Direct Procedural Memory Engagement in Adult L2 Pedagogy

– EXCERPTS –

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Abstract

One aspect of effective secondary language pedagogy is successful abstraction of grammar rules into implicit memory; this experiment will explore the capacity of late L2 learners to acquire natural language grammars implicitly through aural stimuli. Two groups of adult Japanese language learners will learn a grammar concept in one of two ways: one that should engage declarative memory and one that should engage procedural memory. Student performance will be tested in a grammaticality judgment task. The research hypothesis is that students can use implicit learning to acquire simple grammar rules directly for perceived stimuli as well as new stimuli. Predicted results have implications for second language curricula and cognitive memory models.

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The use of implicit memory is a topic of great concern in second language (L2) acquisition. Adults go about learning L2 in a vastly different manner than the way they acquired L1. L2 strategies typically focus on explicit learning followed by automatization (Skehan, 1998). But such techniques may overlook a powerful tool in implicit learning, which arguably is the primary means of L1 acquisition. Implicit learning is a vital aspect of human cognition; as stated by Howard and Howard (2001), "[implicit learning] enables organisms to adapt to new environments just by being in them" (p. 798). The primary aim of this research is to discover implicit learning avenues in adult L2 acquisition.

To investigate such matters requires a theoretical framework. We will take the declarative/procedural (DP) model as a starting point. The DP model asserts that in mental representations of language, the Lexicon (mental dictionary) is distinct from the Grammar (syntactical rules), just as explicit memory is distinct from implicit memory (Ullman, 2001). The lexicon, which stores memorized words and relevant knowledge, is a part of declarative memory, an explicit memory system. Declarative memory functions as an associative memory store with arbitrary mappings. Grammar, on the other hand, is stored mostly in procedural memory, an implicit memory system that manages unconscious cognitive and motor skills and habits. Ullman (2004) indicates that likely only regular grammar rules are stored in procedural memory; irregular and non-productive rules must be memorized explicitly in the DP model. At grammar retrieval time, the declarative and procedural systems run in parallel. If the declarative system produces output (e.g., if an irregular rule is in play), then output from the procedural system is suppressed. This model predicts double dissociations between lexicon and grammar; evidence

for this has been shown with neuroimaging techniques and in aphasias (Ullman, 2001; Ullman, 2004).

This provides a basis for L1 grammar rules in implicit memory; it is not obvious, however, that grammatical rules for L2 could be encoded solely in procedural memory. Wannagat (2007) attributes deficiencies in a Hong Kong L2 immersion system to constructivism: because the instructor does not challenge students to speak and create sentences in L2 spontaneously, the students cannot learn L2 properly. Despite hearing L2 with greater frequency, these students were less proficient in L2 compared to students who practiced creating sentences. In this way, learning a second language seems to require construction. However, this may be due to the teacher providing concurrent translation of L2 sentences into L1 equivalents. Students then are free to disregard L2 and only listen to the language they already know. Furthermore, while it may be the case that total language ability is dependent on constructive practice, the present study will focus only on a small subset of language ability, viz. grammar recognition.

Many language teaching techniques rely on explicit learning of a rule and then attempts to automatize that rule through practice. Skehan (1998) describes the enduring L2 pedagogy based on the 3Ps: presentation, practice, and production. First the teacher presents a discrete grammar production rule. This process engages the declarative memory system as students focus attention on this rule. The students then practice the rule with a number of straightforward examples in an attempt to somewhat automatize the knowledge, hopefully entering it into procedural memory. Finally, the students try to produce new sentences that exemplify the use of the grammar pattern. This system relies heavily on the declarative memory system; it will likely produce students with good explicit knowledge of the grammatical point. However, children do

not learn L1 in this fashion, instead picking up complex grammars through mere listening and imitation. Although there are certainly developmental issues at work in the differences between child and adult language acquisition, it seems well worth asking if older students can bypass declarative memory in L2 through implicit learning techniques.

Implicit learning is traditionally studied through Artificial Grammar Learning (for a discussion of current theories, see Pothos, 2007). A significant focus of AGL studies is determining whether acquired knowledge is explicit or implicit in nature (Pothos, 2007). AGL studies typically proceed in this manner: researchers use a finite state machine to decide a language of letter strings, then give subjects an implicit learning task to learn the grammar rules behind it. Subjects are presented with a sequence of strings that are grammatical in the fabricated language. They are not explicitly told to determine the rule that governed the creation of the strings; in fact, to do so may be detrimental to the implicit memory task (Howard & Howard, 2001). Subjects are then presented with test patterns and told that the strings are determined by a set of rules; they are asked to discriminate between strings that conform to the rules (G), and strings that do not (NG). Subjects are generally able to determine whether sentences are G or NG (Pothos, 2007).

There is evidence to suggest that this discrimination in AGL is implicit in nature. Learned rule systems have been shown to transfer in part to different symbol systems (Shanks, Johnstone, & Staggs, 1997); that is, when researchers substitute symbols into a learned artificial grammar, subjects are able to decide grammaticality of the new symbol system to an extent. This shows that the rule-based knowledge is not likely stored in an associative memory system. The implicit

nature of AGL is also supported by amnesics showing performance in AGL tasks equal to that of normal subjects (Knowlton & Squire, 1994).

The mechanisms of implicit learning with AGL tasks are hotly debated (Pothos, 2007), but abstractions suitable for our purposes can be made. Recent work by Scott and Dienes (2008) shows that similarity of stimulus to a stored pattern prompted feelings of familiarity, which feelings predicted grammaticality judgments. It is clearly important for input stimulus to closely match stored rules: a study showed that learning legal word pairings alone was not enough to generalize a rule into abstract knowledge (Gomez & Schvaneveldt, 1994). Kinder, Shanks, Cock, and Tunney (2003) connect implicit learning with the implicit memory system. By this theory, recollection (explicit recall of an experience) and fluency (making memory decisions without specific recollection) also apply to implicit learning tasks such as AGL. Fluency may come from repetition; thus more frequently encountered stimuli should show direct benefits in processing. This means that previously experienced grammatical strings should be recognized faster; but if we take familiarity into account, strings that are similar to previously perceived grammatical strings should show a frequency effect as well.

There is reason to believe that age has an effect on procedural memory (for a discussion, see Hernandez & Li, 2007). Some evidence indicates that late learners of L2 may rely more on declarative memory than on procedural (Hernandez & Li, 2007); eventual skill in the language may then depend on the ability to transfer this declarative knowledge to the procedural system. However, Howard and Howard (2001) show that not all hope is lost for older learners: both older and younger subjects were able to gain implicit benefit from acquired patterns in a Serial Response Time task. Furthermore, it was shown that implicit learners in this study were not able

to explicitly state the learned pattern, showing that this knowledge had no declarative component. Both old and young subjects showed impaired performance in the task when told to attempt to discover the pattern.

The present study will focus on implicit learning of natural language rules through audition. De Jong (2005) preliminarily studied whether grammar can be learned solely through listening. The study showed that groups presented with a grammar point aurally likely gained some implicit knowledge, although explicit knowledge may have been a factor as well. While this data is not conclusive, it does show promise for aural absorption of grammatical rules. The present study will use aural presentations of grammar concepts in videos. The use of video will make semantic meanings clear, and will focus listener attention on semantics instead of on discovering a pattern. This also relieves the need to explicitly look up L2 words in the lexicon, which would divert attention from semantics.

This study seeks to discover if natural language grammar rules can be implicitly learned by L2 learners through audition. Two groups will learn a new grammar rule through different methods: one expected to engage declarative memory and one expected to engage procedural memory. Results will be compared against expectations to determine if implicit memory is used in grammaticality judgments for new sentences. Late learners will be studied, as they will likely show a greater discrepancy between procedural and declarative memory; it is likely that results will hold true for younger adult learners as well.

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