Management of Extra-Linguistic Cognitive Deficits in Individuals Aphasia

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Attention
(Hula & McNeil, 2008; Posner & Rothbart, 2007; Raz, 2006)

• “Everyone knows what attention is.” (William James)
  ◆ A capacity-limited system consisting of one or more pools of processing resources that can be flexibly and simultaneously allocated to one or more tasks (Kahneman, 1973; Navon & Gopher, 1979)
  ◆ Response selection creates bottleneck that causes processing to switch from a parallel to serial system (Pashler, 1994)
  ◆ Attention problems when:
    ▪ Insufficient attentional resources available
    ▪ Sufficient resources but inappropriate allocation
    ▪ Sufficient resources, appropriate allocation, but slow allocation
    ▪ Combination of more than one of the above
Neural Correlates of Attention
(Filley, 2002; Raz, 2006; Stuss et al., 2006; Yantis, 2008)

• Focal/right hemisphere attention network
  ▪ Posterior parietal and prefrontal cortex
  ▪ Cingulate gyrus, particularly anterior portion
  ▪ Subcortical structures and pathways
  ▪ Posterior/scanning & selection vs. anterior/complex
  Diffuse, bilateral attention network contributes to arousal, and sustained and focused attention
  • Thalamus and its cortical connections
  • Frontal lobes
  • Cerebellum (Highnman & Bleile, 2011; Steinlin, 2007)
Neurotransmitters (Bales et al., 2009; Mahoney et al., 2010; Raz, 2006)
  Norepinephrine
  Acetylcholine
  Dopamine

Memory

• Memory (Davachi & Dobbins, 2008; Sander et al., 2007)
  ▪ Complex, temporally extended cognitive functions that transforms thoughts and perception into a robust registry
• Working Memory (Baddeley, 2012; Martin & Reilly, 2012; Logie, 2011):
  ▪ Currently active arena for concurrent mental computation and temporary storage
    ▪ limited-capacity sensory buffers that temporarily store incoming information
    ▪ a domain-free, executive/controlled attention component that directs which information to process
• Encoding & Retrieval processes (Davachi & Dobbins, 2008; Ellis & Hunt, 1993; Gamino & Chapman, 2009)
  ▪ A set of functions that enable getting information in and out of long term memory
  ▪ Variable depths vs. all/none phenomenon
Long Term Memory

• Declarative/Explicit (Antonucci & Reilly, 2008; Winocur & Moscovitch, 2011)
  ◦ Episodic/autobiographical memory
    - Prospective memory (Knight et al., 2006)
  ◦ Semantic/factual memory
  ◦ Lexical/word form memory
• Nondeclarative/Implicit (Henke, 2010; Reber, 2013)
  ◦ Procedural or habitual memory, priming, conditioning
• Anterograde vs. Retrograde (Markowitsch, 1998; Vakil, 2005)
  ◦ Anterograde: encoded subsequent to brain damage
  ◦ Retrograde: encoded prior to brain damage
• Verbal vs. Nonverbal Memory

Neural Correlates of Memory
(Highman & Bielle, 2011; Reber, 2013; Winocur & Moscovitch, 2011)

Frontal lobe areas
  • Broca’s, L. SMA, L. premotor
  • R. premotor, inf. parietal
  • anterior cingulate
  • dorsolateral prefrontal

Temporal lobe
  • Hippocampus/mesial temp.
  • Temporal cortex

• Basal ganglia
  - caudate nucleus, putamen
  - Cerebellum
  - Other subcortical structures and connections
    - thalamus, mammillary bodies, and amygdala

• Neurotransmitters
  • Dopamine
  • Acetylcholine
  • Glutamate
  • Serotonin
Executive Functioning (EF)

• Complex, interrelated, supervisory processes for generating, choosing, organizing, and regulating goal-directed, adaptive, and nonautomatic behaviors (Alvarez & Emory, 2006; Aron, 2008; Burgess et al., 2006; Stuss, 2011; Wood & Liossi, 2007; Toplak et al., 2013)
  ◆ Multidimensional construct
    ▪ numerous executive subprocesses that act in concert and coordinate basic cognitive processes
      ● Include metacognitive abilities
      ● Perhaps “self-determination” or “general intelligence”
  • Allow for:
    ◆ flexible adaption to situational and environmental changes
    ◆ independent participation in daily activities and relationships

Prominent EF Abilities

• Planning/organization
• Self-regulation and monitoring
• Cognitive flexibility/set shifting
• Initiation
• Inhibition
• Reasoning and problem solving
• EF Challenges
  ◆ Theoretical models are not yet well specified
  ◆ Currently no consensus over (Burgess et al., 2006; Chan et al., 2008; Constantinidou et al., 2012; Mueller & Dollaghan, 2013):
    ▪ vernacular
    ▪ which skills are executive functions
    ▪ which, if any, executive functions are mutually exclusive
  ◆ Implications for assessing and treating EFs
**EF Neural Correlates**

- **Frontal lobes** (Kreuger et al., 2011; Lovstad et al., 2012; Mitchell, 2008; Rosen & Viskontas, 2008; Stuss, 2011)
  - Dorsolateral cortex
  - Orbitofrontal cortex
  - Medial cortex
  - Frontal poles
- **Other brain regions** (Alvarez & Emory, 2006; Mueller & Dollaghan, 2013)
  - Cerebellum (Highnman & Bleile, 2011; Paquier & Marien, 2005)
  - Subcortical structures (Montoya et al., 2006)
- **Corticostriatal and -thalamic circuits and white matter pathways** (Bastos-Leite et al., 2007; Delano-Wood et al., 2009; Vataja et al., 2005)
- **Neurotransmitters** (Bales et al., 2009; Halbauer et al., 2009)
  - Dopamine, norepinephrine, serotonin

**Cognitive and Linguistic Neural Correlates**

- Some neural structures, neurotransmitters, and circuits appear to support *both* cognitive and linguistic functions (Alexander, 2006; Baldo et al., 2012; Kesner, 2009; Klingberg, 2010; Meyer et al., 2014; Murray, 2004)
  - e.g., Broca’s area and arcuate fasciculus/sup. long. fasciculus
  - e.g., left posterior temporal-parietal cortex
  - e.g., acetylcholine
- Therefore, brain damage that disrupts language structures/circuits/neurochemistry likely to also negatively affect some cognitive functions and vice versa
Attention Deficits in Aphasia

- Deficits possible in all attention functions [Murray, 2012]
  - Linguistic and nonlinguistic attention tasks
    - ↓ information processing speed (Visser-Keizer et al., 2002; Winkens et al., 2009)
    - Negatively affects performance in presence of time pressure
    - Sustained attention (Barker-Collo et al., 2010; Gerritsen et al., 2003; Laures, 2005)
    - Attention Switching (Frankel et al., 2007; Ziegler et al., 2001; Murray, 2012)
    - Focused and divided attention (Hunting-Pompon et al., 2011; Kalbe et al., 2005; Murray, 2012)
  - Right neglect (Barker Collo et al., 2010; Wee & Hopman, 2008)
    - 15-65% of left-hemisphere brain-damaged patients
    - May affect one or several modalities
  - Physiological differences [Kramer et al., 2008; Laures-Gore et al., 2007]
    - e.g., ↓ b.p., ↑ cortisol, slower and smaller ERPs, ↑ neural activation

Memory Deficits in Aphasia

- Verbal and nonverbal STM [Baldo et al., 2012; Fucetola et al., 2009; Hoffman et al., 2011; Laures-Gore et al., 2011; Martin et al., 2012; Potagas et al., 2011]
- Working memory [Christensen & Wright, 2010; DeDe et al. 2014; Ivanova, 2009; Mayer & Murray, 2012; Potagas et al., 2011; Seniow et al., 2009; Soares-Ishigaki et al., 2012; Sung et al., 2009]
- Encoding/learning (Valilla-Rohter & Kiran, 2013)
- Verbal and nonverbal declarative memory (Bartha & Benke, 2002; Beeson et al.,1993; Vukovic et al., 2008; Yasuda et al., 2000)
- Procedural memory?
- One of the most frequently reported cognitive changes following left stroke (Visser-Keizer et al., 2002)
EF Disorders in Aphasia

- Most common cognitive deficit in acute stroke (Bour et al., 2011; Lesniak et al., 2008; Nys et al., 2007)
  - About 50% acute stroke cases and 19-75% of all stroke survivors display EF disorders
  - Particularly poor outcome if co-occur with depression (Bour et al., 2011)

- Deficits in several executive functions (Cocchini et al., 2010; Fucetola et al., 2009; Lesnicak et al., 2008; Murray, 2014; Nicholas et al., 2005, 2011; Nys et al., 2007; Penn et al., 2010; Vukovic, 2008; Zinn et al., 2007)

- Limited data require substantiation
  - Explore extent of individual differences
  - In stroke population, EF deficits show least recovery compared to other cognitive domains (Rasquin et al., 2013)

Cognitive Deficits Negatively Affect: Communication

- Phonological and lexical/semantic processing
  - Word discrimination/rhyming judgment (Martin et al., 2012)
  - Semantic judgment/association (Ansaldo et al., 2004; Jefferies & Lambon Ralph, 2006; Martin et al., 2012; Murray et al., 1997, 2004)
  - Word-to-picture matching (Anderson, 1996)
  - Word retrieval (Jefferies & Lambon Ralph, 2006; Murray, 2012)

- Morphosyntactic processing
  - Grammaticality judgment (Dick et al., 2001; Giovannetti et al., 2008; Murray et al., 1997, 2006)
  - Sentence comprehension (Meyer et al., 2014; Sung et al., 2009; Tomic et al., 2009; Wright et al., 2007)
  - Sentence and discourse production (Haarmann et al., 1997; Kok et al., 2008; Martin & Allen, 2008; Murray, 2012; Murray et al., 1997)
Cognitive Deficits Negatively Affect: Communication

• Pragmatics and discourse skills
  ◆ Spoken discourse informativeness, efficiency, and global coherence (Alexander, 2006; Murray, 2012; Murray et al., 1998; Penn et al., 2010; Radanovic et al., 2003; Ramsberger, 2005; Rogalski et al., 2010)
  ◆ Discourse and reading comprehension (Caspari et al., 1998; Connor et al., 2001; Kalbe et al., 2005; Martin & Allen, 2008; Yasuda et al., 2000)
  ◆ Awareness and monitoring of language output accuracy (Marshall et al., 1998)
  ◆ Expressive and receptive social communication/problem solving (Ramsberger, 2005)
• General language/communication skills (Coleman et al., 2011; Fridicksson et al., 2006; Murray, 2012; Nys et al., 2005)

Consequences of Cognitive Deficits

• Ability to profit from treatment (Brownsett et al., 2014; Fillingham et al., 2005, 2006; Murray et al., 2004; Purdy & Dietz, 2010; Lambon Ralph et al., 2010; Lesniak et al., 2008; Nicholas et al., 2011; Nys et al., 2005; Sandt-Koenderman et al., 2008; Senior et al., 2008; Yeung & Law, 2010)
  ◆ Difficulty acquiring new skills/strategies/device use (Evans et al., 2003; Nicholas et al., 2011; Purdy & Koch, 2006)
  ◆ Limited generalization effects (Murray et al., 2004; Yeung & Law, 2010)
  ◆ Limited maintenance of treatment effects (Fish et al., 2009; Yeung & Law, 2010)
  ◆ ↓ compliance/motivation for treatment or compensatory strategy use
  ◆ Need more extensive/intensive treatment?
Consequences of Cognitive Deficits

- **ADL problems** (Cao et al., 2007; Wee & Hopman, 2008)
- **Poor functional, social and vocational outcomes** (Aben et al., 2008; Hachioui et al., 2014; Hoofien et al., 2004; Lesniak et al., 2008; Leung et al., 2010; Tanaka et al., 2014; Visser-Keizer et al., 2002)
- **Psychosocial well being problems** (Aben et al., 2008)
- **Increased risk of subsequent decline and dementia** (Oksala et al., 2009; Sachdev et al., 2009)
- **Caregiver burden** (Choi-Kwon et al., 2005; Watanabe et al., 2000)

New Directions in Aphasia Assessment

- **Moving beyond language**
  - Understanding and assessing the influence of concomitant cognitive deficits
  - Whose responsibility?

- **Moving beyond impairments**
  - Most cognitive assessment and treatment methods focus on the **structural** level of WHO model
    - Cannot assume a direct relationship among model levels (Birkett & Sperry, 2012; Chaytor & Schmitter-Edgecombe, 2003; Irwin et al., 2002)
  - Negative consequences:
    - Under- or over-estimate how well patients function in their daily environments
    - Poor generalization of treatment effects
  - **Must assess at all levels of WHO model** (Simmons-Mackie et al., 2005)
**Need for Formal Screening/Testing**

- Stroke-related cognitive and perceptual deficits can go **undetected** without formal screening/testing!
  - Edwards et al. (2006)
  - Fure et al. (2006)
  - Planton et al. (2012)
- **Do not** use the *Mini-Mental State Examination* (MMSE) to screen for cognitive problems in individuals with aphasia (Golper et al., 1987; Osher et al., 2008)
  - Overestimates presence and severity of cognitive problems
- Cognitive screening tests do not always screen all cognitive domains in an equal manner

**Need for Formal Screening**

- Screening only suggests presence/absence of cognitive problem!!!
  - Additional testing necessary to identify specific cognitive function strengths/weaknesses
- **However...** many health professionals rely solely on cognitive screening tools, particularly to identify/monitor EF deficits (Koh et al., 2009; Korner-Bitensky et al., 2011; Poulin et al., 2013)
The Ideal Assessment

- Case history
- Observations and interviews
  - Primary dx procedure in acute settings (Constantinidou et al., 2012)
- Formal tests
  - Test batteries
  - Tests of specific cognitive functions
  - Tests from the research literature
- Indirect Assessment
  - Strategy use
  - Conditions that ↑ or ↓ extra-linguistic demands
  - Sense of effort and self-awareness measures

Observations and Interviews

- Observations should precede formal testing
  - Formal testing context can mask EF deficits (Birkett & Sperry, 2012)
  - Utilize information from other team members (Constantinidou et al., 2012)
    - e.g., +ive and -ive strategies clients observed using by team members in their hospital room, PT gym, waiting room, etc.
    - Remember that the client and his/her family or caregivers are team members* * (Dawson et al., 2009)
      - e.g., Research supports value of client involvement in goal setting
  - Essential to identifying influential contextual factors
    - The Environment and Communication Assessment Toolkit (Brush et al., 2012)
      - Includes questionnaires to evaluate public and personal spaces
### General Cognition Test Batteries

- **Cognitive-Linguistic Quick Test** (Helm-Estabrooks, 2001)
  - Ages 18-89
  - English and Spanish versions

- **Repeatable Battery for the Assessment of Neuropsychological Status Update** (Randolph, 2012)
  - Ages 12-90
  - Has parallel forms

- **Scales of Cognitive and Communicative Ability for Neurorehabilitation** (SCCAN; Milman & Holland, 2012)
  - Ages 18 – 91

### Patient-Reported Measures of General Cognitive Functioning

- e.g., **BOSS (Burden of Stroke Scale) Cognitive Domain scale** (Doyle et al., 2004)

- **Avoid using patient-reported measures that combine cognitive and communicative items/responses** (Hula et al., 2010)

- An important indication of the effects of cognitive deficits on everyday functioning (Schmitter-Edgecombe et al., 2011)
  - Self-report of IADLs was a unique predictor of observation measures [taken while participants completed IADLs]
  - Sensitive to the effects of healthy cognitive aging
Attention Tests

• Test Batteries
  - Test of Everyday Attention (Robertson et al., 1994)
    - Also available - TEACH (Manley et al., 1999)
  - Behavioral Inattention Test (Wilson et al., 1987)
    - Visual neglect

• Tests of Specific Attention Functions
  - Color Trails Test (D’Elia et al., 1996)
  - Test of Visual Field Attention (Williams, 1994)
  - Test of Variables of Attention – 8 (Greenberg et al., 2011)
    - Ages 4 – 80+

Attention Tests

• Observational/Rating Scales
  - Rating Scale of Attentional Behavior (Ponsford & Kinsella, 1991)
  - Mental Slowness Observation Test and Questionnaire (Winkens et al., 2009)
Neglect Testing

- **Tests**
  - BIT, Test of Visual Field Attention
  - Kicking Test (Grossi et al., 2001)

- **Research recommends assessing:**
  - With multiple tests/tasks
    - Patients often perform within normal limits on one neglect task (Arene & Hillis, 2008; Shiraishi et al., 2008)
  - On more than one occasion
    - Variability even within a day reported, particularly for mild to moderate neglect (Hamilton et al., 2008)

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Memory Tests

- **Test Batteries**
  - Wechsler Memory Scales - IV (Wechsler, 2009)
    - STM, LTM, working memory
    - Adult (16-69 yrs) and Older Adult (65-90 yrs) batteries
    - Difficult for SLPs to obtain
  - Rivermead Behavioral Memory Test – III (Wilson et al., 2008)
    - Variety of memory functions in ages 16 - 96
    - Functional tasks and 4 parallel forms
  - Test of Memory and Learning – Senior Edition (Reynolds & Voress, 2012)
    - Variety of memory functions in ages 55 - 89
Tests of Specific Memory Functions

- **STM/WM Tests**
  - Repetition span subtests
    - forward and backward span, immediate recall tasks
  - Matching listening/pointing span tests
    - PALPA subtest 13 (PALPA, Kay et al., 1992)
- **Tests with demands on executive component of WM**
  - NIH Toolbox List Sorting Working Memory Test (NIH, 2012; Tulsky et al., 2014)
  - Test of Everyday Attention subtests (TEA; Robertson et al., 1994)
- **Language tests with STM demands**
  - Revised Token Test (McNeil & Prescott, 1978)

Tests of Specific Memory Functions

- **Tests of other specific memory functions**
  - Rey Complex Figure Test (Meyers & Meyers, 1995)
  - Continuous Visual Memory Test (Trahan & Larrabee, 1988)
  - Location Learning Test (Bucks et al., 2000)
  - Cambridge Test of Prospective Memory (Wilson et al., 2005)
  - Doors and People (Baddeley et al., 1994)
- **Patient-reported measures**
  - Working Memory Questionnaire (Vallat-Azouvi et al., 2012)
- **Observation**
  - Does the patient remember task instructions?
  - Is patient displaying spontaneous use of encoding/retrieval strategies?
Executive Function Tests

• Test Batteries
  ◆ Behavioral Assessment of the Dysexecutive Syndrome (Wilson et al., 1996)
    ▪ Ages 16-87
    ▪ BADS-C (Wilson et al., 2004)
      ▪ Ages 8-16
  ◆ Delis-Kaplan Executive Function System (Delis et al., 2001)
    ▪ Suitable (ages 8-89 years)

Tests of More Specific EFs

• Planning tests
  ◆ Porteus Maze Test (Porteus, 1965)
  ◆ NAB Mazes Test (Stern & White, 2009)
  ◆ Tower tests
    ▪ Tower of Hanoi
    ▪ Tower of LondonDx – 2 (Cullbertson & Zillmer, 2012)

• Problem solving/reasoning tests
  ◆ Progressive Matrices (Raven, 1998)
  ◆ Test of Nonverbal Intelligence - 4 (Brown et al., 2010)
  ◆ Comprehensive Test of Nonverbal Intelligence - 2
  ◆ Functional Assessment of Verbal Reasoning and Executive Strategies (FAVRES; MacDonald, 2005)
Tests of More Specific EFs

- Card sorting tests
  - Modified Wisconsin Card Sorting Test (Schretlen, 2011)/Wisconsin Card Sorting Test (WCST; Heaton et al., 1993)

- Fluency tests
  - Ruff Figural Fluency Test (Ruff, 1996)
  - Test of Verbal Conceptualization and Fluency (Reynolds & Horton, 2007)  
    - Ages 8-89
  - Calibrated Ideational Fluency Assessment (Schretlen & Vannorsdall, 2011) 
    - Ages 18 - >90

- Clock drawing (Freedman et al., 1994)
  - CLOX (Royall et al., 1998)
  - Various scoring protocols

Executive Function Tests

- Documenting awareness issues
  - VATA-L: Visual-Analogue Test Assessing Anosognosia for Language Impairment (Cocchini et al., 2010) 
    - Caregivers and patients rate how well patient can carry out daily language production and/or comprehension tasks

- Estimating pre-morbid intelligence
  - Useful for prognosticating
  - Typically use oral word reading (e.g., NART; ANART) 
    - Pronounce 50 words varying in irregularity and difficulty
  - Lexical Orthographic Familiarity Test (Leritz et al., 2008)
Functional/Naturalistic EF Tests

- Relate to ICF levels of personal activities and/or society participation (Poulin et al., 2013; WHO, 1998)
  - Photocopy test (Crepeau et al., 1997)
  - Multiple Errands Test (Aitken et al., 1993; Birkett & Sperry, 2012; Rand et al., 2009; Morrison et al., 2013)
    - Various versions including virtual reality version
  - Cooking task (Chevignard et al., 2008; 2010)

- Still underused by clinicians (Constantindou et al., 2012)

Confounding Variables

- Inadequate norms for the elderly and ethnocultural minorities
  - Quality of translated verbal test materials of “unacceptably poor quality” (Bender et al., 2010, p. 227)
  - Must acknowledge interaction between cultural background of client and structured, time-limited testing environment (Agranovich et al., 2011; Ardila, 2005; Bender et al., 2010)
  - Check research literature for extended norms and new test protocols
- Inadequate norms for people with aphasia (Murray, 2012; Murray et al., 2015; Poulin et al., 2013)
- Excessive linguistic demands
  - use nonstandard administration (e.g., Laures-Gore et al., 2011)
  - informative but negates use of norms
Confounding Variables

- Ecological and content validity (Birkett & Sperry, 2012; Burgess et al., 2006; Mueller & Dollaghan, 2013; Pickens et al., 2010; Poulin et al., 2013)
  - Implications in terms of ICF activity and participation levels?
  - Tests often assess more than target function
  - Structure of EF tests’ format may support EF deficits (i.e., underestimate deficit)

- Some tests (partic. EF tests) report or have established (Mueller & Dollaghan, 2013; Poulin et al., 2013):
  - Test-retest reliability or responsiveness
  - Floor and/or ceiling effects
  - Inter-rater reliability, particularly for functional/naturalistic tests
  - Norms that consider educational differences

- Cost, but can utilize test protocols in the empirical literature
  - e.g., Temple Assessment of Language and Short-Term Memory in Aphasia (TALSA; Martin et al., 2010)

Indirect Assessment

- Observe cognitive skills when assessing communication
- Assess communication under conditions with low vs. high cognitive demands
  - Quiet vs. noisy (auditory and/or visual distracters)
  - Increase memory demands
  - Novel/unstructured vs. routine/structured tasks, stimuli, environments, etc.
- Sense of effort or self-awareness measures (Markova & Berrios, 2006)
  - Compare pre- and post-task completion predictions
    - Performance accuracy/speed
    - Task difficulty
    - May be used before/after each item, a subtest, test, etc.
  - Compare on- vs. off-line ratings/self-corrections
  - Compare patient and caregiver ratings
**Important EBP Resources**

- [www.ancds.org](http://www.ancds.org)
  - Links to systematic, evidence-based reviews of treatments for a variety of neurogenic communication disorders
- [www.asha.org/members/slp/topics/ebp/evidence_guidelines.htm](http://www.asha.org/members/slp/topics/ebp/evidence_guidelines.htm)
  - Information to descriptions and levels of evidence-based practice
- [www.psychbite.com](http://www.psychbite.com)
  - psychBite - evidence-based practice resource for cognitive disorders treatments

**Treatment Study Design Issues**

- **Randomized Clinical Trials (RCTs) as gold standard?**
  - Drug treatment research “yes”
  - Behavioral treatment research “no” ([Barrett et al., 2006; Galante et al., 2011; Miller et al., 2011; Togher et al., 2009; Tucker & Reed, 2008; Whyte et al., 2009](http://example.com))
  - Require large *n* samples of homogeneous patients
  - Procedural issues
    - Difficult to administer double-blind protocol
    - Appropriate activities for control group?
  - Outcome issues
    - Poor generalization power
    - Poor transfer to clinical practice
    - Difficult to identify factors/processes that contribute to treatment’s effectiveness
      - Not well-suited to chronic conditions influenced by environmental and social factors
Attention Treatment

- Attention training recommendations and guidelines (Cappa et al., 2003; Cicerone et al., 2011; Michel & Mateer, 2006; Sohlberg et al., 2003; Zoccolotti et al., 2011)
  - Mild, post-acute TBI cases most responsive
  - Utilize complex training tasks in concert with metacognitive/strategy training
  - Intensive training with optimal session length of 1 hour
  - Individualize tasks, stimuli, etc.
  - Expect primarily task-specific improvements

Direct Tx of Cognitive Disorders: Attention

- Sturm & Willmes (1991; 1997)
  - Group ABA study to compare specific vs. nonspecific computerized attention training
  - 22 LHD (19 aphasic), 16 RHD subjects
  - Two 14 one-hr session training periods to train each subject’s two most impaired attention functions
- Murray et al. (2006)
  - Single subject, multiple baseline ABA design to examine Attention Process Training-II effects
  - Received 30 60-min sessions plus asked to complete 30 at-home sessions with spouse
Direct Treatment of Cognitive Disorders: Attention

• Positive APT outcomes for language:
  - Coelho (2005)
  - Sinotte & Coelho (2007)
  - Amaddii et al. (2007)
    - APT part of cognitive tx for thalamic stroke patient
      - tx included internal and external memory aids and prospective memory training
      - ↑ discourse informativeness

Direct Treatment of Cognitive Disorders: Attention

• Future Ideas
  - Functional skill-specific training (Wilson & Robertson, 1992)
    - Case study of relaxation + reading treatment
  - Outcomes
  - Computer programs/workbooks?
    - Examples
      - www.brainconnection.com - Bungalow software
      - www.mybraintrainer.com
      - www.Challengingourminds.com
      - www.cogmed.com
    - Positives
    - Negatives
  - Cognitive-motor dual task protocol (Evans et al., 2009)
Direct Treatment of Cognitive Disorders: Memory

- **General memory treatment guidelines** (Ehlhardt et al., 2008)
  - Avoid hyper-specificity of training conditions
    - Include stimulus variation and effortful processing
  - Emphasize strategies
    - These promote effortful processing
  - More practice leads to better maintenance
  - Choose ecologically valid tasks
    - Focus on daily information and/or skills

Direct Treatment of Cognitive Disorders: Memory

- **Traditional memory retraining**
  - Task-specific learning only, unless paired with strategy training (Cornis-Pop et al., 2012; Ehlhardt et al., 2008; Murray, 2012; Piras et al., 2011)

- **Internal mnemonic strategies** (Cicerone et al., 2011; Ehlhardt et al. 2008; Piras et al., 2011; Radford et al., 2012)
  - ↑ language demands
    - Aphasic patients typically excluded from these tx studies
  - +ive outcomes in *mild, stable* memory disorders
    - Require effortful processing
    - More severely impaired less likely to acquire independent strategy use
Memory Tx: No Delay Repetition Protocols

- Francis et al. (2003)
  - Case study trained on sentence repetition tasks to improve STM/WM and in turn, auditory comprehension

- More recently, often task specific gains:
  - Berthier et al. (2014)
    - 40 hrs of at home sentence repetition tx (+ donepezil)
  - Harris et al. (2014)

Memory Tx: Delayed Repetition Protocols

- Koenig-Bruhin & Studer-Eichenberger (2007)
  - Case study of chronic conduction aphasia patient trained on sentence repetition tasks to improve STM
    - Compound nouns and sentences under immediate and delayed repetition

- Kalinyak-Fliszar et al. (2011)
  - Single-subject design with chronic conduction aphasia patient trained on word and nonword repetition tasks
    - 137 sessions with three 45-60 min sessions/week

- Salis (2012)
  - Single-subject ABA design involving a patient with severe transcortical motor aphasia
    - Listening span task in which decided if 2 lists of words were the same or different
Memory Tx: Working Memory Span Tasks

- **Mayer & Murray (2002)**
  - Single-subject alternating treatment design to compare reading (MMOR) and working memory (SEW) treatments in an individual with chronic anomic aphasia
    - Modified multiple oral reading
    - Sequenced exercises for working memory
    - Reading rate and comprehension probes
    - 11 2-hr treatment sessions

Memory Tx: Multiple Components/Tasks

- **Vallat et al. (2005)**
  - Single subject design with an individual with chronic conduction aphasia
  - Treatment targeted the central executive and phonological buffer components:
    - 8 tasks with auditory stimuli
    - 3 60-min sessions per week for 6 months

- **Vallat-Azouvi et al. (2014)**
  - Single subject design with participant with nominal conduction aphasia but all WM components
  - 3 successive training stages for each WM component
    - Verbal/phonological WM tasks from 2005 study
    - Visuospatial WM tasks from Vallat-Azouvi et al. (2009)
    - Executive WM tasks
Memory Tx: Future Ideas

- **Strategy training** (Amaddii et al., 2014; Butler & Copeland, 2002; Cicerone, 2002; Duval et al., 2008; Levaux et al., 2009; Ponsford et al. 2014)
  - e.g., Cicerone (2002) with TBI participants
    - 1/2 of each session devoted to:
      - working memory N-back tasks practiced under different attention conditions
      - strategy and self-evaluation training
  - e.g., Duval et al. (2008) with left temporal lobe tumor excision client
    - Triple strategy approach
      - Dual encoding strategy - use phonological and visuospatial buffers
      - Serial processing – avoid dual-task situations
      - Speed reduction – slow down/emphasize quality
    - Storage, manipulation, n-back, and dual-task activities + scenario analysis and real-life simulations + information sessions

Direct Tx of Cognitive Disorders: Executive Functioning

- **EF treatments most successful if** (Catroppa & Anderson, 2006; Cicerone et al., 2006; Gordon et al., 2006; Schutz & Trainor, 2007):
  - Provided to patients who:
    - Can concentrate for > 20 min
    - Don’t have abulia or anosognosia
  - Start with individual and move to group tx setting
  - Use contextualized learning
    - i.e., learning within everyday situations
  - Focus on training strategies - i.e., top-down approach
    - Kennedy et al., 2008; Mateer, 2009; Singer & Bashir, 1999; Sohberg & Turkstra, 2011)
Direct Tx of Cognitive Disorders: Executive Functioning

- Limited data
  - Aphasia a common exclusionary criteria or fail to specify presence/severity of aphasia (e.g., Spikeman et al., 2009)

- Awareness training (Kennedy, 1983)
  - Stopping strategy for individuals with Wernicke’s aphasia

- Treatment of Aphasia Perseveration (Helm-Estabrooks et al., 1987; Helm-Estabrooks & Albert, 2004)
  - Strategies taught
    - Give no response or ask for help vs. perseverate
    - Sensitizing technique

Direct Tx of Cognitive Disorders: Executive Functioning

- Future Ideas
  - Awareness training ideas (Kennedy et al., 2008; Kortte & Hillis, 2011; Nilsson et al., 2011; Ownsworth et al., 2006, 2008; Schmidt et al., 2012)
    - Psychoeducation
    - Prediction paradigms (Cicerone, 2002)
    - Track own performance/guided self-evaluation
    - Videotape review/self-advocacy videos
    - Role play/reversal
    - Peer teaching
    - Best outcomes when use a variety of approaches (e.g., Ownsworth et al., 2006; Stuss, 1991)
**EF Tx: Future Ideas**

- **Goal Management training** (Dawson et al., 2009; Grant et al., 2012; Hickey & Saunders, 2010; Krasny-Pacini et al., 2014; Kurowski et al., 2013; Levine et al., 2011; Metzler-Baddley & Jones, 2011; Rand et al., 2009)
  - Target goal setting and planning/problem solving and self-regulation to achieve these goals
  - Steps
    - Set goal/identify problem
    - Separate relevant and irrelevant info
    - Generate steps/solutions
    - Select/apply a solution
    - Monitor effectiveness of steps/solutions
  - Suitable for individual and group tx settings
  - Outcomes

- **Holistic/Alternative Approaches**
  - **Mindfulness Meditation** (Orenstein et al., 2012)
    - Easy to learn
    - Faster reaction times
    - Patient report of ↑ relaxed/peaceful
    - ↑ WM and emotional status in healthy adults (e.g., Zeidan et al., 2010) and military personnel (e.g., Jha et al., 2010)
  - **Physical fitness training** (Lorenzen & Murray, 2011)
    - ↑ cognitive and language measures
    - ↑ WM following combined aerobic and strength training in older adults (e.g., Klusmann et al., 2010; Smith et al., 2010)
Pharmacological Approaches

• **Dopamine agonists** (Berthier et al., 2011; Napolitano et al., 2005)
  - e.g., amantadine, dextroamphetamine, methylphenidate, bromocriptine
  - **Drawbacks in aphasia related to high rates of** (e.g., Bragoni et al., 2000):
    - Side effects and patients with contraindications for taking high doses

• **Noradrenergic agonists** (Bedard et al., 1998; Berthier et al., 2011; Malhotra et al., 2006; Sawyer et al., 2008)
  - e.g., naphtoxazine, tricyclic antidepressants, clonidine, amantadine

• **Noradrenergic antagonists** (Beversdorf et al., 1999; 2007)
  - e.g., propranolol

• **Cholinergic agonists** (Atri, 2011; Berthier et al., 2011; Chang et al., 2011; Halbauer et al., 2009; Moretti et al., 2004; Wilkinson et al., 2010)
  - e.g., bifemelane hydrochloride, donepezil, citicoline, galantamine, rivastigmine

• **Modafinil/Provigil** (Arciniegas & Silver, 2007; Chew & Zafonte, 2009; Krupp, 2003; Young, 2011)

• **Serotonin agonists** (Halbauer et al., 2009; Levine & Langa, 2011; Narushima et al., 2007; Portugal et al., 2011; Tanaka & Bachman, 2007)
  - e.g., buspirone, sertraline, fluoxamine

• **NMDA/glutamate antagonists** (Atri, 2011; Berthier et al., 2009; Halbauer et al., 2009; Johnson et al., 2010; Lee, 2011; Paskavitz et al., 2007)
  - Memantine

• **Nootropic drugs** (Berthier et al., 2011; Diamond et al., 2000; Penn, 2000)
  - e.g., piracetam, gingko biloba
Indirect Treatment Approaches

• **Environmental accommodations** (Brush & Calkins, 2008; Catroppa & Anderson, 2006; Sander et al., 2007; Sohlberg & Turkstra, 2011)
  - Avoid distracting environments and numerous response choices
  - Neglect accommodations (Kerkhoff et al., 2012)
  - Pacing strategies
  - Task demand modifications
  - Organizational systems/structured environment (Michel & Mateer, 2006)

Indirect Treatment Approaches

• **Perseveration strategies** (Corbett et al., 2008; Frankel & Penn, 2007; Moses et al., 2004)
  - ↓ presentation rate
  - Give breaks between tasks to help establish a new set
  - ↓ semantic relatedness of targets
  - ↑ word/target frequency
  - Minimize repetition of stimuli during a task
  - Utilize extrinsic cues [e.g., phonemic, sentence completion]
  - Communication partner behaviors
Indirect Treatment Approaches

- **External devices** (Amaddi et al., 2014; de Joode et al., 2010; Shum et al., 2011; Sohlberg & Turkstra, 2011; Van de Sandt-Koenderman et al., 2007; Wild, 2013)
  - Practice standard/guideline for memory disorders (Cicerone et al., 2011)
  - Low tech
  - Specialized and main stream high tech
  - Specific vs. variety of settings

Sentence Shaper
(Linebarger et al., 2004; 2007; 2008; McCall et al., 2009)

- Computer program or “prosthesis” that reduces temporal and working memory demands of real-time language processing through self-directed practice
  - Records and stores patient’s speech for later manipulation/ordering and/or correction
    - Combine recorded segments into sentences and narratives
  - Can be used for nonspecific or specific grammatical structure training
  - Most success with patients who have:
    - Nonfluent aphasia
    - Some speech
    - Relatively intact auditory comprehension at word level
    - Some self-monitoring ability
    - Good grammaticality judgment for simple syntactic structures
**Sentence Shaper**

- **Outcomes in nonfluent patients** [Allbright & Purves, 2008; Linebarger et al., 2004; 2007; 2008; McCall et al., 2009]:
  - Narratives contain longer and grammatically complex sentences
  - ↑ informativeness in aided *and* unaided productions in many, but not all, patients
  - **Qualitative outcomes** [Allbright & Purves, 2008]
    - Use for e-mail
    - Less likely to use to augment communication in everyday life

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**Indirect Treatment Approaches**

- **Must explicitly and systematically** train external device and strategy use [Ehlhardt Powell et al., 2013; Mateer, 2009; Singer & Bashir, 1999; Sohlberg et al., 2007; Sohlberg & Turkstra, 2011]

  - **Application**
    - what strategy/device can do
  - **Acquisition**
    - Train how to use
      - e.g., errorless learning
    - Extensive practice needed
  - **Adaptation**
    - when, where, and with whom to use
      - Practice in daily contexts
Language Treatments That Consider Cognitive Limitations

• Patient- vs. paid/unpaid caregiver-implemented strategies (Nys et al., 2005; Rende, 2000; van Mourik et al., 1992)
  ✷ Caregiver-implemented may be more appropriate if patient (e.g., Schutz & Trainor, 2007):
    ▪ Has significant concomitant cognitive issues
    ▪ Has profound, diffuse brain damage

• Length of language treatment
  ✷ Longer treatment phase may be necessary if:
    ▪ Patient with aphasia has significant concomitant cognitive issues

Language Treatments That Consider Cognitive Limitations

• Cognitive-language treatment
  ✷ Treat language in multi-task/complex environments (Davidoff & Katz, 1985)
  ✷ Spaced retrieval in concert with anomia treatment (Fridriksson et al., 2005; Morrow & Fridriksson, 2006)
  ✷ Errorless learning (Ehlhardt et al., 2008; Fillingham et al., 2006; Lloyd et al., 2009; Middleton & Schwartz, 2012; Page et al., 2006)
    ▪ e.g., Errorless learning for anomia (Fillingham et al., 2005, 2006)
    ▪ e.g., Mapping plus errorless learning (Wierenga et al., 2006)
  ✷ ELA-Syntax Programme (Stark, 2005)
  ✷ Depth of encoding (e.g., Rajaram et al., 2012)
  ✷ Spatial attention considerations during anomia tx
    ▪ Dotson et al. (2008): Name simple line drawings 45° L of body midline
Variation (Bornhofen & MacDonald, 2008; Golisz, 1998; Piras et al., 2011)

- Tasks
  - Recognition vs. free recall vs. cued recall
- Stimuli (Ehlhardt et al., 2008; Jackson-Waite et al., 2003)
- Contexts
  - ↓ acquisition rate but ↑ maintenance/generalization

Relevance (Dawson et al., 2009; Ehlhardt et al., 2008; Horton et al., 2011; Wressle et al., 2002)

- Motivational, emotional, & functional significance
  - Patient-directed and/or adequate clinician explanation

Intensity and duration (Basso, 2005; Bhogel et al., 2003; Ehlhardt et al., 2008; Piras et al., 2011; Raymer et al., 2008)

- Minimum: > 2 hrs/week
- ↑ frequent sessions lead to ↑ acquisition BUT:
  - May or may not enhance long term maintenance
  - May not be suitable for all patient populations


Selected References


Selected References


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### Selected References


