual's conceptual system are linguistically labelled. However, it is not unreasonable to assume that mental operations involving labelled concepts would be easier and probably more efficient than mental operations involving unlabelled concepts. Such an assumption does seem plausible in the light of recent research (Gumperz & Levinson 1996, Bowermann & Levinson 2001) suggesting that concepts which are linguistically coded are cognitively favoured - they are preferred for cognitive categorization, they are more accessible, easier to remember, etc.

While the primacy of thinking/cognition in relation to language is not questioned, once a correspondence is established between the lexico-semantic meaning of a word and a concept, this correspondence is normally quite stable and the lexical meaning can even exert a certain restraining influence on the concept: the linguistic label may effectively limit the scope of the concept to the lexical meaning of the word. This may be particularly valid with regard to how more complex and abstract concepts are acquired or passed onto younger generations (in which language is the principal (and often only) mechanism).

Concepts exist as part of the individual's conceptual system, but concepts also exist outside of the individual: as a shared system of concepts which subserves a whole community. If this is indeed the case, then we can speak of individual concepts and community concepts. A community concept can be seen as a composite of the respective individual concepts, and as such a community concept would necessarily be larger, richer, and more complex than any of the individual concepts. One consequence of this would be that individual concepts will only partially overlap with the respective community concept; significantly, the variation among corresponding individual concepts can be not only in terms of size (i.e. how much of the community concept the individual concept covers), but also in terms of actual area of coverage (i.e. what aspects of the community concept the individual concept covers). Even in monolingual communication sometimes individuals find it easier to communicate meaning to some speakers rather than others: this may in part occur as a result of the degree of correspondence between the concepts of the two speakers. Another notable point is that community concepts would also be subject to variation among different communities. The content of a community concept would be determined at least in part by historical and cultural factors. It would be a plausible assumption that in different communities corresponding concepts would be more or less different in contents, volume, internal structure. etc.



## **Cognitive Advantages of Bilingualism**

In recent years there has been an increased interest in all aspects of bilingualism, including if and how it impacts on the individual's cognitive capacity (Baker 2001). Over the past 40 odd years experimental studies have consistently shown that knowing and using more than one language bestows a range of cognitive benefits on the individual (even in strictly non-verbal cognitive domains, such as shapes, numbers). To quote Robert Owens Jr.: "there is a very strong relationship between bilingualism and cognitive development. Bilinguals are superior in classifying objects, creativity, concept formation, memory, metalinguistic awareness, perceptual disembedding, problem solving, role taking, science concepts, social sensitivity, and understanding complex instructions. [...] even 5- to-6-year-olds exhibit higher divergent thinking, imagination, grammatical awareness, perceptual organization and reading achievement" (1996: 425). It has even been suggested (e.g. Bialystok 1999: 643) that bilingual knowledge is related to an enhanced processing capacity of the brain ("executive functioning" in her words).

It is not among the goals of this paper to review such studies and their findings. It should be noted though that there is a general agreement that in order for cognitive advantages to be obtained, the bilingual must be highly proficient in the two languages. The opposite has also been found to be valid: low proficiency in both languages has been found to be related to inferior performance on non-verbal cognitive tasks (Dawe 1983); such findings underscore the crucial role of language in relation to most (if not all) higher level thinking processes.

Why or how knowledge and use of more than one language produces cognitive advantages for the individual is to a very large extent a mystery, which is likely to remain so until we get a better understanding of exactly how language interacts with thinking. In the view taken here, one important dimension is the interaction between the individual's conceptual system and **two** lexico-semantic complexes (of meaning). It is very likely that, as a result of the availability of two linguistic labels for each concept, the bilingual speaker's conceptual system is richer and more complex, compared to that of monolinguals, and individual concepts probably have a more clearly articulated internal structure. Quite a few studies have underscored the heightened metalinguistic awareness of bilinguals: it is not unreasonable to assume that the awareness of there being two distinct lexical items (from the two languages) for each concept may prompt the bilingual individual to reflect on the contents of the concept, leading to the formation of concepts with more clearly delineated boundaries and refined content structure. In addition, these two lexico-semantic complexes are differentially related to the individual's conceptual system (Paradis 1990), because it is very rarely the case that there is a one-to-one correspondence between the L1 word and the L2 word and the concept(s) they represent: especially with more complex and abstract concepts, the L1 community concept will be somewhat different from the corresponding L2 community concept. Through the two languages, the bilingual

speaker will effectively have access to both, leading to the formation of concepts that would be richer than the corresponding L1 or L2 monolingual concepts.

The cognitive advantages are far from being the only advantages of bilingualism: there are also practical, professional, cultural, etc. dimensions whose benefits are so obvious that they hardly need to be discussed here. In a word, there is substantial evidence that knowing and using more than one language bestows a range of benefits on the individual, including enhanced cognitive capacity, while at the same time having no known detrimental effects<sup>1</sup>. The obvious conclusion therefore is that bilingualism is a highly desirable condition that anyone would be trying to achieve. The problem is that, with the exception of situations of natural bilingualism, the learning of a 2<sup>nd</sup> language usually comes at a high cost: it requires a sustained effort over a large period of time (at least a few years) and even that does not guarantee complete and lasting success. Which brings us back to a point made earlier: for cognitive advantages to hold the bilingual must be highly proficient in the two languages (it is a safe guess, that the same applies to non-cognitive advantages). Thus the pertinent question becomes: What are the conditions that can ensure long-term attainment of high levels of proficiency in two (or more) languages? The position argued for here is that this question is directly related to the notion of Critical Period for language acquisition.

## **Critical Period, Brain Development and Implications for Bilingual Education**

The Critical Period (CP) Hypothesis in essence contends that the ability to learn a language is limited to the years before puberty, after which, as a result of maturational processes in the brain, this ability disappears. Since Penfield & Roberts (1959), and especially since Lenneberg (1967), this has been one of the most hotly debated issues in psycholinguistics and, generally, in cognitive science. Despite the substantial amount of research on CP, there still remain a number of unclear and controversial issues. There is an ongoing debate on whether this phenomenon is indeed a critical period, or rather a sensitive/optimal period (Bialystok 1997, Long 1990). There are also different views regarding what linguistic ability is affected by the CP: is it only phonology (Scovel 1988), is it phonology and syntax, or is it the total language ability (Schachter 1996)? In relation to this, it has been suggested that different linguistic abilities might be subject to different critical/sensitive/optimal periods: until around six or seven years of age for phonology, and until around fifteen for syntax (Long 1990).

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<sup>1</sup> Critics might suggest '(double) semilingualism', or underdevelopment of both of the speaker's two languages, as one possible negative outcome of bilingual language development. An in-depth discussion of semilingualism and its underlying causes is clearly outside of the scope of the current paper. It should be noted, though, that there seems to be a growing consensus (see, e.g. MacSwan 2000) that semilingualism is likely to be the result of some social and economical factors, rather than a side-effect of bilingualism as such.

Nevertheless, nowadays there seems to be a wide acceptance that there is a CP for first language (FL) acquisition, with compelling evidence indicating that, unless they are exposed to language in the early years of life, humans lose the ability to learn a language, especially its grammatical system (see, e.g., Moskovsky 2002, and the sources cited there).

The situation with (adult) SL acquisition however appears to be far less clear, mostly because – in contrast to FL acquisition – language learning does take place outside of the presumed critical period, with some SL learners achieving very high levels of proficiency in the SL. Some studies have even identified exceptional SL learners, whose exposure to the SL only started after the closure off of the CP but who nevertheless attained native levels of competence in the SL, even in the area of phonology (Birdsong 1992, Bongaerts et. al. 1996, White & Genesee 1996).

It is not among the goals of this paper to contribute to the CP debate, but there are a few general aspects of SL acquisition which are relevant to the current proposal and therefore require some consideration. SL acquisition differs from FL acquisition in a number of non-trivial ways (Bley-Vroman 1989). The most striking difference is between the uniform 100% success in FL acquisition and the general lack of success in SL acquisition. No one denies the fact that the cases (reported in some studies) of arguably native attainment of the SL are extremely rare and that the vast majority of SL learners never come close to native levels of attainment even after years of continuous exposure to the SL. There is also a general agreement that there exists a correlation between age of initial exposure and ultimate attainment. Experimental studies have demonstrated that SL learners who receive sufficient exposure to the SL before the age of 15 have a strong chance of achieving native mastery of the morpho-syntactic system of the SL, while those whose exposure starts before the age of 6 have a strong chance of achieving native mastery in the SL, including the phonological system. The overall conclusion seems to be that the two decisive factors for SL success are **age** and **exposure to the SL**.

In light of this, the answer to the question formulated earlier “What are the conditions that can ensure long-term attainment of high levels of proficiency in two (or more) languages?” seems obvious. Individuals must be provided with opportunities to receive large amounts of exposure to the SL early in life: in fact, the earlier, the better. Clearly, most existing educational practices do not meet these conditions: language education is only provided in secondary or high school, i.e. around the time or after the closure off of the CP, and exposure is often limited to an hour or two per week. Immersion bilingual education – initially in Canada, but now spreading all over the globe, is a notable exception. Immersion programs have been found to provide students with very high levels of proficiency in the SL – with few or no ill effects on the development of FL or non-language literacy. It seems that early total immersion programs are the most successful ones: they start at the kindergarten level and involve 100% SL immersion. Early total immersion students have been found to achieve native (or

near-native) competence in the SL, and according to some studies (Swain & Lapkin 1991), such students have even been found to outperform their monolingual peers in FL achievement. Early total immersion programs meet most completely the conditions stated above: early exposure to massive SL inputs. However the view taken here is that even such programs do not start early enough. Evidence from brain growth on the one hand, and FL development on the other, strongly suggest that the period of time between 2 and 4 years of age is crucial for language acquisition. This is one of the periods of rapid brain growth (Epstein 2001), when language starts to play a key role in cognitive development (fusion of thought and language, according to Vygotsky); this is also when the core of the FL grammar is acquired (by the age of 4, most normal children will have acquired the morphosyntactic system of their mother tongue).

Based on the evidence presented in the studies discussed above, it would appear that immersion should start as early as the age of two and should take the form of child daycare where appropriately qualified bilingual speakers with native proficiency in the SL (but not necessarily in the children's FL) will perform the standard daycare functions, with ALL communication in the SL (including games, TV shows, movies, etc.). Children will be encouraged to use the SL for all purposes (though they will not be banned from using their FL). The program will include carefully planned and executed activities designed to evoke continuous productive use of the SL. Critics may argue that the immersion model tentatively proposed here contains some of the features of the so called "submersion" form of education, and therefore potentially some of its detrimental effects (Baker 2001: 196-7). It is unclear to me whether such risks are at hand, given that submersion models involve subjects of school age, while the current proposal targets a younger cohort of pre-school age, when the brain is particularly receptive to linguistic stimuli. Also, the model briefly outlined here does not involve SL instruction *per se* (which is a very common feature of submersion models), but rather exposure to appropriate SL input and provision of opportunities for the SL to be used in normal daily activities and, most of all, in play. Furthermore, submersion seems to create problems with the development of literacy skills, rather than basic language competence<sup>2</sup>. It is the latter that is targeted with the proposed model.

With the start of normal schooling (around the age of 6 or 7), these programs can follow the model of the early immersion programs in Canada, in which SL immersion is gradually reduced from 100% to around 50%, to give up space for FL education. A detailed discussion of the nature of these programs is well beyond the scope of this paper, and certainly deserves separate treatment.

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<sup>2</sup> In the sense of knowledge of the grammatical system of the language which enables the speaker to produce and perceive a potentially infinite number of meaningful combinations of words.

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