TREATMENT OF VERBAL SHORT-TERM MEMORY & VERBAL WORKING MEMORY DEFICITS

A Clinical Guide

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Important Caveat

This guide contains treatment activities that are logically consistent with current theories of language and short-term memory. While they are based on tasks that have been validated for diagnostic purposes, they have not yet been validated as treatment tasks.

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TALSA Test Selection Guide

		Testing Focus					
		Time delay effects (1 sec. vs. 5 sec.)	**Verbal STM capacity**	**Verbal WM load**	**Linguistic processing level**	**Response mode**	**Aphasia severity of the patient**
1	**Phoneme Discrimination**	yes			Phonological	pointing	severe
2	**Rhyming Judgments**	yes			Phonological	pointing	severe
3	**Word/Nonword Repetition Test - Single item**	yes			Phonological	pointing	mod-severe
4	**Lexical Comprehension**	yes			Semantic	pointing	severe
5	**Category Judgments**	yes			Semantic	pointing	severe
6	**Picture Naming**	yes			Semantic	verbal	moderate
7	**Auditory Lexical Decision**	yes			Semantic	pointing	severe
8	**Sentence Comprehension**	yes			Semantic	pointing	all
9	**Sentence Repetition**	yes			Phono & Sem	verbal	mild-mod
10	**Rhyming Triplets**			yes	Phonological	pointing	all
11	**Synonymy Triplets**			yes	Semantic	pointing	all
12	**Category Typicality**			yes	Semantic	pointing	mod-severe
13	**Word/Nonword Repetition Span - Open set**		yes		Phonological	verbal	mild-mod
14	**Digit/Word Span - Closed set**		yes		Phonological	pointing & verbal	all
15	**Wd Rep Span - Hi/Lo Imageability - Open Set**		yes		Phono & Sem	verbal	mild-mod
16	**Rhyming Probe Span**		yes	yes	Phonological	pointing	all
17	**Initial CV Probe Span**		yes	yes	Phonological	pointing	all
18	**Nonword Identity Probe Span**		yes	yes	Phonological	pointing	all
19	**Category Coordinate Probe Span**		yes	yes	Semantic	pointing	all
20	**Synonymy Probe Span**		yes	yes	Semantic	pointing	all
21	**Superordinate Probe Span**		yes	yes	Semantic	pointing	all

Subtest Selection – Where do I start?		
If your patient has…	**You may ask…**	**Start with these subtests…**
Broca's aphasia and apraxia	How much of their communication impairment is due to aphasia and how much to apraxia?	Compare their scores on Word Span – Closed Set – Pointing *vs.* Word Span – Closed Set – Repetition.
Wernicke's aphasia	Is their auditory comprehension deficit centered more at the phonological level of word processing or at the semantic level?	Compare their scores on Rhyming Judgment *vs.* Category Judgment Compare their scores on Rhyming Triplets *vs.* Synonymy Triplets
Conduction aphasia	How exactly are their repetition skills affected?	Administer a variety of repetition tests: Word Repetition Test – Single Item Nonword Repetition Span – Open Set Sentence Repetition
Anomic aphasia	Are their word retrieval deficits due more to slow/weak activation of the word, or due more to difficulty maintaining the word in vSTM?	Compare 1 second *vs.* 5 second variations: Phoneme Discrimination Category Judgment Picture Naming
Severe aphasia	What are their underlying linguistic strengths and weaknesses?	Administer tests with nonverbal responses: Rhyming Judgment Lexical Comprehension Digit Span – Closed Set - Pointing
Mild aphasia	How can I document aphasia if my patient scores well on standard aphasia batteries?	Chose challenging tests: Sentence Repetition – Padded Nonword Repetition Span – Open Set Synonymy Probe Span
Sentence level comprehension deficits	How much does limited vSTM capacity vWM load contribute to their auditory comprehension impairment?	Assess vSTM capacity Word Span – Closed Set – Pointing Sentence Comprehension Assess vWM load Rhyming Triplets Synonymy Triplets

Interpretation of TALSA Scores

Each subtest of the TALSA is scored independently.

Raw scores - Proportions: For most subtests, the raw score is a proportion (e.g., 0.72 or 72%).

Raw scores – Spans: For span subtests, the raw score represents the vSTM capacity for that task and is expressed in the number of words repeated or pointed to. For example, on the Word Repetition Span subtest, if the patient consistently repeats lists of 2 words accurately and can repeat lists of 3 words half the time, their span score is 2.5 words. For most span subtests, the maximum score possible is 7.0.

Error patterns – qualitative data: In addition to the proportion score, the Picture Naming test provides a framework for recording error types, e.g., phonological errors vs. semantic errors, real words vs. nonwords.

T-scores: Raw scores (both proportions and spans) are converted to standardized T-scores. Using this metric, a T-score of 50 represents the mean or "average" skill level of the reference population. A difference of 10 from the mean indicates a difference of one standard deviation (SD). Thus a score of 60 is one SD above the mean while a score of 30 is two SDs below the mean.

Severity ratings – T-score ranges: Note, because T-scores were derived from a sample that included both people with aphasia and neurotypical controls, the mean is skewed upwards. Therefore, the cut score for determining if language skills are within normal limits (WNL) is 55+ rather than 50+.

Severity Rating	T-score
Within normal limits	55+
Mildly impaired	48 - 54
Moderately impaired	41 - 47
Severely impaired	40 and below

Treatment Framework

Treatment is presented in terms of "Active ingredients/essential elements" and "optional variations." This framework allows for a large degree of flexibility in the creation of individualized treatment plans while adhering to the required treatment components. It is based on the Rehabilitation Treatment Specification System (RTSS; Zanca et al., 2019; Turkstra et al., 2016).

- Active ingredients: **Essential** elements that are known or hypothesized to account for changes in patient functioning. Active ingredients/essential elements are **required** components of treatment.
- Variations: **Optional** modifications to active ingredients/essential elements that allow for creation of individualized treatment plans.

Turkstra, L. S., Norman, R., Whyte, J., Dijkers, M. P., & Hart, T. (2016). Knowing what we're doing: Why specification of treatment methods is critical for evidence-based practice in speech-language pathology. American Journal of Speech-Language Pathology, 25(2), 164-171. https://doi.org/10.1044/2015_AJSLP-15-0060

Zanca, J. M., Turkstra, L. S., Chen, C., Packel, A., Ferraro, M., Hart, T., ... & Dijkers, M. P. (2019). Advancing rehabilitation practice through improved specification of interventions. Archives of Physical Medicine and Rehabilitation, 100(1), 164-171. https://doi.org/10.1016/j.apmr.2018.09.110

TREATMENT PLAN GUIDE WITH SAMPLE GOALS

IMPROVING SIGNAL ACTIVATION IN vSTM

Target: Increase signal **strength**

1. **TALSA results:** Patient does worse on time interval tests with **shorter** (1 second) delays. (See Table 2 for list of interval tests.)
2. **Goal:** Increase speed of response.
3. **Why this matters:** Slow activation of words (needing more time to process words, a transmission problem) can result in delays in recalling words or understanding words. If the activation is too slow, it may never reach the threshold necessary to recall or recognize the word. Patients may describe this as a "tip of the tongue" problem.
4. **Treatment ingredients**
    a. Active ingredients/essential elements
        i. Stimuli
        ii. Interval delays that **decrease** in duration, e.g., from 5 seconds to 1 second.
    b. Variations
        i. Stimuli
            1. Type of item – words, sentences
            2. Amount of information to be held in memory
                a. Number of words
                b. Length of sentences
            3. Difficulty of the stimuli (See Table 1)
        ii. Interval delay can be between
            1. The stimulus and the response
            2. The presentation of two items to be compared
        iii. Task variations: repetition of items, comparison of two words (e.g., Do they rhyme? Are they synonyms?), picture naming, picture identification, point to picture described by a sentence.
        iv. Response mode – naming, repetition or pointing
5. **Sample goals** with progression
    a. The patient will name an object in less than 10 seconds with 95% accuracy. → less than 5 seconds → less than 1 second
        i. Functional variation: When presented with a team logo, the patient will name a football team in less than 10 seconds with 95% accuracy.
    b. After hearing a list of 3 words, the patient will point to the pictures of the words in order from an array of 9 pictures in less than 10 seconds with 95% accuracy. → less than 5 seconds → less than 1 second
        i. Functional variation: After hearing the names of 3 flowers, the patient will point to pictures of those flowers in a seed catalogue in less than 10 seconds with 95% accuracy.
    c. The patient will hear a sentence and from an array of 4 pictures, will point to the one that represents the sentence in less than 10 seconds with 95% accuracy. → less than 5 seconds → less than 1 second
        i. Functional variation: Using the Netflix or Amazon Prime website, the patient will point to a movie, show or actor from a sentence length description in less than 10 seconds with 95% accuracy.

Target: Increase signal **duration**

1. **TALSA results:** Patient does worse on time interval tests with **longer** (5 second) delays. (See Table 2 for list of interval tests).
2. **Goal:** Increase the delay (i.e., time interval) that a patient can tolerate between 1) the stimulus and the response or 2) two stimuli to be compared.
3. **Why this matters:** Impaired maintenance of words in vSTM results in losing the signal too quickly. The patient will not be able to hold onto a word long enough to understand it or long enough to combine it with other words to make a sentence. The patient may describe this problem as, "I had the word, but I lost it."
4. **Treatment ingredients**
    a. Active ingredients/essential elements
        i. Stimuli
        ii. Interval delays that increase in duration, e.g. from 5 seconds to 10 seconds
    b. Variations
        i. Stimuli
            1. Type of item – words, sentences
            2. Amount of information to be held in memory
            3. Number of words
            4. Length of sentences
            5. Difficulty of the stimuli (See Table 1)
        ii. Interval delay can be between
            1. The stimulus and the response
            2. The presentation of two items to be compared
        iii. Task variations: repetition of items, comparison of two words (e.g., Do they rhyme? Are they synonyms?), picture naming, picture identification, point to picture described by a sentence.
        iv. Response mode – naming, repetition or pointing
5. **Sample goals** with progression
    a. The patient will repeat a 6 word sentence after being asked to wait 1 second before responding with 95% accuracy. → 5 seconds → 10 seconds
        i. Functional variation: The patient will repeat back a recipe instruction…
    b. After hearing a list of 3 words, the patient will point to pictures of the words in order from an array of 9 pictures after being asked to wait 1 second before responding with 95% accuracy. → 5 seconds → 10 seconds
        i. Functional variation: After hearing the names of three items, the patient will point to pictures on an online shopping page from a preferred store…
    c. The patient will hear two words, with a 1 second delay between the presentations of the words and will indicate by pointing to "yes" or "no" if they belong to the same category with 95% accuracy. → 5 second delay → 10 second delay
        i. Functional variation: The patient will hear the names of two celebrities and will indicate by pointing to "yes" or "no" if they belong to the same category (musicians, politicians, athletes, etc.)…

IMPROVING vSTM CAPACITY

Target: Increase the **amount of information** held in vSTM

1. **TALSA results:** Patient has low scores on tests of vSTM capacity
2. **Goal:** Increase the number of items the patient can repeat back, or point to
3. **Why this matters:** Verbal STM capacity is a key component of all language behavior. Some examples include: holding the phonological, lexical and semantic elements of a word in vSTM long enough to produce the word, holding the words of a sentence in vSTM long enough to understand the sentence, holding several steps of instructions in vSTM to complete a task, holding several words in vSTM in order to produce a sentence, holding several sentences in vSTM in order to tell a joke, holding a sentence in vSTM while waiting one's turn in a conversation.
4. **Treatment ingredients:**
    a. Active ingredients/essential elements
        i. Stimuli
        ii. Increasing the amount of information to be held in vSTM
    b. Variations
        i. Stimuli
            1. Type of items – words, sentences
            2. Difficulty of the stimuli (see Table 1)
        ii. Amount of information to be held in memory
            1. Number of words
            2. Length of sentences
        iii. Response mode: repetition of items, point to pictures or written representations of the items
5. **Sample goals** with progression
    a. After hearing 3 words, the patient will point to pictures of those words (from an array of 9 pictures) with 95% accuracy. → 4 words → 5 words
        i. Functional variation: Using a map, the patient will point to 3 states named…
    b. The patient will repeat a list of 3 concrete words with 95% accuracy. → abstract words
        ii. Functional variation: The patient will repeat a list of 3 desserts with 95% accuracy. → The patient will repeat back a list of 3 qualities that describe a good doctor with 95% accuracy.
    c. The patient will repeat a 5 word sentence with 95% accuracy. → 7 word sentence → 9 word sentence.
        iii. Functional variation: The patient will repeat a 5 word sentence describing a topic of personal interest (favorite movie, vacation spot, pet)…

IMPROVING vWM LOAD

Target: Increase the **amount of information** held in vWM **while performing a task** with that information

1. **TALSA results:** Patient exhibits a **marked** difference in scores on verbal working memory tasks with high vs. low memory load. (Note: It is normal for everyone – with or without aphasia – to do somewhat worse on tasks with higher memory load conditions.)
2. **Goal:** Accurate completion of simple tasks involving an increasing number of words
3. **Why this matters:** These tasks involve comparing and ordering multiple words. Deficits in this area lead to difficulties in understanding and expressing ideas at the phrase or sentence level.
4. **Treatment ingredients**
    a. Active ingredients/essential elements
        i. Stimuli – typically words
        ii. A task that involves manipulation of the words
        iii. Increasing the number of words to manipulate, i.e., the "memory load"
    b. Variations
        i. Stimuli
            1. Difficulty of items - see Table 1.
            2. Amount of information to held in vWM, i.e.., number of words
        ii. Task
            1. Compare items
            2. Put items in an order
        iii. Response mode - pointing response, verbal response
5. **Sample goals** with progression
    a. After hearing 3 words, the patient will state which 2 words are synonyms with 95% accuracy. → 4 words → 5 words
        i. Functional variation: After hearing three sports teams, the patient will state which two teams play the same sport….
    b. After hearing 3 words, the patient will repeat them in alphabetical order with 95% accuracy. → 4 words → 5 words
        i. Functional variation: Using personally relevant sequences, (daily routine, steps in a recipe, etc.) will hear 3 key words and repeat them back in the sequence in which they occur…
    c. After hearing 2 words, followed by a brief pause and an additional word, the patient will indicate by pointing to "yes" or "no" if the additional word belonged to the same category as any of the preceding words with 95% accuracy. → 3 words → 4 words
        i. Functional variation: After hearing the names of 2 items from a grocery list, followed by a pause and an additional item, the patient will indicate by pointing to "yes" or "no" if the additional item is found in the same section of the grocery store as any of the preceding items…

IMPROVING LINGUISTIC PROCESSING in vSTM and vWM

Target: Improve **phonological** level processing

1. **TALSA results:** Patient does worse on tests involving **phonological level processing** (compared to tests of semantic level processing). Table 2 identifies which tests focus on phonological level processing and which focus on semantic level processing.
2. **Goal:** Increase the accuracy of tasks that involve the phonological properties of words.
3. **Why this matters:** Deficits at the phonological level affect accuracy of input processing of the sounds of words (e.g., misunderstanding the word "kitten" for "mitten") or the production of phonemic paraphasias (e.g., saying "picnic" when the intended word is "pickle").
4. **Treatment ingredients**
    a. Active ingredients/essential elements
        i. Tasks that focus on phonological information
    b. Variations
        i. Stimuli
            1. Words and nonwords (**not** sentences)
        ii. Tasks
            1. Rhyming judgment tasks
            2. Initial CV judgment tasks
            3. Word or nonword repetition tasks
        iii. Response modes – verbal, repetition, pointing
5. **Sample goals** with progressions
    a. The patient will hear 2 words and indicate if they begin with the same CV sequence by pointing to "yes" or "no" with 95% accuracy. → 2 nonwords
    b. The patient will repeat a one syllable nonword with 95% accuracy. → two syllable nonword → three syllable nonword
    c. After hearing 2 words, followed by a brief pause and an additional word, the patient will indicate via pointing to "yes" or "no" if the additional word rhymes with any of the preceding words with 95% accuracy. → 3 words → 4 words

Target: Improve **semantic** level processing

1. **TALSA results:** Patient does worse on tests involving **semantic level processing** (compared to tests of phonological level processing.) Table 2 identifies which tests focus on phonological level processing and which focus on semantic level processing.
2. **Goal:** Increase the accuracy of tasks that involve the semantic properties of words and sentences.
3. **Why this matters:** Deficits at the semantic level lead to semantically based comprehension errors (e.g., misunderstanding the word "kitten" for "puppy") or the production of semantic paraphasias (e.g., saying "picnic" when the intended word is "breakfast").
4. **Treatment ingredients**
    a. Active ingredients/essential elements
        i. Tasks that focus on semantic information
    b. Variations
        i. Stimuli
            1. Words (**not** nonwords)
            2. Sentences
        ii. Tasks
            1. Word or sentence comprehension
            2. Picture/object naming
            3. Categorization tasks
            4. Synonymy tasks
        iii. Response modes – naming, pointing
5. **Sample goals** with progressions
    a. The patient will name pictures of high frequency words (e.g., table, tree) with 95% accuracy. → low frequency words (e.g., asparagus, hippopotamus)
        i. Functional variation: Given family photos, the patient will state the names of immediate family members. → Names of distant family members.
    b. The patient will listen to a list of 4 words and state the 2 words that belong to the same category with 95% accuracy. → 5 words → 6 words
        i. Functional variation: The patient will listen to a list of menu items and state the two items that belong to the same category (appetizer, beverage, dessert, etc.)…
    c. The patient will hear a sentence in the active voice and point to a picture from an array of 4 choices that depicts the sentence with 95% accuracy. → passive voice
        i. Functional variation: Using personally relevant stimuli with pictures (e.g. sports, celebrities, gardening magazines or websites) the patient will hear a sentence in the active void and point to the picture that depicts that sentence… → passive voice…

Table 1 – Levels of stimulus difficulty

How words get harder

- Syllable length: monosyllabic words → multisyllabic words
    - peach → banana
- Frequency: high frequency words → low frequency words
    - tree → igloo
- Abstractness: concrete words → abstract words
    - leopard → justice
- Lexicality: real words → nonwords
    - baker → meshby

How sentences get harder

- Sentence length: shorter sentences → longer sentences
- Syntactic complexity
    - Active sentences → passive sentences
        - The man drove the car. → The car was driven by the man.
    - Non-reversible → reversible
        - The boy followed the path. → The boy followed the man.
    - Single clause → multiple clauses
        - The dog drank the water. → The dog, who had a broken leg, drank the water.
    - Subject relative clause → object relative clauses
        - The dog, who chased the cat, was barking. → The dog, who the cat chased, was barking.

Case Study: Broca's aphasia – moderate to severe

Traditional Aphasia Test	
Repetition – Single syllable words	60%
Repetition – Multisyllabic words	10%
Repetition - Sentences	0%
Naming – Common objects	40%
Auditory Comprehension	WNL

- **History**
  - Henry - 72-year-old male - Enjoys vegetable gardening and visiting National Parks
  - Large left middle cerebral artery CVA - 9 months post onset
- **Evaluation results – traditional aphasia test**
  - Broca's aphasia – moderate to severe - WAB-R AQ = 43.4
  - Spontaneous speech - telegraphic utterances with a maximum of three words, frequent phonemic paraphasias and neologisms
- **Evaluation results – TALSA**
  - What is Henry's vSTM capacity?
    - On the **Word Repetition Span**, Henry could, on average, repeat only one word 60% of the time.
      However, when given the option of a nonverbal response – pointing – Henry was able to demonstrate the strength of his vSTM. On the **Word Pointing Span**, after hearing a list of words, he could, on average recall and point to 4 pictures.
  - Are Henry's deficits more phonological or semantic in nature?
    - Henry's performance on phonological tasks, such as the **Rhyming Probe Span**, was lower than his performance on semantic tasks, such as the **Category Coordinate Probe Span**, which indicates a relative weakness in activating phonological representations.
  - Are Henry's deficits due more to a slow activation of the word or with difficulty maintaining the word in vSTM?
    - On subtests such as **Picture Naming**, accuracy was higher in tasks with longer (5 second) delays indicating slow initial activation of words and a relative strength in the maintenance words in vSTM.

TALSA (Sample of subtests)	
Word Repetition Span	0.6 words
Word Pointing Span	4.1 words
Rhyming Probe Span	3.6 words
Category Coordinate Probe Span	5.2 words
Picture Naming – 1 sec. delay	38%
Picture Naming – 5 sec. delay	52%

- **Therapy plan and goals**: Increase speed of phonological activation of words using tasks with response delays that progressively decrease as Henry's performance improves.
  - Henry will name common objects with 90% accuracy when given 10 seconds to respond → 5 seconds to respond → 1 second to respond.
  - Henry will repeat single words with 90% accuracy when given 10 seconds to respond → 5 seconds to respond → 1 second to respond.
  - Functional goal: Using pictures of his garden, Henry will name vegetables with 90% accuracy when given 10 seconds to respond →5 seconds to respond →1 second to respond.
  - Functional goal: Using a map of national parks, Henry will repeat the names of National Parks (shortening the names to one or two words as needed) with 90% accuracy when given 10 seconds to respond → 5 seconds to respond→ 1 second to respond.

Case Study: Anomic aphasia – very mild (latent aphasia)

- **History**
  - Tanya - 52-year-old female – Wants to return to work as a real estate agent, enjoys sewing, especially quilting
  - Small left posterior temporal lobe CVA – 3 months post onset
- **Evaluation results – traditional aphasia assessment**
  - Anomic aphasia – very mild - WAB-R AQ = 94.2 (above criterion cut-off for aphasia – 93.8)
  - Spontaneous speech – fluent, grammatically correct multi-sentence utterances. Word finding difficulties and word substitutions for abstract and/or low frequency words. Reports this is preventing her from returning to work.

Traditional Aphasia Test	
Repetition – Words	100%
Repetition – Sentences	90%
Naming – Common objects	100%
Auditory Comprehension	WNL

- **Evaluation results – TALSA**
  - Can Tanya's aphasia be documented?
    - Despite scoring above the criterion cut-off score for aphasia on the WAB-R, Tanya's scores on several TALSA subtests were significantly below normal.
  - Are Tanya's deficits more phonological or semantic in nature?
    - Tanya's score on the **Rhyming Probe Span**, which focuses on phonological level processing, was WNL. However, her score on the **Category Coordinate Probe Span** was significantly below normal indicating a deficit in semantic level processing.
  - Are Tanya's deficits due more to a slow activation of the word or with difficulty maintaining the word in vSTM?
    - Tanya's ability to name pictures when allowed to respond immediately was WNL. However, on the **Picture Naming** test when a 5 second delay was imposed between the presentation of the picture and her opportunity to respond, her score was lower and indicated an impairment in retention of the word in vSTM.

TALSA (Sample of subtests)	
Rhyming Probe Span	7.0 words (WNL)
Category Coordinate Probe Span	4.6 words
Picture Naming – 1 sec. delay	97% (WNL)
Picture Naming – 5 sec. delay	88%
Synonymy Triplets – 2 word pairs	95% (WNL)
Synonymy Triplets – 3 word pairs	87%

  - How strong is Tanya's vWM?
    - While performance on the **Synonymy Triplets** test when comparing 2 pairs of words was WNL, when working memory load was increased to 3 word pairs, Tanya's performance showed significant deficits when compared to people without aphasia.
- **Therapy plan and goals:** Increase the length of time (signal duration) semantic information is held in vSTM to improve naming of low frequency words . Improve ability to manipulate low frequency words in vWM.
  - Tanya will name low frequency nouns with 90% accuracy when cued to wait 1 second before responding → 5 seconds → 10 seconds.
  - Tanya will sequence 3 low frequency nouns based on a given criterion (e.g., least to most expensive, lightest to heaviest) with 90% accuracy → 4 nouns → 5 nouns.
  - Functional goal: Tanya will name quilting designs and sewing tools pictured in a quilting magazine with 90% accuracy when cued to wait 1 second before responding → 5 seconds →10 seconds.
  - Functional goal: Given the names of 3 local neighborhoods, Tanya will sequence them based on average house prices with 90% accuracy → 4 neighborhoods → 5 neighborhoods.

Treatment of Verbal STM and WM – Therapy Materials

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Words – Syllable Length

One Syllable

milk
house
dog
shoes
bad
shirt
town
cheese
knife
car

Two Syllable

breakfast
before
chicken
building
hotel
butter
narrow
woman
cracker
haircut

Three Syllable

generate
reception
dismissal
computer
organize
apartment
memory
family
episode
concentrate

Four Syllable

registration
operation
preparation
macaroni
information
experience
community
delivery
alligator
watermelon

Five Syllable

emancipation
environmental
communication
decaffeinated
tonsillectomy
momentarily
alphabetical
elasticity
electricity
acceleration

Words – High Frequency/Low Frequency

High Frequency		Low Frequency	
man	head	flame	drum
face	husband	wax	nickel
night	family	diary	wig
brother	dog	popcorn	cape
work	wife	ash	hose
hand	bed	poet	candle
home	kid	ladder	attic
ear	book	deed	arrow
money	school	cellar	saddle
phone	city	fog	magician
girl	door	helmet	ladle
doctor	light	scale	stove
father	food	niece	trophy
town	music	spray	anchor
boy	hand	porch	olive
heart	city	bench	pirate
house		gorilla	
police		kidney	
baby		nectar	
wish		dock	
car		coin	
game		necklace	
mother		silk	
party		menu	
world		butler	
sleep		skirt	
morning		swamp	
water		creek	
woman		journal	
eyes		oven	
friend		lipstick	
fire		pepper	
job		hurricane	
son		deer	
office		shrimp	
minute		balloon	
dinner		butcher	

Words – Concrete/Abstract

Concrete

alligator
ambulance
apple
baby
ball
banana
basket
beach
beard
bed
bedroom
beetle
bike
bird
blanket
boat
boots
bug
cage
camera
car
clock
clothes
cookie
cow
cup
daisy
dog
doll
duck
eagle
ear
elephant
finger
fire
fireplace
fish
flower
forest
frog
garden
girl
goat
gorilla
hamburger
horse
house
ice
island
jar
jeep
kitten
knee
knife
ladder
lemon
leopard
magazine
milk
mirror
mountain
neck
pants
piano
pickle
pig
pillow
pizza
popcorn
puppy
railroad
river
sand
skunk
snake
sponge
squirrel
stairs
steak
strawberry
sun
sunset
telephone
tennis
tiger
tire
tree
trumpet
tulip
turtle
umbrella
water
zipper

Abstract

accident
age
answer
bargain
beauty
belief
blessing
bonus
boredom
bravery
career
clue
control
cost
courage
crisis
danger
debate
duty
election
enemy
excuse
fact
fault
favor
fear
freedom
friend
genius
glory
gossip
grade
heaven
hero
history
hobby
holiday
hope
idea
joke
journey
justice
kindness
language
law
liberty
lie
loan
loyalty
magic
message
midnight
mind
minute
mistake
nature
nonsense
order
plan
power
problem
promise
question
rule
safety
saint
science
service
sight
smart
soul
surprise
thought
time
trial
trouble
truth
vacation
veto
vision
wealth
wisdom
wish
year

Nonwords – Syllable Length

1 Syllable	Two Syllable	Three Syllable	Four Syllable
jice	kample	picaper	astagular
chod	orplay	quipidded	aggrotant
nusk	mubber	lostratic	alotastry
plak	chiset	yantellic	beespalent
stige	poyier	shabaly	benopify
baz	insipe	rableness	cavanator
frab	vocket	metretor	crimipism
slud	baeresh	pacheor	canastocize
pake	bolment	blimpernad	dorichiter
nuy	faper	shabelet	desipament
lup	jample	puntelman	desepoment
tice	micket	floveran	fandosity
maz	eeshin	shokenly	hemostify
jit	oklet	lotastry	havantorly
feep	fower	riftoning	illostriner
dret	gidder	picaper	kimmerately
guz	huhber	rostify	kalasticize
eesh	bimber	fandossic	kinimerate
vusk	tuplen	sploiterful	lacternific
glupe	amtic	matastric	muplarative
maut	kaber	raloosif	metretory
fayd	taliff	lallogon	maderonda
kerp	kimen	maderon	mendoristate
chale	daber	sploiterin	nuplarative
bist	wengle	frupperly	nibernatly
baw	puntel	targobin	pasternation
tane	pama	nendorist	piandify
frik	sangel	suftingly	prominaton
ruv	deppy	kamastic	posidriate
krup	habel	posidrate	pularitive
deek	gober	proferlist	quibberlakie
pood	kipin	mavanter	reostify
skeel	dissen	dorsonny	ribernatist
mert	gocker	bickelty	shagonizement
igs	moogen	pasterna	simipism
vam	thaber	sondera	seterdory
veek	yazy	quibberach	trallocistic
glone	cholid	sablity	triplicable
nink	benum	cranscowet	dallocater
fope	inbok	nuplara	tectoribly

Word Combinations
Repetition Spans

Semantically related word lists

September, July, December

pants, shirt, sock

yellow, blue, orange

hand, eye, arm

one, five, ten

bed, sofa, table

flute, piano, violin

ring, bracelet, necklace

orange, apple, banana

stove, toaster, refrigerator

Semantically unrelated word lists

Texas, Monday, three

spoon, Japan, golf

tennis, chicken, throat

turkey, closet, radio

bee, apple, TV

two, rock, toilet

car, peach, book

rose, bag, phone

cup, seven, dog

sink, broccoli, bus

Word Combinations
Rhyming Triplets

Two word-pairs: Which of these words rhymes with the word in the middle? Add another word that rhymes.

fan	**ban**	race
hand	**rub**	tub
sun	**bar**	car
rough	**tough**	glue
peach	**beach**	land
lunch	**hog**	frog
cap	**rap**	noon
cry	**lace**	pace
look	**book**	vase
light	**bite**	can
fly	**room**	loom
poor	**door**	three
thought	**bought**	chase
salt	**five**	dive
bottle	**zipper**	dipper
pen	**bill**	pill
rent	**bent**	keep
nose	**gash**	lash
eye	**lie**	soup
slice	**dice**	free

Three word-pairs: Which of the two words rhyme? Add another word that rhymes.

fan	ban	race
tub	rub	hand
bar	sun	car
glue	tough	rough
peach	land	beach
frog	lunch	hog
cap	rap	noon
cry	lace	pace
vase	book	look
light	bite	can
fly	room	loom
poor	door	three
thought	chase	bought
salt	five	dive
zipper	bottle	dipper
pen	bill	pill
keep	rent	bent
nose	gash	lash
soup	eye	lie
slice	dice	free

Word Combinations
Synonymy Triplets

Two word-pairs: Which of these words is most similar in meaning to the word in the middle? Add another word that is similar in meaning.

arm	**heart**	kidneys
salt	**pepper**	meat
tuba	**organ**	piano
rice	**milk**	soda
grape	**cantaloupe**	watermelon
dice	**dominoes**	crayon
fruit	**candy**	cookie
sailboat	**canoe**	train
spoon	**refrigerator**	oven
sun	**sleet**	snow

Three word-pairs: Which of the two words are similar in meaning? Add another word that is similar in meaning.

exit	depart	stop
battle	surrender	war
cheat	promise	lie
shirt	slippers	sneakers
cracker	bread	toast
daisy	rose	tree
peach	nectarine	olive
shampoo	detergent	soap
teenager	president	mayor
bus	train	car

Word Combinations
Abstract Words – Phrases and Pairs

The ability to recall and repeat abstract words (also referred to as low imageability words) is facilitated when they are presented in a meaningful context. This list contains:

- abstract nouns presented in the context of a meaningful adjective-noun phrase
- abstract nouns presented as pairs of unrelated words

Suggested therapy tasks:

- Patient will repeat two related words that consist of an abstract noun in the context of a meaningful adjective-noun phrase. (easier task)
- Patient will repeat two unrelated words that consist of abstract noun pairs. (harder task)

Adjective-Noun Phrases
(meaningful context)

athletic agility
childish delight
colorful dream
dark depression
double vision
electrical circuit
generous spirit
golden glory
hateful enemy
heated debate
heavy grief
horrible accident
last option
leap year
legal justice
long distance
loud volume
lovely romance
loyal promise
monetary wealth
nuclear age
political crisis
religious belief
rough friction
shaky deal
shining hope
short election
social exclusion
solemn pledge
useful wisdom
wonderful truth
yearly bonus

Unrelated Word Pairs

agility - delight
dream - circuit
depression - option
vision -debate
spirit – year
glory – truth
enemy – grief
accident – volume
justice – age
romance – deal
promise – exclusion
wealth – pledge
crisis – friction
belief – bonus
hope – wisdom
election - distance

Sentences – Number of Syllables

2 Syllables

Come here.
Sit down.
Hang up
Run fast.
Sleep tight.
Eat cheese.
Go home.
Bright sun
Blue sky
Full moon

3 Syllables

After lunch
Before bed
Yellow bus
Red flower
Cheddar cheese
Ripe apple
Long chapter
Read a book.
Cute baby
Drink your milk.
Apple pie

4 Syllables

I like to draw.
Before breakfast
Happy birthday!
I saw a dog.
Open your eyes.
Ring the alarm.
He is too fast.
Bacon and eggs
Sugar and cream
Do you want it?

5 Syllables

What is your last name?
Come and get your check.
Answer the door bell.
Open the window.
Tell me your first name.
Turn on the TV.
Water the flowers.
There are too many.
Answer the question.
Fill up your gas tank.

6 Syllables

Please tell me your address.
Turn on the radio.
Where is the cantaloupe?
The pineapple is ripe.
Wash the fresh vegetables.
Leave the window open.
The yellow plant has bloomed.
Give me a piece of cheese.
I want an ice cream cone.
Play catch in the back yard.
Sign your name with a pen.

7 Syllables

Tell me your name and address.
Mail the letter and package.
How do you pronounce your name?
Tell me the code to the safe.
Eat your meat and vegetables.
The flag is red, white, and blue.
Help me clean the dirty house.
The sweatshirt is for my son.
Let’s celebrate the birthday.
Don't cry over your mistake.

8 Syllables

Where did you put the address book?
Do you like cookies and ice cream.
How much are a dozen apples?
The red roses are beautiful.
Where is the engagement party?
I like to sit on a hot beach.
I prefer to eat the sandwich.
Give me the Saturday paper.
Are the taxes due already?
Pass me the salt and pepper please.

9 Syllables

I am happy to mention your name.
When will my car be at the station?
The soldiers were carrying rifles.
Come over here and sit on the chair.
Go and pick up the new furniture.
How do you pronounce your maiden name?
She wants spaghetti and meatballs now.
Do you know how to cook lasagna?
I am unhappy to hear your news.
The elephant was gray in color.

Sentences – Number of Words

Unpadded (No Adjectives)

The girl caught the ball in the air.
The tiger scratched the grass with his paw.
The mother is sewing a dress for the girl.
The mailman delivers the package at the door.
The mother is pulling the weeds from the garden.
The chef is cutting the carrots for the soup.
The farmer plants the seeds in the field.
The cat bit the dog on the nose.
The dog chased the mouse into the hole.
The girl hikes the path in the mountains.
The father is pushing the carriage on the sidewalk.
The teenager filled the tank at the station.
The man carries the groceries to the house.
The squirrel hid the acorn under the tree.
The mother is slicing the onions for the salad.
The men are unloading the furniture into the house.
The boy squirted the girl with the hose.
The librarian is putting the book on the shelf.
The clerk is wrapping the presents in the store.
The janitor pushed the mop on the floor.

Padded (With Adjectives)

The young girl caught the red ball in the air.
The striped tiger scratched the grass with his dirty paw.
The tired mother is sewing the dress for the sad girl.
The strong mailman delivers the heavy mall at the brown door.
The helpful mother is pulling the stubborn weeds from the pretty garden.
The young chef is cutting the orange carrots for the vegetable soup.
The elderly farmer is planting the numerous seeds in the dry field.
The rowdy cat bit the quiet dog on the nose.
The quick dog chased the tiny mouse into the hole.
The adventurous girl hikes the difficult path in the mountains.
The young father is pushing the baby carriage on the sidewalk.
The responsible teenager is filling the gas tank at the busy station.
The married man carries the heavy groceries to the house.
The gray squirrel hid the acorn under the tree.
The happy mother is slicing the green onion for the salad.
The three men are unloading the bedroom furniture into the house.
The mischievous boy is squirting the screaming girl with the hose.
The pretty librarian is putting the history books on the shelf.
The efficient clerk is wrapping the birthday presents in the store.
The elderly janitor is pushing the wet mop on the floor.

Sentences – Syntactic Complexity

Active - Passive
Nonreversible - Reversible

Active - Nonreversible

The girl smells the flower.
The teacher eats the apple.
The man paints the house.
The butcher cuts the meat.
The carpenter hammers the nail.
The teacher watches the clock.
The man drives the car.
The clown performs the tricks.
The barber cuts the hair.
The nurse bandages the wound.

Passive - Nonreversible

The parade is watched by the children.
The bracelet is worn by the mother.
The shoe is tied by the man.
The fruit is photographed by the man.
The cracker is eaten by the girl.
The fork is held by the boy.
The kite is flown by the girl.
The picture is painted by the boy.
The car is driven by the mom.
The flower is picked by the girl.

Active – Reversible

The boy chases the girl.
The girl kisses the boy.
The man dresses the woman.
The clerk watches the customer.
The girl races the boy.
The girl catches the dog.
The policeman stops a boy.
The boy covers the girl.
The teacher likes the student.
The patient calls the doctor.

Passive - Reversible

The deer is followed by the hunter.
The dog is chased by the cat.
The boy is splashed by the girl.
The team is applauded by the coach.
The mother is kissed by the child.
The boy is carried by the girl.
The man is hugged by the boy.
The car is followed by the bus.
The robber is followed by the police.
The cashier is harassed by the woman.

Sentences – Syntactic Complexity

Subject Relative Clause – Object Relative Clause
Nonreversible – Reversible

Subject Relative Clause - Nonreversible

The bird that caught the worm is happy.
The man that wore the shirt is handsome.
The dog that bit the boy is angry.
The penguin that ate the fish is satisfied.
The cow that ate the grass is full.
The nurse that examined the dog is kind.
The mailman that carried the mail is strong.
The florist that watered the plants is wet.
The boy that scraped his knee is sad.
The clown that juggled the ball is funny.

Object Relative Clause - Nonreversible

The dress that the woman sewed is large.
The necklace that the woman wore is long.
The cake that the woman baked is delicious.
The beer that the man drank is flat.
The flower that the girl picked is yellow.
The ball that the boy tossed is dirty.
The money that the boy held is green.
The grape that the girl ate is sour.
The music that the man heard is loud.
The car that the man drove is new.

Subject Relative Clause - Reversible

The dog that licked the cat is friendly.
The boy that watched the mother is happy.
The mother that hugged the child is caring.
The bear that chased the camper is scared.
The boy that raced the man is fast.
The owl that watched the mouse is hungry
The woman that kissed the man is loving.
The father that loved the child is smart.
The chef that drove the woman was tall.
The tennis player that hit the man was sorry.
.

Object Relative Clause - Reversible

The dog that the man chased is friendly
The girl that the mom photographed is well dressed.
The man that the girl weighed is heavy.
The teacher that the mother questioned is patient.
The man that the woman vaccinated is scared.
The girl that the boy raced is fast.
The girl that the boy hugged is lost.
The dog that the boy followed is hungry.
The man that the woman photographed is famous.
The man that the woman kissed is intelligent.

Sentences - Semantic Plausibility Judgments

Are these sentences correct? If not, correct them.

1. The pineapple ate the young girls at the table.
2. The young girl caught the ball in the air.
3. The ball caught the young girl in the air.
4. The woman that the cake baked is tasty.
5. The deer is followed by the hunter.
6. The castle that the girl built is big.
7. The spoon that the woman touched was cold.
8. The child is watched by the parade.
9. The boy is splashed by the girl.
10. The policeman that the robber chased is fast.

Verbal Working Memory – Words

Alphabetical Order

Read the words aloud and have the listener place them in alphabetical order:

3 word series

sail, last, please
house, ball, dog
full, skirt, January
apple, zebra, broom
city, bus, date
child, late, orange
bus, chalk, movie
laugh, white, cat
mouth, TV, card
leaf, pretzel, year

4 word series

bank, yellow, sun, apple
grass, salt, water, left
time, walk, storm, January
tree, window, ball, boy
window, question, Tuesday, yard
Xerox, quarter, umpire, spoon
money, baseball, fry, flour
dark, ate, elbow, storm
yellow, skirt, wonder, time
rabbit, time, valentine, ice

Reverse Order

Read the words aloud and have the listener repeat the words back in reverse order.

boat, bus, plane
cake, pie, candy
red, yellow blue
socks, pants, shirt
dog, cat, bird
tulip, rose, daffodil

ceiling, floor, wall
boat, bus, train
brownie, cake, pie
cucumber, onion, peas
January, August, July

Progression

Read the words aloud and have the listener repeat the words in the natural order that they occur:

meat, salad, dessert
cook, clean up, eat
water, grow, seed
envelope, send, write
season, cook, defrost

chew, bite, swallow
dry, wash, fold
go out, dress, shower
eat, wash, peel
December, October, May

Ranking

Read aloud and have the listener repeat them by ranking them accordingly.

Shortest to longest: mile, yard, foot, inch

Softest to hardest: kitten, pillow, toast, rock

Lightest to heaviest feather, pencil, cup, book

Largest to smallest: elephant, lion, dog, mouse

Hottest to coldest: sun, soup, toast, icicle

Loudest to softest: chirp, horn, siren, thunder

Saltiest to sweetest: pretzel, bread, cookie, candy

Darkest to lightest: midnight, dusk, sunrise, noon

Wettest to driest: cloudy, rain, drizzle, sunny

Oldest to youngest: grandmother, mother, teenager, infant

Sweetest to tartest: candy, bread, orange, lemon

Verbal Working Memory: Scrambled Sentences

Read these aloud and have the listener unscramble these sentences:

3 words

love you I
who reading is?
light the close
food your eat
the drink milk
the open window
door close the
see you I
he home goes
up tall stand

4 words

is what name your?
you where from are?
old how you are?
is age your what?
need drink I a
is weather nice the?
name tell your me
hot water is the
floor the pretty is
ate she cereal now

5 words

today is weather the hot
man walking the is home
the water plants some need
woman work the went to
the sharp is very knife
tasty roast beef the is
when back you call will?
needed how money much is?
away when you do go?
at is who door the?

6 words

gas fill up the with tank
money order give me the now
for do what you want dinner?
was open window the far too?
crunchy the carrot rabbit the ate
hard the to walnuts crack were
easy today puzzle was the crossword
collected on is trash the Monday?
Susan day every swims laps ten
the bloomed in the flowers sun