

Evidence-based Aphasia Treatments: Constraint-Induced Language Therapy, ORLA®, Scripting and More

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Disclosure Statement

- I have the following relevant financial relationship(s) in the products or services described, reviewed, evaluated or compared in this presentation.
 - Shirley Ryan AbilityLab - salary
 - National Institutes of Health (NIDCD) and National Institute on Disability, Independent Living, and Rehabilitation Research – research grants (PI=Leora Cherney)
 - Central South Regional Stroke Network – speaker's honorarium
- I have no relevant *nonfinancial relationship(s)* to disclose.

Course Description

In recent years, there has been a proliferation of research targeting various aspects of aphasia treatment. These range from studies addressing the development, theoretical underpinnings and efficacy of specific treatments to more general issues such as intensity and dose that impact learning and outcomes, regardless of the treatment being administered.

This workshop describes the procedures for administering several of the newest aphasia treatment techniques, emphasizing their theoretical background and current evidence supporting their efficacy. Practical issues such as dosage and service delivery models that improve access to and outcomes from treatment are discussed.

Learner Outcomes

At the conclusion of the session, participants will be able to:

- Describe components related to “dose” of aphasia therapy
- List procedures for administering at least three aphasia treatments: Constraint-Induced Aphasia Treatment (CILT), Oral Reading for Language in Aphasia (ORLA), and Scripting
- Differentiate outcomes relevant to the impairment and the activity/participation level
- Explain the importance of considering social / life participation approaches in the treatment of aphasia

Best Practices (Sackett et al., 2000):

- Clinical decision-making based on

Best (possible/available) current scientific evidence



Clinical expertise

Client values & perspectives

- + Clinical context (Hoffman, Bennett, & Del Mar, 2010)

Canadian stroke best practice recommendations: Stroke rehabilitation practice guidelines, update 2015

- i. It is recommended that all health care providers working with persons with stroke across the continuum of care be trained about aphasia, including the recognition of the impact of aphasia and methods to support communication such as Supported Conversation for Adults with Aphasia (SCATM) (Evidence Level C).
- ii. It is recommended that all health care providers working with persons with stroke across the continuum of care be trained about other communication disorders that may result from stroke including: dysarthria, apraxia of speech and cognitive communication deficits (Evidence Level C).
- iii. All stroke patients should be screened for communication disorders using a simple, reliable, validated tool (Evidence Level C).
- iv. Patients with any suspected communication deficits should be referred to a Speech-Language Pathologist (SLP) for assessment in the following areas using valid and reliable methods: comprehension, speaking, reading, writing, gesturing, use of technology, pragmatics (e.g. social cues, turn-taking, body language, etc.) and conversation (Evidence Level C).

- v. Persons with aphasia should have early access to a combination of intensive language and communication therapy according to their needs, goals and impairment severity (Evidence Level B).
- vi. Treatment to improve functional communication can include language therapy focusing on:
 - a. production and/or comprehension of words, sentences and discourse, (including reading and writing) (Evidence Level C);
 - b. conversational treatment, and constraint induced language therapy (Evidence Level B);
 - c. use of non-verbal strategies, assistive devices and technology (e.g., I-Pads, Tablets, other computer-guided therapies) which may be incorporated to improve communication (Evidence Level C);
 - d. Use of computerized language therapy to enhance benefits of other therapies (Evidence Level C).
- vii. Treatment for aphasia should include group therapy and conversation groups. Groups can be guided by trained volunteers and caregivers overseen by an SLP to supplement the intensity of therapy during hospitalization and/or as continuing therapy following discharge (Evidence Level B).

- vii. Treatment for aphasia should include group therapy and conversation groups. Groups can be guided by trained volunteers and caregivers overseen by an SLP to supplement the intensity of therapy during hospitalization and/or as continuing therapy following discharge (Evidence Level B).
- viii. Treatment to improve functional communication should include Supported Conversation techniques for potential communication partners of the person with aphasia (Evidence Level A).
- ix. All information intended for patient use should be available in aphasia-friendly formats (e.g., patient education material should be available in audio/visual format). This includes materials such as educational information, information on diagnostic imaging procedures, consent forms and information regarding participation in stroke rehabilitation research, and assessment tools. (Evidence Level C).
- x. Families of persons with aphasia should be engaged in the entire process from screening through intervention, including family support and education, and training in supported communication (Evidence Level C).
- xi. The impact of aphasia on functional activities, participation and QoL, including the impact on relationships, vocation and leisure, should be assessed and addressed as appropriate from early post-onset and over time for those chronically affected. (Evidence Level C).

The top ten: Best practice recommendations for aphasia

- Nina Simmons-Mackie, Linda Worrall, Laura L. Murray, Pam Enderby, Miranda L. Rose, Eun Jin Paek & Anu Klippion on behalf of the Aphasia United Best Practices Working Group and Advisory Committee. Aphasiology, 2017, 31:2, 131-151.
- Levels of Recommendation /Evidence
 - Level A: Body of research evidence can be trusted to guide practice
 - Level B: Body of research evidence can be trusted to guide practice in most situations
 - Level C: Body of research evidence provides some support for recommendation
 - Level D: Body of research evidence is weak
 - Good Practice Point: Recommendation is based on expert opinion or consensus

1. All patients with brain damage or progressive brain disease should be screened for communication deficits. (Level C)
2. People with suspected communication deficits should be assessed by a qualified professional (determined by country); Assessment should extend beyond the use of screening measures to determine the nature, severity and personal consequences of the suspected communication deficit. (Levels B, C).
3. People with aphasia should receive information regarding aphasia, aetiologies of aphasia (e.g., stroke) and options for treatment. (Levels A–C).
This applies throughout all stages of healthcare from acute to chronic stages.
4. No one with aphasia should be discharged from services without some means of communicating his or her needs and wishes (e.g., using AAC, supports, trained partners) or a documented plan for how and when this will be achieved (Level: Good Practice Point).

5. People with aphasia should be offered intensive and individualized aphasia therapy designed to have a meaningful impact on communication and life. (Level A-GPP depending on approach, intensity, timing).
This intervention should be designed and delivered under the supervision of a qualified professional.
 - a. Intervention might consist of impairment-oriented therapy, compensatory training, conversation therapy, functional/participation oriented therapy, environmental intervention and/or training in communication supports or augmentative and alternative communication (AAC).
 - b. Modes of delivery might include individual therapy, group therapy, telerehabilitation and/or computer assisted treatment.
 - c. Individuals with aphasia due to stable (e.g., stroke) as well as progressive forms of brain damage benefit from intervention.
 - d. Individuals with aphasia due to stroke and other static forms of brain damage can benefit from intervention in both acute and chronic recovery phases.

6. Communication partner training should be provided to improve communication of the person with aphasia. (Levels A, B)
7. Families or caregivers of people with aphasia should be included in the rehabilitation process. (Levels A–C)
 - a. Families and caregivers should receive education and support regarding the causes and consequences of aphasia (Level A).
 - b. Families and caregivers should learn to communicate with the person with aphasia (Level B).
8. Services for people with aphasia should be culturally appropriate and personally relevant. (Level: Good Practice Point)
9. All health and social care providers working with people with aphasia across the continuum of care (i.e., acute care to end-of-life) should be educated about aphasia and trained to support communication in aphasia. (Level C)
10. Information intended for use by people with aphasia should be available in aphasia-friendly/communicatively accessible formats. (Level C)

Priorities for closing the evidence-practice gaps in post-stroke aphasia rehabilitation: A scoping review.

Shrubsole K, Worrall L, Power E,
O'Connor DA.

Arch Phys Med Rehabil. 2017 Sep 15. pii: S0003-9993(17)31083-3.
doi: 10.1016/j.apmr.2017.08.474. [Epub ahead of print]

- Evidence from 100 documents was extracted and summarised. Four topic areas were identified as implementation priorities for aphasia:
 - Timing, Amount and Intensity of Therapy;
 - Goal Setting;
 - Information, Education and Aphasia-Friendly Information;
 - Constraint-Induced Language Therapy.
- Closing the evidence-practice gaps in the four priority areas identified may deliver the greatest gains in outcomes for (Australian) stroke survivors with aphasia.

Principles of Experience-Dependent Neural Plasticity

Table 1. Principles of experience-dependent plasticity.

Principle	Description
1. Use It or Lose It	Failure to drive specific brain functions can lead to functional degradation.
2. Use It and Improve It	Training that drives a specific brain function can lead to an enhancement of that function.
3. Specificity	The nature of the training experience dictates the nature of the plasticity.
4. Repetition Matters	Induction of plasticity requires sufficient repetition.
5. Intensity Matters	Induction of plasticity requires sufficient training intensity.
6. Time Matters	Different forms of plasticity occur at different times during training.
7. Salience Matters	The training experience must be sufficiently salient to induce plasticity.
8. Age Matters	Training-induced plasticity occurs more readily in younger brains.
9. Transference	Plasticity in response to one training experience can enhance the acquisition of similar behaviors.
10. Interference	Plasticity in response to one experience can interfere with the acquisition of other behaviors.

Kleim & Jones,
2008

Principles of Experience-Dependent Neural Plasticity

- Use it or lose it
 - Failure to use specific brain functions can lead to functional degradation
- Use it and improve it
 - Training that uses a specific brain function can lead to an enhancement of that function

Kleim & Jones, 2008.

Principles of Experience-Dependent Neural Plasticity

- Specificity
 - The nature of the training experience dictates the nature of the plasticity
- Repetition matters
 - Induction of plasticity requires sufficient repetition
- Intensity matters
 - Induction of plasticity requires sufficient training intensity

Kleim & Jones, 2008.

What is “treatment intensity”?

- Medication
 - 5 mg X, twice a day, for 7 days
- Behavioral treatment
 - SLT, twice a week, for 8 weeks
 - Is “SLT” = 5 mg X ?
 - Is 60 minutes SLT = 5 mg of X ?
 - But this still does not measure “intensity”
- Warren, Fey, and Yoder (2007) and Baker (2012)
 - Dose form i.e. the typical task or activity within which the teaching episodes are delivered (X)
 - Dose, i.e., # teaching episodes (unique combination of “active ingredients”) per session; number of therapeutic inputs or client acts per session (e.g. 100 trials) (5mg)

Dosage

- Warren, Fey, and Yoder (2007) and Baker (2012)
 - Dose form i.e. the typical task or activity within which the teaching episodes are delivered
 - Dose , i.e., # teaching episodes (unique combination of “active ingredients”) per session
 - Dose frequency (e.g. 2x per week)
 - Total intervention duration (e.g. 6 weeks)
- **Cumulative Intervention Intensity (CII)**
 - **dose x dose frequency x total intervention duration**

Variables that affect treatment outcome

- age
- premorbid language
- education
- type/extent of lesion
- medical/neurological/behavioral status
- hearing/visual status
- severity of aphasia
- family involvement
- motivation

AND Amount and type of treatment

Intensive Language Action Therapy (ILAT a.k.a. CILT/CIAT)

Targeting multiple domains and outcomes

Intensive Language Action Therapy (ILAT)

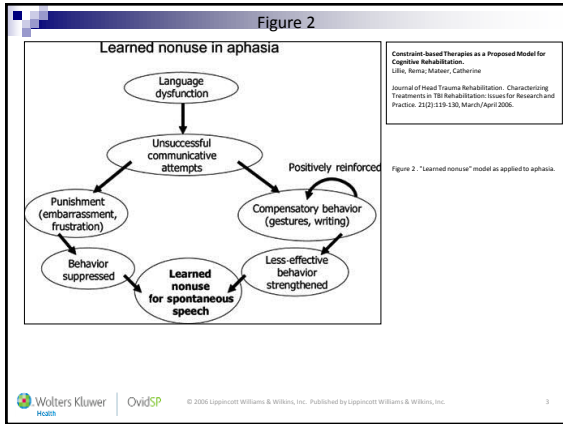
- Derived from Constraint Induced Movement Therapy
- Applies principles of use-dependent learning
 - The potential rehabilitation of the affected limb is detrimentally influenced by:
 - the compensatory use of the unaffected limb,
 - non-use learned through conditioned suppression of movement in the affected limb

Constraint Induced Movement Therapy

- CIMT – counterconditioning
 - Shift in the contingencies of reinforcement
 - Constraint of the unaffected limb during all waking hours
 - Forced use of the affected limb
 - Massed practice occurring in an enriched environment
 - Shaping techniques – successive approximation of a desired behavior

Learned Non-Use in Aphasia

- Language difficulties/failures associated with frustration and embarrassment
- Leads to avoidance of verbal communicative behaviors



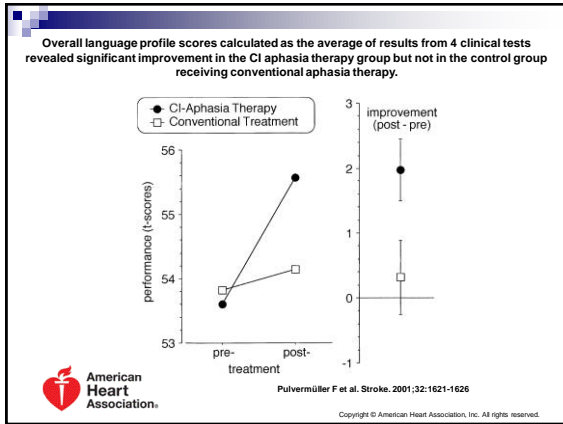
Principles of ILAT / CILT / CIAT

- **Forced verbal language use**
 - Verbalization required; Compensatory strategies prohibited
- **Intensive treatment schedule**
 - 3 hrs/day 5 days/week 2 weeks
 - Massed practice
- **Shaping verbal responses**
 - Begin with words or short phrases
 - Move to longer and more complex utterances
 - Barrier games
 - Go Fish-like activity: pictures selected for individual participants; response components predetermined

Initial publication: Pulvermuller et al. (2001) Constraint-Induced Therapy of chronic aphasia after stroke. Stroke, 32, 1621-1626.

Constraint Induced Language Therapy (CILT)

- Pulvermuller et al., 2001
 - RCT
 - CILT: communicate only verbally; all compensatory strategies suppressed; average of 31.5 hrs of Rx over 2 weeks
 - Traditional therapy: average of 33.9 hours over 3-5 weeks
 - CILT group improved significantly on AAT and a Communicative Activity Log (CAL)
 - Are improvements due to type of Rx or intensity of Rx?



CIAT - controversies

- Not clear from initial studies whether improvements are due to type of Rx or intensity of Rx
- Nonverbal compensatory communication (e.g. gestures, writing, drawing) is restricted/suppressed; yet other studies have shown benefits from multimodal communication approaches

Intensity of Treatment or Type of Treatment ?

- Maier et al., (2006): CILT vs PACE
 - Both groups received 3 hrs Rx daily, 4 days/wk, for 2 weeks
 - CILT group: only verbal responses
 - PACE group: any type of communication attempt allowed (gesturing, drawing etc)
 - Outcomes: both groups changed significantly on the WAB and BNT; changes largely influenced by one subject in PACE group who used mainly verbal responses in Tx; narrative samples judged preferable for 3/4 CILT and 2/5 PACE subjects
 - Conclusion:
 - Intensive therapy influenced both groups
 - May be an advantage to applying constraint principles to aphasia treatment (forced verbal language)

CILT Treatment

(Maher et al., 2006)

- Materials: Pairs of cards
- Level 1: Single words
 - Request: Speaker communicates: book
 - Response: Receiver communicates: yes + book; no + book
- Level 2: Carrier phrase + noun
 - Request: Speaker communicates: Bill, do you have a book ?
 - Response: Receiver communicates: Yes, Patrick, I have a book; No, Patrick, I do not have a book

CILT Treatment

(Maher et al., 2007)

- Level 3: Carrier phrase + adjective + noun
 - Request: Speaker communicates: Bill, do you have a red book ?
 - Response: Receiver communicates: Yes, Patrick, I have a red book; No, Patrick, I do not have a red book
- Level 4: Carrier phrase + # + adjective + noun
 - Request: Speaker communicates: Bill, do you have three red books ?
 - Response: Receiver communicates: Yes, Patrick, I have three red books; No, Patrick, I do not have three red books

Type of Rx or intensity of Rx

- Maher et al., (2006): CILT vs PACE
 - Both groups received 3 hrs Rx daily, 4 days/wk, for 2 weeks
 - CILT group: only verbal responses
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 - Conclusion:
 - Intensive therapy influenced both groups
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Type of Rx or intensity of Rx

- Numerous studies suggest positive results from CIAT

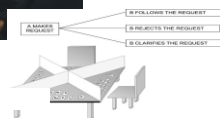
See Cherney, L. R., Patterson, J. P., Raymer, A. et al. (2008). Evidence-Based Systematic Review: Effects of Intensity of Treatment and Constraint-Induced Language Therapy for Individuals With Stroke-Induced Aphasia. *Journal of Speech, Language, and Hearing Research*, 51, 1282-1299. Update, 2010. <http://www.asha.org/uploadedFiles/EBSR-Updated-CILT.pdf>

- But other therapies, given intensively, also suggest positive results (e.g., ORLA, Phonomotor Rx., V-NeST, M-MAT)
- Few comparative studies – most show no advantage of one approach over another (e.g. MOAT – Barthel et al. 2008; Kurland et al., 2016)

Suppression of nonverbal compensatory communication

- Concept of “constraint” modified over the years
 - “Allow relevant non-linguistic actions in context of verbal activities”– “avoid isolated use of gestures in replacement of verbal communication”.
 - See Difrancesco S, Pulvermuller F, Mohr B. Intensive language-action therapy (ILAT): The methods. (2012) *Aphasiology*, 26, 1317-1351.
- Our approach
 - Use only verbal utterances to convey information to the communication partner
 - Encourage gestures and other nonverbal strategies for self-cuing (behind the barrier)

CIAT in action



CILT – Materials



Modifying the exchange

One turn

- Name. What are you having ?
- Name. I'm having(store/food item)
- Me too. OR Not me.

One turn

- Name. Where are you going ?
- Name. I'm going to the(place)
- Me too. OR Not me.

Two turns

- Name. What do you want ?
- Name. I want a(food/store item)
- Me too. Anything else. OR Not me. Anything else.
- Yes. Name. I want(store item)
- Me too. Your turn. OR Not me. Your turn

MODIFICATIONS / INDIVIDUALIZATION of CIAT examples

- Target: Impairment, Activity/Participation, Personal Factors
- Impairment level:
 - Phonology/semantics/syntax
 - Single words / noun phrase / S-V-O sentence
 - Verbs (past/present)
- Activity/Participation
 - Topics relevant to particular patient (consider google images)
 - Speech acts addressed: Requests / Commands / Statements
 - Conversation and conversation repair
 - Production and comprehension
- Personal factors
 - Experience success / build confidence in communication
 - Difficulty level appropriate to particular patient (consider amount and type of cuing from the therapist and encourage compensatory self-cuing)

Measuring/Documenting Responses

- Level – target and # of components
- Rate both the verbal request and the verbal response for the
 - Carrier phrase
 - Target word/phrase
- Auditory comprehension – was the correct picture selected ?

[illegible][illegible]

Rating Scale

- 5- conveyed /understand on first attempt, consistent with cuing level and response accuracy stated in the goal
- 4- conveyed/understood, as stated in the goal, after general cue/feedback (e.g. say it slowly) or self-correction or latency
- 3- conveyed/understood after additional specific cue/fdbk, or closely approximated (e.g. apraxic errors if not part of goal)
- 2- partially conveyed/understood (as compared to the goal) after additional specific cue/feedback
- 1- not conveyed/understood despite efforts by clinician/patient
- 0- client does not attempt to understand/convey message

What does the literature tell us about CILT?

- Cherney, L. R., Patterson, J. P., Raymer, A. et al. (2008). Evidence-Based Systematic Review: Effects of Intensity of Treatment and Constraint-Induced Language Therapy for Individuals With Stroke-Induced Aphasia. *Journal of Speech, Language, and Hearing Research*, 51, 1282-1299.
- Update, 2010.
<http://www.asha.org/uploadedFiles/EBSR-Updated-CILT.pdf>

Studies of CILT

Cherney et al., 2008
Pulvermuller et al., 2001
Meinzer et al., 2004
Meinzer et al., 2005
Pulvermuller et al., 2005
Maher et al., 2006

Cherney et al., 2010
Breier et al., 2006
Meinzer et al., 2006
Breier et al., 2007
Meinzer et al., 2007
Meinzer, Streiftau et al., 2007
Meinzer et al., 2008
Richter et al., 2008
Szafarski et al., 2008
Breier et al., 2009
Faroqi-Shah & Virion, 2009
Goral & Kempler, 2009
Meinzer et al., 2009
Kirmess & Maher, 2010

Evidence

- Zhang J, Yu J, Bao Y, Xie Q, Xu Y, et al. (2017) Constraint-induced aphasia therapy in post-stroke aphasia rehabilitation: A systematic review and meta-analysis of randomized controlled trials. *PLOS ONE* 12(8): e0183349. <https://doi.org/10.1371/journal.pone.0183349>
- <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0183349>
- Conclusion from 8 RCTs: CIAT may be useful for improving chronic post-stroke aphasia, however, limited evidence to support its superiority to other aphasia therapies. Massed practice is likely to be a useful component of CIAT, while the role of "constraint" is needed to be further explored. CIAT embedded with social interaction may gain more benefits.

Modified CILT

- Meinzer et al., 2005
 - CILT vs CILT-plus (additional home practice with family members)
 - Both groups showed gains on AAT, CETI and CAL
 - At 6 month follow-up, continued gains noted in CILT-plus group

Modified CILT

- Meinzer et al., 2007. JINS 13, 846-853
 - 3 hrs/day for 10 days
 - Experienced therapists (10) vs trained laypersons (10)
 - Language function improved in both groups on std. testing
 - No sig difference between groups

Constraint Induced Aphasia Therapy: Volunteer-led, unconstrained and less intense delivery can be effective

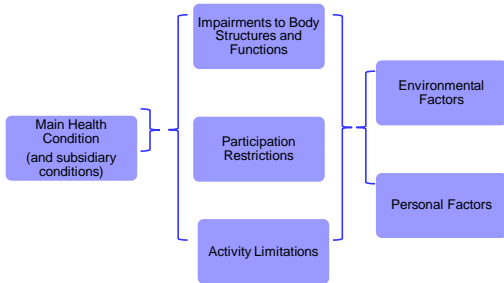
- METHODS
 - Two groups - each with two people with chronic aphasia.
 - Treatment involved a standard CIAT card exchange game, supplemented by a home activity.
 - Spoken language was required for responses but alternative modalities of communication were also permitted.
 - Each group was led by a trained volunteer, lasted 90 minutes and was delivered twice a week for four weeks.
- CONCLUSIONS
 - Clear gains in performance observed for the majority of people with aphasia who participated in a less intense format, considerably lower dose and less constrained form of CIAT led by trained volunteers.
 - This suggests that this 'clinically realistic' service delivery model for CIAT could be added to the clinical repertoire of speech pathologists.

(Nickels & Osborne, 2016)

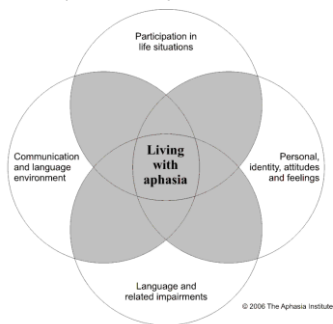
Modified CILT

- Szaflarski et al., 2008. Med Sci Monit. 14(5), CR243-250.
 - 3-4 hrs/day for **5 days**
 - **Group therapy program** with **individualized goals** for semantic, syntactic and phonological production while constraining non-use behaviors
 - Two of the three patients demonstrated substantial increases in verbal and aud comp skills

World Health Organization: International Classification of Functioning



Living with Aphasia: Framework for Outcome Measurement (A-FROM)



■ **Language and Related Impairments Domain**

- Auditory comprehension (e.g., pointing to pictures named); Reading (e.g., matching a written word to a picture); Speaking (e.g., word finding, sentence formulation), and Writing (e.g., writing the names of objects).

■ **Communication and Language Environment Domain**

- Aspects of external context that might facilitate or impede language, communication or participation of people with aphasia such as: Physical environment (e.g., signage, lighting, written supports); Social environment (e.g., attitudes of people, skills of partners); Political environment (e.g., policies supporting participation)

■ **The Participation Domain**

- Life Roles (e.g., mother, teacher); Responsibilities (e.g., managing finances, performing a job); Relationships (e.g., engaging in conversation, making friends); Activities of choice (e.g., leisure and recreation, community participation); and Tasks engaged in by an individual – e.g., writing letters, cashing a check

■ **Personal Factors/Identity Domain**

- factors such as age, gender, culture, but expands the ICF domain to include internal factors that vary as a consequence of aphasia such as confidence and personal identity.

■ **Living with Aphasia Domain**

- dynamic interaction of multiple life domains
- captures elements of quality of life (how satisfied someone is with their life).

**Life Participation Approach
To Aphasia (LPAA)**

- General philosophy and model of service-delivery
- Focuses on re-engagement in life by strengthening daily participation in activities of choice

Life Participation Approach to Aphasia (LPAA)

- LPAA places the life concerns of those affected by aphasia at the center of all decision making.
 - It empowers the consumer to select and participate in the recovery process and to collaborate on the design of interventions that aim for a more rapid return to active life.
 - *The LPAA Project Group (Roberta Chapey, Judith F. Duchan, Roberta J. Elman, Linda J. Garcia, Aura Kagan, Jon Lyon, and Nina Simmons Mackie) of the American Speech-Language Hearing Association*
- <http://www.asha.org/public/speech/disorders/LPAA.htm>

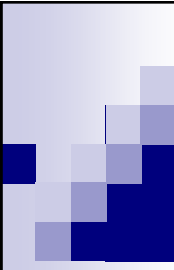
Core Values of LPAA

- Explicit goal is enhancement of life participation
- All those affected by aphasia are entitled to service
- Measures of success include documented life enhancement changes
- Both personal and environmental factors are targets of intervention
- Emphasis is on availability of services as needed at all stages of aphasia



Mission: Growing a network of healthcare, business, and community leaders to advance lifelong communication access for people with aphasia.

<http://www.aphasiaaccess.org>



ORLA (All modalities) and AphasiaScripts

Oral Reading for Language in Aphasia (ORLA): PROCEDURE

- SLP sits opposite patient
- SLP reads stimulus aloud to patient
- SLP reads stimulus aloud to patient, with SLP and patient pointing to each word
- SLP and patient read aloud together, with patient continuing to point to each word
 - SLP adjusts rate and volume
- Above step is repeated twice more

ORLA PROCEDURE CONT.

- For each line or sentence, SLP states word for patient to identify
- For each line or sentence, SLP points to word for patient to read
 - both content words and functors
- Patient reads stimulus aloud
 - SLP reads aloud with patient as needed

ORLA – Key Elements

- Oral reading is systematically applied in programmed format
- Focuses on connected discourse
- Permits modeling of more natural speech
- Allows practice on a variety of grammatical structures
- Graded levels based on stimuli length and reading level
- Consistent with Principles of Learning Theory
 - Active participation by the learner
 - Repetitive practice in the overlearning of skills
 - Use of meaningful materials that are graded in difficulty

ORLA Levels

- Based on length and reading level
 - Level 1: 3-5 word sentences; 1st. grade
 - Level 2: 8-12 words; 1-2 sentences; 3rd. grade
 - Level 3: 15-30 words; 2-3 sentences; 6th. grade
 - Level 4: 50-100 word paragraph; 6th. grade
- Appropriate for individuals with a broad range of aphasia severities

ORAL READING FOR LANGUAGE IN APHASIA

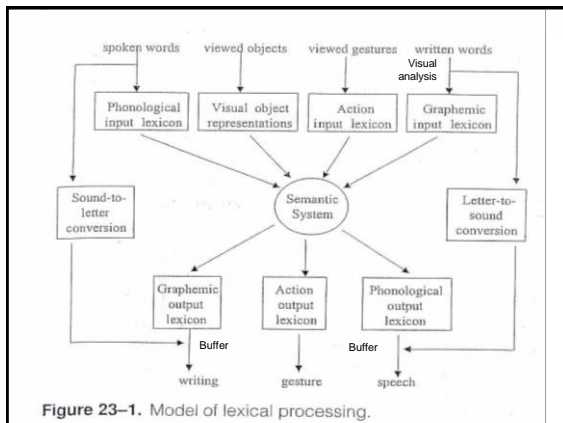
Theoretical Background - Summary

- Based on neuropsychological models of reading
- Improve reading comprehension by providing practice in grapheme-to-phoneme conversion
- As oral reading becomes more fluent and automatic, the reader can focus on comprehension

(Cherney et al., 1986, 1995, 2004)

PSYCHOLINGUISTIC APPROACH TO ALEXIA

- Based on models of the normal reading process
- Identifies components of the normal reading process that are disturbed



NORMAL READING PROCESS

- **Direct Route (Lexical-Semantic)**
 - Initial letter recognition
 - Written word matched to a visual word in the graphemic/orthographic input lexicon memory and recognized
 - Meaning retrieved by the semantic processor
 - If word is read aloud, then pronunciation retrieved by the phonological processor

NORMAL READING PROCESS

■ Indirect Route

(phonological /sublexical)

- ☐ Initial letter recognition
- ☐ Letters transformed into spoken word by the letter-sound convertor (grapheme-phoneme correspondence rules)
- ☐ Meaning obtained when speech is auditorially comprehended

NORMAL READING PROCESS

- Both direct and indirect routes available
- Use direct route to read real words, particularly high frequency words, that are in the visual word store
- Use indirect route for reading low frequency, unfamiliar words; sound out words by using grapheme to phoneme correspondence rules

NORMAL READING PROCESS

■ Fluent reader

- ☐ rapidly decodes words via the direct route
- ☐ can focus on the meaning of the text
- ☐ switches to the indirect route only when confronted by an unfamiliar word

■ Non-fluent reader

- ☐ focuses on the grapheme to phoneme conversion process
- ☐ decreased comprehension

Summary

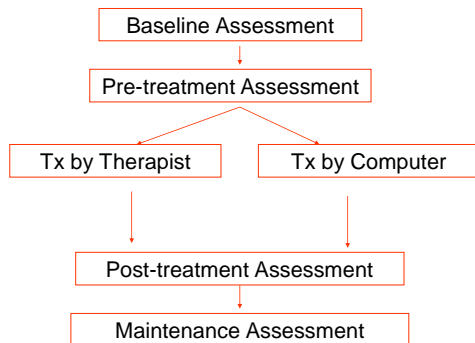
- Severe aphasia
 - Greatest improvements in reading comprehension
- Moderate aphasia
 - Greatest improvements in discourse production
- Mild-moderate aphasia
 - Greatest improvements in written expression and discourse production

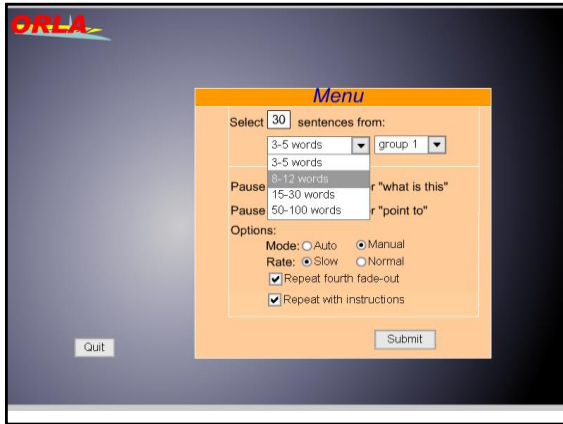
Study: Clinician vs Computer

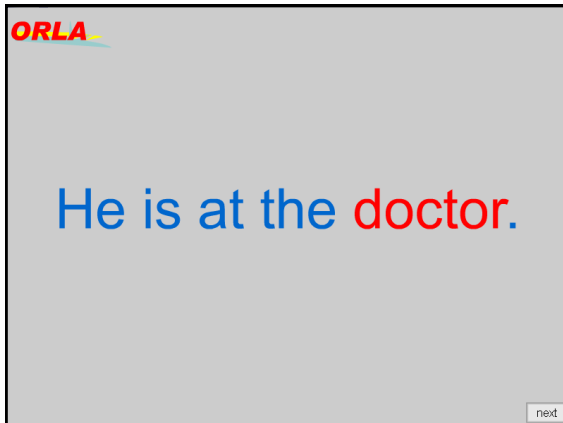
See

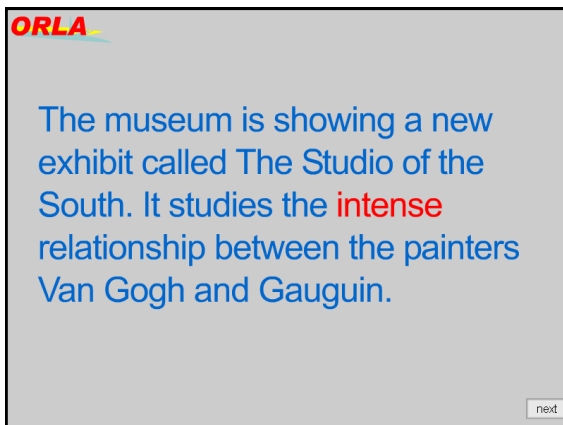
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Study Design









Modifications

- Add animated agent with visible speech
- Assess intensity of SLT:
 - 10 hrs/week vs 4 hrs/week
- Compare to no-treatment group

Our address has
changed.



Session Remain : 14:33 **Pause** **Exit** Total Progress :

The hospital has
recently celebrated its
fiftieth anniversary.



Session Remain : 12:47 **Pause** **Exit** Total Progress :

ORLA + WRITING

- We have developed a unique treatment approach
 - Pairs written production with verbal repetition
 - Extends treatment beyond the word level to the sentence level
 - Provides practice in the generation and revision of sentences
 - Practice is done independently on home computer
 - Practice is intensive

Treatment

- Treatment used state-of-the-art technology in which an anthropomorphically accurate "digital" therapist visually modeled speech and guided treatment.
- Treatment by a digital therapist ensured treatment fidelity and removed clinician-related variables (e.g., clinician expertise, personality factors) that potentially influence treatment outcomes.
- The computer agent read each target sentence aloud in unison with the PWA.
- Using a smart pen, the PWA copied the target, wrote it from memory, reviewed the target and made corrections.
- Participants worked intensively (90 minutes/day, 6 days/week, for 6 weeks) and independently on their home computer which was connected to a central server.
- Progress was monitored remotely and writing samples were captured by the smart pen.

Treatment – digital therapist AND LIVESCRIBE SMARTPEN



Treatment sequence

Step	Instructions Read Aloud by "Digital" Therapist	Program Features
1.	Look and listen	Sentence is presented on screen. As agent reads aloud, each word is highlighted.
2.	Point to each word	Sentence is presented on screen. As agent reads aloud, each word is highlighted.
3.	Say it	Agent reads sentence, each word is highlighted; subject reads in unison.
4.	Again	Agent reads sentence, each word is highlighted; subject reads in unison.
5.	Write the sentence	-Sentence is presented on screen -Subject copies sentence on microdot paper.
6.	Point to _____	Program selects word that is produced by agent
7.	Point to _____	Program selects word that is produced by agent
8.	Copy this.	-Program highlights word -Subject writes word on microdot paper
9.	Copy this.	-Program highlights word -Subject writes word on microdot paper

Treatment sequence

Step	Instructions Read Aloud by "Digital" Therapist	Program Features
10.	Say the whole sentence again	Agent reads sentence, each word is highlighted; subject reads sentence in unison.
11.	Write the whole sentence again	Sentence appears on screen while agent gives instructions, then sentence disappears/screen is blank. Subject must write the sentence on microdot paper without a model.
12.	Check your work and fix it	Sentence appears on screen -Subject compares the hand-written sentence on the paper to the sentence on the screen and makes corrections as needed -Subject hits spacebar to advance program to the next sentence

Sample home practice

Single word copying →

Fix your mistakes →

I'd like a drink.
I'd like a drink.
I'd like the drink.
a

The streets are flooded.
The streets are flooded.
The streets are flooded.
flooded

This is a large hospital.
This is a large hospital.
This is a large hospital.
hospital

He ran home from school.
He ran home from school.
He ran home from school.
home

The computer isn't working.
The computer isn't working.
The computer isn't working.
working

Look out the window.
Look out the window.
Look out the window.
out

← Copy the sentence

← Write it by yourself

Sample practice log

Practice 90 minutes a day for 6 days (3 Day Off)			
Day	Start time	End time	Total practice time
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			

Practice 90 minutes a day for 6 days (3 Day Off)			
Day	Start time	End time	Total practice time
Monday	12:00	1:30	60
Tuesday	9:00	10:30	30
Wednesday	10:00	11:30	60
Thursday	11:00	12:30	30
Friday	12:00	1:30	60
Saturday	10:00	11:30	30

ORLA Expansion

Scripts: Training Everyday Conversations for Individuals with Aphasia

What is a Script?

- A sequence of sentences that a person typically speaks in routine communication situations
- Examples
 - Ordering pizza over the phone
 - Making a doctor's appointment
 - Job interview

Background

- Scripts guide and facilitate identification of participants and actions involved in social situations
- Script knowledge includes understanding, remembering and recalling the temporal organization of events in routine activities
- Research indicates that script knowledge is not seriously compromised by aphasia, at least when the language deficit is mild to moderate thus making aphasic individuals candidates for script training (Armus et al, 1989; Lojeck-Osiejuk, 1996).

Script Training Rationale

- Instance Theory of Automatization
 - Automatic processing is fast, effortless, autonomous, stereotypic and unavailable to conscious awareness
 - Automaticity of skills achieved by retrieving memories of complete, context-bound, skilled performance
 - These memories are formed with repeated exposures to a consistent task (practice)

(Logan, 1988)

Instance Theory of Automatization

- Each instance of exposure contributes to the acquisition of a domain specific knowledge base when stimuli are mapped consistently on to the same responses
- Retrieval occurs automatically when the same stimuli from the practice environment are present
- Practice increases amount and speed of retrieval

(Logan, 1988)

Implications for Script Training

- Focus on complete meaningful segments rather than single words
- Use discourse relevant to daily life
- Practice with a communication partner
- Practice consistently
- Practice intensively

Creating Scripts

- Considerations
 - Identifying patient's communication needs and interests
 - Script topics
 - Type of script (dialogue or monologue)
 - Number and length of conversational turns
 - Grammatical complexity
 - Vocabulary selection

Activities Checklist for Script Identification: Examples

- | | |
|---|--|
| ■ Visit exhibitions, museums, libraries | ■ Talk on the phone to friends and family |
| ■ Go to the movies, theaters, concerts, plays | ■ Make appointments over the phone |
| ■ Go to restaurants | ■ Order over the phone |
| ■ Go shopping | ■ Tell stories and jokes |
| ■ Play with or help children or grandchildren | ■ Discuss finances with banker, accountant, lawyer |
| ■ Visit friends or relatives | ■ Ask for directions |
| ■ Talk to sales people in stores | ■ Discuss your health with your doctor |

Types of Scripts

- Monologue
- Dialogue with person with aphasia as initiator
- Dialogue with person with aphasia as responder

Number and Length of Conversational Turns

- Severity of production deficits helps determine length of each turn
- Comprehension deficits help determine number of turns (total length of conversation)
- Keep the communication partner's lines as short as possible.

Grammatical Complexity

- Measured by the number of morphemes
- Definition of morpheme:
 - Smallest language unit that carries a semantic interpretation; a combination of sounds that carry meaning.
- Increasing number of morphemes increases grammatical complexity

Morpheme Count: Examples

- Jump = 1 morpheme
- Jumps, jumped, jumping = 2 morphemes
- Cake = 1 morpheme
- Cakes, cheesecake = 2 morphemes
- Happy = 1 morpheme
- Unhappy, happier = 2 morphemes
- Unhappier = 3 morphemes

Remember that irregular past tense verbs count as two morphemes, just like regular past tense verbs.

Grammatical Complexity

- Include a variety of different grammatical structures so that the script represents real-life conversation
 - ☐ Avoid using the present progressive "is + ing" for every sentence.
- Use syntax that the PWA would typically produce in conversations rather than perfectly correct grammatical sentences.
 - ☐ Consider using phrases and sentence fragments, rather than complete sentences.

Vocabulary Selection

- High interest to the patient
- Potential frequency of use by patient
- Word length and phonemic complexity
- High vs. low frequency
- Concrete vs. abstract
- Noun, verb, modifier count

Writing the Script

- Clinician and aphasic person collaborate
 - Draft of script is written
 - Reviewed by patient and others selected by the patient
 - Script is edited; may take several review cycles before patient provides final approval

Script templates

- Each participant response has five levels of difficulty.
- Difficulty levels are increased from 1 to 5 by modifying ease of readability and grammatical and semantic complexity.
- Example: Ordering Pizza in Restaurant

	Pat: Welcome. Is this your first time here?
1	Yes. We want to try out your pizza.
2	Yes. We've never tried your pizza before.
3	Yes, it is. We've never tried your pizza before.
4	Yes. My friend told me your pizza was fantastic, but we haven't tried it before.
5	Yes. My friend's always raving about how fantastic your pizza is, but we've never tried it before.

Script templates

- Flesch-Kincaid Grade Level Formula - overall measure of ease of readability (Kincaid, Fishburne, Rogers, & Chissom, 1975).
- Uses three components — syllables, words, and sentences — to create a sentence difficulty measure (average sentence length, or ASL) and a word difficulty measure (average syllables per word or ASW)
- Combined to derive a grade level score:
 - $(0.39 \times \text{ASL}) + (11.8 \times \text{ASW}) - 15.59$.

Script templates

Counts per ten turns in the restaurant script at five levels of difficulty

Restaurant Script	Level 1	Level 2	Level 3	Level 4	Level 5
Sentences	11	11	15	15	19
Words	62	82	114	141	175
Syllables	71	100	145	188	245
Morphemes	74	98	145	181	230
Words/sentence	5.6	7.5	7.6	9.4	9.2
Syllables/word	1.1	1.2	1.1	1.3	1.4
Morph/word	1.19	1.20	1.27	1.28	1.31
Flesch-Kincaid	0.12	1.71	2.38	3.81	4.52

Kaye, R. C., & Cherney, L. R. (2016). Script Templates: A Practical Approach to Script Training in Aphasia. *Topics in Language Disorders*, 36(2).

Script templates

- Semantic difficulty
 - Corpus of Contemporary American English (Davies, 2008)
 - The less frequent the word, the more semantically difficult it is.
- Example:
 - Semantic category: *idea*
 - Server: Then you better get the thin crust.
 - Person with aphasia:
 - Level 1: Good *idea*.
 - Level 2: That's a good *thought*.
 - Level 3: That's good *advice*. Eating's not enjoyable when you're rushing.
 - Level 4: That's a very good *suggestion*. Eating's not enjoyable when you're rushing.
 - Level 5: That's a good *recommendation*. When I'm hungry, I can't really enjoy my food.

Kaye, R. C., & Cherney, L. R. (2016). Script Templates: A Practical Approach to Script Training in Aphasia. *Topics in Language Disorders*, 36(2).

Script templates

Matching script complexity to aphasia severity

WAB-R AQ Range	Standard Difficulty
35 - 50	2
50 - 60	3
60 - 80	4

Kaye & Cherney, 2016

Script templates

Personalizing the script – examples

	Pat: A thick crust takes 30 minutes.
1	NAME and I are going to a show at six.
2	NAME and I are going to a movie at seven o'clock.
3	NAME and I are going to a play in about one hour.
4	NAME and I are going to a concert, and we need to leave in forty-five minutes.
5	NAME and I are going to a musical. We have to leave by six-thirty at the latest.
	Pat: How did you like our pizza?
1	The best in PLACE!
2	You have the best pizza in PLACE!
3	You have the best pizza in PLACE. Next time I'll order dessert.
4	You have the best pizzeria in PLACE. Next time I'll order dessert, too!
5	I believe you have the best pizzeria in PLACE. The next time we come, we'll definitely order dessert!

Analyzing Patient Progress

- Requires analysis of:
 - ☐ Target script
 - ☐ Baseline pre-treatment performance
 - ☐ Post-treatment performance
- Recommend audio recording of baseline and post-treatment performance

Measures

- Percent script related words
- Rate of production of script related words

- Numbers of nouns, verbs and modifiers
- Number / % of morphemes

Computerizing Script Training

- Used technology from The Center for Spoken Language Research (CSLR) at the University of Colorado
- Developed animated computer characters that synthesize accurate visible speech, contextually appropriate facial expressions, eye movements, and head, hand, and body movements
- Applied to profoundly deaf children, autism spectrum disorder, and children with reading problems

Training Sequence

- Listening/reading whole conversation
- Single sentence practice
 - Self-monitoring
 - Individual word practice
- Conversation practice
 - Removing cues (face, voice, written words)

AphasiaScripts

- Sentence and conversation practice involves reading the script aloud with the following cues:
 - Visual verbal - words are highlighted on the screen
 - Visual motor – correct articulatory movements are seen on an animated agent
 - Auditory - words are heard
- Conversation practice - cues are removed in a step-by-step process in a fixed order

AphasiaScripts

■ Available from:

<https://www.sralab.org/oral-reading-language-aphasia-orka>

<http://ricaphasiascripts.contentshelf.com>

■ AphasiaScripts Tutorial (Player only)

<https://www.youtube.com/watch?v=GScQvuNRij0>

■ Email: aphasiascripts@sralab.org

CCSTA: Computerized Conversational Script Training for Aphasia


MAIN MENU

WHOLE CONVERSATION

SENTENCE PRACTICE

CONVERSATION PRACTICE

EXIT




Please select the option you want

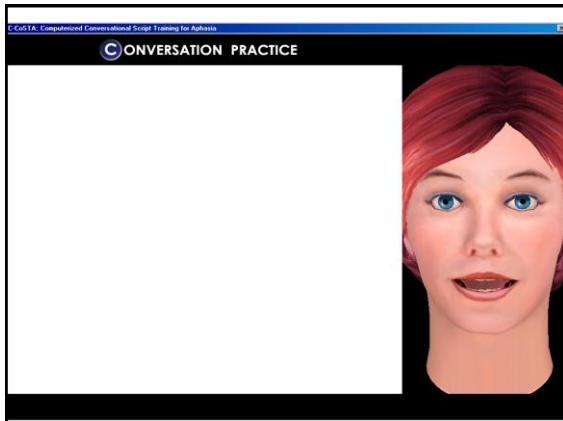
CCSTA: Computerized Conversational Script Training for Aphasia

SENTENCE PRACTICE

Yes. Decaf coffee, please.







Authoring

- Each script recorded
 - ☐ Select number of lines
 - ☐ Select order of speakers – can be reversed in the middle of the script
 - ☐ Rate of recording individualized for subject

Research Protocol

- Three scripts are developed for each subject
- Each script is practiced for three weeks
- Scripts are practiced daily at home for at least 30-minutes on a loaned laptop
- Once-weekly sessions with SLP to check status and ensure compliance
 - First and last scripts are transcribed and coded according to the previously described procedures

Outcome Measures

- ASHA Quality of Communication Life Scale
- Western Aphasia Battery
- Burden of Stroke Scale
- Language Sample: Picture Description and Story Retelling
- Boston Naming Test
- Communication Confidence Rating Scale for Aphasia (CCRSA)
- Exit Interview

Multiple Baseline: Language Probes

- Accuracy and speaking rate on:
 - Script currently being trained
 - Untrained scripts (specific to the individual)
 - Untrained control script (used for all subjects)
 - Picture description
- 30% of all probes rescored for point-to-point inter-rater reliability

Summary : Exit Interview Themes

- Increased verbal communication
- Generalization to other modalities and situations
- Improvements noticed by others
- Increased confidence
- Satisfaction with program

Conclusions

- Conversational script training resulted in improved production of the practiced scripts
- Reports from patients and family indicated improved communication skills in other situations
- Computer script training using virtual therapist software may be cost-effective means of delivering therapy
- Analysis of data from a larger sample of participants is underway

Script Training - Evidence

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Script Training - Evidence

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- Youmans, G., Youmans, S., & Hancock, A. (2011). Script training treatment for adults with apraxia of speech. *American Journal of Speech-Language Pathology*, 20, 23-37.

Talking Photo Album

<http://www. attainmentcompany.com/talking-photo-album>



■ VAST – Video assisted speech technology

■ Speak in Motion

<http://www.speakinmotion.com/>



B.A. Bar

Figure 4. B.A.Bar dialogue training—example of practice material (translated from original German).

(A) (B)

Nobis-Bosch et al., 2011 (JSLHR, 54, 1118-1136).

E-Mails

- Templates
 - Copying
 - Cut and paste

Hi _____!
Dear _____,
What's up _____?

Greetings _____,
Hello _____,

Hope all is well with you.
It's been a long time!
How are you?
What's new with you?
Did you see that football game?

How is _____?
How is work?
What's new in _____?
What have you been up to?
How are the kids?

I've been busy with _____
working out on the treadmill.
working out at the gym
speech therapy
golf
the grandkids

I went to a great restaurant last night. It was a place called _____
with _____ food.

Jenny and I _____

I am looking forward to _____

Would you like to get together soon?

Next time you are in Chicago, give me a call!

Hope all is well.
I would love to hear from you.
Hope to talk to you soon.

Love, John

have been spending time with the kids.
have been relaxing.
went out to eat.
saw a great movie.

seeing you soon.
going to Florida.
playing golf.
seeing the kids.
this weekend.
the Bears game

Let me know how things are going.
Hope to see you soon.
