

Challenging Symptoms

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Perseveration: Clinical Features and Considerations for Treatment

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INTRODUCTION

In the category of repetitive verbal behaviors, perseveration is different from echolalia, recurring utterances, or speech automatisms (i.e., verbal stereotypy), and palilalia. Stark (2011a) defines perseveration as “a phenomenon whereby the subject unintentionally produces or “gets stuck” on an information unit, i.e., a particular linguistic form or action unit, which he/she has previously produced or at some level has heard, i.e., auditorily processed, or seen, i.e., visually processed” (p. 136) in place of the correct response. Linguistically speaking, the perseverated unit can be a phoneme, word, phrase, syntactic structure, semantic feature, or an idea. In addition to the perseveration of linguistic units, action units (as observed in apraxic disorders), or gestures, as well as features or single elements in drawing, can also be affected. The perseverative response can be the immediate repetition of a linguistic unit or it can be separated by several intervening correct or incorrect responses resulting in a complex pattern of responses. The unit perseverated can be a correct response to a former item or an incorrect one, that is, a paraphasia. However, within the context of a specific deficit, it is not predictable *if* and *when* a person with aphasia (PWA) will produce a perseveration instead of a correct response, a paraphasia, or no response at all. Given the complexity of the phenomena subsumed under the heading of perseveration, it is comprehensible that perseveration, in particular verbal perseveration, continues to be a challenge for clinicians working with PWA in a therapeutic setting.

Over the past decades, clinicians and researchers have advanced our understanding of the complex perseverative phenomena in terms of the origin of the errors and have proposed explanations and models for the source of their occurrence. Still, there have been few studies directly addressing the treatment of verbal perseveration in PWA. In particular, few case studies discuss providing therapy to PWA who have a moderate to severe tendency to perseverate. This leaves clinicians with little guidance on how to recognize and treat perseveration in PWA.

This chapter provides an overview of the various aspects of perseveration with the goal of preparing the reader for meeting the challenges when confronted with a PWA who shows a moderate to severe tendency to perseverate. The following questions are addressed:

- What type of cognitive/linguistic deficit is perseveration?
- What accounts have been put forward regarding the origin or cause of perseverative responses?
- Do perseverative responses produced by PWA share common mechanisms with nonperseverative errors produced by healthy subjects?
- Which factors have been cited to trigger a perseverative response?
- Which types of verbal perseveration exist at the various linguistic levels?
- How does perseveration manifest itself in the various aphasia types?
- Which other repetitive symptoms can co-occur with perseveration?
- In the context of the overall impairments in a PWA, how can perseveration be treated?
- Why does a PWA produce a perseverative response and not a paraphasia or no response at all?

THEORETICAL BACKGROUND

In the literature on verbal perseveration, various classifications of the types of perseveration are proposed. Each one is based on the theoretical assumptions of the authors. The standpoint taken in this chapter is that the types of perseveration are an expression of the specific language processing deficits observed in each case. Thus, the types of perseveration are to be characterized in terms of the linguistic units (e.g., phonemes, grammatical morphemes, etc.), levels (e.g., phonological, lexical, syntactic, discourse), and the modalities (e.g., oral vs. written) affected in each case of aphasia.

Despite its elusive nature, the occurrence rate of perseveration reported in aphasia studies is high, and this underlines the clinical importance of this symptom and its analysis according to aphasia type, severity, and affected linguistic units. The reported frequency of perseveration varies from 50 to 93% in the cases reported in the literature (Basso, 2004; Helm-Estabrooks, Albert, & Nicholas, 2013; Santo-Pietro & Rigrodsky, 1982, 1986; Yamadori, 1981). Moreover, the frequency of perseverative responses does

not seem to vary with aphasia type, but rather is related to aphasia severity (Basso, 2004; Helm-Estabrooks, Ramage, Bayles & Cruz, 1998).

Types of Perseveration

In the aphasia literature, the most widely used taxonomy of perseverative responses is that of Sandson and Albert (1984; Albert & Sandson, 1986; Sandson, 1986; Yamadori, 1981), which is very similar to Liepmann's (1905) original typology of *tonic*, *clonic*, and *intentional* perseveration discussed in the classical literature. Sandson and Albert's tripartite classification consists of the following types of perseveration which are differentiated in terms of their clinical features, processes, and neuroanatomy:

1. *Continuous*: the inappropriate repetition or prolongation of an activity without interruption due to a motor output deficit caused by damage to the basal ganglia (e.g., the continuous drawing of loops in a drawing task).
2. *Stuck-in-set*: the inability to switch from one task or response strategy that results in inappropriate maintenance of a current category or framework due to a deficit in executive functioning stemming from a lesion in the frontal lobe. This type can also be termed *task perseveration*. For example, when asked to count from 1 to 10 and then to recite the days of the week, the PWA continues to count.
3. *Recurrent*: the unintentional repetition, after cessation, of a previously emitted response—either immediate or delayed—to a subsequent stimulus. This is caused by damage to the posterior left hemisphere.

These three types refer to how the system responds and breaks down when performing a specific task in correlation with the level of complexity required for achieving that task. The *recurrent* type is most prevalent in PWA and is the main type discussed in the literature on perseveration, particularly in discussions of perseverative behavior on oral confrontation naming tasks, picture descriptions, and in conversational speech.

Linguistic Context

Perseveration can be observed at all linguistic levels starting with conceptual information and ideas or thoughts, to syntactic constructions in tasks requiring the production of a single-word response (e.g., confrontation naming, repetition), or text (e.g., picture description or retelling of a story). The severity of the specific deficit(s) is a determining factor for the occurrence of any type of perseveration. Examples for the various types are described here and listed in **TABLE 1.1**.

- *Phonological level*: distinctive features, phonemes, and consonant clusters are perseverated within items; for example, within a syllable, across syllables, or across items (Table 1.1, examples 1 to 16).

TABLE 1.1 Examples of perseveration at the various linguistic levels.

Linguistic level	#	Target Form (origin of error underlined) (error in bold italics)	Feature Perseverated	Task
Phonological Level				
<i>Distinctive features</i>				
Intramorphemic	1	Danke (“thank you”) → <i>Dante</i>	[+ alveolar]	Spontaneous speech
	2	Hundehütte (“dog house”) → <i>Hundehutte</i>	[+ back]	Naming
	3	Giesskanne (“watering can”) → <i>Giesskange</i>	[+ back]	Naming
<i>Phonemes</i>				
Within item intramorphemic	4	Meine Mutter sitzt im <i>Rorsuhl</i> (for “Rollstuhl”) (“My mother is sitting in a wheelchair”)	[- lateral] or phoneme /r/	Spontaneous speech
Interitem	5	1) Stift (“writing utensil”) + 2) Schlacht (“battle”) → <i>Schlaf</i>	Phoneme /f/	Repetition
Interitem	6	1) Fleisch (“meat”) + 2) Messer (“knife”) → <i>Fesser... Vesser</i>	Phoneme /f/	Repetition
Within item, intermorphemic	7	Fleischpreissteigerung (“increase in meat price”) → <i>Fleischpreissteiberung</i>	[+ frontal] (Labial) or phoneme /b/	Repetition
Within sentence, sentential	8	merke ich gar (→ <i>ger</i>) nicht (“I don’t notice at all”)	[- low] [+high] or phoneme /e/	Spontaneous speech
Within sentence	9	“...als er zu ihr im <i>Finster</i> (for Fenster) geschaut hat” (“...when he looked at her in the window”)	[+ high] or phoneme /i/	Picture description

Intermorphemic	10	Blinde Kuh ("Blind man's bluff") → <i>Blinde Blühe</i> ... <i>Blunde Kuh</i>	a) Consonant cluster /bl/ b) Phoneme /u/	Picture description
Intermorphemic	11	* / no smok / → / no <i>snok</i> /	Phoneme /n/	Spontaneous speech
Within item, intermorphemic	12	Schillingstück ("Schilling piece" = coin) → <i>Schillingstücking</i>	Assimilated phonemes / ng/ → ŋ Phoneme / ŋ / or [ŋ]	Spontaneous speech
Sentence level	13	Jetzt ein Taucher mit 'n Tisch [table] (for "Fisch") ("Now a diver with a fish")	Phoneme /t/	Picture sequence
Sentence level	14	Priester beten <i>trüglich</i> (for täglich) ("Priests pray daily")	Phoneme /r/	Repetition
Intersentential	15	Ein Bauer hat einen Esel. Diesen Esel hat er in ein Bell (for "Fell") ("The farmer has a donkey. This donkey he has [put] in a fur")	Phoneme /b/	Story retelling
Intersentential	16	"Der Mann nimmt den Buben beim *Flock ... beim Spo... beim *Spock- beim Haar Schopf - beim Schopf und das zweite Bub hat sich verst- hat sich ver- hat sich <i>verstopft</i> [clogged] (for "versteckt") ("The man takes the boy by the *flock [paraphasia] ... by the spo- by the *spock [paraphasia] by the hair tuft- by the tuft and the second boy has hi- has hi- has hi- himself – has hidden himself")	Vowel /o/ plus affricate /pf/	Picture description

(Continues)

TABLE 1.1 Examples of perseveration at the various linguistic levels. (Continued)

Linguistic level	#	Target Form (origin of error underlined) (error in bold italics)	Feature Perseverated	Task
Morphological Level				
<i>Derivational morphology</i>				
Intersentential	17	1. Schnell bre nzung (“emergency braking”) 2. Lokomotivführer (= “engine driver”) → * <i>Lokomotivführung</i>	Morpheme –ung	Story retelling
Intersentential	18	1. Die Mutter ist entrüstet (“The mother is outraged”) 2. erzürnt (“angry”) (→ * <i>entzürnt</i>)	Unseparable prefix morpheme ent-	Picture description
Intersentential	19	Es ging so weit gut, bis eines Tages einer- einer der den- die Mut hatte den Esel zu das Fell des Esels zu bewachen oder zu * <i>bemuten</i> (for “belauern”) (“It went pretty well, until one day one- one who had the- the courage to watch over or to” [neologism for stalk])	Morpheme (= word)	Story retelling
<i>Inflectional morphology</i>				
Intersentential	20	“Der Bub schaut der schlafenden Katze zu und er tut was ich nicht mit meiner Katze tut ” (for “tue”) (“The boy is watching the sleeping cat and he does what I don’t with my cat”)	third person singular -t	Picture sequence
Intersentential	21	“Tochter schaut zu und bemerkt aber dann auch wahrscheinlich, dass sie (for er) stürzen wird” (“The daughter is watching and notices then also probably that he will fall down”)	Gender: +feminine	Cookie Picture description

Intersentential	22	“Und entsetzlich hat die Mutter geschrien. Um Gottes Willen ihr habt das Geschirr heruntergeschmissen und ... Den Krug, die Milch und die Teller. Alles ist herunter geschrien ” (for “heruntergefallen”) (And terrible the mother has screamed. For God's sake you have thrown down the dishes and... The jug, the milk, the plates. Everything has fallen down)	Participle	Picture description
Lexical (Whole Word) Level				
Interitem	23	1) Ein kleines rotes Auto (“A small red car”); 2) Ein großes weißes Auto (for “Haus”) (“A big white house”)	Whole word	Story Completion Test (Goodglass et al., 1972)
Interitem	24	1) Zwetschenknödel (“plum dumplings”) 2) Blechlöffel (“metal spoon”) 3) Topfenstrudel (“cream cheese strudel”) 4) Fleischpreissteigerung (“increase in meat price”) → Fleischpreisknödel	Whole word, part of compound word	Repetition
Intrasentential	25	Das Eichhörnchen knabbert ein Eichhörnchen (for “Nuss”) (“The squirrel is nibbling on a nut”)	Whole word	Oral sentence production to a picture stimulus

(Continues)

TABLE 1.1 Examples of perseveration at the various linguistic levels. (Continued)

Linguistic level	#	Target Form (origin of error underlined> (error in bold italics)	Feature Perseverated	Task
Semantic Level				
Interitem	26	1) Er wird arbeiten (He will work) ... 3) Soldat - Unteroffizier (→ Arbeiter – Chef)	Semantic feature: relationship between subordinate and superordinate	Story Completion Test (Goodglass et al., 1972)
Interitem	27	1) Stiefel (“boots”) 2) Gans (“goose”) ... rote Stiefel (for “Fuße” [feet])	Semantic feature: having to do with feet	Naming
Interitem/intertextual	28	1) Teller fallen (“Plates fall down”) 2) ... kalte Teller (“cold plates”) (for Schneebälle [snowballs])	Semantic feature: + round (Plates, snowballs)	Picture description
Interitem	29	1) Birne (“pear”) 2) Katze (“cat”) → * Kapfel (/k/ + “apple”)	Semantic category: fruit (Initial phoneme /k/ is correct but the resulting production is a nonword)	Naming
Interitem	30	1) When naming the picture “Auto” (“car”), the PWA counted the four wheels: “1, 2, 3, 4” 2) Elefant → Auto	Associative perseveration: Car: 4 wheels Elephant: 4 legs	Naming

Syntactic Level		Imperative construction	Story Completion Test (Goodglass et al., 1972)
Interitem—form			
31	<p>1) Trink die Milch! Trink sie! Trink sie damit du gesund bleibst! (Drink the milk! Drink it! Drink it so that you stay healthy!)</p> <p>2) [Stimulus to be completed: "A baby has a toy. I take the toy away. What will happen?"]</p> <p>Das Baby weint. Spiele nicht mit dem Spielzeug! ('The baby cries. Don't play with the toy!')</p>		
Intersentential –Form/ Content	32	Structure + content	Spontaneous speech
Ideational Level		Idea of gardening: leaves and trees; Association triggered by the verb 'to fall down'	Picture description: Blind man's bluff
Interitem /Intertextual	33		
	<p>Context: The PWA and the clinician had a prior conversation about the weather and gardening (trees and plants). Then, the PWA described a picture about children playing (a boy pulls on the table cloth and the dishes fall onto the floor).</p> <p>'Also ein größeres und zwei kleinere ah... also laufen mit und ... einen.. einen Krug der dürfte runterfallen und die Blätter sind von den Bäumen heruntergefallen ... und das große Mädchen ("an older and two younger and the leaves fell from the tree") [Clin: What fell down?]. Also die Blätter ("the leaves")</p>		

(Continues)

TABLE 1.1 Examples of perseveration at the various linguistic levels. (Continued)

Linguistic level	#	Target Form (origin of error <u>underlined</u>) (error in bold italics)	Feature Perseverated	Task
Interitem /Intertextual	34	<p>1) Picture description: a child falls down. ‘Diese Mädchen oder die Mutter schreit da heraus und sagt, dass das Kind <u>herausgefallen</u> ist [paraphasia: hingefallen] .. und der läuft daher. [Clin: Was sagt die Frau?] Frau wird sagen, der Bub ist <i>herausgefallen</i> [fell out]’ (the mother screams that the child has fallen...and runs towards it. [Clin: What does the woman say?] The woman says that the child has fallen).</p> <p>2) Questions after retelling of another story: Child is playing on train tracks, trips and falls down. A train is approaching. The engine driver uses the emergency brakes, gets off the train, picks up the child, and hands it to her mother. [Clin: Wo liegt das Kind?] “Vor dem Zug.” [Clin: Wie ist es dort hingekommen?] “Es ist <i>herausgefallen</i>. Es ist aus dem Zug <i>herausgefallen</i>.” ([Clin: Where is the child lying?] “In front of the train.” [Clin: How did it get there?] “It fell out. It fell out of the train.”)</p>	Idea of child falling down Association triggered by the verb ‘stürzen’ = ‘to fall down’	<p>1) Picture description</p> <p>2) Story retelling: Child on the train tracks</p>

Interitem	35	<p>1) Uhr ("watch") [Clin: What time is it?] 12:30</p> <p>2) Tür ("door") → Tisch [paraphasia] ("table") [Th: What about it? (= door is open)] "Mit dem Tisch. Da ist es 12:30" ("With the table. It is 12:30")</p> <p>3) Hase ("rabbit") → Eichhörnchen [paraphasia] ("squirrel")</p> <p>4) Auto ("car") (Clin: What color is it?) "It is blue"</p> <p>5) Flugzeug oder Flieger ("Airplane or plane") "Aber ich weiss es nicht, wie spät es darauf ist" ("But I do not know what time it is on it")</p> <p>6) Balloon (for Bälle) ("balls") [Clin: Where are they?] "Sie sind in einem Flieger. (for "Netz" ["net"] [perseveration]) ("They are in an airplane.")</p>	<p>Perseveration of the time or of the idea of telling time and also verbal and semantic paraphasias and also lexical perseveration</p>	<p>Naming + Answering questions about picture stimuli</p>
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- *Morphological level*: bound and free morphemes are perseverated. Both derivational and inflectional morphology are affected by perseveration (Table 1.1, examples 17 to 22).
- *Lexical perseverations*: lexical items, parts of words, and whole words that are not semantically related can be perseverated (Table 1.1, examples 23 to 25).
- *Semantic perseverations*: include the perseveration of semantic features, semantically related words and more complex associations. For example, visual-perceptive and form features. A semantic perseveration can usually be distinguished from a semantic paraphasia, since in the case of a perseverative response, the feature perseverated is apparent from the context and is often inappropriate; for example, for a plate the form “round” is perseverated in a following picture description and the word “cold plates” is produced for the target word “snowballs” (Table 1.1, examples 26 to 30).
- *Syntactic level*: perseverations encompass syntactic form and content. Either a syntactic construction as such (e.g., wh- question, imperative construction, auxiliary and adjective, perseveration of a prepositional phrase) or the content or meaning of a syntactic phrase can be perseverated (Table 1.1, examples 31 to 32).
- *Text or discourse level*: with regard to the text level, ideational perseverations are observed within a text and from one text to another (Table 1.1, examples 33 to 35).

On the various linguistic levels, a perseverative response can be clear cut or simple in its structure whereby single phonemes, parts of words, whole words, and semantic features are perseverated. In more complex examples, several types of perseverative responses can be interlaced and can co-occur with paraphasias. The phonological, morphological, lexical, and semantic types of perseverative responses are the most common types (Stark, 1984). These errors are striking and easier to detect in the speech flow or in written samples from PWA than subtler and more complex perseverative responses. In particular those related to the perseveration of an idea or thought, can at first glance be difficult to detect.

Ideational Perseveration

An *ideational* or *idea* perseveration refers to a perseverative response in which an idea or parts of an idea are perseverated to new items (e.g., from a first question to a second question in conversation, or to a subsequent picture description, or from one picture description to another). An ideational perseveration can result from a syntactic perseveration of form or content or a semantic perseveration (e.g., semantic features). The meaning or idea(s) of the following utterance(s) is/are uncertain or not discernable, or the meaning of the utterance is in contradiction to real-world knowledge (e.g., in picture descriptions) or to the assertions made in previous utterances. An ideational perseveration is usually produced within lengthier language samples (i.e., picture descriptions, retellings of stories,

or a combination of tasks). Examples of complex perseverations across test and therapy sessions separated by days have been observed (Stark, 2007b).

An idea can persist without a new question being posed or without presentation of another stimulus item and the PWA then continues his or her response with uncalled-for, additional responses to items (e.g., in a naming task) that actually require only a single-word response. An interesting example of an ideational perseveration is example 35 in Table 1.1: After the clinician asked the PWA what time was shown on the watch in the picture, she perseverated both *the concept of time* and *what time it is* over the next several items. For the next item, she produced a semantic paraphasia: (open) door → table. In an attempt to elicit the correct response, the clinician asked, “What about it?” referring to the fact that the door was open. The PWA added, “With the *table* it is 12:30.” Then, following two other items, after naming an airplane correctly, she continued her response with, “but I do not know what time it is on it” (i.e., on the airplane). Idea perseverations have been reported in other disorders including right hemisphere stroke, traumatic brain injury, and dementia.

Factors Influencing the Occurrence of a Perseverative Response

In the publications on perseveration, various factors have been put forward that are assumed to trigger or induce a perseverative response in the context of the specific processing difficulties a PWA reveals. In general, linguistic variables that have been found to influence language performance in healthy subjects, also apply to the tendency to perseverate in PWA.

The linguistic factors that may influence or play a role in triggering a perseverative response include:

- *Phonological relatedness*: similar or identical phonological form in the onset, nucleus, or coda of a word
- *Semantic relatedness*: similar or overlapping semantic features
- *Syllable or word structure*: same syllable structure or word form and word length
- *Lexical/word frequency*: less frequent words have a greater tendency to be perseverated.
- *The overall level of difficulty*: of the individual task, test, or individual items and the order of the tasks

Task demands such as the presentation rate can influence a person’s response (Muñoz, 2011, 2014). A faster presentation rate and a very brief or no interval between the presented stimuli can lead to a breakdown in the PWA’s ability to process the stimuli. The ordering of the individual tasks in assessing the PWA as well as the ordering of the individual stimuli can also influence the response. Other general factors that are discussed in the classical and recent literature include fatigue, attention deficits, memory disorders, and the difficulty of the task to be performed. Although certain tasks, such as repetition priming, have been

shown to improve word retrieval abilities, repeating the presented stimuli several times may increase the tendency to perseverate an item upon presentation of the following stimulus.

Classical Theories of Perseveration

Classical works written by the most famous aphasiologists such as Wernicke, Broca, and Pick, have been translated into English. However, numerous classical works on perseveration are only available in German and French. In particular, the German classical aphasia literature from the 1880s to the 1930s abounds in discussions of perseveration. These studies may not always follow the rigorous structure of recent publications, but their theoretical merit is undisputed.

Excluding the classic Greek and Latin literature, the first actual use of the term *perseveration* dates back to 1894 when Neisser responded to a patient presentation by Arnold Pick at the 65th meeting of the East German Psychiatrists in Breslau (Neisser, 1895). Neisser recommended that the term “perseveration” should be applied instead of the term “pseudo-apraxia” for a patient’s “getting stuck on the impressions.” Neisser suggested that the phenomenon Pick called pseudo-apraxia was appropriate for the particular case in question, but that this symptom was found in very different conditions. For this reason, he asserted that it is necessary to have a term that can be applied to all the conditions; namely, “perseveratory response” or “perseveration.”

From 1890 to 1931 three explanations for the occurrence of perseveration in brain damaged individuals were put forward in the German publications, all of which remain relevant today. These accounts differ in their view of perseveration as a primary or secondary symptom.

1. **Deficit account** (Heilbronner, 1895, 1897, 1906; Lissauer, 1890): Perseveration is considered a symptom secondary to the primary language deficit. According to this account, a perseverative response is produced, for example, when a PWA experiences difficulty retrieving and producing a target word in a naming task. The gap produced by the primary word-finding difficulty is filled by the perseverative response. Thus, the perseverative response mirrors the underlying word-finding impairments (Basso, 2004; Moses, Nickels, & Sheard, 2004; Stark, 1984).
2. **Overactivation account** (von Sölder, 1895, 1899): Perseveration is seen as the primary symptom. Increased activation of a previously produced unit—a phoneme, word, phrase, sentence, idea—results in the production of a perseverative response. The correct target does not have a chance of being produced due to the ongoing overactivation in the language processing system of the just-produced item.
3. **Underactivation or Weakened Activation account** (Pick, 1892, 1900, 1902, 1903, 1906, 1931): According to this account perseveration is a secondary symptom. The PWA produces a perseverative response because his/her overall activation level is too weak. The to-be-produced target response does not receive sufficient activation to reach production.

Contemporary Accounts of Perseveration

According to Yates (1966), brain damage results in three types of symptoms/deficits. His trifold hierarchical differentiation encompasses the following types:

Type-a: "... a general deterioration in all aspects of functioning"; but will also produce

Type-b: "... differential (group) effects, depending on the location, extent, etc. of the damage," and will produce

Type-c: "... highly specific effects if it occurs in certain highly specified areas of the brain." (Yates, 1966, p.122).

Stark (1984) analyzed an extensive database encompassing language data produced by 20 PWA with different aphasia types (6 anomic, 5 Broca's, 4 Wernicke's, 1 transcortical sensory, 4 global) in response to various language tasks tapping all linguistic levels. In that study, the author put forward two working hypotheses regarding the nature of verbal perseveration:

Hypothesis 1. Verbal perseveration is to be characterized as a non-specific indicator of brain damage and, for that reason, the same type(s) of perseveration will be observed in all people with aphasia, regardless of aphasia type.

Hypothesis 2. Verbal perseverative responses reflect the specific language impairment and, therefore, are not generalized across every aspect of language processing. Verbal perseverative responses are to be characterized as Type-b effects, according to Yates (1966).

These two hypotheses derive from the neuropsychological literature on cognitive deficits, in which the symptoms of brain damage are divided into localizing (or specific) versus nonlocalizing (or nonspecific) symptoms. Goodglass and Kaplan (1979) consider perseveration to be a nonspecific effect or nonlocalizing symptom. Other nonspecific deficits include behaviors such as slowing and "stickiness" of ideational processes, stimulus boundedness, and reduced scope of attention. In contrast, agrammatism or paragrammatism are considered specific impairments of grammar and syntax. It is interesting to note that paraphasia is cited as a lateralizing and localizing deficit, although—just as is the case with perseverative responses—the types of paraphasic errors differ according to the PWA's specific deficits. Not all types of paraphasia will be produced by a single PWA, and the origin will differ depending on the functional locus of the underlying impairment(s). One possible reason for Goodglass and Kaplan considering perseveration to be a nonspecific deficit, is that a nonspecific disorder may affect all areas of performance.

Hypothesis 2 is concordant with Yates' (1966) Type-b effects, which capture the essence of the different forms of perseveration observed in PWA with various lesions more adequately than the twofold dichotomy of Goodglass and Kaplan (1979). Stark's (1984) analyses of the language data from the 21 PWA provided evidence for Hypothesis 2, namely that the perseverative errors observed in the PWA diagnosed with the main

aphasia types reflected their respective primary language processing deficits. Perseverative responses were observed in those language processing domains that were affected and not in an across-the-board fashion. Only in the case of a severe overall language breakdown (e.g., in the late phase of a progressive degenerative disease such as Creutzfeldt-Jacob), will perseveration be observed in all language tasks.

Recent Accounts of Perseveration

Reminiscent of the classical accounts, several proposals regarding the mechanisms involved in the production of perseverative responses have been put forward in recent years. These accounts are mainly based on connectionist, spreading activation models of language processing (Cohen & Dehaene, 1998; Gotts, della Rochetta, & Cipolotti, 2002; Gotts & Plaut, 2004; Martin & Dell, 2004, 2007).

Cohen and Dehaene (1998) provide the most detailed theoretical and analytical account on the origin of perseveration, and they document their findings with formulas for determining the presence and severity of the tendency to perseverate in terms of a *lag distribution analysis* and *perseveration probability analysis*. The perseverative responses produced by three PWAs with naming difficulties due to a functional lesion at different stages of language processing provide evidence in support of their innovative statistical account.

According to their account, perseverative responses are the result of persistent activity unmasked by deficient input. That is, a perseverative response is produced when a given processing level does not receive the input it normally requires and activity from a previous trial persists. Cohen and Dehaene also maintain that another possible source for perseveration is that previous responses remain activated at an abnormally high level, due to impairment of some inhibitory mechanism or check-off mechanism. According to their account, a single mechanism operating at different stages of speech production can be considered to explain the occurrence of various perseverative responses.

With regard to the duration of perseveration on any processing level, Cohen and Dehaene (1998) refer to the term *exponential decay*, which states that the probability that a perseverative response is produced decreases in accordance with the lag between the two trials. These authors have developed an algorithm for determining the presence and duration of perseverative responses, that is, the lag distribution analysis and perseveration probability analysis (see **TABLE 1.2**). An exponentially decaying internal level of activation is assumed to be responsible for the recurrence of perseverations.

In the framework of their serial position model, Dell, Burger, and Svec (1997) postulate that perseveration occurs because a current target item is weakly activated. The previous utterances that are residually activated intrude into the current utterance. The perseverative response correlates with the functional locus of the deficit(s). In recovery, the proportion of perseverative errors decreases, and an increase in anticipatory errors is observed as calculated by an *anticipatory perseverative ratio*.

According to their account of word production, at any one point in time there is competition between the past, present, and future elements to be produced. In the context of

TABLE 1.2 Quantifying perseverative behavior in PWA.

Authors	Description	Measure
Helm-Estabrooks et al. (2013)	Picture stimuli from the BDAE (2nd ed.): 7 semantic categories objects, letters, geometric forms, actions, numbers, colors, body parts	Divide the number of items that elicited a perseveration by 38; then multiply by 100. < 5% = minimal 5% to 19% = mild 20% to 49% = moderate > 49% = severe
Muñoz (2014)	Items from Boston Naming Test (Kaplan, Goodglass, & Weintraub, 1983)	Percentage of items for which a perseveration was produced
Cohen and Dehaene (1998)	<i>Lag distribution analysis:</i> <ul style="list-style-type: none"> Used for revealing local perseverations and their duration For each perseverative response the clinician looks backward in the protocol to the first production of the response perseverated. The number of trials separating the two responses is noted. Each immediate recurrence = 1. The frequency distribution of the lags is plotted for the entire corpus. 	Observed distribution for x errors: Lag, number of matches, and number of remaining non-matches
	<i>Lag perseveration probability analysis PP(L):</i> <ul style="list-style-type: none"> Captures the temporal aspects such as several recurrences of the same response This method links each error to all preceding trials and takes into account multiple matches of each error with previous trials. "If a patient produces an error on Trial T, PP(L) provides an estimate of the probability that this error matches the response produced on trial T-L" (p.1644). 	Ratio: perseveration probability (PP(L)): $\frac{M(L)}{N(L) + M(L)}$ For each lag L, the number of matches M(L) and the number of non-matches N(L) at this lag is calculated

a mechanism that maintains serial order in speech production, Martin and Dell (2004) postulate that perseverations and anticipations produced by PWA result from the malfunctioning of one of the three components of that mechanism: (1) a means to turn off past utterances, (2) a means to activate the present utterance, or (3) a means to prime the future utterance.

In a later study, Martin (2011) characterized similarities and differences between perseverative and nonperseverative errors in aphasia from a theoretical and clinical perspective. She applied the account of perseveration put forward in Martin and Dell (2007), which postulates that word and sound perseverations result from the same mechanisms as nonperseverative errors, namely, a slowed activation of the intended utterance and the linguistic similarity between the target and the produced error.

Extending a connectionist modeling approach, Gotts and colleagues (2002) provide a neurophysiological account of recurrent perseveration in terms of a cholinergic deficit hypothesis (or deafferentation; Buckingham & Buckingham, 2011; McNamara & Albert, 2004; Sandson & Albert, 1984). In an earlier report, Sandson and Albert (1984) suggested that recurrent perseverations result from low levels of acetylcholine and cholinergic deficits. In accordance with that proposal, Gotts and colleagues (2002) put forward the following neural mechanisms to account for the underlying perseveration in general and with regard to data from a single-case study (EB):

“Under a cholinergic deficit, the normal suppression of intrinsic and feedback projections is removed and cells are somewhat less excitable overall. One potential impact of this is that neural activity will sustain itself for longer through the undamped intrinsic/feedback projections. This will require that new stimuli override persistent activity at even longer delays. Perseverations will be more likely, particularly to stimuli with low frequency names, because afferent input contributes proportionately less to processing, making it harder to override sustained activity” (p. 1944).

In sum, recent accounts further illustrate the complexity of the perseverative behavior and provide evidence for the specific nature of the perseverative responses revealed by the different language processing system deficits of each PWA. The terminology used in the recent accounts for the two aspects of processing which can be affected in isolation or in combination are *activation level* and *decay rate*. In one scenario, the system in general is affected; it is underactivated, and the target item does not reach the threshold needed for it to be retrieved and in turn produced (i.e., Pick’s account). Alternatively the activation level, which should return to its resting state, instead remains activated or overactivated and the new target does not have a chance of being retrieved and produced (i.e., von Sölder’s account). The final possibility is that the overall system is affected in combination with an ongoing activation of a previously produced item. The decay rate is compromised in this case, that is, the previously activated unit reveals a very slow decay rate. Ultimately, it seems that perseveration is closely related to the specific language processing system deficits of each PWA.

The Role of Executive Processes

Any attempt to address the topic of perseveration must consider the fundamental role of executive functions including activation, inhibition, attention, and monitoring in

performing any activity. Most often the role of activation or facilitation is emphasized. However, without inhibitory processes interference would be a constant disruptive factor and a necessary balance could not be achieved. Although activation and inhibition are considered opposites, they actually are oppositional only in their results. In both cases, for all neurophysiological processes they both require nervous activity to attain the desired results. Dempster (1991) draws attention to the relevance of inhibitory processes in relation to intelligence. He states that “inhibitory processes appear to define a basic cognitive dimension that enters into a broad spectrum of intellectual processes” (p. 167) which are necessary for suppressing task-irrelevant information that would otherwise interfere with effective performance. Attention is also a key component in the processing of information. Under normal conditions, being able to attend to a stimulus enables more adequate processing. However, when this basic capacity is impaired, information processing will be adversely affected.

Monitoring one’s own speech is an important factor in the ongoing speech production process and important for treating perseverative behavior. Producing an error is the first half of the process, and recognizing and in turn correcting the incorrect response is the second half. When a PWA produces a specific error—i.e., a paraphasia or a perseveration—and immediately attempts to correct it, his or her monitoring can be considered to be intact for that particular type of error. If however, specific types of errors remain unrecognized and no attempts at correction are made, monitoring is impaired. In these cases making a person aware of a particular error is more difficult than when monitoring is successful. In any case, the clinician should not repeat the incorrect response; this would only reinforce it. If a PWA recognizes and corrects certain types of errors (e.g., phonological but not semantic paraphasias) his or her monitoring is differentially affected and the impairment is more severe. Thus, monitoring is another key component in the processing of information.

Perseveration Observed in the Main Aphasia Types

The perseverative responses produced by a PWA must be analyzed within the context of the PWA’s overall language performance. However, it may be possible to associate general patterns of perseveration with particular aphasia types. Indeed, Stark (1984) classified the perseverative errors produced by PWA based on aphasia types as well as linguistic levels.

Anomic Aphasia

In anomic aphasia ($N = 6$), perseverations were found when word-finding difficulties were apparent in oral confrontation naming, and in particular in the more difficult tasks requiring semantic processing such as reactive naming, providing opposites, finding shared features to pairs of words, and providing definitions of words. Nouns and verbs were perseverated, for example, when defining professions:

1. “A shoemaker *repairs* shoes” (correct)
2. “A gardener *repairs* gardens” (incorrect)

Perseverative responses were also found in spontaneous conversational speech, oral sentence production, picture descriptions, and retelling stories in the context of word-finding difficulties. Few perseverations were observed in repetition tasks and these errors were immediately self-corrected. Phonemic and morphological perseverations were seldom produced. In most cases, the person with anomic aphasia was aware of his or her errors and in turn tried to correct them.

Broca's Aphasia

In Broca's aphasia ($N = 5$), the perseverative responses were observed on the morpho-syntactic and the phonological levels, that is, (a) in agrammatic sentence production with impaired morphosyntactic processing, and/or (b) in the production of phonological units. The main perseverative responses were observed in word and sentence repetition tasks in the form of perseveration of single phonemes and consonant clusters intra-syllabically, intersyllabically, within a phrase or a sentence, between task items, and between successive and more remotely produced sentences. Lexical perseverations were also common; however, few semantic perseverations were observed. Several perseverations of syntactic form were produced particularly by severely impaired individuals with Broca's aphasia. Specific sentence constructions were repeatedly used, although they were less adequate as responses.

Wernicke's Aphasia

People with Wernicke's aphasia ($N = 4$) predominantly produced phonological or semantic errors, or a mixture of these two types. Individuals with moderate to severe Wernicke's aphasia perseverated on all oral production tasks and produced phonological, morphological, semantic, syntactic, as well as ideational perseverations. In conversational speech, the ideational perseverations manifested themselves as the continuation of a response that was adequate for the previous question. Impaired auditory comprehension may also play a role. For example:

P: "I really have to have something to eat."

Clinician: "Where do you live?"

P: "I didn't get anything!"

Individuals with neologistic jargon were not included in the study. Although these patients' productions abound with perseverative responses, their severe comprehension difficulties prevented them from understanding the instructions to the assessment tasks. Buckingham and colleagues (Buckingham, 1985, 1987; Buckingham & Kertesz, 1976) provide elaborate descriptions of perseverative behavior in people with neologistic jargon aphasia.

The phonemic perseverations produced by individuals with Wernicke's and conduction aphasias were more complex in their structure, with the exception of the responses to compound words. In compound words, the first component was better retained and

the second component included more semantic and phonemic paraphasias. For example, in a word repetition task, “*Hausbau*” (“house building”) was correctly repeated and then appeared three items later for the item “*Bootsbaus*” (“houseboat”); the PWA responded “*Bau, Baus, na da is ein Bau, Baus net Bau sondern ein Bau net Bau sondern Boot, Boots.*” (“building, building+s, no that is a building, building+s not building rather a building not building rather a boat, boat+ s”). Perseverative responses affecting one component of a compound word were also observed in people with Broca’s aphasia.

Global Aphasia

Because of the severe nature of global aphasia ($N = 4$), perseverative responses were found in all tasks requiring an oral or written response. Single phonemes or consonant clusters, parts of words, and sentences—insofar as these can be produced at all—were perseverated. For example, in response to test item 1, the target word cannot be immediately produced; however, it is produced in response to item 5. Perseveration is already observed when producing serial speech (e.g., days of the week, counting) and even more pronounced when switching from days of the week to months of the year.

In summary, the perseverative responses produced by people with fluent aphasia—Wernicke’s, conduction, mild anomic—are characterized by a predominance of phonemic errors, whereas people with anomic aphasia seldom produce phonemic perseverations and if they do, they most often self-correct. The *conduite d’approche* behaviors of the individuals with conduction aphasia often result in moving away from the target word. The individuals with nonfluent aphasias (i.e., Broca’s, global) differ in particular with regard to the monitoring of their own perseverative responses. Individuals with global aphasia tend not to be aware when producing an error, whereas the person with Broca’s aphasia produces approximations that may or may not be perseverations in an attempt to arrive at the correct pronunciation of the target item.

Simple Versus Complex Forms of Perseverations

In the aphasia literature, analyses of perseverative responses are usually based on language data from oral and written naming, writing to dictation, or from repetition tasks. In these cases, single-word responses are required. Buckingham and colleagues’ (1978; Buckingham, 1985) analyses of perseverative behavior from text-level samples from individuals with neologistic jargon are a notable exception. When examining language data from tasks requiring a single-word response, the perseverative responses are readily detectable and can be characterized as “simple.” The most common perseverative response is observed in confrontation naming tasks, in which an item is either correctly named or the original response is a paraphasia. For the immediately following item or after a few intervening items, the same name is produced. A “simple” example from an oral confrontation naming task is:

Item 1. book → [correct]

Item 2. table → **book** or Item 3. +; Item 4. +; Item 5. **book**

The response to item 2 is an example of an immediate perseverative response and the response to item 5 is a delayed recurrent perseveration with correct responses in the interval.

However, when examining extended speech production consisting of spontaneous speech produced in a semistandardized interview or narrative production (e.g., picture description, story generation or retelling), the task of detecting perseverations can become more difficult. The resulting examples of perseveration are more complex in their overall structure. Further, the aforementioned ideational perseveration can result in an entanglement or interlacing of several different items from various types of tasks. Because in many publications, the analyzed corpora consist of single-word errors, the question remains unsettled as to whether the assumption of shared mechanisms holds for all types of perseverative behavior, in particular for extended speech production.

Simple perseverative responses are rarely observed in non-brain-damaged subjects. When analyzing extended passages of language production, the complexity of the perseverative responses actually produced by a PWA makes it difficult to assume that a healthy subject would produce such utterances. Such complex examples span several utterances (intra- and intertextual) and often consist of a blend of several parts of those utterances. The temporal duration can range from seconds up to several days. However, the longer the time passed, the more difficult it will be to consider a response to be perseverative since the contextual information may be lacking. Temporally speaking, the clinician may not have been present when the original occurrences were produced by the PWA, further complicating identification of a perseverative response.

The following examples of complex verbal perseveration were produced by MH—a person with transcortical sensory aphasia. A lengthy discussion of MH's perseverative responses is provided in Stark (1984, 2007b). MH's main deficits were impaired word retrieval with the production of semantic paraphasias, impaired comprehension, inability to monitor her own production for semantic anomalies, echolalia, and a severe tendency to perseverate. The most interesting aspect of her perseverative responses is that, although her productions were almost always syntactically correct, they were semantically incorrect and consisted of words and phrases perseverated from several task items and extended over several days. For this reason, Stark (2007b) postulated that based on her analysis of the responses produced by MH a clear dissociation between syntactic and semantic processing could be discerned. That is, syntactically speaking, MH's utterances were grammatically correct, but semantically anomalous. The syntactically correct utterances consisted of words from various sentences resulting in semantically anomalous and incorrect utterances.

Example 1. Picture description—Blind Man's Bluff (translation from German)

Content: The children are playing blind man's bluff. The blindfolded boy thinks that he is holding a girl's skirt in his hand, but he is pulling the tablecloth from the set table and the dishes are falling on the floor. In the background the mother is raising her arms in desperation.

MH: “Here an accident is happening. Something is breaking and the mother is unhappy about it.... The mother, the son and the child and the daughter.... The daughter // f-// it happens to the daughter that something is falling down and the mother is unhappy about it and ... Th//the mother (dative case) she is happy about it that the daughter is unhappy. (Ex.: What does the mother say?) The mother says be careful *that nothing falls over you*.

Example 2. Examples from Story Completion Test (SCT) (Goodglass, Gleason, Bernholtz, & Hyde, 1972) (translation from German) (Task administered following the above picture description)

Ex. 1a) Target: “Sit down!” → “Be careful so that nothing happens to you!”

Ex. 1b) Target: “Come in!” → “Follow me so that nothing happens to you!”

Ex. 2a) Target: “Drink your milk” → “Drink it so that you stay healthy!”

Ex. 2b) Target: “Mow the lawn!”/ “Cut the grass!” → “Cut the lawnmower so that nothing happens to you!”

Ex. 3a) Target: “The baby cries/will cry” → “Don’t play with the toy or else something will happen to you.”

In further examples from the Story Completion Test, MH produces correct responses intervening with perseverative responses and incorporates parts of three SCT items into a semantically incorrect response:

Target: “He will work again” → **Where have you put Peter’s toy?**

“Where (= Test item 7a), have you put Peter’s (= Test item 8b), toy (= Test item 7b).”

Echolalia and Recurring Utterances

Although the various types of repetitive verbal behaviors are distinguishable, they can be difficult to differentiate at times (Lebrun, 1993). In addition to perseverative responses, echolalic and stereotypical utterances can be also found back-to-back in successive responses. Christman, Boutsen, and Buckingham (2004) suggest that the salient features constituting the overall performance of a PWA must be considered to distinguish between related repetitive phenomena. These include the overall speech fluency, the inventory of available utterances, the nature of the task being administered, and the content of the response.

Echolalia is one form of repetitive behavior that is often also present in PWA who reveal a more severe tendency to perseverate (see Chapter 5, this volume). However, the two phenomena can be differentiated upon analysis of the source of utterances produced.

Stereotypical responses, automatisms, and recurring utterances are considered in the literature by some authors to represent the same phenomenon. Other authors consider stereotypes as the overproduction of single words or phrases, for example, “of course,” “naturally,” “so-so,” “and so on,” which can be appropriate in certain contexts. However, their extreme

overuse makes them stereotypical. Recurring utterances are by far the most persistent type of repetitive oral behavior and, thus, most easily distinguishable from the other types of repetitive verbal behavior. They consist of the production of a single-phoneme combination (i.e., a real word or a neologism) each and every time a PWA spontaneously produces a response. The most famous case is Paul Broca's client "Monsieur Leborgne" who produced the recurring utterance "tan tan" (Broca, 1861).

The symptoms *recurring utterances*, *speech automatisms*, or *stereotypies* are present in individuals with severe language impairment—predominantly global aphasia. In this case, the PWA is only able to produce the same single word, phrase, or meaningless sound combination every time communication is attempted. Recurring or recurrent utterances (RUs) are defined by Blanken and colleagues (1988) as highly stereotyped and repetitively used utterances that are produced without phonological control. They constitute a highly complex and persistent production deficit in people with predominantly non-fluent, and in particular global aphasia. Wallesch (1990) and Code (1982) reported that real word recurring utterances (RWRU) result from activity of the right hemisphere. The functional lesion for non-meaningful recurring utterances (NMRU) is considered to be at the "bottom of the formulation apparatus" and may be indicative of basal ganglia damage.

For the clinician working with PWA, recurring utterances are the most severe repetitive deficit and also the most difficult to treat. Breaking through recurring utterances, that is, getting a PWA to produce words other than his/her recurring utterance(s) is very difficult. In the context of such a severe language production deficit, the symptoms of perseverations and recurring utterances overlap. For example, patient KB consistently produced two recurring utterances: the nonword "*unterfiat*" and the real word "*the greatest*" (English translation; Stark, 2014). In this context, novel perseverative responses can be considered an improvement. In one instance, KB perseverated a target word for the next item (instead of using one of the recurring utterances) and in another, KB produced a word that had been practiced the week before. Such perseverative responses are an indication that at some stage they were processed by KB and are still "active." KB also exhibited perseverations in his drawing of objects to be named. Helm-Estabrooks and colleagues (2013) provide interesting examples of perseveration in drawing, as drawing of the objects to be named is included in their Treatment of Aphasic Perseveration program.

ASSESSING VERBAL PERSEVERATION

In the clinical setting, it is seldom the case that a PWA will present with a "pure" deficit for which an exact procedure can be readily and directly applied and measurable changes in language performance achieved quickly. In the literature, most PWA are in the chronic stage and reveal multiple and severe deficits that require specific, intensive treatment

over a longer period of time. Perseveration is one of the striking symptoms that requires the clinician's utmost attention. The clinician needs to understand that the observed perseverative behavior is a reflection of the PWA's underlying deficits. Thus, perseveration must be treated in the overall context of the individual's language impairment. It must be stressed that there is no specific assessment tool for assessing perseveration. In the process of administering standardized language tests and selected nonstandardized tasks that allow the clinician to assess specific aspects of language processing not included in the standardized procedures or to evaluate them in depth, the clinician observes the PWA's overall language performance and in particular documents the type of tasks (e.g., confrontation naming, picture description) where perseverations are present as well as their frequency.

Thus, a traditional in-depth language assessment of a PWA's abilities is required to reveal the PWA's strengths and weaknesses in various aspects of language processing and in turn to aid the clinician in developing the most adequate therapy approach for the PWA. The results from such an assessment will also bring to light the presence and severity of the perseverative behaviors in each language domain assessed. The clinician will then be able to combine language therapy goals and approaches with specific objectives and strategies to address the perseverative behaviors.

On the one hand, with regard to verbal perseveration, a comprehensive understanding of the PWA's language processing difficulties and the assumed functional locus/loci of the deficits will allow the clinician to treat the specific difficulties more adequately and target the cause(s) of the perseverative responses directly, as the perseverative responses result from the primary language deficit(s). On the other hand, an analysis of the evolution of a PWA's perseverative responses over time can help the clinician evaluate how the PWA is responding to the therapy being administered. If the administered treatment addressing the underlying language deficits is successful, the clinician will observe a concomitant reduction of perseverative responses and in some cases their total elimination.

The starting point for any therapeutic intervention to target verbal perseveration is a comprehensive understanding of the PWA's intact abilities, specific deficits, and their degree of severity. Formal, standardized tests or assessment materials preferred by the clinician can be used (e.g., Boston Diagnostic Aphasia Examination [BDAE]; Goodglass, Kaplan, & Barresi, 2001; Western Aphasia Battery-Revised [WAB-R], Kertesz, 2007), and informal assessment performed (see Chapter 13, this volume). The communicative experiences of the PWA (i.e., speaking, writing, hearing, reading) immediately prior to the appointment with the clinician may represent significant information for assessment purposes because any specific error could be a perseverative response. Without that information, responses may be classified as paraphasia, although they may actually be perseverative in nature. In this case, any information of prior communication may be of use to the clinician, but a complete record of the PWA's verbal communicative activities outside the therapy room is unlikely to be compiled.

In the process of conducting an interview or administering the language assessment tasks to determine the PWA's specific language difficulties, the reappearance of an immediately or recently produced language unit (i.e., phoneme, word, phrase, semantic feature, sentence, or idea) should be documented as a perseverative response. Oral and written confrontation naming tasks also provide valuable information regarding the tendency to perseverate phonemes and/or lexical items. Further it is important to evaluate word-finding for nouns and verbs further in the production of larger language units (i.e., sentences and texts) both orally and in writing. This will allow the clinician to determine whether the observed difficulties at the single-word level are more or less evident at the syntactic and discourse levels and in which modality they are observed.

Since the repertoire of language assessment tools at the clinician's disposal is dependent on the purpose of the language evaluation and his or her preferences, a prescribed set of specific tests or tasks for assessing perseveration is neither available nor necessary. The important issues are when, where, and how much a PWA responds with a perseveration.

As stated previously, the severity of perseverative behaviors can be described using several continuums:

1. *Frequency*: amount or percentage of perseverations per unit of language
2. *Persistence of perseverations*: PWA perseverates on multiple consecutive stimuli, possibly with a correct response in-between (= severe, but simple in form)
3. *Delay between source and perseveration*: PWA perseverates after a longer temporal or stimulus interval with correct items in-between
4. *Combination of perseveration types*: PWA perseverates using several stimuli resulting in an interlacing or blending of features (severity due to complexity of form)

In the first continuum, the mere frequency of perseverations determines the level of severity. In the second continuum, when a PWA continues to perseverate the same form (e.g., phoneme(s), whole word, etc.) over several consecutive items and then perseverates another response also for several items (even if it is only a single phoneme or word), the tendency to perseverate is to be characterized as severe. The most serious form of this type of repetitive behavior is a recurring utterance. In the third continuum, the PWA is able to correctly name or produce paraphasias for the target items. However, the perseverated word remains activated and fills the gap when the next lexical retrieval difficulty arises. In the fourth continuum, the perseverative behavior is to be characterized as severe due to the complexity of the response: components or parts of several responses are interlaced resulting in more complex perseverative responses. All of these continuums should be considered when evaluating perseverative behavior in PWA.

In the literature, various measures are described for calculating the severity of perseveration in a PWA as well as the candidacy for a specific therapy method targeting perseverative behavior. These measures are summarized in Table 1.2. The two perseveration measures advocated by Cohen and Dehaene (1998) require statistical analyses to compute chance values. This process requires a time commitment and some knowledge of statistical procedures.

TREATING VERBAL PERSEVERATION

Moses and colleagues (2004) examined recurrent perseveration in PWA and suggested possible directions for intervention. After diagnosing presence, type, and severity of perseveration, they recommended that the clinician should:

- *Increase the activation of the target.* By providing specific cues that are adequate for the PWA (e.g., semantic, phonemic, etc.), the clinician can increase the activation level for the target word, which should result in the production of the correct name. This suggestion is in line with the view that the activation of the target word is insufficient.
- *Avoid adding more activation to the perseveration.* The clinician should avoid using the perseverated word and should not produce it when providing the PWA with feedback or assistance. The clinician's use of the word would draw more attention to the perseveration, which would thus receive more activation.
- *Provide alternative communicative strategies.* If the clinician cannot elicit the target word by providing one or more cues to the PWA, then the clinician should resort to other strategies, such as providing a circumlocution or gesture to elicit the target word or instructing the PWA to acknowledge that he or she does not know the word.
- *Encourage self-monitoring.* One aim of therapy should be to develop the PWA's ability to self-monitor and self-correct errors. The authors suggested that the clinician encourage the PWA to stop and think before producing a response, in the hope that the PWA will produce the target word or, possibly, state that he or she does not know the answer.
- *Educate family members and caregivers about perseveration.*

The overall suggestions notwithstanding, the authors nevertheless conclude that the clinician should focus on treating the underlying language impairment rather than treating perseverative errors as an isolated problem, since perseveration is symptomatic of the specific underlying language impairment. This illustrates the two possible approaches to remediating perseverative behaviors in PWA: *targeting perseverations* and *targeting the underlying language impairment*. These two alternatives are discussed in detail next.

Treatment Targeting Perseveration

This approach considers perseverations as the root cause of the problem and posits that perseverations block the retrieval of a target word. According to this hypothesis, the clinicians should use general strategies to prevent the blockage such as increased stimulus interval or extended pause time. This approach is related to the overactivation account (von Sölder, 1895, 1899). However, the proponents of this approach also usually provide concomitant therapy for naming, which transforms this technique into a hybrid approach.

In theory, this approach focuses on specific aspects of therapy administration and requires that the clinician immediately respond to a client who perseverates. The strategies used in this approach aim at breaking through the tendency to perseverate by (a) asking the client to take a deep breath, (b) using a hand gesture to stop the client from responding too quickly, (c) pausing by conversing with the PWA briefly about something entirely different, or (d) presenting the task items with more than the usual amount of time between each one. These suggestions may seem like common sense but they often succeed because they interrupt the PWA from continuing to speak or write. The short interruption allows the (over)activated language units to return to their resting state or to a lower activation level. This allows the PWA to start again and possibly overcome the specific difficulties, for example, of finding a specific word. In such an instance, the brief interruption in producing speech may positively influence the word retrieval process.

The aforementioned strategies are important for treatment planning as well as for administering therapy to PWA who reveal a tendency to perseverate. For a PWA whose oral language production consists mainly of perseverative responses, targeting the specific language deficits as well as the perseverative behavior will be difficult. Initially, the manner in which the clinician is able to break through the severe perseverative tendency is crucial for the therapy process. Only when the frequency of the perseverations decreases will it be possible to administer the planned specific language treatment. In the case of a PWA with milder symptoms, a judicious selection of the stimuli may have a heightened contribution to reducing the frequency of perseverative responses. For example, words that are very different phonologically or semantically will tend to minimize the risk of perseveration, whereas selecting minimal pairs or phonologically similar words or lexical items from the same semantic category will tend to increase the tendency to perseverate.

In the context of this approach targeting perseverations directly, two therapy programs have been published to date: *Treatment of Aphasic Perseveration* (TAP; Helm-Estabrooks, Emery, & Albert, 1987; Helm-Estabrooks et al., 2013) and *Reducing Aphasic Perseveration* (RAP; Muñoz, 2011, 2014).

Treatment of Aphasic Perseveration (TAP)

The first published therapy approach for explicitly and directly treating perseveration is the TAP therapy protocol (Helm-Estabrooks, 1987), which was revised in Estabrooks

et al. (2013). The authors state that nonperseverative responses can be achieved by bringing perseverative responses, which block the production of the correct ones, under control. The intent of their approach is to bring “perseverative behavior to the individual’s level of awareness and help him or her suppress perseverative responses” (p. 264) and in turn to produce correct responses. Thus, the functional goal of their program is to reduce recurrent verbal perseverations that block retrieval and production of the correct target words by bringing perseverative responses under control.

Based on results from a pretest, the best candidates for the TAP program are PWA who reveal a moderate to severe tendency to perseverate, but are fully alert, have moderately preserved auditory comprehension and memory skills, and are able to name some objects. To determine a person’s candidacy for the program, a two-step procedure is followed. The PWA must score at least 20% on the Perseveration Severity Rating, which is calculated by dividing the number of perseverative responses in the visual confrontation naming and word discrimination tasks of the Boston Diagnostic Aphasia Examination (BDAE; Goodglass et al., 2001) by the number of total responses (see Table 1.2). The TAP approach follows an ABAB therapy design alternating TAP therapy periods with standard language therapy periods. Each phase consists of five sessions: TAP—standard treatment—TAP—standard treatment—TAP. After each phase, progress is charted by the changes (a) in the number of correctly named objects and (b) the percentage of perseverative responses. The scoring system ranges from 0 for no perseveration up to 4 for a perseverative response produced after three cues have been given.

Before administering the program, a hierarchy of semantic categories (taken from the categories assessed by the BDAE in the confrontation naming task) is established for each PWA based on his or her test performance. In the actual therapy the PWA is required to name pictured and real objects. The clinician may provide up to 3 of the following 10 specific strategies, which are selected for each PWA based on the diagnosed symptoms (described later here). A list of 38 TAP stimuli to be used with all patients is also provided by the authors.

The authors provide four general strategies that are applied with each PWA participating in the program. These include:

1. *Explain and alert to perseveration.* Before initiating the TAP program, the clinician explains to the PWA what perseveration is and the purpose of TAP.
2. *Establish task sets.* Before proceeding to the next item to be named, the PWA should be made aware that it is a new item.
3. *Bring perseveration to the level of awareness.* The clinician makes the PWA aware that he or she is perseverating, for example, by writing down the perseveration on a piece of paper and then ripping it up and leaving the pieces of paper on the table and pointing to them when the PWA perseverates again.
4. *Monitor presentation pace.* Allow at least a 5-second break before presenting the next item stimulus to be named.

Furthermore, the authors propose 10 specific strategies to be used for cueing in the TAP approach. They are ranked according to the amount of assistance provided by the clinician from minimal to maximal assistance:

1. *Time interval* (TI): A 5- or 10-second interval is imposed before the PWA can respond.
2. *Gestural cue* (GC): A pantomime associated with the object to be named is provided.
3. *Drawing* (D): A picture of the object is drawn and the PWA says the name as soon as he or she recognizes the object, or the clinician asks the PWA to draw the object.
4. *Descriptive sentences* (DS): The object or its function is described by the clinician.
5. *Sentence completion*: An open-ended sentence for the PWA to complete is provided.
6. *Graphic cue* (GC): The first (two) letter(s) of the target word is (are) written down and the PWA is asked to complete writing it and then read the word aloud.
7. *Phonemic cue* (PC): The initial phoneme of the target word is provided. ("This is a(n) /initial phoneme/.")
8. *Oral reading* (OR): The PWA is asked to read aloud the target word written down by the clinician.
9. *Repetition* (R): The PWA is asked to repeat the target word.
10. *Unison speech or singing* (US): The PWA is asked to say or sing the target word with the clinician. (p. 271)

The authors stress that the selection of the order of the strategies is based on the individual needs of each PWA and can be modified if needed.

Since the introduction of the TAP approach in 1987, Helm-Estabrooks and her colleagues have administered it successfully to numerous clients and have also refined the technique. In summary, even though the TAP approach is designed to directly treat perseveration, by means of the TAP procedure of general strategies the authors are also actually providing therapy for the underlying functional naming deficit(s). Although TAP is subsumed under the first approach, that is, to treat perseverative behavior, it actually adheres to both approaches: applying general strategies for targeting perseverations and therapy for underlying word-finding difficulties.

Reducing Aphasic Perseveration (RAP)

Another treatment focusing directly on perseverative behaviors is Reducing Aphasic Perseveration (RAP; Muñoz, 2011, 2014). Muñoz (2011) summarizes a therapy study that is specifically aimed at reducing perseverative responses in a Spanish-speaking PWA (SC) presenting with moderate to severe receptive-expressive aphasia with severe naming deficits. The theory behind RAP stems from Cohen and Dehaene's (1998) and Martin and Dell's (2007) account of the origin of perseverative responses: persistent activation of a previous response in combination with weak activation of the new target word. The treatment

protocol targets the overactivation of the perseverative response and the underactivation of the correct target response by systematically manipulating the interstimulus interval (ISI) between items in a picture naming task. The time interval before presenting the next picture was increased or decreased depending on whether a perseveration was or was not produced. Between stimuli an ISI of 20 seconds was used and it was reduced by 2 seconds if a perseverative response was not produced regardless of the accuracy of the response. If a perseveration was produced, the interval for the next picture stimuli was increased by 2 seconds. As a second component of the therapy, the Semantic Feature Analysis (SFA) protocol (Boyle & Coelho, 1995) was administered in which SC was asked to identify attributes of the items that were incorrectly named by providing their function and physical properties.

The therapy resulted in a decrease in perseverative responses. However, naming accuracy showed only a minor improvement on trained and untrained stimuli, possibly due to the short duration of the therapy. The author notes an observed increase in the PWA's overall verbal output, as well as an increase in his communicative effectiveness as judged by the PWA and his family. At follow up, his decreased tendency to perseverate was maintained. Muñoz claims that the results of her study suggest that the language therapy provided to SC successfully reduced perseveration and increased verbal output.

Muñoz (2011, 2014) designed RAP to reduce the occurrence of perseverative responses on trained and untrained picture stimuli using a naming paradigm by systematically manipulating the time between the presentation of each item and increasing the activation of the target. The RAP method is for PWA who frequently perseverate—on the order of 30% or more (see Table 1.2). The author emphasizes that the goal of the therapy protocol is not to increase the PWA's naming accuracy, although that may occur. For this reason, this method is considered to be representative of the first approach. Under the second approach, the clinician would expect naming accuracy to improve, since the treatment target would be to improve naming and this would result in a reduction of perseverative responses.

Before therapy is initiated the clinician administers a naming task and records a spontaneous speech sample (interview and picture description). Then the PWA and caregivers are instructed about what perseveration means. RAP itself consists of a two-part treatment cycle: (1) Manipulation of the interstimulus interval (ISI) between the presentation of each picture stimulus from a confrontation naming task, and (2) SFA. The therapy itself consists in administering SFA (Boyle & Coelho, 1995) to those items incorrectly named in the first part of the cycle. This cycle is repeated for each item and the ISI is adjusted to the needs of the PWA. The homework involves practicing the trained words using the pictures from therapy.

Although the stated emphasis of both TAP and RAP is to treat perseverative behavior directly, it must be noted that both also include structured naming tasks. Thus, in both protocols the clinicians are also addressing the specific deficits of the PWA, which is the main tenet of the second approach to treating perseverative behaviors by administering therapy targeting the specific deficits.

Treatment Targeting the Underlying Language Impairment

In the second rehabilitation approach, the clinician targets the specific language deficits in therapy. This approach posits that perseverations are a reflection of the primary language deficits of the PWA in accordance with the Deficit Account (Heilbrunner, 1895, 1897, 1906; Lissauer, 1890). This explains why a PWA will display perseverative behaviors in the impaired language domains. For example, if a word cannot be retrieved (i.e., anomia), the gap is automatically filled by an available (i.e., previously activated) item. In this instance, the perseveration is secondary to the word-finding problem and the therapy should focus on the underlying anomia problem. It is anticipated that the administered therapy will result in a reduction of perseverative responses. In this case, perseverations are treated by directly treating the specific underlying language deficits of a PWA and thereby eliminating the source for perseverative behavior. This perspective is reflected in some patient studies on perseveration (Basso, 2003, 2004; Moses et al., 2004; Papagno & Basso, 1996; Stark, 1984, 2007a, 2007b, 2011b; Stark, Kristoferitsch, Graf, Gelpi, & Budka, 2007).

Basso (2003, 2004) and Papagno and Basso (1996) are proponents of this approach focused on treating the underlying language impairment. Basso (2004) analyzed language data collected from 50 consecutive PWA from her clinic to determine the occurrence of perseveration in an unselected group. In that study she also described the language therapy administered to two PWA who showed a high rate of perseveration. Treated Subject 1 (cited as TS1, AB, or BA in various publications) displayed transcortical sensory aphasia—resulting from a gunshot wound—with a severe impairment of the lexical-semantic system and relatively well preserved sublexical processing. He perseverated in all production and comprehension tasks, except for repetition, reading aloud, and writing to dictation. He also perseverated in drawing objects. The therapy concept developed for him targeted his impairments in the lexical-semantic system, because perseverations were produced only when TS1 was unable to produce the correct response (Papagno & Basso, 1996). The therapy administered to this PWA focused on semantic processing (Basso, 1993, 2004) and consisted of the following tasks:

1. Categorization
2. Odd-one-out
3. Picture verification tasks

For the categorization tasks, two categories were targeted: clothing and food. Initially he was unable to perform the odd-one-out task, which consisted of five pictures, four of which were animals and one was from a distant category (furniture). The authors report that targeting whole semantic categories was not successful for this patient. For this reason, in a second therapy attempt, single concepts were targeted, starting with the category of tools. The procedure consisted of several steps:

1. A picture of a hammer was shown to him and after being unable to name it, he was asked to copy it.
2. Discussion of all the parts of a hammer and explanation of its use.

3. Demonstration of use of the hammer. With the picture in view, he was asked to pretend to use it.
4. The next step was for him to pretend to use it without the picture being visible and then to draw the object from memory.

It took a great deal of therapy for the PWA to achieve a recognizable drawing of a hammer. When this was achieved, a new concept was introduced and the same procedure was followed. Two other categories were worked on: kitchen utensils and clothing. The perseverative responses first disappeared in pointing tasks, followed by written naming tasks. The authors reported “TS1 showed a slow but progressive improvement and simultaneous reduction of semantic errors and perseverations” (p. 383). Therapy was administered for 2 years, and at the last control he revealed mild Wernicke’s aphasia with rare semantic errors, perseverations, and word-finding difficulties.

Treated Subject 2 (TS2) had mild Wernicke’s aphasia with agraphia. She also revealed a functional deficit at the level of the semantic system that expressed itself as semantic errors in oral naming. TS2’s more severe writing impairment was ascribed to a deficit in the output buffer. She perseverated in all writing tasks. TS2 received treatment for her output buffer deficits (according to the cognitive-neuropsychological model; Whitworth, Webster, & Howard, 2005) that resulted in a striking reduction of perseverative responses in writing. Summarizing the two case studies, Basso (2004) maintains that treatment should vary according to the underlying deficit (as proposed by Moses et al., 2004 and Stark, 2011b). By treating the underlying deficits the clinician should observe a reduction in the PWA’s perseverative behavior. Moreover, “... besides having a hypothesis about when perseverations occur, we should know the mechanisms responsible for the appearance of perseverations” (p. 388). After locating the deficit, a theoretically based treatment *must* be administered for language in general, which will result in a reduction of perseveration, if the hypothesis underlying the therapy concept is valid.

CONCLUSION

Perseveration is one of the most challenging symptoms for a clinician to deal with in the clinical setting. The claim being made throughout this chapter is that a PWA’s perseverative behavior is a reflection of his or her underlying deficits. For this reason, the perseverative behavior must be treated in the context of the individual’s language deficit(s). The therapy goals developed to treat the PWA’s specific language impairment(s) are paramount. The clinician also should implement general strategies necessary for the provision of any therapy protocol such as appropriate cueing, feedback, and reinforcement. However, particular emphasis should also be placed on reducing the occurrence of perseverative responses by selecting and applying strategies shown to reduce perseverations, such as pausing, increasing interstimulus delays, etc. Although there is no single assessment for perseveration, in-depth assessment of a PWA’s language abilities is required to arrive at an overall picture of the nature and extent of the perseverative behavior and, in turn,

to conceptualize the most appropriate therapy approach for that client with a tendency to perseverate.

With regard to verbal perseveration, a comprehensive understanding of the PWA's language processing difficulties will allow the clinician to treat the specific difficulties more adequately and at the same time treat perseveration directly, as the perseverative responses result from the primary deficit(s). In addition, analysis of a PWA's perseverative responses will provide the clinician with more information regarding the assumed functional locus/loci of the deficits and also how the therapy is proceeding. Most importantly, under the assumption that the perseverative tendency will decline when the administered treatment targeting the underlying deficits is successful, the clinician will observe a reduction of perseverative responses and in some cases total elimination.

CASE ILLUSTRATION

Another example illustrating the second approach is the case illustration of MV. She is a 69-year-old, German-speaking pharmacist 7 months post CVA presenting with moderate Wernicke's aphasia. Extensive language testing revealed a moderate tendency to perseverate nouns and verbs in various oral and written naming tasks, and other production tasks, including sentence and discourse tasks. When MV could lead the conversation and was not required to produce a specific single target word, her language production was generally more coherent and adequate. Initially, she frequently produced phonemic and semantic paraphasias as well as neologisms, and she revealed self-correcting behaviors in conversational speech, confrontation naming, and repetition tasks. Her successive approximations often resulted in perseverative responses.

In **FIGURE 1.1** the results are given for the first Aachen Aphasia Test (AAT; Huber, Poeck, Weniger, & Willmes, 1983) administered pre-therapy at 7 months post onset.

Initially MV was most impaired on the naming subtests of the AAT (59/120) that required the production of simple and compound nouns and color names and sentences. For the repetition subtest in which phonemes, words, and sentences were repeated, her score was 108 out of 150. For the other subtests of the AAT: Token Test, written language, and auditory and written comprehension of words and sentences, she was mildly impaired. She produced recurrent perseverations mainly in confrontation naming of nouns, compound nouns, and color names on the AAT and also for items on the Boston Naming Test (BNT; Kaplan, Goodglass, & Weintraub, 1983) and the Action Naming Test (ANT; Obler & Albert, 1979).

MV's pretherapy score on the BNT was 11/60 correct (18%) and on the ANT 44/63 correct (70%). It must be stressed that MV was allowed ample time to respond. On all tasks she produced multiple responses; however, in most cases her attempts resulted in phonological and semantic paraphasias.

For example, MV produced the following perseverative responses on the AAT:

1. Word repetition:
 - a) **Knirps** (umbrella) → [correct]
Zwist (dispute) → **knick-knicks**- swis
 - b) Püre (mashed potatoes) → [correct]
Pilot → pire
2. Sentence repetition (translated from German):
"He picked his mother with a new **car** from the train station up" → He picked my mother from a -ah with the **car** from the **car** up
3. Sentence naming to picture stimuli:
Item 3: "The man fished/caught a boot" The man fished/caught a boot
That is the ah- ah /flos/ and /lof/ he has led a pair of shoes instead a /**fusch**/- /**fusch**/ [for /fish/] ...
Item 6: "The policeman is arresting the criminal" → Here is the /po-poliziden/ poli-police is holding him ah-ah backwards with the **fish** [for the target: handcuffs].

In these examples phonemes and phoneme clusters as well as whole words were perseverated.

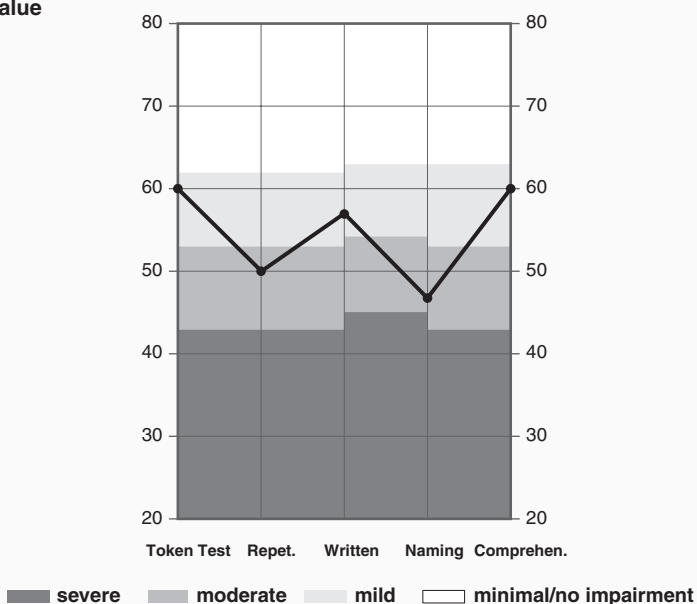
Based on the data from the language assessments, the clinician designed the therapy protocol to target MV's difficulties in retrieving and producing nouns and verbs, particularly in the context of oral and written sentence to picture stimuli. The assumption behind the therapy protocol conceived for MV was to reduce or eliminate her word retrieval and production difficulties that often resulted in perseverative behavior by directly targeting her noun and verb retrieval deficits in the context of oral sentence production with extensive retrieval practice and recall of the treated items. Moreover, as her auditory comprehension was relatively intact for single words and sentences, she was considered a good candidate for the ELA-Syntax program (ELA= Everyday Life Activities; Stark, 2005). It was assumed that she would benefit from the structure of the protocol requiring her to retrieve the nouns and verbs depicting relevant everyday activities and to stick with the first semantically adequate sentence produced to a picture stimulus, as well as to answer questions about the constituents of the produced sentences.

AATP for Windows
Assessment Program for the Aachen Aphasia Test
T-Value Profile of the Subtests

Patient: MV
 Address: Vienna
 Patient ID: 1
 Test number: 1

Date of birth (d/m/yr): 05/06/1924
 Age: 69
 Aphasia begin (d/m/yr): 01/12/1993
 Months post onset: 6

T-Value



Single case diagnostic results:

NAMING	REPET.	WRITTEN	COMPREHEN.	TOKEN TEST
(47)	(50)	(57)	(60)	(60)

FIGURE 1.1 Results from the pre-therapy language assessment for the Aachen Aphasia Test (AAT) at seven months post onset

Three trial sessions were administered to introduce the overall structure of the program to MV and for the clinician to acquaint herself with the most adequate way of providing feedback to MV. She then received 60 hourly therapy sessions. The therapy protocol consisted of a sequence of steps that was held constant for the 60 sessions and the therapy was provided three to four times per week. The overall structure of the ELA protocol is in accordance with the principles of experience-dependent neuroplasticity (Kleim & Jones, 2008) with a main focus on oral sentence production to picture stimuli depicting everyday life activities. Following a brief conversation, the steps for each session included:

1. Recall of the sentences worked on in the previous session
2. Sentence production to picture stimuli from last session (“old cards”)
3. Sentence production to new picture stimuli ($N = 12$) (“new cards”)
4. Questions about the constituents of the sentence
(Steps 3 and 4 done consecutively for each stimulus)
5. Auditory sentence comprehension check
6. Second trial of sentence production to new picture stimuli
7. Recall of the sentences worked on in the actual session

Intensive feedback was provided for steps 2 to 6. Multiple repetitions and production of the correct sentences in unison resulted in a steady improvement, and in turn, fewer perseverative responses. The homework assignment consisted of writing down the sentences worked on in therapy from memory.

In the first therapy session examples of MV’s perseverations included:

1. *Stimulus card 1.* Das Mädchen **putzt** sich die Ohren [“The girl is cleaning her ears”] (After multiple attempts and feedback from the clinician MV finally produces the whole sentence correctly.)
Stimulus card 2. Der Bub stellt den Wecker ab [“The boy is turning off the alarm clock”] → Der Bub will **sich die Ohren** [persev.] ... Der Bub buz- **putzt** [persev.] [“The boy wants to his ears ~ ~ The boy is ~ clean—cleaning”]
2. *Stimulus card 4.* Das Mädchen föhnt seine Haare [“The girl is blow drying her hair”]. She also produced “das Fräulein” [paraph.] [“the young lady”] for girl.
Stimulus card 5. “Die Frau raucht eine Zigarette” [“The **woman** is smoking a cigarette”] → Das **Fräulein** [persev.] pfeunt [neologism] mit der .. ah zeunt [neologism] mit der Zigarette” ... Sie fennt -... sie **föhnt** [persev.] sich gerade die Zigarette auf. [“She blow dries just now a cigarette on/up”]

Several instances of perseveration were observed for single phonemes and consonant clusters affecting both the verbs and nouns in the produced sentences. Each stimulus required multiple attempts before MV was able to produce a correct response which upon repetition was either correct, a perseveration, or a paraphasia. MV's self-monitoring ability, that is, her awareness of the produced errors improved over time. Initially, she revealed less self-corrective behavior, which is one indication that she was not aware of them. Her responses to questions pertaining to single components of the sentences were often correct, but she also produced phonological and semantic paraphasias and neologisms and semantically inadequate responses. She also perseverated verbs in her home practice assignment: The verb "give" was perseverated for three sentences.

- a. "Der Bub gibt [paraph.] (Target: "nimmt") einen Teller aus dem Kasten" ["The boy is **giving** (Target: "taking") a plate out of the cupboard]
- b. "Die Frau **gibt** [persev.] (Target: "steckt ... ein") den Stecker in die Steckdose" ["The woman is **giving** (Target: "putting ... in") the plug into the outlet"]
- c. "Der Mann **gibt** [persev.] (Target: "schenkt ... ein") aus der Flasche ein Glas Wein" ["The man is **giving** (Target: "pouring ... in") from the bottle a glass [of] wine"]

The first verb was incorrectly produced as "give" in place of "take." In sentences to the following picture stimuli, she perseverated the verb "give" in the third person singular form. In one case "give" would be an adequate verb as a less specific formulation for "steckt ... ein" ("put ... in").

It is important to note that during the assessment MV produced a mixture of errors and perseverative responses were among them. However, in the initial phase of therapy her retrieval and production difficulties became more pronounced and she produced more perseverative responses. However, as therapy progressed MV's ability to retrieve the correct nouns and verbs improved steadily. Initially, during home practice, MV was able to recall 7 of the 10 sentences worked on in therapy, although her written productions exhibited paraphasias and perseverations. In later therapy sessions, she recalled all of the sentences with minor spelling errors. As therapy progressed, it became apparent that interrupting MV's attempts to retrieve and produce the correct verb were successful in breaking through the perseverative tendency. For this reason, the clinician added having MV take a deep breath and pausing whenever she perseverated. This general strategy carried over so well to everyday life that a relative thought MV had difficulties breathing! Initially the clinician had MV stop speaking and listen to the correct production and only

then had her repeat it. This interruption sufficed until she produced a perseverative response; then it became necessary to introduce the “breathing pause.”

As a proponent of the importance of qualitatively analyzing language data from therapy sessions as a realistic indicator of a PWA’s performance, the transcripts from the 1st and 60th therapy sessions were analyzed. In **TABLE 1.3** a comparison of MV’s language performance in the 1st and 60th therapy sessions revealed a marked reduction in the number of errors on the variables which related to her language deficits.

The second AAT, administered following the 60 therapy sessions at 12 months post onset, revealed improved performance on the subtests that were initially most impaired (**FIGURE 1.2**): mild impairment for the naming and repetition subtests and minimal to no impairment on the other subtests.

MV’s scores improved on the BNT and ANT: 37/60 (67%) and 52/63 (82.5%), respectively. Thus, MV’s post-therapy performance on the BNT revealed an increase in 49% correct and for the ANT an increase in 12.5% correct. A carryover of therapy effects from oral sentence production—the modality worked on in therapy—to the untrained modality of written sentence production (= home practice assignment in which she also perseverated) was also observed. Thus, by specifically treating MV’s lexical retrieval difficulties in a systematic, linguistically structured manner in combination with general strategies to minimize perseveration, perseveration was no longer an issue for her.

TABLE 1.3 Comparison of MV’s language performance in the 1st and 60th therapy sessions for selected variables.

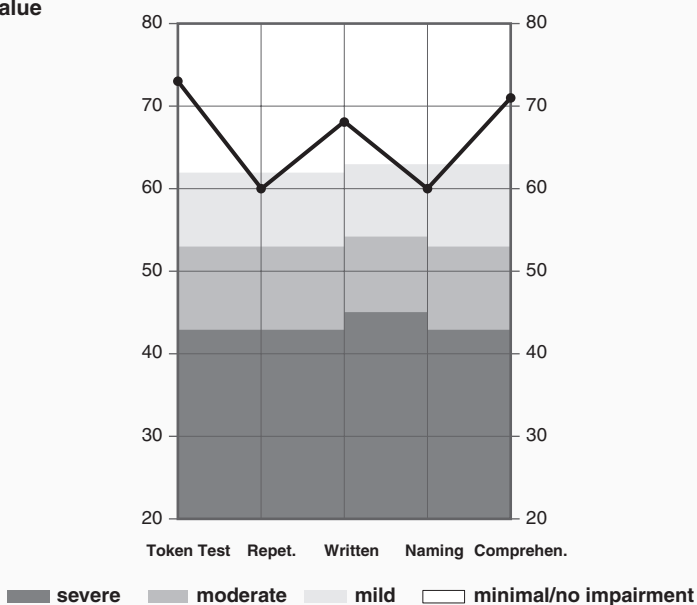
Analyzed Variables	1st Therapy Session	60th Therapy Session
Perseveration	40	1
Phonological paraphasia	45	4
Neologisms	37	1
Semantic paraphasia	18	0
Successive approximations (incorrect) (conduite d’approche)	33	1
Self-correction	13	17
Incorrect verbs	18	1

AATP for Windows
Assessment Program for the Aachen Aphasia Test
T-Value Profile of the Subtests

Patient: MV
 Address: Vienna
 Patient ID: 1
 Test number: 1

Date of birth (d/m/yr): 05/06/1924
 Age: 69
 Aphasia begin (d/m/yr): 01/12/1993
 Months post onset: 11

T-Value



Single case diagnostic results:

NAMING	REPET.	WRITTEN	COMPREHEN.	TOKEN TEST
(60)	(60)	(68)	(71)	(73)

FIGURE 1.2 “Results from the post-therapy language assessment for the Aachen Aphasia Test (AAT) at 12 months post onset Aachen Aphasia Test.

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