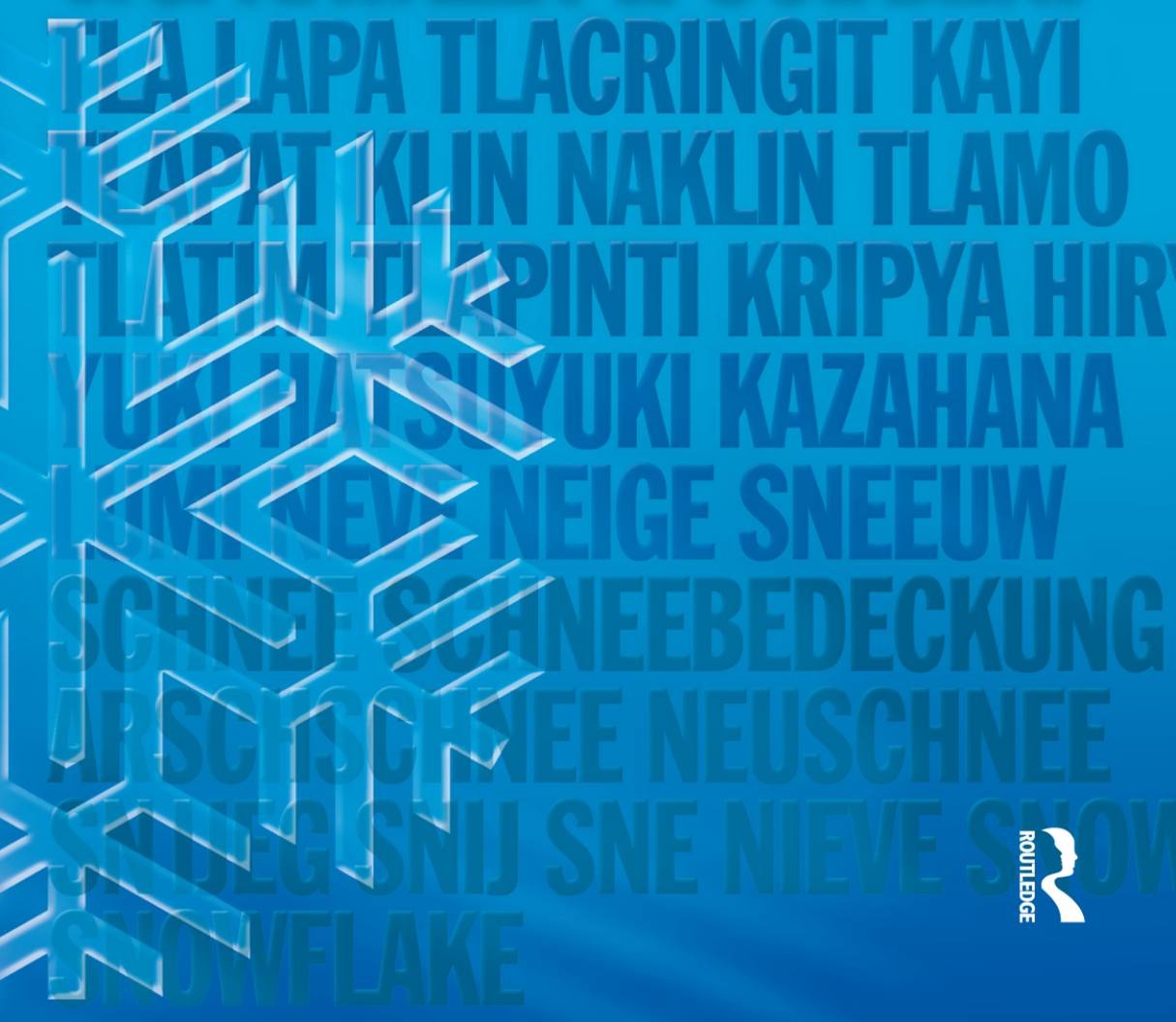
learning about language

SECOND EDITION

AN INTRODUCTION TO PSYCHOLINGUISTICS

DANNY D. STEINBERG
& NATALIA V. SCIARINI



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1894 Chautaugua, New York
Alexander Graham Bell (47 years), who was a teacher of the deaf before he invented the telephone, with Helen Keller (14 years), seated, and Anne Sullivan Macy (28 years), standing. Helen Keller became deaf and blind at 19 months due to an illness. At the age of 7 years she learned language through a system of touch by her teacher, Anne Sullivan.

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An Introduction to Psycholinguistics

Second edition

Danny D. Steinberg and Natalia V. Sciarini

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To our sons Kimio, Will, and Artem, who brought us joy and furthered our understanding of language.

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Contents

Preface

A little more than a decade has passed since the first edition of this book appeared. Since then the field of psycholinguistics has grown so much that it is necessary to update the earlier materials.

This book is directed towards readers who wish to understand the psychology of language as it relates to learning, mind and brain as well as various aspects of society and culture. Although the topics that are presented are dealt with in depth and involve current issues and research, no specific knowledge of any topic is presupposed on the part of the reader; basic terms and concepts are generally presented and discussed before more complex or abstract matters are considered.

The knowledge presented in this volume is intended to bring the reader to the highest level of understanding of the topics considered in an engaging way. Students, lecturers and researchers from a variety of fields – psychology, linguistics, philosophy, second-language teaching, speech pathology – can all benefit from the wide range of important knowledge and theory that are considered.

The book is divided into three parts, each with a number of chapters:

Part 1, First-language learning: Chapter 1, How children learn language; Chapter 2, The deaf and language: sign, oral, written; Chapter 3, Reading principles and teaching; Chapter 4, Wild and isolated children and the critical age issue for language learning; Chapter 5, Animals and language learning.

Part 2, Second-language learning: Chapter 6, Children vs. adults in second-language learning; Chapter 7, Second-language teaching methods; Chapter 8, Bilingualism, intelligence, transfer, and learning strategies.

Part 3, Language, mind and brain: Chapter 9, Language, thought and culture; Chapter 10, Where does language knowledge come from? Intelligence, innate language ideas, behaviour?; Chapter 11, Natural Grammar mind and speaker performance; Chapter 12, Language and the brain.

Of particular note in this book is the presentation of a radically new theory of grammar, *Natural Grammar*. Such a grammar conforms to the primary acquisition process of speech comprehension, where comprehension develops prior to production in normal children and it develops without production for mute-hearing children. Production is considered as a secondary process deriving from comprehension. Natural Grammar is the only current grammar that can account for the psycholinguistic processes of speech comprehension and speech production.

We are indebted to Professor Hiroshi Nagata of Kawasaki University of Medical Welfare, Japan, Professor David Aline of Kanagawa University, Japan, and to Mr Jeff Matthews, Naples, Italy, who not only made substantial contributions to various chapters of the book but were instrumental in providing us with many source materials. We would like to thank Professor Steven Davis of Carleton University, Canada, for his enlightening discussion on mind and philosophical functionalism, Professor Richard Schmidt of the University of Hawaii for his important comments on morpheme learning, and Professor Julia Herschensohn of the University of Seattle for her insightful suggestions on aspects of Chomsky's Universal Grammar, as well as Professor Jun Yamada of Hiroshima University for his useful comments on the new theory of grammar, Natural Grammar. These scholars, it must be noted, do not necessarily agree with the views expressed in the chapters.

Our appreciation is extended to the editors, Professor Geoffrey Horrocks, Ms Casey Mein, and Mr Philip Langeskov for their encouragement, help and patience in bringing this book to publication.

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Part 1

First-language learning

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Chapter 1

How children learn language

We have minds and in our minds we have the means for producing and comprehending speech. But how did we come to have such abilities? At birth we cannot comprehend speech, nor can we produce speech. Yet, by the age of 4 years we have learned vocabulary and grammatical rules for creating a variety of sentence structures including negatives, questions, and relative clauses. And although 4-year-olds still have passives and some other elaborate syntactic structures to learn, along with a never-ending stock of vocabulary items, they have already overcome the most difficult obstacles in language learning. This is true of children the world over, whatever the language may be.

Indeed, the language proficiency of the 4- or 5-year-old is often the envy of the adult second-language learner, who has been struggling for years to master the language. It is one of the fundamental tasks of psycholinguists to explain how children learn language.

For reasons that will become apparent later, we will separate language into two distinct, but related, psychological processes: *speech production* and *speech comprehension*. We will deal with each in turn and then consider how they are related.

1.1 The development of speech production

1.1.1 From vocalization to babbling to speech

1.1.1.1 Vocalization to babbling

Prior to uttering speech sounds, infants make a variety of sounds – crying, cooing, gurgling. Infants everywhere seem to make the same variety of sounds, even children who are born deaf (Lenneberg *et al.*, 1965). The ability and propensity to utter such sounds thus appear to be unlearned. Later, around the seventh month, children ordinarily begin to babble, to produce what may be described as repeated syllables ('syllabic reduplication'), e.g. 'baba', 'momo', 'panpan'. While most of the syllables are of the basic *Consonant + Vowel* type ('baba' and 'momo'), some consist of closed syllables

of the simple *Consonant* + *Vowel* + *Consonant* variety ('panpan'). This structure of babbling as repeated syllables has been found to be produced by children in all studied languages.

The sounds that infants make involve many but not all of the speech sounds that occur in the languages of the world. For example, English sounds like the 'th' in 'though' and the 'th' in 'thin' are rare, as are the click sounds common in various African languages such as Zulu. In time, however, such vocalizations take on the character of speech. From as early as 6 months of age infants from different language communities begin to babble somewhat distinctively, using some of the intonation of the language to which they have been exposed (Nakazima, 1962; Lieberman, 1967; Tonkova-Yampol'skaya, 1969). Research seems to indicate that in languages where the intonation contours are quite distinctive, native speakers can tell the difference between the babble of infants who were learning their (the native speakers') language as opposed to the babble of infants learning other languages (de Boysson-Bardies *et al.*, 1984).

The production of sounds using the intonation contours of the first language is obviously a learned phenomenon because when infants babble they follow the intonation contours of the language which they hear. This is something that deaf infants deprived of hearing speech do not do. While such infants are able to vocalize and cry, they do not progress to babbling. Interestingly, deaf infants who have been exposed to sign language from birth do the equivalent of babbling – *with their hands* (Petitto and Marentette, 1991)!

1.1.1.2 Babbling to speech

It is from the advanced stage of babbling that children move into uttering their first words. Often this occurs at around 1 year of age but can occur much earlier or much later. When children begin to utter words, somewhat surprisingly only some of the sounds that they have uttered in babbling appear in speech. The other sounds must be reacquired.

And there may be some order to the acquisition of speech sounds. For example, sounds like /x/ (as in Ba*ch*), /k/, and /l/ that commonly occurred in vocalization and babbling prior to speech may now tend to occur later, after the acquisition of such phoneme sounds as /p/, /t/, /m/, /a/ '*f*all', and /o/ '*t*all'. A phoneme, it should be said, represents a class of speech sounds in a language. For example, in the word 'pep' the individual sound /p/ can represent the sound at the beginning of the word '*p*ep' as well as the sound at the end of the word 'pe*p*'. (Incidentally, the letters surrounded by slashes (//) indicate that a phoneme sound is identified. A phoneme sound is a single discrete sound of a language.) Phonetically, the two sounds are different, with /p/ in the final position having a large amount of aspiration (puff of air). Nevertheless, they are regarded as the same phoneme. There is, then, some discontinuity between babbling and meaningful speech

where the kinds of sounds that occur in babbling are not always immediately realized in meaningful speech.

While some studies show some continuity between babbling and early speech (Vihman *et al.*, 1985), most research shows a lack of continuity, e.g. Oller and Eilers (1982), Stoel-Gammon and Cooper (1984), and Kent and Bauer (1985), in that advanced babbling seems to approach the consonant–vowel combinations of later meaningful speech. The relationship, however, is not a strong one.

Why is there some degree of discontinuity from babbling to the production of speech sounds? In our view, the discontinuity issue involves, as Jesperson (1933) noted many years ago, the distinction between intentional and non-intentional vocalization. Babbling is non-intentional in the sense that particular sounds are not under central cognitive control; the infant does not intentionally make the particular babbling sounds that occur. They seem to happen by the chance coordination of *speech articulators* (various parts of the body that are used to create speech sounds: mouth, lips, tongue, vocal cords, etc.). The case of meaningful speech is quite different. Here, sounds must not be uttered at random but must match previously heard sounds that are conventionally associated with certain objects, needs, and so forth. In order to accomplish this feat, it is necessary that the child discover which sound is created by which speech articulators. It is this knowledge that the child must acquire in order to speak meaningfully. Speech *is* dependent to some degree on babbling, however, for it is in engaging in babbling that the child will chance on many of the various articulatory mechanisms for producing speech and give practice to the use of those articulators.

1.1.1.3 Explaining the acquisition order of consonants and vowels

In the meaningful speech phase, it appears that consonants are acquired in a front-to-back order, where 'front' and 'back' refer to the origin of the articulation of the sound. Thus, /m/, /p/, /b/, /t/, and /d/ tend to precede /k/, and /x/. Conversely, vowels seem to be acquired in a back-to-front order, with /a/ (b*a*ll) and /o/ (t*a*ll) preceding /i/ (m*ee*t) and /ʌ/ (m*u*d). Jacobson (1968) devised a theory based on his distinctive feature theory of phonological oppositions that attempts to predict the order of the acquisition of speech sounds. In the main, however, empirical studies have not supported his predictions (Velten, 1943; Leopold, 1947; Braine, 1971; Ferguson and Garnica, 1975). There is much more variation in the order of acquisition than the theory predicts. Actually, this may well be expected, since there could be a great deal of chance involved when a child searches for the proper articulators of speech with which to make a sound.

As far as the establishment of intentional connections is concerned, our opinion is that two variables dominate this process: *visibility of articulators* and *ease of articulation* (first proposed by Steinberg, 1982). When the child becomes motivated to produce meaningful speech (this occurs after the

child has learned to understand some words spoken by other people), the child begins to seek ways to produce the desired sounds. The child then becomes alert to clues that relate to the articulation of the speech sounds.

The child observes where speech sounds come from and notes the relationship between the sounds and the position of noticeable speech articulators, particularly the mouth and lips (Kuhl and Meltzoff, 1988; Legerstee, 1990). It is mainly movements that the child observes and imitates. Since noticeable mouth and lip movements are primarily involved in the articulation of certain consonants, it is not surprising, therefore, that children tend to produce these consonants, such as /m/, /p/, and /b/, before the others. Consonant sounds like the stop /k/ and the fricatives /s/ and /z/, which involve the movement of non-visible articulators, are generally learned later.

As for vowels, since most involve the use of largely unseen articulators, children get little aid from direct observation. Rather, they must indulge in a lot of trial and error in order to secure the proper positions for articulators. It seems that those sounds that are closest to the resting position of articulators, e.g. back vowels such as /a/ (w*a*tch), are easier to create and are learned earlier while those sounds that require more motor control to create, e.g. a tensed front vowel such as /i/ (f*ee*t), are learned later.

However, over and above the operation of these variables of ease and visibility, there is (as first mentioned above) the important one of *chance*. It seems that children may discover by chance a particular articulator–sound connection, e.g. the daughter of Leopold (1953), Hildegard, was able to pronounce the word 'pretty' with precision yet she was unable to pronounce other words composed of similar sounds. Interestingly, although the word 'pretty' was pronounced accurately at first, over time, as her pronunciation of words developed, the pronunciation of that word deteriorated. It seems that if a word is to be retained, the chance discovery of an articulator–sound connection must be followed by its incorporation within the overall developing sound system.

1.1.2 Early speech stages: naming, holophrastic, telegraphic, morphemic

1.1.2.1 Naming: one-word utterances

When do children start to say their first words? It may surprise you to learn that research on this basic question is not at all conclusive. This is not only because there is a very wide range of individual differences but also because the precise determination of just when a word has been learned is not easy to make and is not standardized.

The mere uttering of speech sounds by the child, e.g. 'mama', may or may not indicate word knowledge. Children can be said to have learned

their first word when (1) they are able to utter a recognizable speech form, and when (2) this is done in conjunction with some object or event in the environment. The speech form may be imperfect, e.g. 'da' for 'daddy', and the associated meaning may be incorrect, e.g. all people are called 'da', but, as long as the child uses the speech form reliably, it may be concluded that the child has acquired some sort of word knowledge.

First words have been reported as appearing in children from as young as 4 months to as old as 18 months, or even older. On average, it would seem that children utter their first word around the age of 10 or 12 months. Some of this variability has to do with physical development, such as the musculature of the mouth, which is essential for the proper articulation of sounds. Certain brain development is also involved since the creation of speech sounds must come under the control of speech areas in the cerebral cortex (Bates *et al.*, 1992).

It appears that children first use nouns as proper nouns to refer to specific objects (Moskowitz, 1978), after which they may or may not extend the meaning correctly for common nouns (Clark, 1973). For example, while 'dada' may first be used to identify one particular person, it may or may not be extended to include all men or all people. Or, 'wow-wow' may be used to refer to one dog, and then be extended to refer to all animals, soft slippers, or people in furs. In time, of course, the proper restrictions and extensions are learned.

1.1.2.2 Holophrastic function: one-word utterances

However, children do not only use single words to refer to objects; they also use single words to express complex thoughts that involve those objects. A young child who has lost its mother in a department store may cry out 'mama', meaning 'I want mama'. Or a child may point to a shoe and say 'mama', meaning 'The shoe belongs to mama'. Research has shown that the young child can express a variety of semantic functions and complex ideas by the use of single words (Bloom, 1973; Greenfield and Smith, 1976; Scollon, 1976). In such cases, the child uses a single word to express the thought for which mature speakers will use a whole sentence. It is because of this whole sentence function that this aspect of one-word speech is often referred to as 'holophrastic', where 'holo' indicates whole, and 'phras' indicates phrase or sentence.

Actually, it is quite remarkable how inventive children can be in the use of single words. Researchers have noted that children may describe a complex situation by using a series of single-word holophrases. For example, 'peach, Daddy, spoon' was used to describe a situation where Daddy had cut a piece of peach that was in a spoon (Bloom, 1973), and 'car, go, bus' was used to describe a situation in which hearing the sound of a car reminded the child that she had been on a bus the day before (Scollon, 1976). These strings of words are not yet sentences, because at the end of each

word the child pauses slightly and uses a falling intonation of the sort that is used by mature speakers to signal the completion of a sentence.

It is often not easy, of course, to interpret what a child is intending to convey by the single word. And, while knowing the child, the child's previous experiences, and elements of the present situation will serve to aid in the interpretation of an utterance, even the most attentive parents are frequently unable to interpret utterances that their children produce. Incidentally, we often use the traditional term 'utterance' rather than 'sentence' in order to avoid disputes as to whether what the child says is truly a sentence or whether it is grammatical. The advantage of the term 'utterance' is that it describes what the child says without having to worry about assigning sentencehood or grammaticality to what was said.

1.1.2.3 Telegraphic speech: two- and three-word utterances

Children do not proceed as rapidly to two-word utterances as one might expect. Why this should be the case is a matter of conjecture, although it is our view that children must first become aware that adding more words will improve communication, e.g. 'tummy hurt' is more effective than just 'hurt' or 'tummy'. In any case, around 2 years of age or so children begin to produce two- and three-word utterances.

Table 1.1 lists a number of typical two-word utterances along with what a mature speaker might say in the same circumstances. The possible purpose of each utterance is indicated, as are some of the semantic relations involved.

Variety of purposes and semantic relations

The most striking features about the dozen and a half or so very ordinary utterances shown here are the *variety of purposes* and the complexity of *semantic relations* that they exhibit. Regarding purpose, the child uses language to request, warn, name, refuse, brag, question, answer (in response to questions), and inform. In order to gain these ends, the utterances involve such semantic relations and concepts as agent, action, experiencer,[1] receiver, state, object, possession, location, attribution, equation, negation, and quantification.

Low incidence of function words

A second feature of the child's utterances is the low incidence of function words such as articles, prepositions, and the copula 'be'. Rather, it is nouns, verbs, and adjectives which mainly appear in the utterances. This is not surprising when one considers that these are the most informative classes of

[1] The term *experiencer* is used differently from many theorists here. We use it as indicating a sentient being that experiences states or ideas. A *receiver* is an experiencer who is affected by an action.

Table 1.1 Two-word child utterances and their semantic analysis

Child utterance	Mature speaker utterance	Purpose	Semantic relations (expressed or implied)
Want cookie	I want a cookie	Request	(Experiencer)–State–Object
More milk	I want some more milk	Request	(Experiencer)–State–Object; Quantification
Joe see	I (Joe) see you	Informing	Experiencer–State–(Object)
My cup	This is my cup	Warning	Possession
Mommy chair	This chair belongs to Mommy	Warning	Possession
Mommy chair	This chair belongs to Mommy	Answer to question	Possession
Mommy chair	Mommy is sitting in the chair	Answer to question	Location
Big boy	I am a big boy	Bragging	Attribution
Red car	That car is red	Naming	Attribution
That car	That is a car	Naming	Equation
No sleep	I don't want to go to sleep	Refusal	Experiencer–State–Negation
Not tired	I am not tired	Refusal	Experiencer–State–Negation
Where doll?	Where is the doll?	Question	Location
Truck table	The truck is on the table	Informing	Location
Daddy run	Daddy is running	Informing	Agent-Action
Joe push	I (Joe) pushed the cat	Informing	Agent–Action–(Object)
Push cat	I pushed the cat	Informing	(Agent)–Action–Object
Give candy	Give me the candy	Request	(Agent)–Action–Receiver–Object

words and would be the first that children would learn to understand. The meanings of function words, *to* John, *with* Mary, *the* car, candy *and* cake, could never be determined if the meanings of nouns, verbs, and adjectives were not known. Given knowledge of the words 'toy' and 'table', a child could guess what function a preposition like 'on' might signify when hearing the sentence 'The toy is *on* the table' in a situational context where a toy is 'on' a table. In other situations the idea 'under', for example, may be suggested.

Close approximation of the language's word order

The final feature of the child's utterances that should be noted is the close correspondence of the child's word order to that of proper sentences. The child learning English tends to say 'My cup' rather than 'Cup my', 'Not tired' rather than 'Tired not', and 'Daddy come' rather than 'Come Daddy' when describing the arrival of Daddy. Thus, even with two-word utterances, the child exhibits some learning of the word order of the language. This is not to say that the child does not produce significant deviations, nor is this a sufficient basis for claiming that the child realizes that different word orders signal different semantic relations. Yet it does show that the child has acquired a significant aspect of the grammar of English that will later enable the child to comprehend and produce appropriate utterances.

1.1.2.4 Morpheme acquisition

Once two- and three-word utterances have been acquired, children have something on which to elaborate. They start to add function words and inflections to their utterances. Function words like the *prepositions* 'in' and 'on', the *articles* 'the', 'a', and 'an', the *modals* 'can', and 'will', and the *auxiliaries* 'do', 'be', and 'have', begin to appear, together with *inflections* such as the plural /s/ on 'cats', and /z/ on 'dogs', and tense markings such as the /t/ past tense form on 'worked'.

A morpheme, it should be noted, is a root word or a part of a word that carries a meaning. Thus, for example, the single word 'elephants' consists of two morphemes, 'elephant' and Plural (s), as does the single word 'ran', which consists of 'run' and Past. Incidentally, 'elephants' consists of eight phonemes /e/, /l/, /ə/, /f/, /ð/, /n/, /t/, and /s/ (the symbol ə, schwa, represents a sort of reduced vowel). Clearly, the orthography often does not adequately represent actual speech sounds.

The Brown morpheme acquisition research

The most notable piece of research on morpheme acquisition to date is that done by the noted psycholinguist Roger Brown (1973). In a long-term and detailed study with three children, Brown focused on the acquisition of different function words and inflections in English. He found that children acquired the morphemes in a relatively similar order.

Brown's order of morpheme acquisition

Table 1.2 shows the list of morphemes and the general order in which they were acquired. Other studies have generally confirmed Brown's results. Even though other researchers have found some variation among children in terms of the speed in which they learned the morphemes, nonetheless the order was generally the same (Lahey *et al.*, 1992). A similar acquisition order of these English morphemes has also been found for children with language disorders (Paul and Alforde, 1993).

Morphemes towards the top of the table are acquired before those towards the bottom. Thus, we see that Present Progressive,[2] Prepositions ('in' and 'on'), and the Plural were learned well in advance of morphemes like the Article, Third Person (Regular and Irregular), and the Auxiliary 'be'.

Why this order of acquisition?

That the morphemes should have been acquired in this order has been the subject of much speculation. Brown checked the frequency of occurrence of the morphemes in adult speech to see if more highly used morphemes were learned faster by the child. He found no relationship. He then considered that the order reflected an increasing order of semantic or grammatical complexity. For example, Plural is learned early because it only requires the idea of 'number', whereas the copula 'be' is more complex because the child needs to apply both number and tense to select which form of the copula to use (see Kess, 1992, p. 294). Undoubtedly, these are contributing factors. More contentious is the view of Dulay *et al.* (1982), who suggest that there is a sort of predetermined order in the child's mind that is governed by as yet *unknown* mechanisms, and that the morphemes appear in the order they do because of such mechanisms. We do not agree. A less metaphysical explanation is available.

Our explanation of the order of acquisition

Although it has been nearly three decades since Brown's theory of morpheme acquisition was first presented, no theory to date other than that of Steinberg (1982, 1993) and Steinberg *et al.* (2001) has adequately explained that order. The order of morpheme acquisition can be explained directly and simply by applying psychological learning principles, principles that are universal and accepted. As such, they will hold for children learning the grammatical morphemes of any language. The three variables that we posit to explain the general order of acquisition, according to the first author, are: (1) *Ease of observability of referent*, (2) *Meaningfulness of referent*, and (3) *Distinctiveness of*

[2] Regarding Brown's naming of the first morpheme acquired as Present Progressive, it should probably be termed simply Progressive because only the '-ing' suffix appears. However, the Present is implied in the child's utterance because the child usually talks about the here and now. The auxiliary 'be' that goes along with the Progressive does not appear until much later. It is for this reason that the Present is marked off with parentheses in Table 1.2.

Table 1.2 How psychological variables explain order of learning of morphemes

Morpheme name and concept	Examples	Learning variables					
		Observability of referent	Meaningfulness of referent	Sound signal for referent	Summary		
1. **(Present) Progressive**: continuing action	Mary playing	High	High	High	H	H	H
2. **Prepositions**: location	in, on	High	High	High	H	H	H
3. **Plural**: one vs. more than one object	/s/, /z/, /iz/	High	High	Low	H	H	L
4. **Past Irregular**: past time	came, went, sold	Low/Medium	High	High	L/M	H	H
5. **Possessive**: possession	/s/, /z/, /iz/	High	High	Low	H	H	L
6. **Copula 'be' Uncontractible**: connector with tense	What is it?	Low	Low	High	L	L	H
7. **Articles**: one; previous reference	a, an, the	Low	Medium	High	L	M	H
8. **Past Regular**: past time	/t/, /d/, /id/	Low/Medium	Medium	Low	L/M	M	L
9. **Third Person Regular**: third person present singular	/s/, /z/, /iz/	Low	Low	Low	L	L	L
10. **Third Person Irregular**	does, has	Low	Low	High	L	L	H
11. **Auxiliary 'be' Uncontractible**: tense carrier	Is Mary happy?	Low	Low	High	L	L	H
12. **Copula 'be' Contractible**: connector with tense	Mary's hungry	Low	Low	Low	L	L	L
13. **Auxiliary 'be' Contractible**: tense carrier	Mary's playing	Low	Low	Low	L	L	L

the sound signal that indicates the referent. The three variables are further based on the principle that generally what the child first understands will be that which the child first produces. These variables affect second-language learning as well.

- **Variable 1: Ease of observability of referent**. Whether an object, situation, or event is or is not easily observed by the child is essential for learning. The more easily a child can see or hear or otherwise experience the referent, e.g. seeing a dog, smelling a cookie, hearing a car, feeling hungry, the more likely are such referents – in conjunction with the speech sounds spoken by others – to be stored in memory. For example, if someone were to say 'The dog is barking' as opposed to 'The dog barked' or 'The dog will bark', the referent in the first sentence will be more saliently observable because it involves a present ongoing action, and this difference will affect learning.
- **Variable 2: Meaningfulness of referent**. Referent objects, situations, and events that are of interest to the child and about which the child desires to communicate will be learned faster than those that lack such interest. It is only natural that the child will remember the more highly meaningful referents.

  Child utterances reflect the concepts that the child wishes to communicate, e.g. 'Car table', 'Car going', 'Doll sitting', 'Doll walking'. When these highly meaningful items are compared to such grammatical function items as the Article, Auxiliary 'be', Copula 'is' with the auxiliary contractible 's, and Third Person marker, it is clear that function items have little inherent meaning for a child who is just beginning to learn the language. These are not, therefore, items that we would expect a child to learn quickly.
- **Variable 3: Distinctiveness of the sound signal that indicates the referent**. In order to learn a morpheme, besides the observability and meaningfulness of the referent, it is essential that the child be able to identify the speech sound that signals that morpheme. The greater the sound distinction involved, the easier it will be for a morpheme signal (consisting of one or more phonemes) to be learned. For example, compare the Incontractible Copula 'be' in 'What *is* it?' with the Auxiliary 'be' Contractible in 'Mary'*s* playing'. The former case with 'is' is more distinctive from a hearing point of view because it is a separate word with a vowel, and, as a separate word, it receives some degree of stress in a phrase or sentence. This gives prominence to the sound. In contrast, -'s is merely a consonant that is manifested as a suffix and does not receive stress.

Rating the morphemes on these variables

Let us rate the morphemes in the Brown study on each of these variables, assigning a value of High (H), Medium (M), or Low (L) depending on the degree to which we estimate the morpheme to manifest that variable.

Thus, for example, for the child's utterance of No. 1, 'Mary play*ing*', we assign a High on Observability (the continuing action is easy to see), a High on Meaningfulness (the whole event is of great interest to the child), and a High on Sound Signal because the '-*ing*' suffix is easy to distinguish ('play' vs. 'play*ing*') when the child hears this spoken.

Thus, in the Summary column this morpheme receives a H–H–H pattern. In contrast, for number 13, Auxiliary 'be' Contractible, we assign a Low on Observability because even without the -'s the child probably assumes that the '-ing' in 'playing' already implies present time in addition to continuing action. Until the child learns to understand and wants to express ideas of the past that involve a continuing action, like 'Mary *was* playing', the child will not be interested in such a morpheme. A Low is also given on Meaningfulness for the same reason. Since the -'s is barely discernible at the end of a noun, it is assigned a Low on Sound Signal. Thus, in the Summary column, this morpheme receives an L–L–L pattern.

Looking at the top of the Summary column, we see three Highs for number 1, (Present) Progressive, and number 2, Prepositions. As we proceed downwards in the order, the number of Highs decreases on the Observability and Meaningfulness variables; there is H–H–L for number 3, Plural, until at the bottom we see L–L–H for number 11, Uncontractible Auxiliary, and L–L–L for both number 12, Contracted Copula, and number 13, Contractible Auxiliary. Clearly, the more Highs there are for a morpheme, the faster is the learning, and, conversely, the more Lows, the slower the learning.

The data are remarkably uniform with respect to the postulated variables. This could hardly be otherwise, on reflection, *given the strong psychological drive that motivates the child in its search for meaning in speech*. Thus, morpheme referents that are more observable and carry more meaning will be more quickly learned than those that are not; this is why we find morphemes whose referents are less observable and less meaningful, generally the so-called grammatical function morphemes, towards the bottom of the list.

The morphemes in the top third of the table are undoubtedly qualitatively different from the morphemes in the bottom third of the table. The summary ratings reflect that intuition. This being the case, we can conclude that the three variables provide a good general explanation for the learning order of morphemes.

Explaining the order of some morphemes by the three variables theory

Let us now look in some detail at how the variables operate with one another so as to provide the learning outcomes that they do. In this regard, it will be instructive to consider three questions on morpheme acquisition order that highlight the operation of these variables. They are: (1) Why are Progressive and Prepositions 'in' and 'on' learned earliest?; (2) Why is Plural