Amplitude-Based Treatment in the Pediatric Group Setting
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Justine Dombroski O'Brien MS CCC-SLP

Disclosures

I have no relevant financial or non-financial relationships to disclose.

Introduction

About me:

- University of Maryland — B.A.
- Vanderbilt University — M.S.
- Ann & Robert H. Lurie Children's Hospital — C.F.
- Specialty in feeding/swallowing disorders
- Shirley Ryan AbilityLab
  - Senior Speech-Language Pathologist in Outpatient Pediatric Department
  - Specializing in the treatment of pediatric neurological impairments
  - Cerebral Palsy
  - Completion of Implementation of LSVT LOUD in Pediatric Motor Speech Disorders

Cerebral Palsy

A group of disorders that affect a person's ability to move and maintain balance and posture. (2010, 2013)

Classification Scales

- Communication Function Classification System (CFCS)
- Gross Motor Function Classification Scale (GMFCS)

Cerebral Palsy (CP)

Motor Speech and CP

Voice Camp

Conclusions

Agenda

Communication Function Classification Scale

- Level I
  - "A person independently and effectively alternates between a sender and a receiver of information with most people in most environments"
- Level II
  - "A person independently alternates between being a sender and receiver with most people in most environments but the conversation may be slower"
- Level III
  - "A person usually communicates effectively with familiar communication partners, but not unfamiliar partners, in most environments"
- Level IV
  - "The person is not always consistent at communication with familiar communication partners"
- Level V
  - "A person is seldom able to communicate effectively even with familiar people"

Hickman et al., 2011
Gross Motor Function Classification System

Cerebral Palsy and Dysarthria

- What factors might contribute to reduced speech intelligibility?
  - Motor disorder (Olive, 1980)
  - Speed, range, strength, coordination, accuracy of movements in the vocal tract
  - Reduced Control (Dew, 2003; Valsala et al., 1999)
  - Respiration, phonation, resonance, articulation, and prosody
  - Wide range in severity
  - Each speech system might be affected differently

Cerebral Palsy and Dysarthria

- What are the perceptual characteristics?
  - Hypernasality
  - Breathiness
  - Monotonous speech
  - Reduced loudness
  - Uncontrolled rate/rhythm
  - "Shallow, irregular breathing for speech"

Cerebral Palsy and Dysarthria

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LSVT and Cerebral Palsy

- LSVT LOUD, typically used in adults with Parkinson's disease, has emerging research supporting its use treating dysarthria in patients with Cerebral Palsy (Bolu & Fox, 2014).
- The focus of LSVT LOUD is to increase respiratory-phonatory effort and use this "target of being "loud" to create spread effects across the speech production system. (Bolick & Fox, 2014)
- This singular focus and use of modeling reduces cognitive-demands on patients and be desirable when treating children (Fox & Bath, 2012); (Mars & Fox, 2014)
- Can be performed with patients with low-average to below average cognitive level

LSVT Key Concepts

- **Target**
  - Amplitude
  - Intensive/high effort

- **Mode**
  - Generalization

References: Bolick et al., 2014; Bolick, 2012; Davies, Bolick, Johnson, 2013; Fox et al., 2013; Fox et al., 2012; Fox et al., 2014; Fox et al., 2015
**LSVT Overview**

- **Frequency**: Sustained phonation; x1.5
- **Intensity**: Pargs; rIS
- **Sustained phonation**: x1.5
- **Pargs**: rIS
- **Type**: Speech/Voicetreatment
- **Targeting**: Respiratory-phonatory effort and goal vocal quality/effort
- **Time**: 1 hour treatments; 15 minutes of homework

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**LSVT Overview**

- **Daily Tasks — 30 min**
  - Maximum duration sustained vowels (ahs)
    - 15 or 12-15 minutes
    - May have to do more reps if the "ah" is short
  - High/Low "ahs"
    - 15 high, x15 low OR
    - 5-8 minutes high, 5-8 minutes low
  - Functional phrases (no to)
    - Generated by the patient or his/her family
    - 5 each OR
    - 5-10 minutes

- **Speech Hierarchy -30 min**
  - Tasks that gradually progress in difficulty over the course of the treatment
    - Length of utterance
    - Words to sentences
    - Complexity
    - Repeating phrases to conversation

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**LSVT-Mechanism of Recovery**

- **Treatment intensity** with a single or multi system target improves speech outcomes in the cerebral palsy population.
  - Aligns closely with motor-learning principles and activity-dependent neuroplasticity (Fox & Bantle, 2012)
  - specificity of training, treatment intensity
  - sufficient multiple repetitions
  - progressive behavioral challenges
  - verbal praise
  - treatment salience

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**LSVT Overview**

- **Homework**
  - Includes all daily and hierarchy tasks
  - Assigned all 30 days
  - On treatment days, one homework session is assigned (5-10 minutes)
  - On non-treatment days, two homework sessions are assigned (10-15 minutes)

- **Carryover exercises**
  - Functional and individualized to each patient
  - "Say hello to your teacher using your LOUD voice"

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**LSVT Outcome Measures for Pediatric Patients**

- **Objective Acoustic Measures**
  - Duration
  - Sound Pressure Level
  - Frequency

- **Listener Perception**
  - Clinician ratings of voice quality
  - Speech intelligibility

- **Communicative Effectiveness and Participation Outcomes**
  - Focus on the Outcomes of Communication under six (FOCUS)
    - Communication Function Classification Scale (CFCS)
    - Social communication sections of Ages and Stages

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**Equipment to Help Measure Outcomes**

- **Stop watch or timer**
- **Digital sound level meter**
- **Pitch app, orchestral tuner**
- **Digital recorder**
- **Praat, Visipitch**
Level III Evidence for LSVT in CP

The good
- Statistically significant preference for overall voice quality and articulatory precision in speech samples taken 6 weeks following to those taken at baseline (Fox & Bokk, 2012)
- Parent report of positive change in characteristics of voice and speech and qualitative changes about communication both immediately following treatment and at 6-weeks following up (Fox & Bokk, 2012)
- Significant improvements in max SPL in sustained phonation immediately following and 6 weeks following treatment (Fox & Bokk, 2012)

The so-so
- Inconsistent improvements in acoustic measures of vocal functioning, mostly on maximum performance tasks more so than speech intelligibility (Fox & Bokk, 2012)
- Improved parent perception of vocal loudness immediately following treatment; however, after 6 weeks maintenance of changes were inconsistent amongst participants (Fox & Bokk, 2012)
- Improvements in simple word intelligibility immediately post treatment but not at 6-weeks follow-up (Fox & Bokk, 2012)
- Significant improvements on the whole word intelligibility post treatment but not at 6-weeks follow-up (Fox & Bokk, 2012)

Level IV Evidence for LSVT in CP

- Levy, 2014
  - Greater acoustic vowel space following treatment in 2/3 children Greater articulatory accuracy at the word and conversational speech levels
  - Clinician ratings of more intelligible speech post treatment in
- Levy, Ramig, & Camarata, 2013
  - Higher percentages of words preferred
  - Spontaneous speech preferred
  - Word "easier to understand"
  - Spontaneous speech "easier to understand"
  - Higher scores on the Arizona Articulation Proficiency Scale

Other Evidence

- Levy, Camarata, 2013
  - Greater articulatory accuracy at the word and conversational speech levels
  - Clinician ratings of more intelligible speech post treatment

- Levy, Ramig, & Camarata, 2013
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Group Treatment

- We decided to target amplitude as our primary intervention focus for our pediatric group.
- We are not doing LSVT with these patients.
- We cannot replicate the research-based LSVT protocol in a group context.
  - Less of a "push" of the system in terms of number of reps and increasing resistance
  - More difficult to shape voice quality

Group Treatment Design-Adults

- Limit group size to 4-5 participants
  - Cannot be too big that you are compromising treatment intensity and efficacy
- Patient selection
  - Similar severity levels
  - Stimulability
- Role of SLP
  - Facilitator, not leader
    - Design a session that encourages patient interaction

Challenges to implementing LSVT

- Difficult for have insurance cover treatment 4x a week
  - Medicaid typically only covers 3x
- During the school year, difficult for families to come 4x a week
- During the summer, difficult to schedule patients for 4x a week for 4 weeks
- Sometimes difficult to keep patient engaged due to the repetitive nature of the tasks
  - Clinician error?
**Group Treatment Benefits-Adults**
- Mirrors real world
- Leads to increased insight/awareness
- Communication is grounded in emotional interactions
- Communication is grounded in functional tasks
- Peer support

**Voice Camp Evaluation**

**Criteria**
- Presence of dysarthria
- No concern for vocal abuse or pathology
- Able to follow simple commands
- Sustainable for daily tasks
- No behaviors that would harm self or others

**Assessment and Outcome Measures**
- Pediatric Voice Handicap Index (pVHI)
- Assessment of Intelligibility in Dysarthric Speech
- Objective Voice Measures taken using PRAX
  - Average Sustained Phonation (x3)
  - Max db sentences, conversation
  - Max sustained phonation time (x3)
- Organization Measures
  - FIM Scores, NC AAS

**Let's Get Loud! Camp**
- Camp designed from amplitude-based treatment principles
- Participants
  - Ages 6-14
  - Each child had at least one peer similar in age
  - Older children became leaders of the group
- Physician orders
  - Some previously had participated in individual LSVT, some had not
  - Range of:
    - Cognition abilities
    - Physical movements
    - Types of dysarthria
    - Interests

**Voice Camp**

- Camp Scheduling and Overview
  - 4 times a week for 4 weeks during the summer
  - 90 minute sessions
  - First 45 minutes: sustained phonation, pitch glides, and functional phrases
  - Participants practiced these tasks both individually (~10x) and as a group (~5-10x)
  - Phrases were determined as a group on the first day of camp
  - Second 45 minutes: speech hierarchy tasks
    - Activities that allowed for repetitive use of a phrase or target (i.e., stories, songs, games, crafts).
    - Targets increased in complexity over the course of the 4 weeks
  - Homework was assigned to parents daily

**Sample Phrases:**
- My turn
- Good morning!
- I need help
- Go away
- I need to go to the bathroom
- I love you
- What are we doing?
- Hi
- Bye
- I'm hungry

**Speech Hierarchy Tasks**
- Books with repetitive phrases
- Songs with repetitive phrases
- Games
- Activities
- Conversation
Voice Camp

Books
- Caps for Sale
- Pete the Cat
- There Was an Old Lady Who Swallowed a Fly
- Are You My Mother
- Silly Sally
- No David
- Three Little Pigs

Songs
- "Going on a Bear Hunt"
- "Who Stole a Cookie from the Cookie Jar"
- "Baby Bumble Bee"
- "Apples and Bananas"
- And yes, "Baby Shark"

Games
- "Pin the shoe on Pete"
- "Who Stole a Cookie from the Cookie Jar"
- "Baby Bumble Bee"
- "Apples and Bananas"
- "Baby Shark"

Activities
- Therapy dogs
- "Sit, Come here tingalay"
- Karate
- Crafts
- "Pass the bag"
- Snack time
- "I want more please!"
- Show and Tell
- Build confidence in speaking in front of a group
- Pretend "Store"—buying and selling things

Facilitating Group Interaction

Weekly Themes:
- Animals
- Disney
- Superheroes
- Summer Vacation
- Food
- Sports
- Favorites

Shaping Voice Quality

Use positive reinforcement and peer modeling
- "Wow AB did such a great job using a loud, clear voice! Can you try it BC?"
- "I like how LOUD CD was when she asked for a turn! Who else can ask that way?"

Correct hyperfunction immediately
- Provide immediate, clear feedback
- "Okay, that sounds like it hurts! Try doing what I did."

Provide ample encouragement and positive feedback
- "I love how you're using your LOUD voice!"

Encourage peers to give feedback

Pitch glides
- Can be challenging for some kids
- Use visual cues and analogies
- "We're going up an escalator, so we're going down a rollercoaster"
- Incorporate gross motor movements
- Hand moving up and down
- Consider starting from environmental sounds
- "Breathe," "inhale"
- Shape to "ah" after they have the idea
Positioning to help Shape Voice Quality

- Make sure the child is supported
- Be realistic
  - What can be carried over to home
- Get creative
  - Laying down
  - Dynamic
  - Bouncing, movement, different hand positions
- Be hands on
- Collaborate
  - Consult the patient's physical therapist

Increasing the Challenge/Demand

- Think time not reps to ensure proper intensity
  - If a child has a shorter sustained phonation time, have them do more reps
- Use distance
  - Have a volunteer hide in closet, behind the door, and different corners of the room and report back if the group was "loud enough"
- Use visual feedback
  - Rate the group's vocal loudness attempts visually by marking how loud they were on a visual display (Loud Meter)
  - Use technology—Beats by Dre, Vox Pitch games, or other technology making the settings increasingly harder
- Use background noise/distractions
  - Bring in family, have volunteers talk in the background, leave the door open if your neighbors don't mind
- Use longer targets
  - Move from one-word tasks in your hierarchy to phrases and sentences.

Calibration in the Group Setting

- Use communication breakdowns to help patients recognize need to be louder
  - "I don't think AB heard you ask for the glue, try using your loud voice"
- Rate effort as a group and individually
  - "Do you think we can be louder? Do you think we can say our "ah" longer?"
- Check in with patients individually
  - "How did that feel? Were you using your LOUD voice?"
  - Have peers provide encouragement
    - "GO GO GO, keep going!"
    - "Good job!"

Documentation—The simpler is better

- Number of reps vs. percentages
  - This is what was entered in daily documentation in EMR
- Stick to a few outcome measures and be consistent
  - Try to take speech measures weekly
  - Be sure to take measures at the end of the camp
- If possible, get help with data collection (volunteers, therapy aid)
  - Don't spend your session getting measures and documenting—it will take away from your patients' experiences in the group
- Focus on shaping good, loud voice quality and facilitating opportunities for practice in the group!

Documentation

- Goal Writing:
  - LTG: Given (min/mod/max) cueing, patient will increase vocal loudness to a sound pressure level of XX dB SPL at a 50 cm microphone to mouth during sustained phonation, for improved communication of basic wants and needs.
  - STG: Given min verbal cueing, P will be able to clearly express simple 3-4 word phrases in noisy environments without the need for repetition in 80% of opportunities.
  - STG: Given mod verbal and visual cueing, P will complete x15 2+ word functional phrases with good voice quality and at > 70 dB SPL at a 50 cm microphone to mouth distance for improved communication of wants and needs.
**Parent Involvement**

- At the initial evaluation, educate parents on the purpose of the treatment
  - Give handouts on daily exercises and tasks to be done on days off from camp
  - Include a therapy log
  - Remind parents to implement exercises on Thursdays
- Give parents short but specific homework daily
  - Try to individualize for each patient
  - "Have all patients say hi to their physical therapist using the LOUD voice"
  - "Encourage RC to use her LOUD voice to ask for seconds of dessert"
- Allow opportunities for parents to observe parts of camp
- Design a parent feedback form
  - This will help you improve the program from year to year

**Outcomes 2018**

- Strengths
  - Improvement in social skills
  - Increased insight due to peer response
  - Improved motor skills
  - Improved self-esteem
  - Involvement in therapy
  - Socially skilled
  - Peer Support
  - "Camp" experience
  - Easier to schedule and able to get these patients in faster
  - Brings in new patients to clinic
  - More fun!
  - Faster generalization

- Limitations
  - Least research supporting group vs. individual treatment
  - Hard to plan and facilitate a group with patients with a range of ages, physical abilities, and interests
  - Mobility restrictions limited activities and required group members to make it independently
  - Less individualization of treatment
  - Potential to compromise intensity and efficacy of treatment if not monitored and evaluated
  - Behavior management
  - Transportation issues
  - "Hectic!

**Outcomes 2019**

**Let's Get LOUD! Camp**

- Strengths
  - More opportunities to practice using LOUD voice in social and functional tasks
  - Improved insight due to peer response
  - Peer models
  - Help from a real-life therapist is needed
  - Can help with behavior management
  - Socially skilled
  - Peer Support
  - "Camp" experience
  - Easier to schedule and able to get these patients in faster
  - Brings in new patients to clinic
  - More fun.
  - Faster generalization

- Limitations
  - Less research supporting group vs. individual treatment
  - Need for plan and structure that is flexible with patients with a range of ages, physical abilities, and interests
  - Mobility restrictions limited activities and required group members to make it independently
  - Less individualization of treatment
  - Potential to compromise intensity and efficacy of treatment if not managed well
  - Behavior management
  - Transportation issues
  - "Hectic!

**Future Directions**

- Simplifying outcome measures and improving consistency
- Improving caregiver education and involvement
- Increasing visual feedback/supports
  - Technology?
  - Sound-activated games
- More research
  - Collaboration with LSVT Global
  - Pilot study looking at group treatment for maintenance following LSVT
  - Comparing LSVT and other dysarthria interventions

**Questions?**
Thank You