

**DYSARTHRIA TREATMENT:
PRACTICE GUIDELINES AND
OPTIONS – PART 2**
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TREATMENT FOR ARTICULATION: SURGICAL MANAGEMENT

- Neural anastomosis
 - This procedure is designed to restore function to a nerve (usually CN VII); connect a branch of CN XII to CN VII (which is damaged). Can result in some lingual weakness and swallowing difficulty (oral phase).
 - Usually done for cosmetic purposes rather than for improving articulation; thus, client would have no dysarthria or mild dysarthria
- Botox injection
 - For those with hemifacial spasm, spasmodic torticollis, oral mandibular dystonia, lingual protrusion dystonia, and jaw tremor
 - Designed to reduce the abnormal movements associated with hyperkinetic dysarthria; evidence of effectiveness for those with lingual protrusion dystonia and orofacial and mandibular dystonia

TREATMENT FOR ARTICULATION: SURGICAL MANAGEMENT

○ Segmental Gracilis Muscle Transplant

- For children with Mobius syndrome (paralysis of CN VI and VII bilaterally)
- Transplant the segmental gracilis muscle (in the thigh) to the face (use the motor nerve to the masseter for reinnervation)
- Speech difficulties improved in all 10 children in a study Zuker et al. (2000)
- Improvements in drooling, drinking, speech, and facial expression



TREATMENT FOR ARTICULATION: PROSTHETIC MANAGEMENT

- Bite Block
 - Small piece of putty or acrylic that the client holds between the lateral upper and lower teeth
 - Designed to help with jaw control
 - Target populations: those with jaw opening dystonia (person inhibits jaw opening by biting on the bite block), persons with hyperkinetic dysarthria who have involuntary movement of the jaw, or those with flaccid dysarthria (force the client to use the lips and the tongue by NOT allowing the jaw to compensate for weak lip/tongue movements)
- Pacing Board – precision of artic can improve when rate is slowed
- Alphabet Board – precision of artic can improve when rate is slowed
- Speech Enhancer
 - Discussed previously

TREATMENT FOR ARTICULATION: BEHAVIORAL INTERVENTION – TRADITIONAL APPROACHES

- Integral stimulation – “Watch me, listen to me, do as I do”
- Phonetic Placement – clinician shows illustrations of correct placement of articulators and/or physically manipulates client’s articulators
 - The University of Iowa Phonetic library
www.uiowa.edu/~acadtech/phonetics/about.html
- Phonetic Derivation – derive a target speech sound from a nonspeech gesture (e.g., blowing) or from an intact speech sound
- Exaggeration of consonants – tell client to increase effort and slow rate; work at syllable or word level rather than sounds in isolation
- Use of compensatory articulatory movements (e.g., use tongue blade instead of tip)

TREATMENT FOR ARTICULATION: BEHAVIORAL INTERVENTION – TRADITIONAL APPROACHES

- Determine which articulation errors result in a decrease in intelligibility; target those articulation errors first
- Contrastive drill tasks
 - Minimal contrasts (e.g., Sue, shoe)
 - Look at client’s artic errors when designing the contrasts
 - Client is told to make the distinction between the minimal contrasts as clear as possible
- Intelligibility drills
 - Stimuli could be words, sentences, pictures
 - The clinician does NOT know the stimulus that the client will produce; correct/incorrect guesses are feedback to the client
 - Client modifies his/her production if clinician guesses incorrectly

TREATMENT FOR ARTICULATION: STRENGTH TRAINING

- Controversial because there's limited info about its effectiveness
- Contraindicated for those with degenerative neuromuscular disease such as ALS
- Most likely candidates are those with nonprogressive flaccid dysarthria; additional possible candidates: some persons with unilateral UMN dysarthria, spastic dysarthria, and hypokinetic dysarthria (persons with weakness)
- Procedures include moving the jaw, tongue, or lips often against external resistance and often in the context of nonspeech exercises
- Expert opinion suggests that few people with dysarthria are candidates for strength training because only a small amount of force of the articulators is needed for speech (lips and tongue use only 10-30% and jaw uses only 2% of their maximum forces for speech)

TREATMENT FOR ARTICULATION: STRENGTH TRAINING

- Argument FOR strength training: such training "can be directed at variables other than increasing tension and force" (Duffy, p. 477); strength training could be directed at endurance or speed
- Endurance may be a target for those with dysarthria who experience fatigue while speaking
- Speed may be a target for those who have a slow rate of speech
- If strength training is undertaken, "the effort should be concerted... exercises done in 5 sets of 10 repetitions each, 3 to 5 times per session, with 5 to 10 exercise periods per day." (Duffy, p. 478)
- Could use the Iowa Oral Performance Instrument (IOPI) to measure strength and endurance; it's a pressure-sensing instrument (\$1,125 <http://www.iopimedical.com/>)

TREATMENT FOR ARTICULATION: RELAXATION EXERCISES

- Appropriate candidates would be those with spasticity or rigidity
- Exercises might include shaking the head and jaw to loosen jaw movement; chewing movements to reduce high muscle tone in the jaw and tongue
- Persons with dysarthria may be unable to perform the movements required for the exercises in addition to being unable to perform the target muscle movements required for speech production
- May be better to focus on the movements required for speech

TREATMENT FOR ARTICULATION: STRETCHING

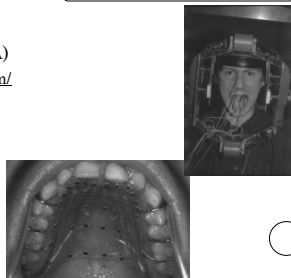
- A person might stretch the muscles to prevent symptoms of spasticity (limb literature); slow, steady stretching is recommended
- Perhaps slow, steady stretching of the articulators beyond their normal range of motion (ROM) would improve ROM and decrease spasticity in the context of speech; may improve strength
- The most appropriate candidates would be those with rigidity or spasticity
- "There is neither positive nor negative evidence regarding the effect of stretching exercise on speech" (Duffy, p. 478)
- Stretching the lips and the tongue may not be beneficial in terms of reducing spasticity because the lips and tongue don't exhibit the typical pattern of stretch reflexes

TREATMENT FOR ARTICULATION: INSTRUMENTAL BIOFEEDBACK

Types of Instrumentation

EMA (top) & EPG (bottom)

- Electromagnetic articulography (EMA)
 - <http://abcnews.go.com/Video/playerIndex?id=7555114>
- Electropalatography (EPG)
- Electromyogram (EMG)



TREATMENT FOR ARTICULATION: INSTRUMENTAL BIOFEEDBACK

- Some data (sparse) supports that spasticity and hypertonicity (dystonia) can be modified using instrumental biofeedback; improvements in speech intelligibility have been reported
- Subjects have included those with PD, hemifacial spasm, and spastic dysarthria
- The lips, face, tongue, and jaw have been a target of intervention

SPEAKING RATE: SELECTING THE APPROPRIATE TECHNIQUE

- **Effectiveness**
 - Does the technique elicit the desired speaking rate?
 - Is there an appropriate distribution of pause time?
- **Training requirements**
 - Lots of training required or a little?
- **Consequences**
 - Improved intelligibility?
 - Negative consequences for naturalness?
 - Is the ability to produce breath groups that are closely associated with the meaning of the utterance affected?

RIGID RATE CONTROL TECHNIQUES

- Pacing boards
- Alphabet board supplementation
- Metronome
http://www.woodwindandbrass.co.uk/acatalog/wittner_piccolo_metronome.jpg
- Advantages
 - Effective in slowing rate
 - Increased intelligibility/comprehensibility
 - Inexpensive
 - Require little user training
 - Allow for continual practice of slowed rate
- Disadvantages
 - Disrupt the naturalness of speech
 - Cosmetically unacceptable
 - Loss of eye contact with communication partner
 - Adaptation to the rate control technique

RATE CONTROL TECHNIQUES THAT PRESERVE PROSODY

- Oscilloscopic Feedback
- Rhythmic Cueing
 - Clinician signals speaking rate
 - Computer signals speaking rate
- Backdoor approaches
 - Train loudness and person reduces rate of speech
 - Train phrasing and breath patterning
- Delayed Auditory Feedback (DAF)
- Advantages
 - Naturalness is better preserved
 - Speakers can develop their own compensatory strategies
 - Independent practice possible
- Disadvantages
 - Lots of training required
 - Speaker must have learning ability
 - Speaker must devote time to learning the technique

SELECTING AN OPTIMUM SPEAKING RATE

- Take intelligibility and naturalness into consideration
- Normal rate of speech is usually not a goal
- Reevaluate speaking rates and rate control strategies periodically
- Use more rigid rate control techniques as the speech disability becomes more severe

SPEAKING RATE: ANCDs SYSTEMATIC REVIEW

- 19 articles were reviewed (Yorkston et al., 2007)
- Tx included external pacing devices (n = 5; DAF, pacing board, metronome), computer training (n = 3), behavioral instructions (n = 10), & biofeedback (n = 1)
- Subjects included those with ALS, TBI, anoxia, PD, CP, tumor, and others
- Most common dysarthria types included hypokinetic, mixed, ataxic, and spastic
- Severity of dysarthria ranged from mild to profound
- Perceptual ratings were included in 79% of the studies, acoustic measures were included in 74% of the studies, physiologic measures were included in 11% of the studies

SPEAKING RATE: ANCDs SYSTEMATIC REVIEW

- The studies that were reviewed showed that a decrease in speaking rate resulted in improved intelligibility; this was true for sentence intelligibility but not phoneme intelligibility
- There was a larger decrease in naturalness when rate was decreased in typical speakers compared to when rate was decreased in dysarthric speakers
- Rate can be modified using a variety of techniques
- Outcome may depend on the characteristics of the dysarthria (e.g., severity) and the intervention strategies
- We don't have info about generalization to natural communication settings

PERCEPTUAL CHARACTERISTICS OF PROSODY IN DYSPHAGIA

- Stress Patterning
 - Monoloudness
 - Monopitch
 - Excessive loudness variation
 - Loudness decay
 - Alternating loudness
 - Reduced stress
 - Excess and equal stress
- Intonation
 - Pitch level that is too high or too low
 - Monopitch
 - Short phrases

PERCEPTUAL CHARACTERISTICS OF PROSODY IN DYSPHAGIA

- Rate-Rhythm
 - Increased or decreased rate
 - Increased rate in segments or overall
 - Variable rate
 - Prolonged intervals
 - Inappropriate silences
 - Short rushes of speech
- Prosodic disturbances are a characteristic of all the dysarthrias studied by the Mayo Clinic group
- Darley and colleagues identified two general types of prosodic disturbance: excessiveness (seen in cerebellar lesions, and characterized by excessive and equal stress) and reduced prosody (seen in parkinsonism, and characterized by monopitch and monoloudness)

PROSODY: ASSESSMENT & INTERVENTION

- Perceptual Assessment of Accuracy and Naturalness
 - Get info about targeted stress (the syllable on which the speaker intended to put the primary stress) and the perceived stress (the syllable that the listener judges to be most important)
 - Increase the person's ability to signal stress if s/he cannot do this. The error may be failing to signal stress at all or sending misleading acoustic signals (e.g., longest duration on one syllable, but highest F_0 on a different syllable)
 - If person is able to signal stress appropriately, you may work on increasing the naturalness of the production.

PROSODY: ASSESSMENT & INTERVENTION

- Acoustic Analysis of Habitual Prosodic Patterning
 - Use instrumentation that displays F_0 , and intensity x time contours on an oscilloscopic screen (e.g., Visipitch) or a computer monitor
 - Gives insight into how speakers are achieving the perceptual results – may help to explain the perceived lack of naturalness

PROSODY: ASSESSMENT & INTERVENTION

- Analysis of Modified Prosodic Patterning
 - Tx may consist of asking the person to modify his/her production (e.g., use only durational adjustments to signal stress)
 - Don't ask the person to change specific parameters (e.g., duration of syllables). Ask the person to modify the production in an effort to signal stress, and then analyze the features associated with the most natural productions; train the speaker to use those features.
 - "The best possible speech" is the goal rather than normalcy (rarely achieved by those with dysarthria)
 - The speaker is asked to compensate for his/her deficits rather than produce normal speech

PROSODY: ASSESSMENT & INTERVENTION

- Analysis of Modified Prosodic Patterning (cont'd)
 - Tx for those with insufficient prosodic patterns might consist of giving general instructions (e.g., "Make the target word stronger" "Use extra force on the target word")
 - Tx for those with prosodic excess might consist of reducing the number of suprasegmentals that signal stress (e.g., use durational adjustments only to signal stress – exaggerating intensity or F_0 is perceived as less natural)

PROSODY: ASSESSMENT & INTERVENTION

- Comparison Across Breath Groups
 - We need to assess across breath units in addition to within
 - Monotony is more than reduced pitch and/or loudness ranges
 - Monotony may be due to excess uniformity across breath group units, which are usually determined by the syntactic demands of the utterance (for normal speakers)
 - Tx may consist of having the speaker vary the breath group unit and not inhale at every pause

PROSODY: ASSESSMENT & INTERVENTION

- Generalization to Spontaneous Speech
 - Fade feedback
 - Practice materials made increasingly complex
 - Clinician-client dialogue (intermediate step between reading a paragraph and spontaneous speech)
 - Self-rating/critique – in the context of reviewing an audio/video tape of self first and then monitoring on-line
- Indirect Tx of Naturalness
 - Rate adjustments and the type of rate control technique (rigid) can have a negative impact on naturalness (not as much of a negative effect if the person presents with unnatural speech prior to intervention)
 - LSVT may result in increased naturalness
 - Be mindful that other intervention goals may reduce speech naturalness

PROSODY: ANCDs SYSTEMATIC REVIEW

- 10 articles were reviewed (Yorkston et al., 2007)
- Articles that focused on rate, rhythm, and intonation were included
- Biofeedback (n = 5) and behavioral instruction (n = 6) were the two main areas of tx
- The majority of subjects (50%) had a diagnosis of TBI, with other diagnoses including CP, CVA, MS
- The most common type of dysarthria was ataxic (50%)
- 30% of the studies did not specify the type of dysarthria
- Severity ranged from mild (50% of the studies) to severe; not all subjects had reduced speech intelligibility

PROSODY: ANCDs SYSTEMATIC REVIEW

- 80% of the studies included perceptual measures, and 80% included acoustic measures
- In general, the studies showed improvement on perceptual and acoustic measures of prosody, but speech still did not approach normal
- We need info about generalization to natural settings and we need info about social validation of tx effects
- We don't know whether there is more benefit to specific acoustic feedback (e.g., fundamental frequency contours) vs. more general feedback about stress patterning
- "Because of the relatively small number of studies and the heterogeneity of the tx techniques and participant characteristics, few conclusions about tx effectively can be draw[n] at this time."

SPEECH SUPPLEMENTATION TECHNIQUES: ANCDs REVIEW

- 1) Alphabet supplementation – the speaker points to the first letter of the word on an alphabet board as s/he says the word (n = 9)
- 2) Semantic or topic supplementation – the speaker provides the topic of the message before the message is spoken (n = 9)
- 3) Gestures (illustrators) (n = 6)
- 4) Syntactic supplementation – the speaker provides information about the grammar or the word class of each word spoken (n = 2)
- Six studies included a combination of strategies
- Total # of subjects < 90
- Most common medical diagnoses = CP, CVA, TBI; also subjects with ALS and PD

SPEECH SUPPLEMENTATION TECHNIQUES: ANCDs REVIEW

- Type of dysarthria was reported in 63% of studies (flaccid 32%, mixed 32%, spastic 26%, athetoid 5%, and hypokinetic 5%)
- Most of the subjects were adults
- Most of the speakers had severe or profound dysarthria
- Speaker tasks: reading words or sentences most of the time; some picture description and conversation
- Most often, there was no report of the amount of practice the subjects had using the strategy; when it was reported, the speakers were NOT experienced supplementation users

SPEECH SUPPLEMENTATION TECHNIQUES: ANCDS REVIEW

- Mode of presentation: audio or video (not live); in 9 studies, listeners viewed supplementation that the speaker generated, and in 7 studies, the listeners viewed superimposed information (the speaker was not actually using supplementation)
- Listeners were most often undergraduate or graduate students; SLPs or rehab professionals took part in three of the studies
- In two studies, familiar and unfamiliar listeners took part
- Intelligibility was the most common outcome measure (68% of the studies); 26% of the studies also included info about speaking rate
- Overall, the results of the studies reviewed showed consistent improvement in outcome measures in structured, experimental situations

SPEECH SUPPLEMENTATION TECHNIQUES: ANCDS REVIEW

- **Alphabet Cues**
 - Word intelligibility – mean gain of 11.5% (range = 5-25%)
 - Sentence intelligibility – mean gain of 25.6% (range = 5-69%), with more gain for the severely involved speakers (but also more variability for this group)
- **Semantic Cues**
 - Word intelligibility – mean gain of 28.1% (range = 3-48%), with the largest gains in the mid-range of severity
 - Sentence intelligibility – mean gain of 10.7% (range = 0-52%)

SPEECH SUPPLEMENTATION TECHNIQUES: ANCDS REVIEW

- **Limitations in Interpreting the Studies**
 - Lack of spontaneous speech – utterances were prepared by someone else
 - Practice with supplementation – the speakers in the studies had little training or practice with the strategies
 - Lack of live interactions – the mode of presentation was audio or video
 - Acceptance of supplementation – little info about listener attitudes toward supplementation
 - Superimposed vs. speaker-imposed – not always clear which one the study included; in speaker-imposed supplementation, the speaker may have altered rate of speech in addition to providing contextual info (the letters)

SPEECH SUPPLEMENTATION TECHNIQUES: ANCDS REVIEW

- **Summary of Clinical Implications**
 - Speech supplementation strategies may be useful for speakers with severe or profound dysarthria, regardless of medical diagnosis or type of dysarthria
 - Best candidates: those with dysarthria that interferes with communication function in natural settings, good pragmatic and cognitive skills, and enough motor function to generate the cues
 - Strategies should be selected on an individual basis
 - Select strategies that have the best chance of moving the person into a functional range of speech intelligibility
 - Listeners are crucial to the successful use of the strategy; obtain info about the attitudes and skills of the most frequent listeners, and train listeners as well as speakers with dysarthria