**Adult second language acquisition: A selective overview with a focus on the learner
linguistic system¹**

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Abstract

This review article selects and elaborates on the important issues of adult second language acquisition research in the second decade of the twenty-first century. The fundamental question of whether adult second language acquisition and child first language acquisition are similar or different is addressed throughout the article. The issues of a critical period for acquisition, the importance of the linguistic input, and processing are discussed. Generative as well as usage-based perspectives are considered. Future research concerns and promising areas of investigation are proposed.

Key words: Critical Period Hypothesis, the Bilingual Turn, linguistic input, generative approaches to SLA, usage-based approaches to SLA, processing

¹ I am grateful to three anonymous reviewers for giving me excellent suggestions on clarity as well as substance, I regret that I could not incorporate even more of their suggestions than I did. Thanks also go to Tiffany Judy, who read the whole text in a preliminary version and helped me to enhance the accessibility of the exposition. All errors and opinions are mine.

1. Introduction

In every review of an extensive body of research (such as, for example, the body of work investigating adult second language acquisition, SLA, or L2A), the author is inevitably faced with the hard choice of what issues to cover, from what perspective, and whether to go for a chronological or for a current-situation approach. In making these choices, then, I have been guided primarily by two considerations. The first is that the research reviewed should fall into the remit of the journal *Linguistic Approaches to Bilingualism*; that is, it should represent formal and cognitive approaches to SLA that are based in a grammatical or psychological theory of language. This means that I will not attempt to cover much of the interesting research on aptitude, individual differences, motivation and the social factors that affect SLA, that is, the acquisition process from a learner's perspective. I will focus instead on what system of mental representations (mental grammar) learners build in the acquisition process, what prompts learners to go from one (relatively) steady state to another; and how they use this mental grammar in their language production and comprehension.

Secondly, and not only for space reasons, I have mostly chosen to skip chronology and to present issues of current concern. Thus, for example, I am not going to spend much time on the issue of what constitutes the initial state of SLA, since it seems that not too many researchers have been inspired to make new claims about this matter in the last decade. This current lack of research interest in the topic does not mean that we have solved the matter to everyone's satisfaction, nor that we have a definitive answer to the question "What constitutes the initial state of L2A?" (Meisel, 2011:91). Perhaps it is altogether too optimistic to expect that answers to seminal questions within a scientific discipline will inevitably reach some sort of relative consensus (just think of global warming). In my fifteen years of following and engaging in L2A

research, I have already witnessed “hot issues” come to the front of the collective mind, and then recede from mind without being definitively settled. There may not always be a good answer as to why these shifts of attention happen. In this review, I will not try to admonish the field collectively for leaving research questions unsolved and moving on; instead, I will try to reflect (admittedly, from my point of view) on what the current concerns of the field seem to be and what kind of evidence might help settle (some of) these concerns. The following issues will be reviewed as representative of current concerns: the Critical Period Hypothesis and the related issue of near-native competence; the importance of input as treated by UG-based and usage-based approaches; language processing, access and inhibition as explanations of L1-L2 acquisition differences. Throughout the article, I will be considering the fundamental question “To what extent is second language acquisition similar or different from child first language acquisition?” (Bley-Vroman, 1989, 2009).

2. The Critical Period Hypothesis

Language may be like other neurological development processes (such as the ocular development in kittens, Hubel & Wiesel, 1970) and have a critical period early in life, after which no amount of experience can bring the development to normal ranges. Alternatively, many researchers argue that language development may have a sensitive period, after which some impairment normally occurs, but problems can be occasionally compensated and reversed (Hensch, 2004). First language acquisition research (e.g. Curtiss, 1977) has established that failure to engage the “language acquisition device” in children through exposure to meaningful input (due to deprivation or isolation) results in severe linguistic deficits that cannot be overcome by subsequent exposure to language. However, L2 learners already have a native language, and

the deficits found in linguistically deprived children are unlikely to be demonstrated in them (Lenneberg, 1967: 176). In principle, it is possible that there is a critical period for first but not for second language acquisition. Johnson and Newport's (1989: 64) discussed the "exercise theory" (i.e., as long as the language-learning capacity is exercised once during the critical period, it remains available during the life-span) and the "maturational state hypothesis" (the language-learning capacity for first as well as second languages declines or disappears with maturation), coming on the side of the latter. These two positions in the field of second language acquisition have recently solidified without getting much closer to each other. The first position answers the fundamental question "To what extent are L1A and L2A different?" by maintaining that qualitative and quantitative differences exist between the two types of acquisition. For example, Long (2005), DeKeyser and Larson-Hall (2005), and Hyttenstam and Abrahamsson (2003) argue that it is impossible for adult near-native speakers to attain native-like grammars, when all facets of the grammar such as pronunciation, perception, syntactic representation and processing are investigated. In these authors' opinions, the incidence of native-like performance among early-onset bilinguals is also less common than it was previously assumed. On the other side, researchers contend that there are quantitative but not qualitative differences between L1A and L2A. In other words, the language acquisition mechanism is essentially the same through the lifetime, adjusting for other age-dependent faculties. Birdsong (2005), Flege (2009), Montrul (2009), Muñoz and Singleton (2011), Rothman (2008b), Singleton (2005), Slabakova (2008) argue that native-like attainment of the grammar is warranted; quality and quantity of linguistic input as well as language proficiency play bigger roles than previously assumed; sensitive periods for some but not for other modules of the grammar and even for specific grammatical properties can be uncovered.

Two large-scale recent studies addressing the Critical Period Hypothesis should be cited, those of Abrahamsson and Hyltenstam (2009) and Dekeyser, Alfi-Shabtay and Ravid (2010). Both studies are a considerable improvement over previous work addressing the CPH in terms of number of subjects, variety of tests, and statistical treatment of the data. DeKeyser et al (2010) test around 75 Russian learners of English and 64 Russian learners of Hebrew on a comprehensive 204-item grammaticality judgment task adapted from Johnson and Newport's (1989). A verbal aptitude test similar to the SAT was used in Russian, the native language of the learners. Correlation analyses reveal a steep decline in the scores on the grammaticality judgment task before age 18 in both groups, followed by an essentially horizontal slope until age 40, that is, an L-shaped function. In other words, age of arrival was a predictor of ultimate attainment in the L2. Verbal aptitude was a predictor of grammar score only in adults who started learning English or Hebrew between the ages of 18 to 40, but not in the group who arrived as children and adolescents.² What one would wish to see in this study is a comparison group of native speakers of the same number and similar education profiles as the non-native speakers, scatter-plotted together. Only then would claims of "ultimate attainment" in grammar make sense in such experiments, since we don't know how natives would score on this particular GJ test.³

Abrahamsson and Hyltenstam (2009) reports on a large-scale, labor-intensive study of the competence of L2 speakers of Swedish, perceived to be near-native by native speakers. The

² A possible criticism of the DeKeyser et al. (2010) study is the reliance on a verbal aptitude test in the learners' native language, Russian. These early learners of L2 English and Hebrew may be heritage speakers of Russian, that is, incomplete and/or attrited speakers of Russian, in which case their performance on an aptitude test in the heritage language will tell us little about their true verbal aptitude. This is a possible explanation for the lack of correlation between aptitude and GJ score among the early arrivals. Thanks go to an anonymous reviewer for suggesting this point.

³ A further consideration is the exclusively aural presentation of the GJ sentences, since adult learners' speech perception in the L2 may be a barrier to good comprehension and correct judgment. Since written stimuli might present a difficulty for participants with lower levels of literacy, simultaneous written and aural presentation might be best suited for studies of linguistic competence.

researchers started out with 195 native speakers of Spanish who were very advanced learners of Swedish and were living in Sweden. A panel of 10 native judges evaluated the native-likeness of those participants' speech samples, interspersed with some native speaker speech samples. The findings demonstrated that only a small minority (5%) of those bilinguals who had started their L2 acquisition after age 12 were perceived as native speakers. However, a majority (62%) of those with an age of acquisition below 12 were deemed to be native-like speakers by at least nine of the ten judges. A second experiment involved 41 participants that were considered native-like by a majority (>6) of the native judges; these were divided into 31 child learners and 10 adolescent and adult learners. The experiment comprised 10 tests covering from phonetic perception and production, through grammar and inferencing, to formulaic language. An important advantage of this experimental design was that it established native speaker ranges for all tests, and then checked how many of the L2 speakers fell within those ranges. Only three of the child learners and none of the adolescent or adult learners performed as native speakers on the whole array of 10 linguistic tests. The authors concluded that complete native-like acquisition after puberty is impossible.

The conclusions of the two studies reviewed above are disputed from two main perspectives. As Flege (2009) argues, the interpretations of such findings imply that late learners receive input equal in quality and quantity with early learners; however, they do not use it in similar ways so as to reach a native-like grammar. There is a dangerous confound in such an interpretation, since in most cases early learners have been exposed to decades of native input while late learners have enjoyed significantly less exposure. An interesting twist in this debate is offered by the case of heritage speakers (Montrul, 2009), who should be more successful than adult learners since they are child learners. Montrul (2009) reported overall results from a large-

scale study comparing 70 post-puberty L2 learners and 67 adult heritage speakers in different areas of Spanish morphology and syntax. She demonstrated both comparable error patterns for the two groups as well as advantages for the early bilinguals in some areas, arguing that an early start may not be crucial in language acquisition while maintaining high-quality linguistic input may be just as important.

Secondly, many researchers have argued on theoretical grounds, and continue to demonstrate, that native-like attainment is possible for some learners with respect to some modules of the grammar, and even individual properties within modules. For example, Montrul and Slabakova (2003) found that 19 out of 64 participants (30%) performed within the range of native speakers on two tasks of aspectual tense interpretation deemed to be particularly difficult (Preterit and Imperfect past tenses). Based on this and many other studies, Slabakova (2006, 2008) argued that there is no critical period for the acquisition of phrasal semantics, while functional morphology may be the real bottleneck of L2 acquisition. Sorace and her colleagues (e.g. Sorace, 2011) have identified the syntax-discourse interface as the area of the grammar most likely to remain an insurmountable obstacle for near-native L2 speakers (more on this below). In short, while pronouncements of near-natives' global failure to attain native-like grammars may ring true, a number of researchers are interested in identifying areas of successful acquisition with a view of understanding the reasons for success and failure. Access to abundant linguistic input as well as to the innate hypothesis space may still prove to be key in this inquiry.

A recent study that addresses the Critical Period Hypothesis in the L2 acquisition of complex syntactic structures is Kim and Goodall (2011). The authors start from the conjecture that there is no need to presuppose age of acquisition would equally affect all areas of the grammar, and that linguistic theory is in a position to predict differential difficulty for principled

reasons. The study compares accuracy on two types of constructions: *wh*-islands that are arguably unacceptable for processing reasons and *that*-trace effects, assumed to be ungrammatical for purely syntactic reasons. Sentences in (1) and (2) exemplify islands and *that*-trace violations (copies of movement are shown crossed out).

- (1) a. *Who do you wonder [whether [Ann saw ~~who~~]]? (wh-island)
b. *Who do you believe [the claim that [Ann saw ~~who~~]]? (complex NP island)
- (2) *Who do you think [that ~~who~~ will see Mary]]? (that-trace violation)

The prediction was that, since processing island violations is extremely taxing for natives and learners alike, learners who have acquired *wh*-movement would obey island constraints (at least to the extent that natives do). On the other hand, the recognition of *that*-trace effects as ungrammatical in English depends on an operation for which there is very little evidence in the input, hence the authors predicted that the successful acquisition would be laborious and slow, reflected in lower accuracy. Native speakers of English as well as early and late learners of English with Korean (a *wh-in-situ* language) as their native language participated in the study, the cutoff point being the age of 12. Group results on two GJ tasks demonstrated that both early and late learners were sensitive to islands, but none of the learner groups were sensitive to *that*-trace effects. Keeping in mind that learners were dealing with unacceptable sentences that were long and taxing to compute, and that both types of test items looked superficially similar and were equally long, it is hard to explain the differential accuracy of the learners on the two types of violations. At least in this respect, the Critical Period Hypothesis did not make the right predictions for acquisition, while psycholinguistic and syntactic theory did.⁴

⁴ This interpretation of the results depends on an assumption of a language processor dependent on the grammar, and processing as indicative of underlying grammatical competence. Even if such an assumption is unwarranted, this study underscores that any formulation of the CPH has to make precise predictions about what age effects are expected for the various language modules.

One other issue related to the Critical Period Hypothesis has very forcefully come to the forefront recently, the Bilingual Turn issue (Ortega, 2009: 25-27). Following Cook (2008) and Singleton (2003), Ortega argues that bilinguals should no longer be compared to monolingual controls in the whole of the L2A research, but particularly so in the critical period research. There are many reasons why monolingual-bilingual comparisons look more and more like comparing apples and oranges, but arguments from neuroscience seem particularly compelling. The seemingly trivial observation that experience changes the mind/brain has now been well established (see Bialystok, 2009 for one review). In the bilingual experience, the most important fact that may have an effect on neural pathways is the well-supported observation that while a speaker is using one language, the other language is also activated but has to be inhibited. As Bialystok puts it,

“[T]his situation creates a problem of attentional control that is unique to bilinguals – the need to correctly select a form that meets all the linguistic criteria for form and meaning but is also part of the target language and not the competing system. The need to control attention to the target system in the context of an activated and competing system is the single feature that makes bilingual speech production most different from that of monolinguals [...]” (Bialystok 2009: 3-4)

If we take this cognitive difference seriously, we immediately see that monolingual-bilingual comparisons are not completely fair and may be underestimating bilinguals’ achievements. Furthermore, the languages of the bilingual individual interact. There is extensive literature on bidirectional influence in L2A, both from and back to the native language, affecting lexical semantics, morpho-syntax, etc. (Cook, 2003; Kroll, Gerfen, & Dussias, 2008; Pavlenko & Jarvis, 2002). From a generative perspective, Haznedar & Gavruseva (2008), Montrul (2004),

Rothman (2008a) have argued that the input of monolinguals and bilinguals is too varied for direct comparisons to be justified. One concrete methodological performance, Sorace (2011b) argues that the best controls for L2 experiments are early bilingual native speakers who maintain control over both languages through continued exposure. Her rationale is that such speakers have developed linguistic competence and optimal executive function abilities for the two languages. Slabakova (2011), on the other hand, argues that late but very proficient (advanced and near-native) bilinguals tested in their native language should be the best controls for L2A experiments. What such controls would have in common with adult L2 learners will be exposure to a second language in adulthood, thereby comparable inhibitory control mechanisms. Studies that include both bilingual and monolingual controls would be most informative. This is an issue that is starting to be debated widely in the L2A community; other proposals and extensive debate will certainly come in the future.

To summarize the Critical Period issue, the two main positions are: a) L1A and L2A are fundamentally different, in other words, there are qualitative *and* quantitative differences between them; and b) L1A and L2A are not fundamentally different, although there are quantitative differences between them, and factors such as proficiency as well as quality and quantity of the input are crucial. The Bilingual Turn discussion questions the legitimacy of the native/non-native comparison in the first place.

3. Input

Language acquisition input comprises all the comprehensible primary linguistic data that learners are exposed to. However, different frameworks have worked with slightly different assumptions of what “input” is, which would be useful to clarify. Instructional, or pedagogical, approaches to

L2A scrutinize the input and interaction that go on in language classrooms, discussing, for example, the effects of recasts versus explicit correction versus prompts for correcting the wrong form, etc. Usage-based (statistical learning) accounts have placed scrutiny of the natural linguistic input at the core of their scientific inquiry (see next section). As in usage-based accounts, the primary linguistic data has always been recognized as crucial in setting parameter values within the generative framework (together with innately provided parametric options). Recently there has been a new and welcome push towards a formal treatment of synchronic variation in the input, both in language production and in language acquisition (see Roeper, 2000; Kroch, 2001; Crain & Pietroski, 2002 for similar approaches). Charles Yang's Variational Learning Model, which unifies parameter setting with general learning mechanisms based on frequency of parametric evidence in the input, is gaining theoretical and empirical support (Yang 2002, 2004, 2010). The main idea of this model is that parameters are indispensable in constraining the hypothesis space of the child, but a parameter supported with abundant and unambiguous evidence in the input will be learned earlier than a parameter for which the supporting evidence is scarce. More concretely, this learning model considers the frequency of unambiguous input (what he calls a parameter "signature") in proportion to all the input relevant to that parameter. An example of a very early set parameter is that of Verb Movement in French, where children's verbs preceding negation *pas* are almost all finite at the age of 1;8 (Pierce 1992). The crucial evidence, or the signature, that drives the French child to posit the [+verb movement] value of the parameter comes in sentences where the verb is to the right of the adverb or negation, as in (3).

- (3) Jean voit souvent/pas Marie
 Jean sees often/not Marie

‘John sees Mary often. / John does not see Mary.’

Such sentences amount to about 7% of all child-directed input (Yang 2004: 455). On the other hand, the V2 parameter in German is unambiguously evidenced only by sentences where the object or some other constituent is in the sentence-initial position and the verb precedes the subject, as in (4):

(4) Gestern ist Steve Jobs gestorben.

yesterday is Steve Jobs died

‘Yesterday, Steve Jobs died.’

Such data only comes at the frequency of 1% in child-directed speech, which results in a relatively late acquisition at the 36–38th month (Clahsen, 1986). Thus, even if parameter values are available to the child, representing Chomsky’s (2005) first factor in language design, the second factor, that is, experience, can make a crucial difference.

The effect of variable input on child language acquisition is demonstrated in a recent study by Miller and Schmitt (2010). The authors take advantage of existing dialectal differences in Spanish to test a situation that they could not have created experimentally. Chilean Spanish and Mexican Spanish differ in phonetic realization of plural morphology. In Mexican Spanish, plural is overtly realized as [s] on nouns, adjectives and determiners, while in Chilean Spanish (subject to sociolinguistic variation) this piece of inflectional morphology undergoes a regular process of lenition to aspiration or to nothing. Plural morphology is not completely absent in Chilean Spanish, but it is rendered unreliable as linguistic evidence, being pronounced about 50% of the time. Miller and Schmitt (2010) report on the production of adults as well as children (mean age of 5;2-5;3) of different socio-economic groups: middle-class and working class, tested by three different tasks. Both younger and older Mexican (working-class) children were

significantly more accurate than their Chilean counterparts. The authors argue that the more variability/ambiguity in the input there is, the longer it will take the learner to converge on the adult grammar.

While Miller and Schmitt (2010) study the effects of variability in the input (which leads to ambiguity of inflectional morphemes), Meisel, Elsig and Bonnesen (2011) address the effects of quantity and quality of the input on adult native grammars. French has a variety of interrogative constructions, some used more often in colloquial speech and others in more formal varieties. For example, subject-verb inversion as in (5) is almost non-existent in the input to children before they go to school and are exposed to standard French there.

(5) Quand arrive le train?

when arrives the train

“When does the train arrive?”

The main point of the article is that if children are not exposed to an interrogative construction before they go to school, then this construction will be learned as a second language construction and will be inherently unstable in their grammar. Meisel et al (2011) tested 20 adult native speakers using a grammaticality judgment task. While the standard French interrogative constructions that are supported by evidence in colloquial French (subject-clitic inversion, complex inversion) were judged consistently by all participants, the ones which are only present in standard French (stylistic inversion) exhibited a lot more cross-individual variety as well as more intra-individual inconsistency. The authors interpret this behavior of native speakers as “afflicted by persistent optionality” (p. 380) and essentially indistinguishable from that of second language speakers.

This conclusion raises the very interesting questions of what comprises native and non-

native knowledge of language (see also discussion in the previous section) and whether colloquial rules, standard grammar rules or normative rules should qualify as being part of the native grammar. Obviously, if limited exposure to particular constructions results in optionality in native grammars, then non-native grammars, also characterized by variability and optionality, are highly native-like indeed, at least as far as these constructions are concerned! This type of reasoning is supported by another recent body of work, that of Dąbrowska and colleagues (see LAB 2:3 epistemological issue for a review and commentaries). For example, Street and Dąbrowska (2010) argue that simple sentences employing the quantifier *every* (e.g., *Every cat is on a mat*) and the reversible passive voice (e.g., *The soldier was hit by the sailor*) present a comprehension challenge to low-educated native speakers of English. One possible explanation for these findings could be that people without much formal education do not often encounter sentences with passives and with quantifiers.

In this section, I have taken an indirect route to emphasizing the importance of the input for adult L2 acquisition. Data has come from child and adult native language production and comprehension, demonstrating that full competence is dependent on quality and quantity of the input. Showing that exposure to linguistic input is the best explanation for variation in native language production and comprehension has underscored a critical implication for L2A. Non-native grammars are not the only ones to be characterized by variability and optionality; native grammars are also characterized by similar levels of variability and optionality, if the linguistic input to the learners is unreliable and can be construed as ambiguous. This conclusion based on first language acquisition dovetails nicely with the point about heritage language acquisition highlighted in the previous section. Reduced input is a primary cause of the incomplete first language acquisition that may characterize heritage speakers (Montrul, 2008). Thus the linguistic

input emerges as a key factor (maybe even *the* key factor) in the answer to the fundamental question of L1-L2A differences. See the other articles in this issue for the importance of the input in simultaneous bilingualism and child L2 acquisition.

4. Usage-based versus nativist accounts

While input is recognized as *a* crucial ingredient for successful acquisition in generative approaches, crucially working in association with Universal Grammar, input is *the only* important ingredient, together with general cognitive skills and operations, in usage-based approaches to language acquisition. Within these approaches, language is treated as a complex adaptive system involving multiple agents: the speakers as well as the speech community. The system is adaptive in the sense that speakers' behavior is based on their past experience. The structures of language emerge from interacting patterns of experience, social interaction, and general cognitive processes. While there is a lot of disagreement within usage-based explanations of language acquisition, the most important divide seems to be on the issue of whether or not symbolic representations of language in the mind exist. On the "no" side, connectionist models (e.g. McClelland, Rumelhardt & the PDP research group 1986) are concerned with demonstrating that simple learning mechanisms, faced with the complex linguistic input, are capable of learning it. This is demonstrated by artificial neural networks being able to acquire the associations between, for example, two different phonemes in a sequence, or a form and a meaning, along with their respective reliabilities and validities, and then using these associations to produce novel responses by "on-line" generalization. Thus behavior that seems rule-governed, for example children's U-shaped behavior in acquiring the English past tense morphology, can be shown to be based on pattern-noticing, rote-learning and

analogy. Therefore, it is argued, learning and cognition does not depend on symbolic representations but can be created in the neural networks based on past experience only.

Usage-based, emergentist approaches that acknowledge some role of symbolic representations are based on cognitive and functional linguistic analyses (Bybee, 1995; Croft, 2001; Goldberg, 1995; Langacker 1987). The term “emergentist” applies to those researchers/research programs that deny any plausibility of the “innatist” generative-linguistic assumption that some linguistic information is available to the child to constrain her hypothesis space.⁵ Instead, interactions occurring at all levels, from genes to environment, give rise to emergent forms and behavior. These outcomes may be highly constrained and universal, but they are not themselves directly contained in the genes or in any neurological structures in any domain-specific way. Constructionism (Goldberg 1995, Tomasello, 2003) treats syntax as nothing more than an assembly of form and function pairs (the constructions) and so “learning grammar is the piecemeal learning of many thousands of constructions and the frequency-biased abstraction of regularities within them” (Ellis 2002: 168). In O’Grady’s general nativism approach (O’Grady, 2001, 2005, 2008) the core properties of natural language syntax follow from the operation of an efficiency-driven computational system that is indistinguishable from a processor.

“The computational system outlined by O’Grady does exactly what any processor does: it operates in a linear manner, it combines elements, and it checks to make sure that lexical requirements (‘dependencies’) are being satisfied. But unlike conventional processors, it is not constrained by grammatical principles. Rather it simply seeks to reduce the burden on working memory by carrying out its operations at the first opportunity (the ‘Efficiency

⁵ As Gregg (2003) writes, when the word “innatist” is used in a text, there is a big chance that the text is trying to argue against generative positions. Generative linguists normally do not call themselves “innatists” but “nativists.” Thus “innatist” has a negative connotation while “nativist” carries a more positive connotation.

Requirement’)'’ (O’Grady 2008: 479).

Evaluating some or all of these claims is beyond the scope of the present review, and I refer the reader to a spirited refutation of a lot of these arguments on theoretical grounds, Gregg (2003). What is important for our present endeavor is that, even though emergentist approaches have been around for a number of years, it is only recently that research within a second language context has begun to take place (Gass & Selinker, 2008: 220).

Tolentino and Tokowicz (2011) review functional magnetic resonance imaging (fMRI) and event-related potential (ERP) studies on the L2 processing of morphosyntax. They set out to check the predictions of the Unified Competition Model (MacWhinney 2005, 2008). This model asserts the essential similarity of the first and second language acquisition processes, despite their obvious differences. It adopts the core Competition Model insight which maintains that, for the adult native speaker, learning happens through form-meaning associations that have “cue strength” (how often a form is used) and “cue validity” (how reliable the association is). “In the Unified Model, forms are stored in associative maps for syllables, lexical items, constructions, and mental models. During processing, the selection of forms is governed by cue strength within a competitive central syntactic processor.” (MacWhinney 2008: 342) The process of L2 grammar learning begins with L2 cue weight settings that are close to those for the native language. Over time, these settings change in the direction of those for the L2. A direct prediction of the morpho-syntactic part of the model, then, is that if the cue settings of the first and the second language are the same, learning the second language (both creating the L2 representations and processing the L2) would be easier than if new cue strengths have to be learned. Tolentino and Tokowicz (2011) examine phrase structure and word order at the sentence

level, as well as the morpho-syntactic features⁶ of subject-verb agreement, number, gender and case agreement, verb inflection and auxiliary omission. They operationalize similarity as the correspondence between L1 and L2 linguistic structures based on word-by-word translation, because “bilinguals’ errors in L2 production are often a result of inappropriate word-by-word translation from the L1 to the L2” (Tolentino & Tokowicz 2011: 93). The findings of 3 fMRI and 6 ERP studies suggest that in the case of morphosyntactic features that are similar in the L1 and the L2, the participants exhibited physiological markers of sensitivity similar to native speakers. These features include regular verb inflection, phrase structure violations, aspect marking, and determiner number agreement. In the case of morphosyntactic features “that differed in their implementation” (p. 114) in the L1 and the L2, neural signatures in the participants differed from the native speakers or were just absent. Such features included irregular verb inflection, another type of determiner number agreement, and gender agreement. The authors argue that these results are compatible with the prediction of the Unified Competition Model.

The problem, of course, is that these results are largely compatible with another recent model: Lardiere’s Feature Re-Assembly Hypothesis (2009), formulated within the generative approach to language acquisition. Challenging the parameter-resetting approach to second language acquisition, this hypothesis argues that the biggest L2 learning task is not to reset parameters but to reconfigure features from the way they are represented in the L1 into the way they are encoded in the L2. When there are mismatches between the feature configurations, for example when two features are encoded together in an L1 functional morpheme but scattered in different pieces of morphology in the L2, difficulty is predicted by this approach. What

Tolentino and Tokowicz (2011) call “feature implementation” is given a more precise, linguistic

⁶ However, they do not use “feature” with the same meaning as in generative linguistics, but just descriptively, as in any grammatical feature.

theory-based formulation in Lardiere's work. Of course, the generative framework, which postulates grammatical representations separate from their usage, allows for conceiving of such mismatches while "feature implementation" remains a vague term that has to rely on word-by-word translation. The latter is far from rich enough to capture all the possible ways in which languages can differ. Take for example the progressive aspectual tense in English, which would be the word for word equivalent of the Spanish progressive. There is a class of verbs, stative verbs, which are not appropriate with the progressive (**I am knowing*), and if they are used with it, the meaning of the tense changes (*I am being lazy today*). If we look for word-for-word equivalence in the Tolentino and Tokowicz sense, the Spanish and English progressive tenses would be classified as "equivalent," while in reality they are far from being equivalent.

The obvious challenge before nativist and usage-based, and any two theoretical frameworks trying to explain acquisition, is not to come up with research designs that will produce data *compatible* with the approach (as the Tolentino & Tokowicz 2011 review did), but data that will be able to *tease the two positions apart*. Below, I will briefly review three studies that in my view fit the bill.

Williams and Kuribara (2008) is a study in which learners are acquiring a semi-artificial language based on Japanese. In the language "Japlish", case endings and other functional morphology was attached to English lexical items (e.g. *That girl-ni scarf-o John-ga gave*) and Japanese word order was maintained. One group of English native speakers was exposed to training on head-directionality and some scrambling in Japlish, and then both the experimental and the control group, unexposed to scrambling, were tested on other scrambling constructions. While the trained group did better than the untrained group on the tested scrambling constructions, they did not learn the head-directionality reliably. The authors interpret this lack

of correlation as contradicting the possibility of a parameter resetting. On the other hand, the researchers also tested if the obtained responses could be based entirely on the statistical structure of the sentences the participants encountered in the exposure phase. An artificial network trained on the same sentences came up with very similar behavior to the human participants. However, the network's ability to discriminate ungrammatical and new scrambling structures became worse with increased training. In the final analysis, the researchers argue that symbolic rule-learning mechanisms are still necessary for full language acquisition to occur.

On the other side of the barricade, Bruhn de Garavito (2011) and Slabakova (2009) are two rare generative studies that set out to test predictions of usage-based connectionist approaches. For reasons of space, we will only look at the first-mentioned study here. Bruhn de Garavito looks at two constructions in Spanish that have the exact same word order: the impersonal passive and the inchoative:

(6) Se vendieron las faldas. (Impersonal passive)

se sold-pl the skirt-pl

'The skirts were sold.'

(7) Se mancharon las faldas. (Inchoative)

se stained-pl the skirt-pl

'The skirts got stained.'

Since the two constructions exhibit the same word order, the prediction of an approach exclusively based on frequency of collocations in the input would be that these two sentences should be treated in the same way, by language-learning algorithms and human acquirers alike. Furthermore, there is widespread ambiguity in the language, in fact, (7) is ambiguous between the two interpretations. However, the only nominal in the impersonal passive exhibits some of

the properties of objects, while the nominal phrase in the inchoatives behaves exclusively like a subject. In order to associate the various syntactic properties, no matter frequent or infrequent in the input, with the correct representation and meaning, the two structures have to be differentiated in the mind of the speaker. However, the author argues that the input is not sufficient to differentiate them because in all situations in which one structure is appropriate, the other will be appropriate, too. Bruhn de Garavito shows that participants in her study, early and late bilinguals, are sensitive to a range of properties of these constructions and argues that this sensitivity cannot arise solely based on pattern-noticing within the linguistic input, but is utilizing the innate UG hypothesis space.

Finally, O’Grady (2008) takes up the well-known facts of *wanna*-contraction in English, widely used by generative language acquisition researchers as an example of a construction, for which knowledge has to come from UG, not from the input alone.

- (8) a. (Guess) who they want to/wanna see.
(cf. They want to see who.)
b. (Guess) who they want to/*wanna stay.
(cf. They want who to stay.)

Providing an alternative explanation of the facts, O’Grady et al (2008) argues that it is not necessary to resort to UG knowledge in order to account for the possible and unavailable contractions. Instead, his efficiency-driven linear processor allows the contraction to happen where it is able to combine the involved elements immediately. In this particular case, the processor minimizes the burden on working memory by resolving the *wh*-dependencies (the relationship between a *wh* word and the verb with which it is associated) and the contraction of *want* and *to* at the earliest opportunity. This is achieved by linking the *wh*-word (*who*) to the first

available ‘open’ position in a verb’s argument grid in a series of processing steps, which is possible in the case of (8a), but blocked in the case of (8b). The authors argue that this analysis elegantly explains why L2 learners of English (with Korean and Japanese as their native languages) divide roughly equally into conservative learners who never contract, overgeneralizing learners who always contract, and native-like learners, no matter their levels of proficiency.

The division between usage-based and nativist accounts of language acquisition is not so much along the lines of L1-L2 differences being fundamental or not, but more along the lines of conceptualizations of language and language acquisition. While proponents of usage-based approaches are vocal in outlining in theory how second language acquisition proceeds, there are to-date relatively few studies actually testing emergentist predictions, and even fewer studies that are in a position to tease apart generative nativist from emergentist explanations. Future research in this respect will have to involve linguistic competence as well as processing (see O’Grady 2005, 2008).

5. Processing

Processing differences between monolingual native speakers and bilingual or multilingual L2 users, together with reliable and copious input, is emerging to be the most powerful explanation of L1-L2 competence differences. Researchers who would not agree on much else in L2A would nevertheless agree that bilingual processing is among the most important areas of L2A. Slower or more belabored processing in L2 learners should be distinguished from competence difference explanations such as the Fundamental Difference Hypothesis (Bley-Vroman 1989, 2009) and the Interpretability Hypothesis (Hawkins & Hattori 2006; Tsimpli & Dimitrakopoulou 2007). In

other words, an L2 user may appear to be different from a native language user for two reasons: either because their processing is different, or because their competence (hence, linguistic representations) *and* processing are different. The views on L2 processing divide into two main positions largely as follows. One position maintains that processing mechanisms in the second language are essentially the same as in the first language, but the pressures of bilingualism can lead to apparent L1-L2 differences. Processing preferences and routines can transfer from the native language, but also be overcome. This position is exemplified in the work of Dekydtspotter, Dussias, Gabriele, Omaki, Schulz, VanPatten and many others. For reviews of this position, see Dekydtspotter (2009) and Belikova and White (2009).

On the other hand, proponents of the Shallow Structure Hypothesis (Clahsen & Felser 2006) maintain that there are qualitative differences between L1 and L2 users, in the sense that the shallow processing, characteristic of native processing some of the time, is the only type of processing available to L2 users. Shallow, or good-enough, processing is characterized by dependence on lexical knowledge, knowledge of the world, pragmatic routines, basic argument-predicate relations such as SVO templates, and crucially lacks structural details such as copies (traces) of movement in filler-gap dependencies. Evidence for this position comes from experiments where language users have to calculate a long-distance dependency between some moved phrase and the gap in the clause where this phrase originated. One example of such a sentence comes from Marinis, Roberts, Felser and Clahsen (2005).

- (9) The nurse_i [_{RC} who_i the doctor argued [_{CP} <who_i> that the rude patient had angered <who_i>]] is refusing to work late.

The relative pronoun *who* starts out as the object of the verb *to anger* and on its way to the top of the relative clause RC, it stops over in the intermediate position in front of *that*. When the

relative pronoun stops in that position, it leaves a copy (trace) of itself and continues on its way. In the generative theory of *wh*-movement, copies of movement have psychological reality although they are not pronounced, and they are indicative of abstract structural representations of sentences. Since learners in the Marinis et al. (2005) study did not show sensitivity to this intermediate trace as indicated by reading times, the researchers argued that second language speakers rely on lexical-semantic and argument-predicate relations between words, when they are processing such long-distance dependencies. In other words, their processing is meaning-based but not structure-based. Felser and Roberts (2007) present more evidence for L2 speakers using quantitatively different processing routines from the native speakers.

Opponents of the Shallow Structure Hypothesis try to show that L2 speakers are sensitive to such structural representations that are needed to calculate sentence meaning online. Among many recent studies, Omaki and Schultz (2011) demonstrate that both the English native speakers and Spanish learners of English obey relative clause island constraints. Aldwayan, Fiorentino and Gabriele (2010) show evidence that Najdi Arabic speaker process English *wh*-movement actively guided by syntactic constraints. Dekydtspotter and Miller (2010) study the activation of intermediate traces of *wh*-movement in a priming experiment and argue that their results are better explained by weak activation of semantic concepts, probably due to lexical access difficulties. They caution that research on the processing of *wh*-dependencies in sentence processing must give full consideration to lexical activation mechanisms. Dekydtspotter, Kim, Kim, Kim and Lee (in press) report reading time asymmetries in L2 speakers that are consistent with observing constraints on binding. Another line of argumentation against shallow processing counters that a number of (low-educated, low-reading-span or non-proficient) native speakers also resolve to using semantic-based processing most of the time (Indefrey 2006).

The type of L2 exposure (naturalistic versus classroom) possibly affecting processing engages researchers' attention as well. Pliatsikas and Marinis (2012) examined the processing of two similar groups of Greek-English bilinguals with either naturalistic and or classroom exposure to English. Using the same stimuli from Marinis et al (2005) exemplified in (9), they found that their naturalistic learners (but not the classroom learners) were indeed processing the intermediate traces like native speakers. These results suggest that linguistic immersion can indeed lead to native-like abstract syntactic processing in the L2.

Explanations in terms of processing are making their way to other areas of second language acquisition research trying to illuminate L1-L2 discernable differences. The essential idea is that even if the grammatical representations of native and non-native speakers are the same, their processing mechanisms may differ and give rise to detectable differences in behavior. For example, the Interface Hypothesis (Sorace, 2011; Sorace and Filiaci 2006) identifies the syntax-discourse interface as the locus of most near-native versus native differences, because at this interface, information from the linguistic system (core syntax) and information from other cognitive domains (observation of the discourse situation) have to be calculated together. "One reason why bilingual speakers may be less efficient at processing structures at the syntax-pragmatics interface is that syntactic processing is less automatic for them. This may be due to less developed knowledge representations or to less efficient access to these representations" (Sorace 2011: 17). Sorace contends that the reason for non-native speakers' difficulty integrating syntactic and contextual information online may be due to difficulties in accessing and combining syntactic knowledge, and provides additional evidence from processing studies (Hopp, 2009; Roberts, Gullberg & Indefrey, 2008).

The fundamental issue of L1-L2 differences, extended to native versus non-native

processing, gets essentially the same two answers as in the competence debate: either quantitative and qualitative differences, or quantitative but not qualitative differences exist and can be documented between adults processing their native language and adults processing their second language. Factors such as type of exposure (naturalistic versus classroom), experience with complex language constructions, and language proficiency can probably account for a good portion of the recognized variation.

6. Future Directions

My goal in this review has been to present the current state of knowledge on several issues in L2A that have come to the fore of the collective mind. I have argued that the Critical Period Hypothesis and the related issue of near-native competence have not been solved to everyone's satisfaction just yet. This could simply be for the reason that the two sides of the debate have offered valid observations: yes, L2 learners do not get to be like native speakers in all respects; and yes, there are certain respects in which the two types of competence are not qualitatively different. It is high time our field engaged in a constructive debate to see which point of view on L2 competence is more relevant to our applied purposes. The effect of input on acquisition (in first as well as second language acquisition) has securely come into the limelight, and many solutions to the inquiry of where exactly the L1-L2 differences lie should come from scrutinizing input at a new, much heightened, level of attention. The second direction from which explanations of L1-L2 acquisition differences will come is the study of language processing, and more specifically, access and inhibition of mental representations.

It has become traditional in reviews of L2A applied research to call for more replication studies and more longitudinal studies. While those are obviously needed and important, I would

like to make the case for better integration of current linguistic and psychological theory in applied linguistic studies. The mission of applied linguistics is to represent the interface between linguistics and its various applications, for example, language instruction. As described in section 4 above, cognitive models of the mind guide the investigation of how to achieve new states of second language knowledge and how to use that knowledge in comprehension. In this endeavor, a theoretically-informed cognitive linguistic model with psychological reality is crucial since without it, the applied linguist does not know what to look for in the mind, what the nature of the relevant representations might be, or how the different components of a process might interact with each other. Linguistics may have felt as a treacherous guide to some practitioners in the field, when linguistic theories have evolved. However, evolving linguistic theory is still our best hope of grounding applied concerns on a firm scientific foundation.

One example of such effective application of grammatical theory is Lardiere's (2009) Feature Reassembly Hypothesis. As mentioned above, this model views L2 acquisition as involving the assembly or reassembly of the formal feature matrices of functional categories and mapping them onto their new morphological exponents. The process conceivably goes through two steps, which may be of differential difficulty and consequently may take different time to accomplish. The first step is based on perceived similarities between the functional meanings of the target lexical items and the L1 lexical items. These similarities lead to initial mapping of the complete feature set of the L1 item onto the target item. To take a simplistic example, initially a Spanish learner of English may notice that the past progressive tense and the Spanish Imperfect tense overlap in some meanings. In principle, there may be many-to-one, one-to-many, or many-to-many possible mappings. To continue with the same example, the Spanish progressive tense would also be a candidate for mapping onto the target progressive tense. Once some initial

mapping is established, the next step involves “feature reassembly”: features can be added or deleted, progressively adjusting the target feature set to the evidence for meaning and usage coming from the input. In the case of the English progressive tense, noticing its unavailability with stative verbs and its lack of habitual interpretation should result in altering its feature set. Such feature reassembly may be slow to occur or may not occur at all if the relevant evidence is rare or contradictory. Future research questions should stem, then, from concrete proposals of L1-L2 feature set comparisons and proceed to examine in detail the evidence available for the target grammatical or semantic features in the input. Such a theory-grounded approach will yield much more detailed accounts of where to expect difficulty in L2 development.

A related application of linguistic theory for the purpose of understanding development is the “parsing to learn” direction in L2 psycholinguistics (Dekydtpotter & Renaud 2009, VanPatten & Jegerski 2010, see also the upcoming special issue of LAB on this topic). Applied to parsing (the attribution of linguistic structure to the incoming signal), the feature-based view of grammatical development attains a new level of concreteness and profitable predictions. Van Patten (2004), Carroll (2001), Truscott and Sharwood Smith (2004) have argued that a parsing failure is what triggers the acquisition of new grammatical features. If an input string comes along that cannot be parsed by the speaker, it is because the string is not licensed by the current interlanguage grammar. This moment presents an opportunity for change. The processing system “sets itself” the task to get to such a grammatical system that would license the previously unparsable input. Careful examination of processing patterns of learners of various stages of development then offers the possibility of postulating exactly how this learning process unfolds. In this approach, the universal parser mediates between the linguistic input and Universal Grammar so that targetlike L2 feature matrices are attained.

Testable predictions based on a cognitive theory of language will be the key to successful future L2 explorations. At a time when representation-based and usage-based approaches to language acquisition have evolved sufficiently to be tested head to head, the field will benefit from research designs capable of teasing apart conflicting predictions on acquisition of syntactic, semantics and pragmatic properties, not just on lexis and inflectional morphology. The new and constantly changing techniques and methodologies in processing research, especially if based on sound linguistic theory, are in a position to profitably address both L1-L2 differences as well as the critical period issue. In my view, the issue of utmost interest in L2A research should be the following: how does encountering a new or differently assembled grammatical feature in the input (while processing the second language comprehensible input) trigger a new grammatical state? In other words, how do we parse to learn? Once we have made significant progress on the issue of what triggers grammatical development, we will know what to include in and how to structure classroom input.

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