

Original Paper

Lexical Organization and Access: A Developmental Cognitive Approach to the Acquisition of Morphology

Noureddine Kahlaoui^{1*}

¹ Department of English Language and Translation, Qassim University, KSA

Abstract

The present paper represents a further step in the work of Kahlaoui (2000) on lexical organization and access. It was argued in this paper that the distinction between regular and irregular morphology is counter cognitive as it deprives a good deal of the lexical elements from being processed via rule abstraction (Plunkett & Marchman, 1993) only because they are processed by minor rules (Mohan, 1986). The lexicon is the modular mental component of a speaker's linguistic knowledge. It was also argued that the poor performance of dysphasic speakers on regular morphology is to be explained outside the non-natural and cognitively unwarranted distinction between regularity and irregularity. The lexicon is the sum of words – devoid of any internal structure -- known to the speaker. It was also argued that the set of word formation strategies generated/abstracted by the speaker in a developmental cognitive fashion constitutes his/her morphological system, which will be used for an automatic normal access to words. Automatic access is the normal access route via the central nervous system which is linguistically aware of the grammar it uses to access the modular the encapsulated lexicon. Access is performed through the strategy itself for both comprehension and production and happens in a non-modular fashion. Default – or emergency – access is performed in cases of accidental or mnemonic failure through a direct look-up procedure into the associative lexicon and through the central nervous system.

Keywords

first language acquisition, mental lexicon, regular and irregular morphology, access and retrieval, word formation, cognitive abilities

1. Introduction

Speakers interpret and produce words of their native language with an ease and a speed that allowed Fodor (1983, 1987) to constrain language in a perceptual module similar to those of vision (Arbib, 1987) and audition. Fodor's modular approach to the lexicon would provide only for a connectionist organization of the linguistic system and the connectionist models do not need any separate grammatical component. Grammar will be the sum of the relationships between the nodes of the

network/connections (Bybee, 1985, 1988, 1995; Elman, Bates, Johnson, Karmiloff-Smith, Parisi, & Plunkett, 1996). One would then question the necessity of separating a rule component from a lexicon of words. In fact, the speaker using morphological rules does not need a store of words since he/she can develop a word formation system capable of generating all the possible words of his/her language and, on the other hand, a speaker using rote memory and direct access to a lexicon of words does not need a set of rules to generate words which he/she already knows or new words he/she can coin by analogy. If there were no lexicon, a speaker's morphology would have to let him/her interpret variables¹ by using rules of word formation only. The speaker would then need a rule for each lexical relationship. There would be no difference between a lexicon and a morphological systemic component in such a non-abstractive morphology for the following reasons:

- i. there would be no need for abstraction, which is counter-cognitive since induction will be inhibited as a normal cognitive process;
- ii. changes in natural languages would be triggered only by mnemonic or accidental failure;
- iii. loans from other languages would always keep their source language form; the only means for productivity would be more memory for words and relationships between words;
- iv. the speaker, not knowing if the hearer has got the same set of words, will have to specify the meaning of his/her words.

(i-v) seem to warrant two separate mental components for the speaker's linguistic knowledge: a lexicon and a morphological system. Our linguistic knowledge is underdetermined by the empirical stimuli we get from the environment (Matthews, 2001) and we seem to supply it with the result of a productive systemic process that transcends memory.

The solution seems then to lie in a model that allows for a seamless lexicon (Ford, Singh, & Martoharjono, 1997; Singh & Starosta, 2003) confidently held in a modular locus (Fodor, 1987) and, at the same time, a chiefly automatic rule system and a morphological prosodic mould/matrix instrument acquired in the course of development of the linguistic system by the child (Karmiloff-Smith, 1992; Plunkett & Marchman, 1991). There will be one main automatic access route that unveils the ready-to-discover and-use lexicon and a default access through a mainly pragmatic route when the strategy route fails.

2. Representational Redescription and U-shaped Learning

Karmiloff-Smith (1986, 1992) sees language as a non-modular component – if modular requires domain-specificity as for Fodor (1983, 1987). She considers language as domain general knowledge

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- i. We use Ford & Singh (1985) distinction between the word as a lexical variable and the word as a grammatical constant. In *walked*, for example, *walk* would be the lexical variable whereas the grammatical *-ed* is a the grammatical constant.

(Kelly & Martin, 1994) that is modularized by the child in the course of his/her development. She proposes three phases for the acquisition of language:

2.1 The Pre-Redescriptive Phase

Before reaching three years and a half the child encounters his/her native language and uses it in a procedural, declarative and non-decompositional way (Kehayia, 1994, 1997). During this first phase, the child does not make a lot of errors and may appear ahead of his/her age when producing sophisticated words using mere imitation and repetition. The child is not creative at this phase and his/her knowledge is built by behavioral mastery – actual use of the language on an item by item basis -- and is implicit in the sense that the child is not aware of the relationships between words. Creativity will start with the redescription of the representations. Redescription does not distinguish between regular and irregular morphology as it treats both as generalizations extracted from the language data available to the child. For a while, the child is modeling the language instead of taking and memorizing it on an item by item basis.

2.2 Representational Redescription

When the child starts to make more and more errors, producing words like **goed* and **breaked*, that is the onset of reorganization and redescription of his/her prior cumulative mnemonic knowledge. The child is actually using the general cognitive processes – not language specific – to build an internal linguistic system (Plunkett & Marchman, 1993) in the Kantian sense. The child realizes/notices the relationships between words and extracts/induces rules such as the rule of past formation in English, say 'ADD –ed'. The rising number of errors is due to his/her willingness to automate the rule and/or fill in with the available process to explain the relationship waiting for the new observation to come up with amendments to the rule or new rules. It looks like the child is training the 'machine' of automation as he/she is upgrading its components. This phase is characterized by explicit knowledge.

From a neuroanatomical angle (Pulvermüller, 1992; Pulvermüller & Schumann, 1994), what is happening in the mean time is that the child is building some neurological associations to be used in the processes of language comprehension and language production before the myelination of synapses takes place (Lecours, 1975, 1981).

Overgeneralization, taking place during the redescription of representations phase and behaving like a pervasive error, can have two reasons in the mind of the system architect child. It can take the form of over-regularization or over-irregularization, which is contrary to what is assumed by the tenets of the Dual Access Model (Pinker, 1996; Pinker & Prince, 1994; Marcus, Pinker, Hollander, Rosen, & Xu, 1992). We also note that the abstraction process (cognitive induction) takes place as a linguistic mechanism as the child develops the cognitive ability of symbolism.

2.3 Theorizing about Language

Once the set of grammatical rules is extracted and reinforced by overgeneralization, around the age of five-six the child shows some metalinguistic awareness that occurs in the form of comments, i.e. theories (Gopnik & Meltzoff, 1997), about his/her language, thus uncovering a mental linguistic

maturity: "We don't say *leafs* because we say leaves, says a speaker of English. On ne dit pas *unieme* parce qu'on dit *premiere*, says a speaker of French talking about ordinals".

After acquiring his/her words by rote learning in the first phase and augmenting his/her store of words by means of what was extracted as rules of word formation in the second phase, thus building a morphological system, the child enters the third phase of language acquisition and starts emitting comments on language in an explicit way. The child is, thus, informing us about his linguistic system which is under construction.

3. Regularity, Irregularity, and Developmental Dysphasia

Pinker (1996) proposes that access is assumed to follow the Paninian structural distinction between "regular" and "irregular" morphologies. On the other hand, a theory of morphology is usually tested through the solutions it offers for the processing of irregulars. The field of psycholinguistics being interested in elaborating models of lexical organization, access, and retrieval, any model thereof must provide for the processing of irregulars.

3.1 Developmental Dysphasia

Specific Language Impairment (Gopnik, Dalalakis, Fukuda, & Fukuda, 1997) provided the Dual Access Model with the psycholinguistic argument that 'proves the rule' (Marcus, Brinkmann, Clahsen, Wiese, & Pinker, 1995). In fact, dysphasic subjects tested by Gopnik and Crago (1991) showed some difficulty/impairment in producing regular forms like *talked* and *walked* as opposed to their normal production of irregulars like *thought*, *taught*, etc.

Gopnik and Crago (1991) present developmental dysphasia as a grammatical problem:

At first glance, the language that the adults produce seems almost unimpaired, but careful testing reveals that this normality is only apparent. Although they have learned to cope with language, their underlying grammar remains severely impaired. The pragmatic aspects of language seem unaffected.

Gopnik and Crago (1991: 5)

3.2 Developmental Dysphasia and Representational Redescription

Even if the genetic basis of developmental dysphasia is agreed upon, the locus of the problem is not necessarily the grammar or suffixation (Gopnik, 1990). It is rather a cognitive deficit that prevents the KE family members from extracting a grammar. They show a phenotype of a more general nature which affects every aspect of their language (Vargha-Khadem, Franeh, Watkins, Fletcher, & Passingham, 1995; Fisher, Faraneh, Vargha-Khadem, Watkins, Monaco, & Marcus, 1998). They suffer from a severe orofacial dyspraxia and their utterances are not easy to understand for a non-trained ear.

However, if we look beyond morphology we may find a more plausible explanation for the dysphasic impaired performance on regulars. Unlike irregular formation, regular past formation in English requires some prosodic changes to the word. Grammar may add a syllable to the word or a second consonant to a full coda. When it happens to a dysphasic speaker who has more phonotactic constraints than normal speakers he/she may not be able to accommodate the addition. The addition may also be

inhibited by a constraint or a principle of preservation of the lexical identity of the word (Kahlaoui, in preparation a). In addition, dysphasic speakers seem to have some preference for open syllables (Leonard, 1982). They also have a fundamental constraint on the prosodic word which must be equal to a foot in its maximal and minimal size according to Piggott and Robb (1999).

If we add this above constraint to the A-templacity constraint put forward by McCarthy (1993) we may shed more light on the difficulty the dysphasic speakers encounter when they try to produce regulars suffixed with *-ed* or *-s*.

4. Lexical Access

The disparity in production between dysphasic speakers and normal speakers led the tenets of the Dual Access Model – the essence of the Dual Access Model -- to conclude that regulars are accessed via a symbol-concatenation rule while irregulars are accessed directly through a look-up procedure into a declarative a declarative memory. Their argument draws heavily upon the notion of frequency (Newmeyer, 1997; Jesheniak, & Levelt, 1994) as surface frequency seems to influence Reaction Times in normal speakers during the processing of irregulars but does not influence the processing of regulars (Royle, Jarema, & Kehayia, 1998). Still, these results cannot warrant the distinction between regular and irregular morphology and the setting of a dual-route model because the rules/strategies used for regulars, say the plural *-s* suffixation or the past *-ed* suffixation, are pervasive through the language and their pervasiveness gives the speaker more speed. The strategy for passing from *think* to *thought* or *give* to *gave* does not have a similar number of members and frequency is an actual surface one that could not possibly provide enough training for the speaker.

Once the morphological explanation is dismissed, it will be no longer warranted to distinguish between an access via symbol rules for regulars and another one that uses a look-up procedure for irregulars. The developmental framework set by Karmiloff-Smith predicts the acquisition – say construction – of a redescriptive cognitive grammatical system to be used by the child in an automated way in the normal course of language use. Default access is carried out by means of a look-up procedure that accesses a lexicon organized in a connectionist fashion (Bybee, 1995).

On the other hand, the use of Word Formation Strategies, i.e. the morphological system, to access the mental representations of words is performed through the central nervous system which showed to be as fast as the modules (Marslen-Wilson & Tyler, 1987). By happening through the central nervous system, morphology is aware of the structure of words. Modularity encapsulates the lexicon. The lexicon encapsulates words but the central nervous system has the grammar that reads into that lexicon as we speak and as we comprehend language (Kahlaoui, in preparation b). Irregulars even when they are really irregulars because English irregulars showed to be governed by minor rules (Mohan, 1986) will be accessed through the same rule reading system but probably through prosodic molds that can stand for rules. The look-up procedure is a necessary route for accidental failure that prevents the well-functioning of the rule route. Memory seems to need organization and organization is about rules.

When we fail the automated route of lexicon reading the look-up procedure -- mostly pragmatic -- is activated.

5. Conclusion

We tried to look at lexical organization, access and retrieval from a cognitive developmental point of view and revisited the fundamental argument for the Dual Access Model by searching for alternative explanations for the poor performance on regulars in dysphasic speech. The idea was that such explanations should not rely on the non-natural and cognitively unwarranted distinction between regularity and irregularity in morphology. We proposed a modular lexicon of seamless words and a central systemic morphological component that guides the speaker into the lexicons through its awareness of the composition of words be it segmental or prosodic. Emergency access, in cases of failure of the normal access, is achieved through a 'manual' search into the lexicon but again through the pragmatic or prosodic system available in the central nervous system.

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