Chapter 11
Syntax and Linguistic-Based Approaches

Gayle DeDe and Erin O'Bryan Richtsmeier

Many people with aphasia have difficulty with sentence comprehension and production. This chapter focuses on treatments for sentence-level impairments that are derived from the fields of linguistics and psycholinguistics. Understanding these treatment approaches is facilitated by a familiarity with some basic linguistic concepts and with the reasons why some sentences are more difficult to interpret than others. Thus, we briefly introduce some foundational knowledge before discussing current approaches to the assessment and treatment of disorders of sentence comprehension and production.

♦ Why Are Some Sentences More Difficult Than Others?

One early observation was that some people with aphasia who can understand simple active sentences, such as examples 1 and 2 in Table 11.1, have trouble understanding complex sentence types, such as the passive structures in examples 3 and 4 (Caplan, Waters, DeDe, Michaud, & Reddy, 2007; Grodzinsky, 2000). There are several ways to characterize sentences that are relatively simple and yet still difficult for people with aphasia.

One feature that can make a sentence more difficult to understand is the words in it, as illustrated in examples 1 to 4. The example sentences are similar but differ in important ways. In sentences 2 and 4, we can use world knowledge to help interpret the sentence. That is, because we know that “dolls” cannot usually hug “girls,” and that “girls” can hug “dolls,” we can make a pretty good guess about who was the “hugger” and who was the “hugged.” This type of inference does not work for sentences 1 and 3 because “boys” and “girls” are equally likely to be the “hugger” or the “hugged.” This is known as semantic reversibility; reversible sentences such as 1 and 3 are more difficult to understand than nonreversible sentences such as 2 and 4. For nonreversible sentences, strategies based on word meaning will lead to the correct interpretation of the sentence even if we cannot understand the syntactic structure.

Sentence structure also plays an important role in determining how challenging particular sentences are to understand. In this context, sentence structure refers to the hierarchical relations between the elements of a sentence. These hierarchical relations are discussed in more detail later in the chapter, when we discuss syntactic structure. Here, the important point is that sentences with more complex syntactic structures are more difficult to understand than sentences with relatively simple structures. One important signal of complexity is the order of the words in a sentence. In the English language, the most typical order for elements in a sentence is subject–verb–object (SVO). Sentences 1 and 2, which contain SVO word order, are said to have canonical word order. In contrast, sentences with noncanonical word order deviate from the typical order of elements in the language. Sentences 3 and 4 have noncanonical word order because the object of the verb precedes it (i.e., object–subject–verb word order). Sentences with noncanonical word order are
more complex than those with canonical order. For canonical sentences, strategies based on word order provide the correct interpretation of the sentence even if we do not process the hierarchical relations of the syntactic structure.

The number of propositions also contributes to how difficult a sentence is to understand. Propositions can be thought of as the number of ideas in the sentence. The number of verbs in a sentence, excluding auxiliary verbs, is typically equivalent to the number of propositions. Sentences that contain more than one verb, such as those in examples 5 and 6, are more complex than sentences with only one verb, such as examples 1 to 4.

Sentences 1 to 6 differ with regard to how easily they can be interpreted using strategies based on word meaning and word order, as shown in Table 11.1. Sentence 1 can be interpreted using strategies based on word order but not word meaning, whereas sentence 2 can be interpreted using word meaning or word order heuristics. Sentence 3 can be understood using word meaning but not word order, and sentence 4 cannot be understood using word order or word meaning. Table 11.1 also shows the number of propositions in each example. Factors such as word order and number of propositions interact with one another, so that sentences with two propositions and noncanonical word order (sentence 5) are more difficult to understand than sentences with two propositions but canonical word order (sentence 6). Such sentences as 4 and 5 can be understood based only on the syntactic structure, which is more fully described below.

Finally, note that features such as word order and number of propositions also affect sentence processing in unimpaired populations. That is, sentences that are difficult for people with aphasia to understand are also generally hard for people without language impairment. The difference is that people with aphasia have more difficulty, and so they might fail to understand a sentence that an unimpaired person would just take a little longer to process.

**Syntax**

Syntactic theories provide a more formal way to capture the distinctions between sentence types and describe what makes one sentence more complex than another. In simple terms, syntax is the study of how phrases, clauses, and sentences are structured.

**Syntactic Phrases**

Syntactic trees show the structural relationship between words and phrases in a sentence. Figure 11.1A is an example of a somewhat simplified syntactic tree. Two types of syntactic phrases are depicted: noun phrases (NPs) and verb phrases (VPs). The noun phrases consist of a determiner (Det) and a noun, whereas the verb phrase consists of a verb and a noun phrase. In Fig. 11.1A, these phrases are arranged hierarchically into a sentence, denoted by the S-node of the syntactic tree. This tree captures some of the important relations among the phrases. For example, the sentence consists of a subject noun phrase "the girl," and a verb phrase. The verb phrase can be further decomposed into the verb "throws" and another noun phrase, which represents the object that was thrown (the ball). The configuration of the noun phrase nested within the verb phrase indicates that "the ball" is the thing that was thrown, rather than "the girl."
also generally hard
language impairment. The
aphasics have more
ight fail to understand a
implies.

e a more formal way to
between sentence types
es one sentence more
simple terms, syntax is
clauses, and sentences

the structural relationships
phrases in a sentence,
ple of a somewhat sim-
Two types of syntactic
noun phrases (NPs) and
noun phrases consist of
noun, whereas the verb
b) and a noun phrase. In
hierarchies are arranged hierar-
denoted by the S-node.
This tree captures some
ions among the phrases.
ence consists of a subject
and a verb phrase. The
further decomposed into
other noun phrase, an
object that was thrown
ation of the noun phrase
rb phrase indicates that
that was thrown, rather

Fig. 11.1 Examples of syntactic trees.
decisions were faster when the probe was semantically related to the moved element. The facilitation effect was not observed at the earlier control position. Such findings suggest that unimpaired people are sensitive to traces, that is, to the original location of moved elements.

Researchers have also investigated whether people with Broca and Wernicke aphasia are sensitive to the location of traces (Zurif et al., 1993, 1995). People with Wernicke aphasia showed a similar pattern of results as unimpaired controls, suggesting that they are sensitive to the original position of the moved constituent. People with Broca aphasia did not show the same facilitation effect as the unimpaired group, suggesting that they were not sensitive to the location of the trace or that their processing was slower than that of unimpaired controls. Other research supports a slowed processing account, suggesting that people with aphasia retain their ability to build syntactic trees, but execute these processes more slowly than unimpaired people (Caplan et al., 2007; Swinney et al., 1996; Thompson & Choy, 2009).

In summary, psycholinguistic studies have shown that there is some psychological reality to the concept of traces. Although people with aphasia seem to be sensitive to the location of traces, they may process them more slowly than unimpaired individuals.

Assessment

Sentence Comprehension

Several assessments are available to measure sentence comprehension in people with aphasia. Many of these focus on yes/no questions or following commands, and do not systematically assess comprehension of syntactically simple and complex sentences. To do so, tests must include syntactically simple and complex sentences that cannot be interpreted using strategies based on word order or world knowledge (e.g., sentences 3 and 5 in Table 11.1).

The Boston Diagnostic Aphasia Examination, 3rd edition (Goodglass, Kaplan, & Barresi, 2000) includes a test that targets sentences with relative clauses and two propositions, such as "The girl is chasing the boy who is wearing boots." In this sentence picture-matching task, items are presented by the examiner, and the client indicates (by pointing) which of four black-and-white pictures is best described by the sentence. However, all of the sentences with relative clauses contain canonical word order for English, so they can be interpreted using word order heuristics. For this reason, the test does not provide a clear-cut measure of comprehension of syntactically complex sentences.

Psycholinguistic test batteries measure sentence comprehension and production using materials that carefully vary factors such as verb argument and syntactic structure. These include the Psycholinguistic Assessments of Language Processing in Aphasia (Kay, Coltheart, & Lesser, 1992), the Northwestern Assessment of Verbs and Sentences (Thompson, in preparation), and the Psycholinguistic Assessment of Language (PAL) (Caplan & Waters, unpublished). Figure 11.2A contains a representative item from the PAL sentence picture-matching task. On this item, the clinician would say "Show me, The lion was chased by the elephant," and the client would indicate which of two pictures best matched the sentence.

Sentence Production

Testing sentence production ability is sometimes a challenge. Spontaneous speech may be evaluated using picture description or other connected speech tasks. There are several approaches to analyzing spontaneous speech, including correct information unit analysis (Nicholas & Brookshire, 1993) and quantitative production analysis (Saffran, Berndt, & Schwartz, 1989). These methods provide a means of quantifying various aspects of the sample, including efficiency, mean length of utterance, and percentage of complete sentences. However, picture description tasks do not necessarily elicit the full range of sentence structures that the client is able to produce. The problem is that more complex structures, such as passives, are difficult for people with aphasia to produce. This makes it difficult to determine whether a client is unable to produce a particular structure, or just avoiding it.

For this reason, psycholinguistic batteries frequently contain tasks designed to elicit complex
items are pre-dominantly black-and-white pictures. However, clauses contain color so they can be structured. For this reason, a clear-cut mea-sure of sentence production may be best achieved by using stimuli that are based on features such as verb tense, subject-verb agreement, and the presence of modifiers. The measure selected for this study was the number of correct responses on a sentence-identification task. This task involved presenting the client with several sentences, each followed by a picture. The client was then asked to identify the correct picture for each sentence.

Sentence formation. One approach is to present the client with pictures such as Fig. 11.2B, a sample item from the PAL, in which the arrows represent the objects to be described in the sentence, and the dot indicates which object should be mentioned first. The clinician might say “For this picture, I want you to talk about this [point to cat] and this [point to dog], I want you to start with this [point to cat] and use the verb chase.” The target sentence for Fig. 11.2B would be “The cat was chased by the dog.” Another task is sentence production priming (Thompson, in preparation). In this task, the client is shown two pictures that depict similar events. For example, the pictures might show (1) a girl hugging a boy, and (2) a boy hugging a girl. First, the clinician models a sentence to describe picture 1: “This picture could be described as ‘The boy was hugged by the girl.’”
The client's task is to describe picture 2 using the same structure. In the example, the correct target would be "The girl was hugged by the boy."

**Syntactically Oriented Treatments I: Verb-Centered Treatments**

Some treatment approaches have targeted verbs as a way to treat sentence production. Recall that the lexical representation of verbs contains information about their argument structure, and the grammaticality of a sentence requires that the verb's arguments be filled once and only once. The logic of verb-centered treatment is that improving access to a verb and its argument structures result in improved sentence production. Two verb-centered approaches are cuing verbs treatment and verb network strengthening treatment.

**Cueing Verbs Treatment**

Cueing verbs treatment (CVT) was derived from the theory that the verb plays a critical role in specifying the relation between entities in the sentence and thus is the "core" of the sentence (Loverso, Prescott, & Selinger, 1988; Prescott, Selinger, & Loverso, 1982). Clients are trained to produce sentences through structured practice producing verbs with their arguments. In general, CVT involves a progression through six hierarchically arranged steps, divided into two levels (see example in Table 11.2). Clients produce subject–verb sentences in level I and subject–verb–object sentences in level II. For level I, treatment progresses from (1) repetition of the entire sentence, (2) repetition of the verb and selection of an appropriate subject from choices provided by the clinician, and finally to (3) repetition of the verb plus self-generation of the subject based on WH questions. Level II follows the same progression except that the client is cued to produce a subject and an object.

A few studies have reported that CVT is associated with improved performance on standardized tests, improved production of sentences containing trained verbs, and generalization to production of sentences with untrained verbs (Loverso et al., 1988; Prescott et al., 1982). However, the studies contained no measures of generalization to discourse level production. In addition, the experimental design did not adequately control for the possibility that the changes could be due to general language stimulation rather than the specific treatment protocol.

**Verb Network Strengthening Treatment**

More recent work further demonstrates the effectiveness of verb-centered approaches to treatment (Edmonds & Babb, 2009; Edmonds, Nadeau, & Kiran, 2009). The goal of verb network strengthening treatment (VNeST) is to improve retrieval of content words within simple active sentences. VNeST is conceptually similar to CVT, but capitalizes on several additional features of verbs in an effort to maximize treatment gains. First, verbs can be associated with many different nouns,

<table>
<thead>
<tr>
<th>Level</th>
<th>Task</th>
<th>Verbal and Written Cues Provided to Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia</td>
<td>Repeat subject–verb sentence, &quot;The girl eats&quot;</td>
<td>Verb (eats), WH question (Who eats?), sentential subject (the girl)</td>
</tr>
<tr>
<td>Ib</td>
<td>Produce subject–verb sentence, &quot;The girl eats&quot;</td>
<td>Verb (eats), WH question (Who eats?), choice of subjects (e.g., chair versus girl)</td>
</tr>
<tr>
<td>I</td>
<td>Repeat subject–verb–object sentence, &quot;The girl eats the apple.&quot;</td>
<td>Verb (eats), WH question (Who eats?), subject (the girl), WH question (What is eaten?), object (the apple)</td>
</tr>
<tr>
<td>Iia</td>
<td>Produce subject–verb–object sentence, &quot;The girl eats the apple.&quot;</td>
<td>Verb (eats), WH question (Who eats?), choice of subjects (e.g., chair versus girl), WH question (What is eaten?), object (e.g., apple versus tree)</td>
</tr>
<tr>
<td>Iib</td>
<td>Produce subject–verb–object sentence, &quot;The girl eats the apple.&quot;</td>
<td>Verb (eats), WH questions (Who eats? What is eaten?)</td>
</tr>
</tbody>
</table>
nces in level I and cues in level II. For from (1) repetition 2) repetition of the opiate subject from ian, and finally to self-generation of 3. Level II fol except that the client and an object.

and that CVT is associance on standardized of sentences contain- to produced verbs (Loverso 1982). However, the of generalization on. In addition, the adequately control changes could be due rather than the

and nouns can be associated with several different verbs. For example, the verb measure may be associated with agents such as carpenter, chef, and designer; and themes such as lumber, sugar, and room. Along the same line, a noun such as doctor may be associated with the verbs consult, prescribe, listen, and many more. Second, there is evidence from priming studies that nouns activate the verbs with which they are typically associated (McRae, Hare, Elman, & Ferretti, 2005). That is, carpenter may prime measure, and vice versa.

Verb network strengthening treatment exploits these characteristics by training verb production along with pairs of nouns that typically occur with them. The treatment protocol involves several steps (see example in Table 11.3). In the first two steps, the client produces appropriate agents and themes for a given verb. Of note, if clients are unable to produce appropriate agents or themes independently, they may be provided a series of options. For instance, clients may look at printed cards with the words carpenter, photographer, and author and identify which one is the best match to the verb write. Clients are also encouraged to generate pairs of agents and themes from their own experience, to increase the personal relevance of the materials. The rationale for this step is that producing multiple agent/theme pairs may activate slightly different aspects of the verb, thus increasing access to the underlying representation of the verb.

In the third step, the client selects one of the agent/theme pairs and answers WH questions about it. In step four, the client makes judgments about the goodness of fit between verbs, agents, and themes in 12 auditorily presented sentences. These stages provide the opportunity for the client to think more deeply about the items and strengthen the relation between the verb and the nouns with which it is associated.

Finally, the client generates pairs of agents and themes for the verb that has been discussed, repeating steps 1 and 2. These steps are intended to reinforce the representations that have been discussed before moving on to another item.

To date, only a small number of people with aphasia have been treated using VNeST, in part because it is a relatively new treatment (Edmonds & Babb, 2009; Edmonds et al., 2009). The existing studies have reported generalization to production of sentences with both trained and semantically related but untrained verbs. For example, if a client was trained on a verb such as measure, generalization might be expected to a verb such as weigh. There was also generalization to connected speech tasks such as picture description. These are encouraging results that should lead to further research.

♠ Syntactically Oriented Treatments II: Treatments that Focus on Sentence Structure

Another approach to treating sentence production focuses on training particular syntactic structures. Two treatments of this sort are the sentence production program for aphasia and treatment of underlying forms.

Sentence Production Program for Aphasia

The sentence production program for aphasia (SPPA) (Helm-Estabrooks & Nicholas, 2000) is
the revised version of the Helm Elicited Language Program for Syntax Stimulation (HELPSS) (Helm-Estabrooks, 1981). The rationale for this treatment is that production of particular sentence types will improve if the client hears and produces multiple sentences that share a syntactic form but contain different lexical items. Eight different sentence structures are tested in a story completion format. The stories consist of a few sentences that provide a context to elicit the target structure. The target sentence types are arranged in a hierarchy of difficulty determined by the performance of agrammatic clients (Table 11.4) (Helm-Estabrooks & Nicholas, 2000).

Treatment using SPPA includes two levels of difficulty for each item. Level A is a delayed repetition task. The clinician reads the entire story, including the target sentence, and then asks a question to elicit repetition of the target sentence. For level B, the clinician reads the story without the target sentence, and asks a question to elicit the target sentence. During the first treatment phase, the client completes levels A and B for each item in succession. When clients achieve approximately 85% correct on the first treatment phase, they may advance to the next phase, at which only level B is completed.

To date, treatment studies have been conducted only on the HELPSS, which is the original version of the treatment program. Of seven treatment studies that investigated this program, five reported generalization of treatment effects to untrained exemplars of the trained structures, and two have reported generalization to connected speech measures (Doyle & Bourgeois, 1986; Doyle & Goldstein, 1985; Doyle, Goldstein, & Bourgeois, 1987; Fink, Schwartz, Rochon, Myers, Socolof, & Bluestone, 1995; Helm-Estabrooks, Fitzpatrick, & Barresi, 1981; Helm-Estabrooks & Ramsberger, 1986; Salvatore, 1985).

### Treatment of Underlying Forms for Syntactic Structure

Treatment of underlying forms (TUF) is an approach to the treatment of sentence deficits based on Chomskyan (Chomsky, 1995; Marantz, 1995) grammatical theory (Thompson & Shapiro, 2005). The TUF approach incorporates theories of verb argument structure and syntactic structure, which were discussed earlier in this chapter. As suggested by the name of the approach, the treatment involves applying movement operations to the "underlying form" of the sentence to derive the target sentence. The targeted sentences typically involve noncanonical word order and multiple propositions. Recall from earlier in the chapter that such sentences are more difficult to understand than simple sentences, particularly for people with aphasia.

The reason that TUF targets complex sentences is based on research findings. Numerous treatment studies have shown that TUF promotes generalization from complex sentence structures to those that are linguistically related but less complex (Thompson, 2001; Thompson & Shapiro, 2005; Thompson, Shapiro, Ballard, Jacobs, Schneider, & Tait, 1997; Thompson, Shapiro, Kiran, & Sobecks, 2003). What is meant by linguistically related structures? These are syntactic structures that have similar derivations, meaning that they have some of their syntactic operations in common. Consider two linguistically related structures: WH questions (sentence 11, repeated

<table>
<thead>
<tr>
<th>Table 11.4</th>
<th>The Sentence Production Program For Aphasia (SPPA) Sentence Types</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sentence Type</strong></td>
<td>Example</td>
</tr>
<tr>
<td>Least difficult</td>
<td>Imperative intransitive</td>
</tr>
<tr>
<td></td>
<td>Imperative transitive</td>
</tr>
<tr>
<td></td>
<td>WH interrogative (what and who)</td>
</tr>
<tr>
<td></td>
<td>WH interrogative (where and when)</td>
</tr>
<tr>
<td></td>
<td>Declarative transitive</td>
</tr>
<tr>
<td></td>
<td>Declarative intransitive</td>
</tr>
<tr>
<td></td>
<td>Comparative</td>
</tr>
<tr>
<td>Most difficult</td>
<td>Yes-no questions</td>
</tr>
</tbody>
</table>
Forms for

Forms (TUF) is an app- of sentence deficits
sky, 1995; Marantz, Thompson & Shapiro,
incorporates the
structure and syntactic
wss earlier in this
the name of the ap-
olves applying move-
dering form" of the
target sentence. The tar-
olve noncanonical
propositions. Recall
that such sentences
restand than simple
with aphasia.
gs complex sentences
nings. Numerous treat-
that TUF promotes
ences structures
ically related but less
Thompson & Shapiro,
Ballard, Jacobs,
Thompson, Shapiro,
What is meant by lin-
es? These are syntactic
lar derivations, meaning
n their syntactic operations
those linguistically related
(sentence 11, repeated

from sentence 8 for convenience), and object cleft sentences (sentence 12).

11. Who did the girl hug? (WH question)
12. It was the boy who the girl hugged (trace)
   (Object cleft)
13. The boy was hugged (trace) by the girl.
   (Passive)

Look at the syntactic structures for these sentences (Fig. 11.1C,D). Both object clefts and WH questions are formed by WH movement into an
unciation position (i.e., the specifier position of CP).
However, the object cleft structure in sentence 12
more complex because it also includes a relative
clause. In fact, the structure and movement
ations in sentence 11 are also part of the
structure and movement operations for the more
complex sentence in 12. Thus, we can say that
ences 11 and 12 are linguistically related, and
that sentence 12 is more complex than sentence
11. Recall from above that passive sentences, such
as sentence 10 above, involve a different type of
movement (NP movement). Thus, even though
WH questions, object clefts, and passives all
volve syntactic movement, they differ in the kind
of movement and in the landing site.

Early work by Thompson and colleagues
(1997) found that training people with agrammatic aphasia on object cleft sentences such as
sentence 12 resulted in generalization to the
linguistically related simpler WH questions,
such as sentence 11. In contrast, they found
no generalization from object clefts to the
linguistically unrelated passive sentences, such as
sentence 13. These and several other research
ings support what is referred to as the complexity
ccount of treatment efficacy (CATE) hypothesis
The CATE hypothesis is that generalization is more effective in the direction of
more complex structures to less complex
structures than in the opposite direction. Based
on the results supporting this hypothesis, TUF
targets complex sentence structures from the
art for the purpose of improving those
ures and related simpler structures.

The basic steps of the TUF treatment protocol
are shown in Table 11.5 (see Thompson, 2001,
for a detailed description). Throughout the
ent, a picture representing the meaning of the
entence is present. First, comprehension of the
nderlying form of the target sentence is trained,
focusing on verbargument structure. For example,
for the target sentence in sentence 12, the client
next word card ("the girl," "hugged," "the boy"
in that order). The client learns to point to the cor-
correct word card to identify the action ("hugged"),
the agent (who is doing the hugging? "the girl"
and the theme (who is being hugged? "the boy")
Next, the client learns to move the word cards
to form the target sentence. For example, the client
moves "the boy" to the position following "It was"
(Fig. 11.3). After learning to form the target sen-
tence, the client reads the sentence aloud.

In addition to the evidence that TUF generalizes
to simpler related structures, there is also
evidence that TUF generalizes to improvements
in connected speech. Treatment studies have
included measurements of narrative language samples before and after treatment. The studies indicate that TUF resulted in increased mean length utterance (MLU), and greater proportions of grammatical compared with ungrammatical sentences, complex compared with simple sentences, verbs compared with nouns, and verbs with correct compared with incorrect argument structure (Thompson et al., 1997, 2003).

### Treatment of Underlying Forms for Functional Categories

There is also experimental evidence that TUF promotes generalization across some less complex syntactic structures. Thompson, Millman, Dickey, O'Connor, Bonakdarpour, Fix, et al. (2006) found that training on sentences with basic canonical word order generalized to other sentences that were linguistically related in their functional morphology. Examples of functional morphology include those in the higher-level sentence nodes mentioned earlier in the chapter: complementizer, tense, and agreement. Tense, such as past tense -ed in (sentence 14, below), and agreement, such as present singular agreement -s in (sentence 15, below), both are associated with the same higher-level sentence node: the inflectional phrase (IP). Complementizers, such as who, that, and if, are associated with a different high-level sentence node: the complementizer phrase (CP). See Fig. 11.18 for the placement of IP and CP in the syntactic tree. Thompson et al. (2006) found patterns of generalization both from present agreement inflections to past tense inflections and from past tense inflections to present agreement inflections. However, training on complementizers, such as sentence 16, below, never generalized to past tense or present agreement, and training on tense and agreement never generalized to complementizers. The results support the claim that generalization occurs to linguistically related structures (tense and agreement because both occur in IP) and not to linguistically unrelated structures (unlike tense and agreement, complementizers occur in CP). Thus, the results provide additional support for the CATE hypothesis.

14. Yesterday the cat followed the mouse. (Past tense inflection)
15. Nowadays the cat follows the mouse. (Present agreement inflection)
16. They wonder if the cat is following the mouse. (Complementizer)

### Conclusion

Modern linguistic and psycholinguistic theories have motivated several syntactically oriented assessment and treatment approaches for sentence-level impairments in people with aphasia. Such work demonstrates the need to carefully consider how materials for treatment and assessment are constructed. In addition, these theories provide a theoretical framework for treatment and a principled means of predicting generalization patterns.
Chapter Review

Case Study

Mr. Perez is a 45-year-old man who had a left-hemisphere stroke approximately 1 year ago. He is married and has two children, ages 10 and 15. He was a regional manager for a large chain of department stores at the time of his stroke. A speech-language evaluation reveals that his speech is nonfluent. His typical phrase length is fewer than four words, and his speech rate is slow with frequent pauses. He primarily produces simple SVO sentences and frequently omits functor words such as "the" and auxiliary words. He presents with mild word retrieval deficits in spontaneous speech. Auditory comprehension is an area of relative strength. He shows good comprehension of simple sentences, but makes more errors on syntactically complex sentences.

Questions for Discussion

1. Mr. Perez is highly motivated to improve his sentence level production. What approach would you select, and why? What other information would help you make a decision?

2. Which approach would you use if Mr. Perez had moderate word retrieval deficits, particularly within spontaneous speech?

Glossary

**Adjunct:** optional participants (or entities) in an event represented by a particular verb

**Agent:** the entity in a sentence who is performing the action (a.k.a., the doer)

**Argument:** required participants in the event described by a verb (e.g., the agent and theme)

**Constituent:** a group of words that functions together and moves together when syntactic movement occurs; in "The cat follows the mouse," multiword constituents include "the cat," "the mouse," "follows the mouse," and "the cat follows the mouse"

**Derivation:** a series of syntactic operations (such as merge and move) that result in the spoken form of a sentence

**Functional morphology:** words or word parts that provide grammatical information about sentences; examples in the sentence "The cat was following the mouse" are "was" and "-ing"

**Generalization:** following therapy, consistent improvement in an area related to but different from the therapy target

**Inflection:** grammatical information such as tense, number, or agreement, often attached to words as affixes

**Landing site:** the node in the syntactic tree that a word or phrase moves to

**Mental lexicon:** a "mental dictionary" of all the words a person knows

**Relative clause:** a clause that modifies a noun phrase; for example, in "The boy who was hugged by the girl was embarrassed," the relative clause is "who was hugged by the girl"

**Syntax:** the study of how phrases, clauses, and sentences are structured

**Theme:** the entity in a sentence that is undergoing the action

**Verb argument structure:** the relation between a verb and the participants in the event represented by the verb (e.g., agent or theme); this information is encoded in the mental lexicon
References