

2017

The Complementarity between Theoretical Linguistics, Neurolinguistics, and Communication Sciences and Disorders

Deanna Yoder-Black

St. Cloud State University, deanna.yoder-black@live.com

Follow this and additional works at: https://repository.stcloudstate.edu/stcloud_ling



Part of the [Applied Linguistics Commons](#)

Recommended Citation

Yoder-Black, Deanna (2017) "The Complementarity between Theoretical Linguistics, Neurolinguistics, and Communication Sciences and Disorders," *Linguistic Portfolios*: Vol. 6 , Article 2.

Available at: https://repository.stcloudstate.edu/stcloud_ling/vol6/iss1/2

This Article is brought to you for free and open access by theRepository at St. Cloud State. It has been accepted for inclusion in Linguistic Portfolios by an authorized editor of theRepository at St. Cloud State. For more information, please contact rswexelbaum@stcloudstate.edu.

The Complementarity between Theoretical Linguistics, Neurolinguistics, and Communication Sciences and Disorders

Cover Page Footnote

This paper was presented as the keynote address to the Minnesota Undergraduate Linguistics Symposium, held at St. Cloud State University, St. Cloud, MN, in April 2016.

THE COMPLEMENTARITY BETWEEN THEORETICAL LINGUISTICS, NEUROLINGUISTICS, AND COMMUNICATION SCIENCES AND DISORDERS

DEANNA YODER-BLACK MS, CCC-SLP/L
ABSTRACT

As science evolves, there is an ever-increasing interplay between disciplines. In Communication Sciences and Disorders interdisciplinary theory is needed because of a number of factors such as the growing detail in imaging technology, the development of new strategies in the identification and the treatment of disease, and the nuances that arise in fields that have become more and more specialized. Linguistics and the Communication Sciences and Disorders are a perfect example of disciplinary complementarity. This paper is the written version of an invited plenary speech given in 2016 at the Minnesota Undergraduate Linguistics Symposium. The theme of the symposium was Linguistic Applications, namely how linguistics complements and influences other fields. The specific angle taken in this paper is the complementarity between Linguistics, Neurolinguistics, and Communication Sciences and Disorders. Speech Language Pathologists receive patients with diagnoses affecting their ability to use language to communicate effectively. On the basis of the diagnosis, they determine the linguistic symptoms and a course of action. In my clinic, not only does the Speech Language Pathologist use an interdisciplinary approach, but a transdisciplinary model of care is used, as will be explained later in the paper.

1.0 Introduction

Theoretical linguistics is comprised of many specialties and fields of study. While a discussion of theoretical linguistics is beyond the scope of this paper, it is not too much to delineate that there are four basic subsystems in the field, namely phonetics/phonology, morphology, syntax, and semantics. Neurolinguistics is also too large a topic to be fully discussed in this one paper, but in essence it is a science that seeks to identify how language is represented in the brain and the corresponding anatomical and/or physiological features. Lastly, Communication Sciences and Disorders is also too large to address in one paper. However, at its core, it is a science and art that focuses on the treatment of disordered speech. Speech language pathologists diagnose, evaluate, and treat speech related impairments. They also research higher level cognitive-linguistic processes such as attention, memory, and reasoning. In the remainder of the paper, we will see how theoretical linguistics, neurolinguistics, and Communication Sciences and Disorders interact in addressing the needs of people who for one reason or another require language services.

1.1 The Contribution of Phonetics and Phonology

Phonetics and phonology combine to be the study of speech sounds and how sounds are then organized within a language. In phonetics the brain takes in the physical property of sound through the auditory apparatus. Sound waves enter the ear canal, the cochlea, the vestibulocochlear nerve (Cranial Nerve VII), and the auditory cortex. Speech sounds are processed differently from other extraneous sound waves. Phonology then is the study of how those target speech sounds are organized into a system that denotes meaning within a language. These two fields combine to determine which sounds in any given language are distinguishable and meaningful from any other noise that the ear hears. The changes in structure and movement of air flow through the respiratory tract provide speakers and listeners with a means to create sounds waves. These sounds waves are then assigned, in language, some relative meaning

whether it is alphabetically, syllabary, or orthographically. This is important because based on Pulvermüller, Shtyrov and Hauk 2005 noises that are actually speech sounds may be perceived as noise without further accompanying speech context (e.g. “chirp-like noises constituting stop continuants”).

1.2 The Contribution of Morphology

Morphology builds upon phonetics and phonology to identify how those sounds combine to form a structure that maintains meaning. These structures are not limited to words (lexicology) but also the smallest component that can affect meaning such as declensions, prefixes or suffixes. The brain in morphology accesses the word and grammatical pieces that the person will utilize to understand the meaning of the communication- taking the individual components as units, then identify which consequently carry meaning or change meaning with their addition and/or subtraction. The word <tense> can be can be changed a multitude of ways e.g. tense as a verb means to be not relaxed at this moment (static, unchanging, is). If <-ed> is added it becomes a verb plus past, if <-ing> is added it becomes verb plus present (dynamic, is in the process of doing), if <-ion> is added it becomes a noun, if <-ly> is added it becomes an adverb.

1.3 The Contribution of Semantics

Semantics is fundamentally what an individual knows about concepts and language is used to explain those things to someone else. What makes one word different from another? The person who is generating a message has within their lexicon a definition based on features, generally identified as semantic features (not the phonetic or phonologic features of the acoustic signal), that distinguish the chosen word from all other words. A word is chosen based on its ability to accurately convey such things as number, life, function, location- details that will specify to the listener what or whom is being referenced. Further, semantics is impacted by what the speaker presumes the listener knows about language. This factor does not necessarily impact semantics at its core, but it impacts how semantics is utilized. It can also lead to one or the other changing the features that are assigned to specific words in the lexicon as the individual learns more about the world e.g. a child learns shapes as circle, square, triangle. As they continue to interact with the world they are introduced to the fact that shapes are not only two dimensional but can be three dimensional- a ball is a circle that contains volume, a cube is a square with volume, a pyramid is a triangle with volume.

1.4 The Contribution of Syntax

Syntax is primarily thought of as the rules of language that determine how words are put together to organize words into phrases, phrases into sentences, sentences into utterances. Why is it important that language has rules? Word order, punctuation (whether written or spoken), and structure rules ultimately determine how the respondent understands what the communication initiator produced: e.g. “Please come here” vs. “Come here please”: which is important? In the first example the sentence is likely a polite request whereas the second sentence is likely a disgruntled command. “The fast car is red” vs. “The red car is fast.” Which is important? In the first example it is the fast car, in the second it is the red car. These nuances are important in diagnosis and therapy.

2.0 The Contribution of Neurolinguistics

Now that the reader has a basic understanding of Theoretical Linguistics, attention should turn towards Neurolinguistics. As mentioned before, this field delves into the brain and the anatomical/physiological components important to language. The Linguistic Society of America defines Neurolinguistics as “the study of how language is represented in the brain: that is, how and where our brains store our knowledge of the language (or languages) that we speak, understand, read, and write, what happens in our brains as we acquire that knowledge and what happens as we use it in our everyday lives.” The society also identifies Psycholinguistics as a close cohort of Neurolinguistics. The latter is defined as “the study of the language processing steps that are required for speaking and understanding words and sentences, learning first and later languages, and also of language processing in disorders of speech, language, and reading.”

2.1 The Location of Language Functions in the Brain

People have long wondered if there was a language center in the brain. It becomes esoteric when people start conversing about “minds” or “consciousness” but at its heart Neurolinguistics really just seeks to identify what is language “doing” in the brain. The answer continues to become more and more complex as imaging studies improve in their scope. Dr. David Caplan, MD who wrote the book, *Neurolinguistics and Linguistic Aphasiology*, in 1987 opened a section with the statement “What do we want to know about language breakdown and the relationship between language and the brain? It has been said that the most important thing a scientist must learn is which questions to ask...”(4). The depth and breadth of detail that is now available to brain scientists has led to fascinating looks at language and how it functions in the brain. These insights have come from studying all kinds of insults, whether traumatic or atraumatic. These insults help understand how the brain works because it is easier to identify impaired or non-function rather than perfectly functioning structures. Beginning with Paul Broca and Carl Wernicke in the mid to late 1800s, the neural seat of language has been located to the left hemisphere of the brain, primarily in the temporal and parietal lobes.

The interactions between Theoretical Linguistics and Neurolinguistics is clearly visible from insults to different areas of the brain. Broca’s Area was postulated to be responsible for language production. This area is primarily within the temporal lobe, but at the junction of frontal, temporal, and parietal lobes. Change in language resulting from damage to Broca’s Area typically resulted in difficulties with morphology and syntax. Wernicke’s Area was postulated to be responsible for language reception. This area is primarily in the parietal lobe. Change in language resulting from damage to Wernicke’s Area typically results in difficulties with semantics.

2.2 New Insights

During the time of Broca and Wernicke, and for decades after, the study of language and the brain was relegated to findings based on autopsies or simple experiments such as electric stimulation to exposed brain tissue (a phenomenal book detailing these and other somewhat macabre experiments is *The Tale of the Dueling Neurosurgeons: The History of the Human Brain as Revealed by True Stories of Trauma, Madness, and Recovery*” by Sam Kean). The field of Neurolinguistics started with these static, humble beginnings. It has now progressed as new and probing questions are asked, such as by Pulvermüller et al.’s question “are different kinds of information extracted from a stimulus processed in a serial fashion or rather in parallel.”

Research now shows that there are a multitude of areas that are accessed and/or utilized during language comprehension and expression. Pulvermüller (1999) contends that there different areas of neuronal activation between nouns and verbs. Nouns, especially concrete nouns, that is, names of objects that can be seen or touched, will activate a network of brain areas that include the occipital lobe (visual center of the brain). Verbs, on the other hand, will activate a network of brain areas that include the frontal lobe's motor cortex.

As Neurolinguistics and Psycholinguistics evolved, there were difficulties that could not be explained, especially when these damages occur in the arcuate fasciculus, the hippocampus, and the frontal lobe. Pulvermüller (2001) found that when areas of the motor cortex are initiated, *even more discrete areas of the homunculus react*. Words or gestures encoded in words such as licking, kicking, and picking are heard or spoken and result in activation of specific areas of the homunculus even though the action is not being performed physically but only being utilized linguistically.

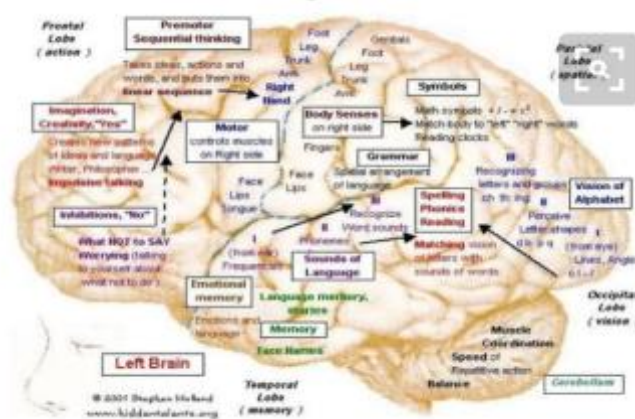


Figure 1: Brain Parts and Functions

3.0 The Work of a Speech Language Pathologist

A Speech Language Pathologist is a practitioner who applies insights from Theoretical Linguistics, Neurolinguistics, and multiple disciplines to help people in need of language services. The therapist may work with a patient of any age, any gender, any socioeconomic status, in a variety of settings not limited to hospital, clinic, outpatient, school, skilled nursing facility, nursery, home... Undergraduate studies typically have at least one course in phonetics and phonology, as well as an anatomy course focusing on the structures and functions of body parts related to breathing, speaking, swallowing, hearing, and the brain. This brings us to the final component in the title of this paper, complementarity. Niels Bohr's (1934:18) description of complementarity in the new approach to medicine underscores the breath of academic disciplines that informs the work of a Speech Language Pathologist, "In our description of nature the purpose is not to disclose the real essence of phenomena but only to track down as far as possible relations between the multifold aspects of our experience." So much of medicine is moving toward a holistic approach to patients. What is happening in one system affects another system; often it is difficult to determine if a symptom is only a symptom or if it is in fact an antecedent to another system, or if it is exacerbated by other causes or effects.

4.0 Case Studies

The following are cases studies of the kinds of clients that Speech Language Pathologists interact with routinely in the course of their works. The medical information included is copied verbatim from their medical records as noted in their clinic files. In some instances, the amount of information provided to the clinician was copious, in others it was quite brief. The readers of this paper receive the same information to which the clinician had access. Abbreviations are included as they are quoted with an explanation in brackets “[]” added by this author. In other words, these are real cases except that the names of the people and care facilities have been changed to protect the anonymity of patients, practitioners, and care facilities. In the case of quotes, or in one instance poetry, releases have been obtained and signed by all patients and/or care-givers. In some instances the deficits are not primarily due to speech and/or language deficits. They are deficits that rely on language to function. Some are related to cognition, namely deficit in attention, memory deficit, deficit in abstract reasoning, in sequencing, problem solving. If there are language/speech deficits, they may not be related to the left hemisphere. Newer research is focusing on the higher level language skills and processes required to understand idioms, sarcasm, and innuendos. These are skills associated with the right frontal lobe.

In my professional routines, I practice with the transdisciplinary model and ask three basic questions for each case that is presented to them. The questions are:

1. What are the linguistic areas for which help is needed?
2. What are the neurolinguistic manifestations?
3. What effects can be remediated and how best to do so?

4.1 Case 1

Brittany is a 12-year-old female middle school student: Patient referred for difficulty with speech and language. Patient has speech/language/pragmatics/ deficit and right facial flaccidity. The onset is due to chronic symptoms. The patient has a history of seizures prior to surgery. The history is taken from Drs. Jones and Thompson from Area Children's Hospital encounter date 01/01/2015 "History of refractory epilepsy and developmental delay that resulted in intracranial grid placement and left temporal lobectomy on 01/02/2015 followed by a left hemispherectomy with EVD (external ventricular drain). A tube was placed from inside the skull to a receptacle outside the body allowing for drainage from around/in the cranial cavity. The procedure was done on 01/03/2015 for ongoing seizures... taken to the operating room by Dr. Jones on 01/03/2015 for grid placement when the temporal lobe was found to edematous and taugth. he therefore proceeded with treatment with left temporal lobectomy. Post-operatively she had seizures requiring rescue medication and eventually midazolam drip. She was in the PICU (Pediatric Intensive Care Unit) intubated during this time. From a neurological standpoint she had right hemiplegia, dysphagia (sic), and no spontaneous speech after her initial surgery. She was then taken back to the operating room on 01/04/2015 for partial left hemispherectomy including portions of the frontal, parietal and occipital lobes as well as interruption of the corpus callosum and had EVD placement. Post-op she was in the PICU, though she was able to wean from the midazolam without seizures and has remained seizure free.... continued to have right sided weakness and with an additional left sided weakness as well as ongoing dysphagia and decreased speech output...

The Speech Language Pathologist dealing with this patient asks the three questions mentioned above. From Brittany's evaluation, it was determined that she had phonetic/phonology, morphology, semantic, and syntactic deficits. The neurolinguistic question for Brittany for which a response is required is this: "Are the effects explicable by damage to the neural correlates to language? The answer to this question is 'yes.' This patient had initial removal of the left temporal lobe, followed by complications leading to the total removal of the left hemisphere due to chronic, debilitating seizures. In regard to speech therapy, the treatment plan focused on goals such as understanding expanded sentences, use of a variety of nouns, verbs, modifiers, and pronouns, naming objects given a description, use of past tense verbs, following complex and/or multi-step directions, use of figurative/abstract language, response to indirect questions, tangential sentence use, voice quality adjustment, loudness adjustment, articulation, speech intelligibility. The video clip that was included in the initial presentation focused on the training of prepositions and how they are used in language. Explicit training in each preposition focused on its relationship to the other concepts in the sentence.

The following is a therapy dialog session with Brittany:

- Clinician : *"The bridge goes across the river. So what is my preposition?"*
- Brittany : *"The bridge"*
- Clinician : *"The preposition" and then prompts "a..." with Brittany finishing: "across" The clinician continues: "Can a rabbit go 'the bridge'?"*
- Brittany : *"No"*
- Clinician : *"Can a rabbit go 'the river'?"*
- Brittany : *"No"*
- Clinician : *"Can the rabbit 'go across'?"*
- Brittany : *"No... Yes!"*
- Clinician : *"Yes, the rabbit CAN go ACROSS! Good job! Now just remember we're working on prepositions but that means we still focus on speaking slow and clear. So now what is going across?"*
- Brittany : *"The rabbit."*
- Clinician: *"So in my sentence 'the bridge goes across the river' what goes across?"*
- Brittany again replies: *"The rabbit."*
- Clinician: *adds stress "the BRIDGE goes ACROSS the river"*
- Brittany : *"The river"*
- Clinician: *"and what goes across the river?"*
- Brittany : *"The bridge"*
- Clinician: *"So in my sentence the bridge and river are being compared by across"*

This interaction accomplishes several goals. Linguistically, the therapist is teaching discrete elements of language, including the preposition "across." Furthermore, the therapist is also teaching pragmatics and figurative language as in the use of the verb "go" in the sentence "The bridge goes across the river." The therapist is also teaching extrapolation by bringing in the "rabbit." The therapist is also teaching articulation/intelligibility that needs to be remediated as well. Brittany is told explicitly "We' are working on prepositions but that means we still focus on speaking slow and clear." With this patient each preposition required explicit teaching and careful steps toward generalization from concrete to abstract use.

4.2 Case 2

Jessica is a 24-year-old waitress. She is a single mother with two children age 4 years and approx 18 months. "Patient is referred for difficulty with speech and language and cognition. Her condition was brought on by motor vehicle accident. The of MRI 02/01/2016 revealed "bilateral diffuse axonal injury superimposed on scattered mild subarachnoid hemorrhage and small right posterior subdural hematoma...with polytrauma (trauma to multiple body parts/systems sustained at one time), R orbital fx (fracture around the right eye), R maxillary fx (fracture around the right maxilla), TBI (traumatic brain injury), dysphagia (swallowing difficulty) s/p (status post, or "after") extubation." Clinician history/intake form states, "Word finding, stuttering, language formulation, language comprehension, memory... Her diagnosis was mild-moderate word-finding and naming deficits, mild deficits in memory, language, and visuospatial skills. At discharge, MoCA v.7.1 (Montreal Cognitive Assessment). It is a quick screening tool that looks at various areas of linguistics and cognition, typically given in the hospital to assess if the patient warrants Speech Language Pathology treatment. The assessment was completed on 02/02/2016 with score of 23/30. This score indicates a mild cognitive-linguistic deficit. The patient makes errors in language and has a hard time with recall. During her stay in inpatient rehab, the patient has been trained in compensatory strategies for memory, including use of a memory log, which she now uses with modified independence. The patient has also made progress with naming and word-finding. She makes fewer errors and has improved retrieval information retrieval time in conversation.

The Speech Language Pathologist dealing with Jessica asked the same three questions mentioned previously. Then a strategy is developed to assist Jessica. The strategy consisted of decreasing frustration. Treatment plan involved therapy focusing on remediating stuttering behaviors that occurred in higher stress environments, anomia (word finding difficulties), memory, and reasoning. There was also a component of the therapy program that addressed decreased sensation to the right side of the patient's face internally and externally.

In the following session, the therapist trying to get Jessica to recall three words: bricks, building, and plan. Jennifer's task focused on the descriptions "party, key, poker."

- Clinician "What were the three words you needed to remember?"
- Jessica "Plan, and bricks and um..."
- Clinician "Yep, go ahead"
- Jessica "I wanna say house?"
- Clinician "So a house is a type of what?"
- Jessica "Oh building!"
- Clinician "There you go, good Jessica!"
- Jessica "I was like I know there's something else..."
- Clinician "So what type of strategy did we use by me telling you 'a house is a type of what?' Is it Picture it, Organize it, Write it, or Repeat it?" (The acronym that this clinician teaches for recall is "giving your memory some POWR; P is for Picture it, O is for Organize it, W is for Write it, R is for Repeat it).
- Jessica "It's uh.. uh organize it?"
- Clinician "Yep, what I did was give you a category."

This task is important because it fulfills two goals simultaneously. It allows the patient to find the right word when presented with circumlocution cues. Additionally, it demonstrates how much working memory ability the patient is able to utilize. Working memory is the ability to hold on to information and then use even when the memory has been interrupted.

4.3 Case 3

James, 78, is a retired white-collar worker who in his retirement has become a poet- an example of his poetry was used as a therapeutic tool and will be seen below. “Patient was referred for difficulty with cognition. He was in a car accident, having been struck from behind. His diagnosis was that he had “difficulty with headaches which occur on a daily basis. Tilting his head posteriorly tends to trigger the headaches. They are essentially holocephalic and are associated with photophobia and phonophobia but no significant nausea. He also has noticed irritability, difficulty with equilibrium, worsening of sleep... difficult to with cognition (sic).” He is also diagnosed as having "difficulty with speech, memory, concentration.... speech and memory/word finding get worse when more tired or over-stimulated, feels like a fog..."

Prior to the injury, James wrote poetry. Here is one of his poems:

Cane poles, fishing holes, dusty roads there and back
A dog named Fred, who could beg,
And tree possums, two green frogs, turtles on logs,
Warm mud curling between your toes late at night
Firefly light, seems so long ago
A man full grown, can't go back, though he'd like to try
To a simple time, trees to climb, rope swing over the fishing hole
The world turns fast, nothing's made to last
And the new outruns the old
And when I'm told, my time has come to quit this very track
There'll be cane poles, fishing holes, and dusty roads there and back

After his injury, he composed the following poem:

The social media worldwide has become a cesspool of spew
And sometimes you just need to flush your mind
Sensory overload is an avalanche of carnage-laden images
And sometimes you just need to flush your mind
We all become inured to damage done to our integrity, vociferous
And sometimes you just need to flush your mind
And at some point you just need to walk away
Because it is you getting flushed by your own hands

In this example it is apparent after looking at the phrase structure and the lexical selection that James has had a change in his linguistic ability. At the time of writing, no imaging studies were available for this patient, but clinical experience would suggest that the patient suffered a broad injury due to a concussion received in a motor vehicle accident. His deficits are commensurate

with that type of injury. The treatment plan for him focused on memory, reasoning, and language use.

4.4 Case 4

Tom is a 41-year-old sportsman. The patient was referred for difficulty with speech and language. His situation was brought on by an on the job injury. The discharge summary from the hospital reads as follows, "This is a previously healthy, 41-year-old-male, who while standing in his boat was struck by a float aircraft-plane in the head. He was notably unresponsive at the scene with a severe traumatic brain injury noted to have a Glasgow coma score of 3, with posturing and trismus. He was stabilized and transferred to Area Medical Center. He had a severe traumatic brain injury...Complex left frontal temporal sinus and basilar skull fractures, as well as a fracture of the temporal mandibular fossa... He shows moments of being automatic, moving the right side, a right gaze preference, purposeful interactions with his children and his CRS-R scores are certainly 12-13 on a more consistent basis. He now has eye opening and his exotropia is better on the left than on the right..."

At the time of the presentation, no linguistic diagnosis was made for the patient because he was technically minimally conscious. The prognosis is that this patient would have major language difficulties because all brain systems have been affected, from basic cerebellar life-sustaining systems to higher cortical level functions. The treatment plan for him at this stage focused on arousal/awareness, simple commands for body position. He was given simple commands such as such as "right hand open." There was a delay of three minutes between initial command and the patient's ability to access correct musculature in the right upper extremity through hand. The clinician was overheard saying this to him:

Think hard, right shoulder, right elbow, right hand, open open open open, right hand open... keep working at it, right hand right hand right hand open open open... oh that's closed, other way. Keep that thumb open, that will help with fingers.

Eventually, Tom was able to isolate and open the thumb, index, and middle fingers of the right hand.

4.5 Case 5

Deborah is 73 years old. She is a retired stay at home mother. She was referred for difficulty with speech and language stroke that affected "1/3 of the left side of her brain." She has had prior treatment at an acute care hospital followed by weeks inpatient rehabilitation, and a 2-month stay at a transitional care center. She displayed linguistic symptoms in phonetics/phonology, morphology, and syntax. These symptoms are explicable because of areas of the brain that are affected. The stroke was a large and dense in the left parieto-temporo-occipital area. In some areas the damage was dense nearly to the white matter tract of the corpus callosum. Treatment plan focused on Yes/no questions, naming, two word phrases, following directions, writing/spelling.

4.6 Update on the Patients

Brittany, the middle school student with the temporal lobectomy, has been away from therapy for the duration of the summer vacation. Upon returning from the break, she resumed therapy and transitioned to the next grade level in her school. She continues to receive therapies

both in school and in the private clinic. Her intelligibility is 90%. She can answer WH-question, regular and irregular verbs and nouns. She continues to work on understanding higher levels linguistic functions such as those requiring sarcasm, abstraction, and figurative language. She cannot produce nasal segments or nasalize vowels. However, Brittany is able to now control the loudness of her speech. Jessica, the waitress, has completed a round of neurological physical therapy. She has returned to driving after passing the Disabled Driver's Evaluation. She has returned to caring for her two children independently. She has also returned to work, albeit on a light schedule. She will be returning for follow-up at the clinic for cognitive-linguistic therapy. James, the retired poet, was doing well in therapy at the original time of presentation. Since then, there has been a marked downturn in his abilities. He underwent neuropsychological and neurological testing which revealed early stage dementia, likely Alzheimer's type. The patient is continuing therapy with the goal of maintenance of functions and/or slowing the progress of the Alzheimers. Tom, the patient who suffered from the plane injury, continues to have inconsistent but steady improvement. Progress is hard because of the type and complexity of the injury that he suffered. He is prone to frequent infections and hospitalizations. The patient however is now consistently following simple to two-step directions during physical therapy. He is also attempting to vocalize. He also is able to answer yes/no questions via simple movements. He appears to recognize and feel emotion such as frustration and pleasant interactions. Deborah, the retired homemaker, took hiatus from therapy as dictated by Medicare when her progress slowed. At the time of her discharge, she was able to accurately convey yes and no via head nods. She was able to produce the appropriate verbal response for the majority of the time. She will return to therapy, after a Medicare mandated break of 60 days.

5.0 Summary

Fairclough and (2005) makes a distinction between “transdisciplinary” and “interdisciplinary” approaches. He explains the difference as follows, “A transdisciplinary approach is distinguished on the one hand from forms of interdisciplinary research which assemble diverse disciplinary resources (theories, methods) for particular research projects without expecting or seeking any substantive change in these resources or in the relationship between them... A transdisciplinary approach asks ‘how a dialogue between two disciplines or frameworks may lead to a development of both through a process of each internally appropriating the logic of the other as a resources for its own development.’” The approach I use in the outpatient rehabilitation health center where I work is transdisciplinary in nature. I work cooperatively with my Physical Therapist. We use all tools available to us, – theories, skills, tactics, and strategies – from both disciplines to help our patients. This is what we have done for the patients in the case studies in this paper. Linguistics, Neurolinguistics, and Communication Sciences and Disorders not only complement each other, but they are used in a transdisciplinary fashion to help patients such Brittany, Jessica, James, Tom, and Deborah.

ABOUT THE AUTHOR



Deanna Yoder-Black is a graduate (BA 2002 Linguistics, BS 2004 Communication Science and Disorders) of St. Cloud State University. She went on to earn her Master's of Science in Speech Language Pathology from Boston University (2006). She has the unique position, then, to utilize her linguistics foundation in the treatment of her patients. Deanna's patients primarily see her for neurological communication and cognition disorders resulting from a variety of neurological insults (e.g. stroke, brain injury, progressive disorders, congenital disorders). Deanna is passionate about the field of Neurolinguistics and strives to utilize this exciting sub-field of Theoretical Linguistics in order to improve patient outcomes as her patients aspire to return to home, work, and life. Deanna has traveled the United States gaining a wide variety of experience while working in IL, NC, GA, TX, MN, VA, and AK. She currently works and resides in the great state of Alaska. Her plenary talk highlighted the complementarity between Theoretical Linguistics, Neurolinguistics, and Communication Sciences and Disorders.

Published Works Cited

- Bohr, Niels. 1934. *Atomic Theory and the Description of Nature*. Cambridge University Press, Cambridge, UK.
- Caplan, David. 1987. *Neurolinguistics and Linguistic Aphasiology: an Introduction*. Cambridge University Press, Cambridge, UK.
- Fairclough, Norman. *Critical Discourse Analysis in Transdisciplinary Research*. Ch. 3. From *New Agenda in (Critical) Discourse Analysis: Theory, Methodology, and Interdisciplinarity*. ed. by Ruth Wodak. John Benjamins Publishing Company. Philadelphia, PA USA 2005.
- Pulvermüller, Friedemann, Yury Shtyrov, and Olaf Hauk. August 2009. Understanding in an Instant: Neurophysiological Evidence for Mechanistic Language Circuits in the Brain. *Brain and Language*. 110. 2. 81-94.
- Pulvermüller, Friedemann. December 2001. Brain Reflections of Words and Their Meaning. *Trends in Cognitive Sciences* 5. 12. 517-524.
- Pulvermüller, Friedemann, Werner Lutzenberger and Hubert Preissl. Jul/Aug 1999. Nouns and Verbs in the Intact Brain: Evidence from Event-related Potentials and High-frequency Cortical Responses. *Cerebral Cortex* 9. 5. 497-506.

Electronic Works Cited

- Figure 3 <https://bhavanajagat.files.wordpress.com/2009/08/brocas-area-brains-speech-center.jpg>. retrieved 2016.
- Figure 4 http://www.ling.upenn.edu/courses/Fall_2001/ling001/brain_func2.gif. retrieved 2016.
- Figure 5 <http://hiddentalents.org/brain/jpg/b-left.jpg>. retrieved 2016.