The "Natural Order" of Morpheme Acquisition: A Historical Survey and Discussion of Three Putative Determinants

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ABSTRACT

The paper discusses the history and implications of the so-called "morpheme" studies. A brief overview of L1 research in this regard is followed by a more detailed discussion of L2 research. Thereafter, the paper explores the impact of three putative determinants of acquisition order: semantic complexity, input frequency, and native language transfer. The possible role of these determinants in accounting for perceived differences in L1 and L2 acquisition orders is also discussed, along with their implications for various theoretical perspectives on language acquisition. The paper concludes with both practical applications and criticism of existing natural (morpheme) order studies as well as suggestions for future work in this field, such as investigating target languages other than English and developing a multi-determinant approach to acquisition order.

INTRODUCTION

Natural order studies have shed important light on the order in which speakers acquire grammatical morphemes. This line of research started as "morpheme order" studies in the 1970s, when researchers were looking into the "independent grammars assumption"[2] (Cook, 1993). Since, however, the researchers who dominated this field in the 1970s and 1980s were primarily concerned with uncovering evidence to support an innatist view of language acquisition, the term "natural order" studies quickly began to predominate. In addition, scholarly interest in the 1980s turned to the determinants of acquisition order and in the 1990s to methodological criticisms of earlier studies, as will be discussed below.

The basic premise of natural order studies is that there may be a consistent order in which first and/or second language learners acquire proficiency in the use of grammatical morphemes, which are traditionally defined in linguistics as "minimal unit[s] of meaning" (Johnson &

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[2] According to the independent grammars assumption, when children acquire their first language they begin as speakers of their own personal languages rather than as defective speakers of the adult language (Goldschneider & DeKeyser, 2001). This notion of an intermediary stage in L1 acquisition influenced Selinker (1972) and other researchers who have used the term "interlanguage" in L2 studies (Johnson & Johnson, 1998).

Johnson, 1998, p. 217). Units and their meanings may be lexical or grammatical. The finite verb form *played*, for example, contains a lexical base form (*play*) and a grammatical morpheme (*-ed*) indicating past tense. The field of natural order studies is primarily concerned with morphemes of the latter type, also known as *functors*.[3]

The studies by R. Brown (1973) and de Villiers and de Villiers (1973) dealt with the order of acquisition of these functors solely from the perspective of first language (L1) acquisition. Dulay and Burt (1973, 1974a, 1974b), on the other hand, extended this research to encompass second language (L2) acquisition. As with R. Brown (1973) in the field of L1 acquisition, the work of L2 researchers represented a backlash against the behaviorist models of the 1950s through the early 1970s. The idea was to demonstrate that second language acquisition (SLA) was not just a matter of learned response but that individuals developed second language competence according to a predictable series of benchmarks. In this regard, morpheme order studies became part of the basis for the Natural Order Hypothesis (NOH),[4] which was advanced by Krashen (1985) in the field of SLA.[5]

Even before the shift to "natural order studies," morpheme acquisition research in the 1970s appeared to have turned up considerable evidence to support the notion of a consistent order. In this regard, a number of researchers found L2 acquisition to be similar to L1 acquisition (Dulay & Burt, 1973; Krashen, Butler, Birnbaum, & Robertson, 1978). Focusing on L2 outcomes, certain researchers found the sequence in SLA to be essentially the same regardless of the learners' L1 (Bailey, Madden, & Krashen, 1974; Dulay & Burt, 1974a, 1974b; Larsen-Freeman, 1975; Fathman, 1975). Similarly, others found the acquisition sequence in L2 to be essentially the same regardless of the learner's age (Dulay & Burt, 1973; Bailey, et al., 1974; Fathman, 1975; Kessler & Idar, 1979).

Compared to the research in the 1970s, the studies published in the 1980s appear to be more concerned with the identification of various determinants of the acquisition sequence. Examples of the latter include Pica (1983), J.D. Brown (1983), Rosado (1986), Pak (1987), and Pienemann and Johnston (1987). Thereafter, in the late 1980s and 1990s, the focus shifted to the reexamination of natural order studies rather than new empirical research. The objections were of a different nature and will be discussed at several points in this paper. One criticism worthy of note at the outset is that some studies tried too hard to peg acquisition order to one particular determinant. As we will see, a multiple determinants approach, as suggested by Gass and Selinker (1994) and supported by Goldschneider and DeKeyser (2001), better reflects the empirical evidence and offers strong prospects for fruitful research in this field.

This paper will review the major L1 and, more particularly, L2 morpheme order studies of the 1970s and 1980s. In this regard, attention will be paid to some of the methodological problems that were highlighted by the subsequent research. Thereafter, the paper will examine,

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[3] R. Brown (1973) defines functors as "forms that do not, in any simple way, make reference. They mark grammatical structures and carry subtle modulatory meanings. The word classes or parts of speech involved (inflections, auxiliary verbs, articles, prepositions, and conjunctions) all have few members and do not readily admit new members" (p. 75). As in other studies, the terms *functor* and *morpheme* are used interchangeably in this paper.

[4] Studies investigating the NOH have identified "natural" developmental sequences for wh-questions and interrogatives as well as for morpheme acquisition (Krashen & Scarcella, 1978; Dulay, Burt & Krashen, 1982; Ellis, 1985).

[5] Indeed, although Dulay and Burt (1973, 1974b) refer to a "universal order" in morpheme acquisition, it is probably preferable to refer to the order as "natural." After all, Dulay and Burt's results were based on subjects' responses, and, as Ellis (1985) points out, the sequence they identified is not universal since not all learners acquired every item in exactly the same order. Thus, the term "universal" would be misleading.

from both the theoretical and the empirical perspectives, three possible determinants that have been widely discussed in connection with morpheme acquisition orders: (1) semantic complexity, (2) input frequency, and (3) native language transfer. This literature review will also address the findings of the reviewed studies in their historical context and attempt to move the discussion on multiple determinants toward current theoretical discourse.

RESEARCH IN FIRST AND SECOND LANGUAGE ACQUISITION

L1 Research

The history of morpheme order studies can be traced to R. Brown's (1973) study of three children[6] who were native speakers of American English. This longitudinal study is widely recognized as the starting point of the acquisition order research (Johnson & Johnson, 1998). Its findings included the observation that the three children learned English morphemes in roughly the same order, although they did not acquire them at the same age. Brown felt that the similarity in the subjects' order of acquisition was particularly interesting because the pattern of development was clear despite the fact that the data were drawn from spontaneous speech; in other words, the specific instantiations of the functors varied along with the topics of the children's conversations, yet mastery in the use of functors occurred in an equivalent order across the three subjects.

As Brown put it, "some factor or some set of factors caused these grammatical morphemes to evolve in an approximately consistent order in these children" (R. Brown, 1973, p. 272). Brown devoted most of his chapter on grammatical functors to an exploration—from a nativist perspective—of what these factors might be. His ideas shaped much of subsequent research, including the search for determinants in L2 acquisition order, which will follow.

Brown's analysis also became a model for scoring and comparing data on functor acquisition order. For example, Brown observed that when the data were represented graphically, the curve of accuracy for a particular functor was initially chaotic, but that once that curve had passed above the 90% line for several consecutive samples it tended to remain above that line. As a result, Brown set his cutoff point for acquisition at 90% of accuracy. However, he also scored and ranked morphemes that did not reach this arbitrary threshold, making it possible for other researchers to compare their results to his.

Perhaps Brown's most important benchmark is the notion of suppliance in obligatory context (SOC). Brown explained SOC as follows:

> …grammatical morphemes are obligatory in certain contexts, and so one can set an acquisition criterion not simply in terms of output, but in terms of output-where-required. Each obligatory context can be regarded as a kind of test item which the child passes by supplying the required morpheme or fails by supplying none or one that is not correct. This performance measure, the percentage of morphemes supplied in obligatory contexts, should not be dependent on the topic of conversation or the character of the interaction. (1973, p. 255)

[6] Data for two of the children were collected over a five-year period beginning at age 27 months. Data for the third child was collected over a one-year period beginning at age 18 months.

From the above, one can infer that the choice of grammatical functors (morphemes) as an object of study was motivated by the fact that their use is obligatory in certain contexts, and, thus, the percentage of morphemes supplied in such contexts provides what many researchers considered to be not only a standard benchmark but a meaningful and quantifiable measure of acquisition. Moreover, the SOC measure also played a role in Brown's selection of 14 morphemes as "functors" to be studied, since his primary criteria for including a functor were that (a) obligatory contexts could be identified for the functor and (b) it was used frequently enough to provide continuous data across speech samples (R. Brown, 1973). Table 1 shows the 14 functors isolated by Brown in the acquisition order demonstrated by the three subjects in his longitudinal study.

TABLE 1
Order of L1 Acquisition of English Morphemes in R. Brown (1973)

Rank	Morpheme
1	Present progressive (*-ing*)
2/3	*in, on*
4	Plural (*-s*)
5	Past irregular
6	Possessive (*-'s*)
7	Uncontractible copula (*is, am, are*)
8	Articles (*a, the*)
9	Past regular (*-ed*)
10	Third person singular (*-s*)
11	Third person irregular
12	Uncontractible auxiliary (*is, am, are*)
13	Contractible copula
14	Contractible auxiliary

Even before Brown's study was published, a partial replication of his research was already underway. One of the limitations of Brown's longitudinal study was that it was based on observations of three children only. By contrast, de Villiers and de Villiers (1973) elicited spontaneous L1 speech data from 21 children in a cross-sectional study and compared the accuracy order they obtained with the acquisition order found by Brown for his three subjects.[7] In their study, de Villiers and de Villiers used Brown's 14 functors and his coding rules to identify obligatory contexts. Their analysis yielded results very similar to those of Brown. In addition, de Villiers and de Villiers introduced a new ranking method: rather than imposing a 90% cutoff level for acquisition, they simply ranked the functors according to the relative accuracy with which they were used by the subjects. Most of the later L2 studies in this field have employed some variant of this method of rank ordering on the basis of percentage of functors correctly supplied in obligatory contexts.

[7] Criteria for establishing "acquisition" are open to debate and are especially problematic in L2 studies. Some studies look merely at the first correct appearance of a given morpheme in a learner's speech. Others establish a cutoff point based on correct usage in a certain percentage of obligatory contexts. A longitudinal study, however, may require this percentage to persist or improve over a period of time before the morpheme can be considered "acquired."

L2 Research

Variables and Findings

Despite slight variations, the early morpheme order studies in SLA supported the researchers' expectations that the order of morpheme acquisition would be largely consistent across L2 English learners. This order also broadly corresponded to that observed in the L1 research of R. Brown (1973) and de Villiers and de Villiers (1973). In L2 morpheme studies, Dulay and Burt (1973) found a consistent order across three groups of L1 Spanish child learners of English. The authors' expanded study (1974b) of English learning children from two different L1 groups—Spanish and Chinese—reached the same conclusion. Bailey et al. (1974) generalized the results of Dulay and Burt's child studies to adults and found a similar order of acquisition for the same set of English morphemes. Their findings and those from L1 research are presented in Table 2, along with a summary of findings of three other researchers who charted the order of acquisition of morphemes in English as a second language in the 1970s. Larsen-Freeman (1975) performed a cross-sectional study of adults using multiple tasks. Hakuta (1976) carried out a longitudinal study of a single Japanese-speaking child. Finally, Rosansky (1976) attempted to combine cross-sectional and longitudinal methodology in a study of six Spanish-speaking adult learners of English.

TABLE 2
Order of Acquisition of English Morphemes in Major L1 and L2 Studies[8]

L1 Studies		L2 Studies				
R. Brown (1973)	de Villiers and de Villiers (1973)	Dulay & Burt (1974b)	Bailey, Madden, and Krashen (1974)	Larsen-Freeman (1975)	Hakuta (1976)	Rosansky (1976)
		Children (Spanish and Chinese)	Adults (classified as Spanish and non-Spanish)	Adults (Arabic, Japanese, Persian, and Spanish)	Child (Japanese)	Chidren, Adolescents, Adults (Spanish)
N=3	N=21	N=60 Span. 55 Chin.	N=73	N=24	N=1	N=6
1 Pres. Prog.	2 Pres. Prog.	1 Art.	1 Pres. Prog.	1 Pres. Prog.	2 Pres. Prog.	1 Pres. Prog.
2.5 on	2 Plural	2 Copula	2 Plural	2 Copula	2 Copula	2
2.5 in	2 on	3 Prog.	3 Contr. Cop.	3 Art.	2 Aux.	3
4 Plural	4 in	4 Simple Plural	4 Art.	4 Aux.	4.5 in	4 Art.
5 Past Irreg.	5 Past Irreg.	5 Aux.	5 Past Irreg.	5 Short Plural	4.5 to	5 Copula
6 Poss.	6 Art.	6 Past Reg.	6 Poss.	6 Past Reg.	6 Past Aux.	6 Aux.
7 Uncon. Cop.	7 Poss.	7 Past Irreg.	7 Contr. Aux	7 Sing.	7 on	7 Poss.
8 Art.	8.5 3rd Pers. Irreg.	8 Long Plural	8 3rd Pers. Pres.	8 Past Irreg.	8 Poss.	8 Past Irreg.
9 Past Reg.	8.5 Contr. Cop.	9 Poss.		9 Long Plural	9 Past Irreg.	9 Long Plural
10 3rd Pers. Reg.	10.5 Contr. Cop.	10 3rd Pers. Sing.		10 Poss.	10 Plural	10 Past Reg.
11 3rd Pers. Irreg.	10.5 Past Reg.				11 Art.	11 3rd Pers. Reg.
12 Uncontr. Aux.	12 Uncontr. Cop.				12 3rd Pers. Reg.	
13 Contr. Cop.	13 Contr. Cop.				13 Past Reg.	
14 Contr. Aux.	14 Uncontr. Aux.				14 Gonna Aux.	

[8] Adapted from Jeong, 2002. Abbreviations are as follows: Pres. Prog., Present Progressive; Art., Article; Contr. Cop., Contracted Copula; Aux., Auxiliary; Past Irreg., Past Irregular; Poss., Possessive; Past Reg., Past Regular; Uncontr. Cop., Uncontracted Copula; Sing., Singular; 3rd Pers. Sing., and 3rd Person Singular. Note that rank order numbers that repeat within a given column (study) indicate a tie for two or more positions, in which case an average point score is assigned to each morpheme. Thus, for example, in a tie for 2nd and 3rd (Brown, 1973), each morpheme is given a rank score of 2.5.

In addition to the studies included in Table 2, Kessler and Idar (1979) compared results for an adult and a child L2 learner in a longitudinal study of English acquisition by a Vietnamese mother in her late twenties and her four-year-old daughter. The study examined a wide range of syntactic structures in data taken from spontaneous speech. Overall, the results corroborated the acquisition order found in cross-sectional studies. Moreover, the study supported the view that adult acquisition order is very similar to that of child acquisition, with the differences attributable to maturational constraints due to cognitive and neurological development. For example, the authors noted that the mother made "a clear use of past tense and future tense contexts even though she categorically avoided the overt markers required by English rules" (p. 75). Thus, they considered utterances such as *Yesterday I buy shoes* and *You tell me and I buy for you* as indicators that the mother was aware of and making efforts to express temporal frameworks. On the other hand, the daughter did not attempt to talk about the past or the future. As Hakuta points out, "the past tense form may be acquired late [in L1 learners and young child L2 learners] because its mastery requires a developed concept of time" (1986, p. 121). In addition to this explanation of the variation with respect to tense, the authors suggested that the slower rate of overall acquisition observed for the mother resulted from affective variables and the retarding effect of difficulties adjusting to a new culture.[9]

The studies discussed thus far show that a natural order of acquisition seems to be common to learners of English as a second language (ESL) regardless of the impact of variables such as age and L1 background. This general finding has implications for the theory of language acquisition, both first and second, as well as for pedagogical considerations in teaching English as a second language. In addition to age and L1, however, learning environment has also been an important variable in natural order studies. Mainly, researchers have looked to see whether there is any difference between instructed learning and naturalistic learning or between ESL learners and those learning English as a foreign language (EFL). Hanania and Gradman (1977), for example, conducted a longitudinal study with a single adult acquiring English in a non-instructed setting. This study provided information about the early stages through which the adult subject progressed and about the factors that affected her language development. The authors found that the subject's progress was significantly slower than that of child learners in a naturalistic setting. They attributed this finding to her limited meaningful exposure to the language, lack of pressing need to use it, and fear of making errors (Hanania & Gradman, 1977).[10]

The subject's progress in Hanania and Gradman (1977) showed a high degree of similarity to that of classroom-instructed students. However, the authors compared their results in this regard only to Dulay and Burt's (1974a, 1974b) research on classroom-instructed child learners. With respect to adult learners, Perkins and Larsen-Freeman (1975) found little difference in the sequence of acquisition of grammatical morphemes in a study that compared instructed and uninstructed groups. These authors concluded that "instruction does not radically alter order of acquisition" (Perkins & Larsen-Freeman, 1975, p. 241).

Likewise, Pica (1983) investigated the effects of formal classroom instruction versus learning in a naturalistic environment. This cross-sectional study compared results for three

[9] Neurological development issues are beyond the scope of this paper but are interesting from the standpoint of connectionism (see below).

[10] Note that although the authors refer to factors both extrinsic and intrinsic to the learners, they do not discuss the difference between their subject's outcome and the outcome of child learners in terms of the critical period hypothesis or maturational constraints.

groups: (a) a group of classroom-instructed adults, (b) a group of adults living in an English-speaking environment in the absence of formal instruction, and (c) a "mixed" group that received both classroom instruction and conversational input from native speakers in a naturalistic environment. All three groups were adult native speakers of Mexican Spanish. The researcher concluded that "different conditions of exposure to L2 English do not significantly alter the accuracy order in which grammatical morphemes are produced" (p. 465).

With the exception of the instruction-only group in Pica (1983), all of the L2 studies addressed thus far looked at subjects who were ESL learners. To find out if similar results would be obtained from EFL learners, Makino (1979) conducted a study involving English learners in Japan. For this study, Makino sampled and stratified data from 777 subjects, aged 13 to 15, in 33 classrooms according to the following variables: (a) grade level (8^{th} or 9^{th} graders), (b) English textbook used (*Total English* or *Prince English*), and (c) location of school (urban or rural). The data collected for the study were from students' written responses, and the order of morphemes found for all the subjects correlated significantly with the orders obtained in most of the studies that had looked at ESL learners, including Dulay and Burt (1973, 1974a, 1974b), Bailey et al. (1974), Larsen-Freeman (1975), and Rosansky (1976). The order also correlated with some sequences observed in L1 studies (e.g., R. Brown, 1973; de Villiers & de Villiers, 1973; Porter, 1977). Together with the studies that compared classroom and naturalistic settings, the results of Makino's (1979) study supported the hypothesis that similarities exist in the L2 acquisition process for all kinds of learners, regardless of differences in the learning environment.

Methodological Issues

Another factor that requires consideration is the testing methods employed in the various studies. Since their subjects were young children, most of the morpheme order studies in L1 acquisition elicited data only through oral tasks. Research on L2 acquisition, by contrast, has used a variety of methods: oral tasks, written tasks, and mixed tasks. Here, too, however, oral tasks have been the measure of choice for most researchers, and the instrument most commonly used to measure performance has been the Bilingual Syntax Measure (BSM), a syntax-based test of L2 proficiency designed for use with young children. Thus, this subsection will first discuss studies that measured oral tasks using the BSM as well as some of the arguments against and in favor of this instrument. Thereafter, I will address the measurement of oral task performance by other means. Finally, the strand of research that measured acquisition with the help of written and/or mixed tasks will be examined.

Although L1 researchers typically measured subjects' levels of language proficiency using samples of spontaneous ("free") speech, apart from certain exceptions (e.g., Hakuta, 1976; Krashen, Houck, Giunchi, Bode, Birnbaum, & Strei, 1977; Kessler & Idar, 1979) L2 research on morpheme acquisition order has usually made use of controlled tasks and specific measurement instruments. Most of the earlier studies (Dulay & Burt, 1973, 1974a, 1974b; Bailey, Madden, & Krashen, 1974) and some of the later ones (Pak, 1987; Ball, 1996) used BSM to gather data for the study of natural order of acquisition. However, the BSM was not specifically designed to test order of acquisition. The instrument consists of seven cartoon pictures and 33 questions. These prompts are used to elicit roughly predictable responses that include various obligatory contexts for grammatical morphemes. The questions are constructed so as to provoke certain structure types almost without fail. For instance, the researchers may point to a very fat cartoon character and ask: "Why is he so fat?" Most children offer a response such as "Because (s)he eat(s) too

much." According to Dulay and Burt (1974b), the value of this method is that the researcher "can look to see how the child forms simple finite clauses (word order, gender, number and case for the pronoun, agreement for the verb, the form of the qualifier, etc.)" (p. 40).

Consistency in the use of a given measure allows a degree of proficiency to be calculated for the structures that each child offers (Dulay & Burt, 1973). For example, Dulay and Burt's body of BSM responses for the three groups of children included eight of the 14 functors from Brown (1973), namely present progressive, plural, past irregular, possessive, articles, third person singular regular, contractible copula, and contractible auxiliary. Each obligatory context for a functor was scored according to the following schema (from Dulay & Burt, 1973, p. 254):

No functor supplied: = 0 (she's dance__)

Misformed functor supplied: = 0.5 (she's dance*s*)

Correct functor supplied: = 1.0 (she's danc*ing*)

The accuracy score for each functor was then calculated as a ratio of the sum of the scores for each obligatory context for that functor across the whole group. (For the above examples, the ratio would be 1.5/ 3= 50 %.)

Despite its advantage of consistency, researchers in the late 1970s began to question the reliability of the BSM. Oller (1978) noted that reliability rates ranged from .41 to .77, a degree of consistency that proponents argued could not simply be ascribed to chance. Oller agreed that something was consistent in the findings, but he felt that the results were insufficient to suggest what that "something" was. Graham (1978) also stated that, although the BSM was easy to administer and to score, it provided little specific diagnostic information, such as the information indicating which grammatical structures needed more emphasis for particular learners.

Even when the BSM was accepted as a valid measuring tool, some researchers were concerned about their dependence solely on one instrument. To test this concern, Porter (1977) administered the BSM to L1 English children between the ages of two and four, using the same scoring procedure as that in Dulay and Burt (1973). The order of acquisition found was closer to the "established" L2 order than to the order found in other L1 studies, suggesting that the consistent findings of L2 researchers in this regard were an artifact of the testing instrument rather than a reflection of actual acquisition order. However, it should be noted that other L2 studies that did not use the BSM to elicit data (e.g., Larsen-Freeman, 1975, 1976; Andersen, 1977, 1978; Krashen et al., 1977; Krashen at al., 1978; Makino, 1979) obtained results similar to those found in the studies which employed that instrument.

Another argument in favor of the use of the BSM—or other syntax-based measures—is that it succeeds in avoiding most of the statistical vagaries that accompany attempts to measure performance across dialectal variants. As Oller (1978) pointed out, the relevance of this objection is not limited to vocabulary and pronunciation, since even functional uses of a language can change from one area to another. Oller cited the following from Dulay and Burt (1973): "…because of differences in environment and social custom, it is not possible to construct the number of natural situations that would be required to test knowledge of speech acts or discourse rules" (p. 235).

As the number of studies focusing on "morpheme acquisition order" grew, the methods for testing the order became more diverse. Fathman (1975) introduced the Second Language Oral Production English (SLOPE) test. This measure was designed to test 20 different morphological and syntactic items, including seven of the functors used by Dulay and Burt (1973). Data obtained from children (Fathman, 1975; Kjarsgaard, 1979) and adults (Krashen, Sferlazza, Feldman, & Fathman, 1976; Fuller, 1978) showed that for structures present in both the SLOPE

and BSM, a similar order was found despite the differences in the task and scoring method.

The MAT-SEA-CAL Oral Proficiency Test (Mace-Matluck, 1977) also revealed an acquisition order of functor that was similar across ESL learners with different L1 backgrounds. The order observed in this study was similar to the orders put forth in the BSM-based study of Dulay and Burt (1973) and the SLOPE-based study of Fathman (1975). Taken together, the results from a variety of instruments provide support both for the consistency of morpheme acquisition order as well as for the validity of the BSM.

Out of a number of the studies mentioned above, only Makino (1979) and Krashen at al. (1978) elicited data through written tasks. Makino used fill-in-the-blank written responses and Krashen et al. used free compositions, first with and then without time constraints. Both of these studies supported the findings of Dulay and Burt (1973, 1974a, 1974b) as well as the findings of the majority of the oral task-based studies.

In order to test the validity of single task-based studies, whether based on data from oral or written responses, Larsen-Freeman (1975) conducted a study that used a mix of tasks, including tasks other than speech production. These tasks consisted of the following: (a) BSM, (b) a picture-cued sentence repetition test, (c) a listening comprehension task, (d) a multiple-choice reading cloze test, and (e) a writing test involving filling in the blanks. The functor orders that Larsen-Freeman's adult subjects displayed on this battery of tests were very consistent across different L1 backgrounds. With respect to the oral tasks, results correlated closely with those of Dulay and Burt (1973, 1974a, 1974b). For the written task there were some differences, such as a rise in the rank order of plural *–s* and third person *–s*. Ellis (1994) points out in this regard that speaking and writing are influenced by different sociolinguistic and psycholinguistic conditions. Thus, the differences observed by Larsen-Freeman may be a function of production conditions rather than the evidence of a natural order other than that postulated by Dulay and Burt (1973, 1974a, 1974b). Moreover, Krashen et al. (1978) later obtained findings using different written elicitation measures that did correlate with Dulay and Burt's oral task results.

In sum, the results of L1 and L2 studies are not identical. However, the similarities between the two appear significant, and many of the differences may be ascribed to disparities in learners' level of cognitive development. Although L2 studies have been carried out using subjects of different age, L1 background, and a variety of learning environments, the findings across these studies have been largely consistent. Despite some valid questions regarding the methodology of the morpheme studies, the overall consistency has led researchers to look beyond age, L1, and environment in their search for major determinants of morpheme acquisition order.

WHAT ARE THE DETERMINANTS?

In addition to the main goal of finding the consistency across different subjects and different learning environments, researchers in both L1 and L2 have attempted to determine what factors may affect the order of morpheme acquisition. These factors are usually referred to as (putative) determinants.[11] Among the determinants frequently cited with respect to L1 acquisition are perceptual salience (e.g., the morpheme *–ing*, as in *talking*, can receive stress and is salient, whereas the morpheme *–ed*, as in *talked*, cannot); syllabicity (whether a given

[11] The term "putative" is sometimes used in this context to mark the fact that the causal relationship between these factors and the observed acquisition orders remains to be established.

morpheme is syllabic or not); and lack of exception (the *possessive* ending *–'s* is used without exception, whereas the past tense *–ed* has exceptions in irregular verbs) (Brown, 1973). In addition to the above, Brown (1973) and others considered the possibility that semantic and/or syntactic complexity may influence L1 acquisition order.

The list of putative determinants suggested by L2 researchers is similar, yet it is also more diverse than the above. Determinants discussed in this regard include the following:(a) perceptual salience (Larsen-Freeman, 1976; Dulay & Burt, 1978; Pye, 1980; Gass & Selinker, 1994), (b) morphophonological regularity, (c) syntactic complexity, (d) frequency (Larsen-Freeman, 1976; Larsen-Freeman & Long, 1991), (e) semantic complexity (Larsen-Freeman, 1976; Andersen, 1978; Krashen at al., 1975; Pye, 1980), (f) native language transfer (Hakuta, 1976; Andersen, 1977, 1978), (g) individual variances (Hakuta, 1976; Rosansky, 1976; Andersen, 1978), and (h) levels of morpheme activation (Wei, 1999, 2000a, 2000b, 2003).

A discussion of the evidence and arguments put forth in connection with all of the above determinants would be beyond the scope of this paper. Instead, three determinants will be explored that have received particularly frequent mention and strong support from researchers, namely: semantic complexity, input frequency, and native language transfer. This set of determinants is also important because semantic complexity and input frequency shed light on the relationship between L1 and L2 acquisition (and between child and adult acquisition within L2), while input frequency and native language transfer have been the subject of changing theoretical perspectives since the 1970s, and could thus be instrumental in charting the theoretical course of natural order studies.

Three Putative Determinants

Semantic Complexity

Ever since R. Brown's (1973) L1 study, semantic complexity has been considered a factor in morpheme acquisition order. Semantic complexity is generally thought to be a function of how many meanings are expressed by a particular form (e.g., Goldschneider & DeKeyser, 2001). For example, plural *–s* expresses number, whereas the third person singular present *–s* expresses person, number, and tense. Even though there is to this day "no general theory of semantic complexity that [would make] it possible to assign complexity values" (Brown, 1973, p. 369), Brown established a complexity hierarchy, according to which morphemes with more meanings would be acquired later than those with fewer meanings.[12]

This hierarchy was subsequently accepted as probable and supported with empirical data by L2 researchers (e.g., Larsen-Freeman, 1976; Andersen, 1978; Krashen et al., 1975; Pye, 1980). Moreover, semantic complexity appeared to have explanatory force with respect to differences observed between acquisition order in L1 and L2. Dulay and Burt (1973) held that many of these differences might be accounted for on the basis of age and developmental factors. L2 adult learners are more advanced in age and therefore, in cognitive and conceptual development, than L1 learners. Thus, as Dulay and Burt (1973) noted, "…the older L2 learner need not struggle with the same kinds of semantic notions already acquired in earlier childhood" (p. 252). For example, it can be seen from the L1 and L2 orders found by various researchers (see Table 2) that the past tense *–ed* form is acquired later by L1 learners (ninth in order according to R.

[12] In this regard, "meanings" can refer to grammatical and/or semantic categories, since it is often difficult or impossible to treat one or the other in isolation (Brown, 1973).

Brown, 1973) than by L2 learners (fifth according to Dulay and Burt, 1974b; sixth according to Larsen-Freeman, 1975). The past tense form, as compared for example to the present progressive *–ing* form (acquired early by both L1 and L2 learners), requires a developed concept of the past. In other words, a morpheme that carries meaning in a single category can be considered more semantically complex than another only if it conveys a meaning that corresponds to a higher level of conceptual development.

Krashen (1981) noted "clear similarities" in the morpheme acquisition order of L2 learners of all ages but pointed out that "free morphemes, especially copula and auxiliary, tend to come later for the first language acquirer" (p. 51). As R. Brown (1973) observed much earlier, "…neither grammatical nor semantic complexity alone could explain the acquisition order in younger children one and one-half to four years old" (p. 403). Yet the copula and the auxiliary both meet at least the first of the above criteria for semantic complexity (i.e., they convey multiple meanings). Thus, their later acquisition—or, in this case, their earlier acquisition by L2 learners than by L1 learners—is in keeping with our prediction based on Brown's complexity hierarchy.

Input Frequency

Input frequency refers to the number of times a given structure occurs in language to which the learner is exposed. Generally, input plays a crucial role in both first and second language acquisition. As Wode (1981) notes, "there is no learner on record who learned a language or even part of it without some language input" (p. 302). More specifically, frequency of input is the second most commonly suggested determinant in the L2 functor acquisition order (Goldschneider & DeKeyser, 2001).[13] The common hypothesis in this regard is straightforward - the more often a grammatical item occurs in the input available to the learner, the more easily and quickly the item will be acquired.

When morpheme order studies first emerged, the conventional interpretation of input frequency in both L1 and L2 was strongly associated with behaviorism. According to the behaviorist perspective, the more frequently one hears a given morpheme, the more likely one is to imitate its use correctly. This assumption was then challenged by nativists, who emphasized the active and creative role of the language learner. Within the nativist framework, the role of input is merely to trigger the learner's innate Language Acquisition Device (LAD) (Chomsky, 1981). The lack of correlation between input frequency and the subjects' order of acquisition in L1 was held by many researchers as evidence that nativism provides a more plausible account of language acquisition than behaviorism.

R. Brown (1973), whose orientation was nativist, suggested and tested several possible determinants of the order of functor acquisition in L1, including frequency in parental speech, semantic complexity, and grammatical complexity. Offering an extended discussion of the problems inherent in the attempts to operationalize these determinants, he concluded that there was "no clear evidence at all that parental frequencies influence the order of development of the forms" (p. 368). Larsen-Freeman's (1976) findings with respect to L2, however, were very different. She found strong correlations between the morpheme acquisition order in L2 English and two measures of input frequency: (1) the frequency of obligatory contexts for the morphemes in her students' spontaneous speech samples ("the morphemes with the highest ranks, the article, auxiliary, progressive and copula, all seem to occur far more frequently than the other

[13] L1 transfer, discussed in the following section, is the most commonly cited determinant of acquisition orders.

morphemes" (p. 130) and (2) the frequencies recorded by Brown in the speech of his subjects' parents. Larsen-Freeman provided several arguments to support her use of these measures, although she made clear that both were proxies to be used only "until second language acquisition orders are compared with morpheme frequency counts from the speech of a larger sample of native speakers using different registers in conversing about a variety of topics" (p. 132). Nevertheless, Larsen-Freeman concluded that "morpheme frequency of occurrence in native-speaker speech is the principal determinant for the oral production morpheme order of second language learners" (p. 132).[14] For this frequency effect, she suggested two possible explanations. On the one hand, "incremental learning" takes place as a result of repeated practice using particular morphemes in the learner's own speech; on the other hand, assuming that Larsen-Freeman is correct that the frequency order of *grammatical* morphemes in the speech of a broad sample of English L1 speakers would differ little from Brown's parent-child samples, the relative frequency of occurrence of certain morphemes in the speech of native speakers (viz., article, auxiliary, progressive, and copula) could explain the fact that learners "score higher on those morphemes" (p. 131) in measures of the acquisition order.

Dulay and Burt (1978), working on L2 acquisition from an innatist perspective, argued against frequency as a determinant on the grounds that although common grammatical morphemes occur more frequently in English than even the most common lexical items, these morphemes are acquired relatively late compared to content words. This argument does not take into account, however, the categorical difference between content words (lexical morphemes) and grammatical morphemes, the former being arguably a more basic element in communication.[15] Thus, the comparison may be irrelevant to the role of frequency as a predictor of acquisition order within the set of grammatical morphemes themselves.

Kessler and Idar's (1979) longitudinal study of a Vietnamese mother and daughter learning English found that the morpheme acquisition order was similar, yet the rate of acquisition was different for the two subjects. The researchers explained the slower rate of acquisition observed in the mother as due to affective variables and the retarding effect of difficulty adjusting to a new culture. However, it is also reasonable (although speculative) to consider "input frequency" as a factor in the observed acquisition rate difference. After all, the daughter was "enrolled in a nursery school which provided extensive opportunity for interacting with English-speaking peers" (p. 71). The mother, who acquired English at a significantly slower rate, had no such input-intensive environment.[16]

Kessler and Idar (1979) provided no quantitative measure of input frequency by means of which the above hypothesis could be tested. Nevertheless, Gass and Mackey (2002) later speculated that "age differences [may] relate to sensitivity to frequency of input and storage" (p.

[14] Although this conclusion was presented as tentative, Larsen-Freeman and Long (1991) not only endorsed Larsen-Freeman's earlier finding, but also maintained that no putative determinant of acquisition order except input frequency has received significant empirical support.

[15] The objection that Dulay and Burt (1978) raised may be countered on the basis of what Wei (2003) calls the "implicational hierarchy" of morpheme acquisition order. Wei claims that content morphemes are "directly elected" by the speaker at the conceptual level, whereas system morphemes are either indirectly elected (e.g., prepositions that act as satellites in phrasal verbs) or assigned by the system (grammatical morphemes). The levels in this hierarchy correspond to the acquisition order for these three classes of morphemes.

[16] Since few studies have considered the different socio-linguistic environments in which child and adult L2 learners acquire the language, Pak (1987) designed a test that was intended to provide a fair comparison between child and adult L2 learners in similar environments. She concluded that the rate of acquisition was related to age, but that age was not related to the morpheme acquisition order.

257). The authors considered the relationship between maturational constraints and frequency effects to be "worthy of research attention" (p. 257), not least for its possible bearing on differences between L1 and L2 acquisition.

Testing such speculation depends on the ability both to fairly measure and compare input frequency as well as to quantify its effects. Neither of these tasks is simple. There is no universal benchmark for input frequency. R. Brown's (1973) parent-to-L1-learner frequencies, for example, cannot be taken as typical of the topics or registers that would constitute input for adult ESL learners or of the input (parental or otherwise) that would be available to children learning an L2, and the differences may have a bearing on morpheme frequency and/or its effects. Moreover, as Larsen-Freeman (2002) points out:

> Although researchers have known about a frequency effect for some time, until recently, we have lacked neurologically plausible models and technologically convenient means of measuring and testing frequency effects in input. Still, as relevant and important as a frequency factor is, it requires greater definition and qualification. For instance, L2 learners are agents of their own learning process. They do not merely record frequency; they categorize frequently occurring patterns, abstract, and generalize from them. (p. 275)

Larsen-Freeman pushes the discussion of input frequency in the direction of connectionism. This theoretical approach to language acquisition and other forms of learning attempts to move beyond the limitations of behaviorism by postulating that learners develop associations based on exposure to repeated patterns in input received in a variety of contexts (Bialystok & Hakuta, 1994). As this interpretation potentially overcomes the innatist dependence on purely hypothetical language-specific learning devices or modules, it represents a promising framework for future research on the acquisition of morphemes.

Native Language Transfer

Over the past three decades, the role of L1 transfer in L2 acquisition has been subject to considerable controversy. The behaviorists, who were the first to use the term "transfer" to mean the influence of habits learned in one language on the acquisition or use of another, were quick to hypothesize a powerful role for such manifestations of learned behavior in language. In the area of morpheme acquisition order in L2, however, studies were conducted in the 1970s and 1980s using subjects from a variety of different L1 backgrounds,[17] and the results seemed to suggest that the acquisition order was roughly the same regardless of the subjects' L1. For example, Dulay and Burt (1973) reported that less than 5% of the errors made by children in their study were due to L1 interference. Yet, at least until the late 1970s, L1 transfer was seen as tied to habit formation theory (Odlin, 1989). Thus, the innatist orientation of Dulay and Burt and other early NOS researchers may have caused them to minimize the role of L1 transfer in their data, since at the time, transfer was seen as antithetical to the universal cognitive mechanisms that such theorists hypothesize as steering learners' development.

[17] Subjects' L1s have included Spanish (Dulay & Burt, 1973, 1974a, 1974b; Rosansky, 1976; Robertson, 1986); Chinese (Dulay & Burt, 1974b; Fuller, 1978; Rosado, 1986); Korean (Fathman, 1975; Lee, 1981; Pak, 1987); Vietnamese (Kjarsgaard, 1979; Kessler & Idar, 1979); Japanese (Gills, 1975; Hakuta, 1975, 1976); and Arabic (Larsen-Freeman, 1976; Hanania & Gradman, 1977). Of these studies, however, only Dulay and Burt (1974b), Fathman (1975), and Larsen-Freeman (1976) examined multiple L1s in a single design.

In contrast, other researchers have found that the role of native language transfer is too significant to ignore. Fathman (1975), for example, found in comparing Spanish and Korean child learners of English aged six to fourteen that these learners differed markedly on one morpheme, namely articles, which are a feature of Spanish syntax but are absent from Korean. Similarly, examining evidence from adult learners, Andersen (1977) suggested that L1 transfer plays an important role in Spanish native speakers' acquisition of English articles and possessive *-'s*. He later observed that L1 transfer "clearly is a factor … that could interact with morpheme acquisition and accuracy order" (Andersen, 1978, p. 267).

Similarly, the single five year old Japanese subject in Hakuta's (1976) longitudinal study did not acquire articles or plurals, morphemes lacking in Japanese, until relatively late, although earlier (and subsequent) cross-sectional studies in the area of L2 acquisition order showed some consensus with regard to the early acquisition of these morphemes (see Table 2). Given his findings, however, it is not surprising that Hakuta (1976) maintained that the possibility of language transfer could not be disregarded. He suggested that the visible absence of transfer as a main predictor in other L2 studies could be a result of the researchers' choice of which phenomena to investigate—which, in turn, may reflect the researchers' theoretical orientation. In other words, it is possible that the overall finding of a low percentage of interference errors, or even of a uniform order of acquisition for a restricted set of grammatical morphemes, does not indicate that all aspects of linguistic development are the result of innate factors such as universal cognitive mechanisms or language-specific modules.

Since Hakuta's (1976) study, researchers have documented a number of putative examples of L1 transfer in the speech of L2 learners and have made a number of interesting claims about their relevance. For example, Wode (1977) found evidence of influence from the subjects' L1 on German native speakers' placement of verbal negation in certain English sentences, but only after a stage of development had been reached that allowed these learners to "recognize" similarities between the two languages. Zehler (1982), found differences in the patterns of acquisition of the English plural -s, which she ascribed to differences in her subjects' L1s. Finally, Zobl (1982) found different paths in the development of English articles when he compared data from a Spanish-speaking and a Chinese-speaking child. He hypothesized that the learners' L1s were the underlying factor in the occurrence of an intermediary stage in which the demonstrative *this* was used by the Chinese (but not the Spanish) speaker in place of the definite article *the*.

The role of similarities and differences between the subject's L1 and the target language (TL) in determining the salience (and hence the relative order of acquisition) of particular grammatical features in the TL has been much discussed (see Gass & Selinker, 2001, pp. 126-132). Since, however, salience is treated as a determinant in its own right in the natural order studies, further discussion of this issue falls outside of the scope of this paper. Nonetheless, it can be noted that most researchers no longer dismiss language transfer as an inherently behaviorist concept, and it is generally agreed that this mechanism plays an important role in L2 acquisition. The nature of L1 transfer is currently being reconceived in new and abstract ways that warrant a more detailed discussion in another context (e.g., the idea that transfer may be as much a creative process as any other aspect of acquisition (Odlin, 1989).

In summary, starting with the "morpheme order" studies of the early 1970s, the field now known as "natural order" studies has played an important role in furthering the understanding of the nature of language acquisition in terms of the sequence of language development. Since the 1980s, determinants of a reputedly invariant order in the acquisition of certain grammatical

morphemes have been a major focus of this field of research. This paper has reviewed a selection of the literature in this field and examined some of the arguments regarding three putative determinants: semantic complexity, input frequency, and native language transfer. For the present purposes, it remains only to note some of the practical applications and some of the criticisms of natural order studies.

NATURAL ORDER STUDIES: APPLICATIONS AND CRITICISMS

Natural (morpheme) order studies enjoyed considerable popularity in the 1970s and 1980s for a number of reasons, some of which remain relevant today. First of all, Brown's (1973) methodological insights into grammatical morpheme analysis facilitated the development of analytical methods for L2 research (Dulay, Burt, & Krashen, 1982). These grammatical morphemes are easily elicited because almost every verbal utterance contains several of them, and it is fairly easy to determine whether they are used correctly or not (Kjarsgaard, 1979). Moreover, morpheme acquisition studies shed light on the relative degree of difficulty in learning various L2 structures (Pak, 1987). Knowledge of this learning hierarchy is very important for teachers and educational policy makers. For example, awareness of the order of acquisition that is natural to L2 learners may help curriculum developers to devise teaching sequences that are more adequate. It may also help teachers to develop effective teaching methods and/or better approaches to understanding and dealing with L2 learners' errors.

However, natural order studies have generated a considerable amount of controversy over the years. In the main, the critics have claimed the following: (1) the results obtained may be a by-product of the BSM or other data collection instruments or methods (Porter, 1977), (2) the functors studied were drawn from too wide a range of linguistic phenomena (Zobl & Liceras, 1994), (3) grammatical functors represent too small and too trivial a part of any language to be a basis for general conclusions (Larsen-Freeman & Long, 1991),[18] (4) morphemes with different meanings should not have been grouped as a single grammatical structure (Hatch, 1978a), (5) variations in individual data are obscured by group data (Rosansky, 1976), (6) the total picture of a learner's use of a form is not taken into account (Hakuta, 1976; McLaghlin, 1984; Ellis, 1985), (7) accuracy order cannot necessarily be equated with acquisition order (Hatch, 1978b; Ball, 1996), (8) the scoring method does not typically take into account oversuppliance of functors in non-obligatory contexts (Lightbown, Spada, & Wallace, 1980; Long & Sato, 1984), and (9) the results are difficult to generalize because, with few exceptions,[19] only English has been investigated (Cook, 1993).

Morpheme order studies have also been criticized for being almost exclusively cross-sectional in nature. Indeed, considering the important insights that this research can offer to L2 teachers, there is an urgent need to conduct additional longitudinal studies. This need is also derived from another criticism, namely the notion that "acquisition" order should not be the same as "accuracy" order (Ball, 1996). According to Ellis (2000), the claims of the cross-sectional studies about the acquisition orders were based on the relative accuracy achieved by learners when they used different functors in isolated samples of output. As Ellis pointed out, the leap to the conclusions about acquisition order was based on the assumption that learners who acquired

[18] Note, however, that much of the language acquisition research is in fact largely concerned with these "trivial" elements.

[19] Exceptions include Dato's (1975) study of morpheme acquisition order and Mendizabal's (2001) study of Basque.

those features performed more accurately. This assumption, Ellis argues, is not—or at least not necessarily—justified.

Of the criticisms cited above, several of which were addressed in this paper, the single most important may be the observation that natural order studies should be undertaken with other L2s in addition to English. The findings from ESL/EFL-only studies are ultimately impossible to generalize to other languages. This severely limits the usefulness of morpheme order studies to teachers of non-English L2s. It also limits the usefulness of morpheme order studies as a tool for understanding the processes underlying language acquisition.

CONCLUDING REMARKS

The above discussion of three putative determinants for morpheme acquisition order in English provided evidence that semantic complexity, input frequency, and native language transfer may play a role in ESL learning and perhaps in the acquisition of other L2s. These findings suggest that an incomplete and inaccurate picture would emerge if we were to insist on a priority among these factors or to attempt to explain "natural order" on the basis of any single determinant. In fact, after about a decade of relative inactivity in this field, Goldschneider and DeKeyser (2001) conducted a multiple regression analysis of the results from 12 "natural order" studies, which showed that a very large portion of the total variance in the acquisition order of grammatical morphemes in English can be explained by a combination of five factors: perceptual salience, semantic complexity, morphophonological regularity, syntactic category, and input frequency. This multiple-determinant approach, I believe, represents the most reasonable and promising course for the future of natural order studies.

Natural order studies have been influential in their attempt to elucidate the nature of developmental sequences. Moreover, natural order studies remain relevant because they highlight the necessity for a change in our understanding of language transfer, and offer a window into a more complex understanding of the mechanisms that govern language development. Most importantly, natural order studies have important implications for second language teaching. Thus, despite considerable criticism, there is still a need for natural order studies, although they may have to go beyond the limitations of previous research in order to achieve generalizability. With greater attention to non-English L2s, more longitudinal methodology, and a multi-determinant approach to interpretation, however, it may be possible to realize this goal.

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