The Science and Practice of LSVT LOUD®: Speech treatment for Parkinson disease

Objectives of Presentation

Explain advances in neuroscience and impact on the field of rehabilitation
Discuss development and data on an efficacious speech treatment LSVT LOUD
Briefly describe development and key aspects of limb motor treatment LSVT BIG
Outline future directions and alternative modes of treatment delivery using technology

It is a “Stunning Time” to be in rehabilitation today

- Basic science evidence for the value of exercise in PD (classically drugs, surgery, today...)
- Identified key principles of exercise that drive activity-dependent neural plasticity
- Demonstrated that exercise can improve brain functioning (neural plasticity) and may slow disease progression
- Exercise is Medicine!

Legitimate Therapeutic Options

To provide symptomatic relief; improve function

Pharmacological (L-dopa)
Neurosurgical (DBS-STN)
Voice and Body Exercise

Video Example:

59 year old female
2.5 years post-diagnosis
On-meds pre and post video

Pre/post LSVT LOUD
(Lee Silverman Voice Treatment)
Intensive physical exercise of speech mechanism

1. Background and development

Critical need for speech treatment in PD
“If only we could hear and understand her”
Family of Mrs. Lee Silverman 1987

BACKGROUND ON LSVT 1987
“Lee Silverman Center for Parkinson’s”
Scottsdale, Arizona
Carolyn Mead Bonitati
M.A., CCC-SP

6 Million people
with PD worldwide

89% have a speech or voice problem
(Logemann et al., 1978)

4% receive traditional speech therapy
(Hortellus & Swenson, 1994; Orstoy, 1982)

Consensus 1990:
Speech treatment (articulation and rate at low dosage)
does not work
(Sarno, 1968; Allan, 1970; Green, 1980; Aronson, 1990;
Weiner & Singer, 1989)

Surgical and Pharmacological Treatment doesn’t improve speech in PD
• Pharmacological: L-Dopa, dopamine agonists
• Surgical: Fetal Cell Transplant, Deep Brain Stimulation (DBS)
  Informal survey 25-60% speech worse after DBS (PA)
• Medical interventions effective on limbs, unestablished effects on speech
  (Sanderson, Megason, Parsons, 1971; Solomon & Hixon, 1980; Larson, Ramig & Scherer, 1994;
  Larson, Ramig & Johnson, 1994; Freed et al., 1992; Goberman, 2000; Trail et al., 2005; Pinto et al., 2004;
  Sagir et al., in press; Krack et al., 2003; Wang et al., 2003; Rousseaux et al., 2008)

Creating a treatment that works
A journey from discovery through efficacy
LSVT LOUD: The fundamentals of therapy
LSVT LOUD Outcomes: Efficacy data
Speech Characteristics in PD

Reduced loudness
Hoarse voice quality
Monotone
Imprecise articulation
Vocal tremor

(Darley et al, 1969a; 1969b; 1975; Logemann et al, 1978)

Some patients report volume, hoarse voice or monotone as the first PD symptom
(Aronson, 1990)

(perceived as bored, disinterested, apathetic)

Mean vocal SPL for subjects with PD and HC
PD are 2-4 dB less than HC across tasks

(Fox and Ramig, 1997)

Self-perceptual Ratings of Communication

PD less likely to participate in conversations or have confidence in voice
PD=30, HC=14 (Fox and Ramig, 1997)

Does this speech problem matter?

“if I have no voice, I have no life”
-Natalie

“No one listens to me anymore”
-Shirley

“... people with PD live for years frustrated by communication impairment, withdrawal, social isolation and embarrassment”
(Miller et al., 2006)

20+ year journey from invention to scale-up
Over 8 million dollars in NIH funding

1987-89: Initial invention; Pilot data (Scottsdale)
1989-91: Office of Education OE-NIDRR
1991-94: OE-NIDRR
1990-95: NIH funded RCT Efficacy
1995-00: NIH funded EMG, Kinematics
2002-07: NIH funded RCT Spread of effects
2007-12: NIH funded RCT, imaging
2001-02: Coleman Institute (PDA; LSVTC)
2002-04: NIH and Michael J FOX Foundation (R21)
2002-04: Coleman Institute (VT; LSVT-VT)
2004-06: NIH LSVTVT (R21)
2004: Coleman Institute (LSVT Down Syndrome)
2004-07: LSVT–Dissemination
2006: Technology-enhanced Clinician Training (SBIR)
TARGET
Loud is more than a laryngeal event – spread of effects

MODE
Intensive High effort
Intensive dosage and within sessions

High effort
Repetitions
Force/resistance
Accuracy
Fatigue

What do data say?
Intensive practice is important for maximal plasticity (Kliem & Jones, 2008)

CALIBRATION
☐ MISMATCH between on-line perception of output and how others perceive it

“I’m not too soft”
“I can’t speak like this, I am shouting!!”

Fox et al, 2002; Sapir et al, 2011

LSVT LOUD Outcomes

Efficacy data

Advances in Clinical Efficacy (Ramig et al, 1995; 1996; 2001a, 2001b; Goetz, 2003)
Cross-system effects, Neural changes

Increase Loudness
Target
Mode
Calibration
Self-perception, Internal cue, increase amplitude of output

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Target
Mode
Calibration
Self-perception, Internal cue, increase amplitude of output

Ms. Fox, Look (2000)
Narayana (2010) PET
El-Sharkawi Logemann (2002) swallow
Spiel (2007, 2010) articulation
Huber, Stathopoulos (2003) respiratory kinematics
P. Fox, Liotti (2003) facial expression
Ramig, Dromey (1996, 1999) articulatory acoustics
Smith, A. (2001) STI
Sapir (2007, 2010) articulation
Taskoff (2001) perceptual
El-Sharkawi, Logemann (2002) swallowing
Ramig & Dromey (1996) aerodynamics
Video Example:

Pre/Post LSVT LOUD Vocal Folds

Long-term follow-up?

CONVENTIONAL WISDOM

“Changes in treatment room disappear on the way to the parking lot”

(Allan, 1970; Sarno, 1968)

2. Unexpected outcomes:

System-wide spread & Insight into Basic mechanism

Articulation Swallow
Rate Face
Speech Motor Stability PET

(0.002; El-Sharkawi, 2002; Spielman et al., 2003; Kleinow et al., 2001; Liotti et al., 2003)

SWALLOWING PRE POST LSVT® LOUD

Approximate oral residue percentage (ORES)


Phonation Task - PD  N=5

Liotti et al, 2003; Neurology

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To a patient......major life impact

“My voice is alive again”
“I can talk to my grandchildren!”
“I feel like my old self”
“I am confident I can communicate!”

What are the LSVT LOUD exercises?

Daily tasks
First half of treatment session
Rescale amplitude of motor output through CORE Loud
- Sustained “ah” (minimum 15 reps)
- High/Low “ah” (minimum 15 reps)
- Functional phrases (minimum 50 reps)

Hierarchical speech tasks
Second half of session
Train amplitude from CORE exercises into in context specific and variable speaking activities
- Week 1 – words, phrases (Shorter, simple)
- Week 2 – sentences (Shorter, simple)
- Week 3 – reading (Longer, more complex)
- Week 4 – conversation (Longer, more complex)

Video Example:
Homework Helper
“Ah” Clip

Speech Hierarchy
Week 1 – words/phrases
short/simple conversation – bridge gap to conversation
Week 2 – sentences/reading
short/simple conversation
Week 3 – reading/conversation
Week 4 – conversation

If you don’t feel like you are talking “too loud”
you are not talking loud enough!!
3. Fundamentals of treatment generalize to:

Other systems (limb motor)

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**TARGET**

BIG (Large amplitude whole body movement)
Single Target - Triggers Activation across motor systems

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**MODE**

- **Delivery**
  - Certified LSVT BIG Physical/Occupational Therapist
  - 1:1 intervention
- **Time of Practice**
  - 4 consecutive days per week for 4 weeks
  - 16 sessions in one month
  - 60 minute sessions
  - Daily carryover assignments (30 days/entire month)
  - Daily homework (30 days/entire month)

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**CALIBRATION**

MISMATCH between on-line perception of output and how others perceive it

“I had no idea how small my world had become”

“I can’t move like this, people will think I am crazy!!”
Patient case: Bernie

- 71 year-old, diagnosed with Parkinson’s disease in 1994
- Reason for referral: slowness and difficulty walking, history of falls, freezing
- Optimized on PD medications
- Hoehn & Yahr 3

Case Study Outcomes:

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<th>POST</th>
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<tr>
<td>Falls</td>
<td>1-2/month</td>
<td>0/month</td>
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<tr>
<td>Assistive device</td>
<td>Cane</td>
<td>None</td>
</tr>
<tr>
<td>Gait Velocity</td>
<td>0.35 m/s</td>
<td>1.17 m/s</td>
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<tr>
<td>% of age matched norm</td>
<td>29.6 %</td>
<td>100%</td>
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<tr>
<td>Endurance</td>
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<td>1200 ft</td>
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✓ To improve his walking
✓ To go to the movies
✓ To play with his grandchildren
✓ To go out to dinner with friends and family

Comparing Exercise in Parkinson’s Disease — The Berlin BIG Study (2010, Movement Disorders)
Georg Elbertbach,1* Almut Elbertbach, Daniela Edler, Olaf Kaufhold, Matthias Kusch, Andreas Kupich, and Jiorg Wissel

FIG. 2. UPDRS motor score (blinded rating), mean change from baseline (vertical bars = standard deviations). Change between baseline and follow up at week 16 was superior in BIG (interrupted line) compared to WALK (dotted line) and HOME (solid line), P <0.001. ANOVA did not disclose significant differences between c-intermediate and final assessments.

Future Directions

LSVT Programs and Technology (telepractice and software programs)

Pre, Post, 6 month dB SPL (p< 0.001)

Changes consistent with those reported in previously published data (Halpem et al., 2012)
### Summary

Advances in neuroscience have provided evidence supporting the positive impact of exercise-based protocols in people with PD.

LSVT Programs have been developed and studied over the past 20 years.

LSVT LOUD has well established efficacy and is considered Level 1 evidence for speech treatment in PD.

LSVT BIG is one type of physical therapy program that has potential to offer improvements in movement and quality of life for people with PD.

Technology will assist with accessibility.

### How to get started with LSVT LOUD and LSVT BIG

- Ask your doctor for a referral and a prescription for a speech or physical/occupational therapy evaluation and treatment.
- Visit [www.lsvtglobal.com](http://www.lsvtglobal.com) to find an LSVT LOUD or LSVT BIG Certified Clinician in your area (as per video demonstration).
- DVDs available to introduce you to voice exercises used in LSVT LOUD and movement exercises used in LSVT BIG: [www.lsvtglobal.com/products](http://www.lsvtglobal.com/products) or [www.amazon.com/shops/LSVTGlobal](http://www.amazon.com/shops/LSVTGlobal).

### QUESTIONS?

info@lsvtglobal.com
www.lsvtglobal.com

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**“If my possessions were taken from me with one exception, I would choose to keep the power of communication, for by it I would soon regain all the rest”**

Daniel Webster
LSVT Global Client Product List

Exercises for Parkinson disease – DVD
Price: $45.00 (plus shipping and handling)

The LSVT BIG Homework Helper DVD features limb and body movement exercises based upon LSVT BIG physical/occupational therapy. Jennifer Tuccitto, who is an expert LSVT BIG Certified Clinician, guides the viewer through a series of exercises designed to maintain improvements in limb and body movement following delivery of LSVT BIG by an LSVT BIG Certified Clinician. This limb and body movement exercise program has been designed for use by people with Parkinson disease. It should only be used with approval of each person’s physical or occupational therapist and physician.

Speech Exercises for Parkinson disease - DVD
Price: $45.00 (plus shipping and handling)

The LSVT LOUD Homework Helper DVD is 28 minutes long and features voice and speech exercises based upon the LSVT LOUD Program. Dr. Cynthia Fox, who is the LSVT LOUD Lead Clinician, guides the viewer through a series of exercises designed to maintain improvements in speech following delivery of LSVT LOUD by a certified LSVT LOUD Clinician. This speech exercise program has been designed for use by people with Parkinson's disease.

LSVT COMPANION™, Home Edition
Price: $299.00 (plus shipping and handling)

LSVT Global created the LSVT Companion, Home Edition to help individuals practice their LOUD voice exercises at home during and after treatment by an LSVT LOUD Certified Clinician. The LSVT Companion is available to individuals working with an LSVT LOUD Certified Clinician and is the only solution of its type cleared by the FDA for use as a medical device.

Your Personal Treatment Plan: Using the Clinician Edition of the LSVT Companion, your LSVT LOUD Certified Clinician personalizes your speech exercises and sets goals for you by defining target performance levels and number of repetitions for each LSVT LOUD voice exercise. To help you get the most benefit from your home voice exercises, as you perform each voice exercise the LSVT Companion displays key measures including loudness (sound pressure level), frequency, and duration.

Convenient and Effective Practice: Practicing your LOUD exercises at home will augment in-person sessions with your speech-language clinician during treatment and help you maintain your LOUD voice after you complete your in-person sessions.

Minimum System Requirements: Microsoft Compatible® 1GHz Pentium Class Computer with 512 Mb RAM, running Windows® 2000 SP4, XP SP2+, XP Professional, Vista, 7, or Windows 8 operating systems and Microsoft Excel.
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<td>D1</td>
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**LSVT Companion**

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**Shipping and Handling**

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*International Shipping*

Please contact LSVT Global at info@lsvtglobal.com for a precise international shipping quote. Import duties, taxes, and charges are not included in the item price or shipping cost. These charges are the buyer's responsibility. Please check with your country’s customs office to determine what these additional costs will be prior to bidding or buying. For alternative shipping options, please call us at 1-520-867-8838 on Monday - Friday between 8:00 AM - 5:00 PM (UTC- Arizona).

*For expanded shipping options such as FREE, priority, and alternate international rates, please look for our LSVT Homework Helper DVDs on Amazon.com.

**For LSVT Companion, Home Edition Orders:**

Name of LSVT LOUD Certified Clinician with whom the client is working: ________________________

**Billing Information:**

Name: ________________________

Street: ________________________

City: ________________________

State: ________________________ Zip: ____________

Email: ________________________

**Delivery Information (if different):**

Name: ________________________

Street: ________________________

City: ________________________

State: ________________________ Zip: ____________

Email: ________________________

**Method of Payment (check one):**

[ ] Visa [ ] MasterCard [ ] American Express [ ] Check (payable to LSVT Global)

Name on Card: ________________________ Credit Card/# ________________________

Expiration Date: ________________________ Signature: ________________________

**Please complete this form and place your order using one of the following methods:**

Fax 1-520-867-8839

Email info@lsvtglobal.com

Phone 1-888-438-5788

Mail LSVT Global, 3323 N. Campbell Avenue, Suite 5, Tucson, AZ 85719

Online www.lsvtglobal.com
The LSVT LOUD® improves both the voice and speech of individuals with Parkinson disease by treating the underlying physical pathology associated with the disordered voice.

Treatment focuses on improving vocal loudness and immediate carryover into daily communication enabling patients to maintain and/or improve their oral communication.

The LSVT LOUD® is administered on an intensive schedule of 16 individual, 60 minute sessions in one month’s time.

90% of patients improve vocal loudness from pre to post-treatment.

Approximately 80% of patients maintain treatment improvements in their voice for 12-24 months post-treatment.

ALL patients report improvement in their ability to communicate.

LSVT LOUD® is being successfully delivered by over 10,000 certified LSVT clinicians in 52 countries.

Research has been funded by the following organizations: National Institutes of Health-National Institutes on Deafness and Other Communication Disorders (NID-NIDCD) Grants #P60 DC00976 and #R01 DC001150; and The Office of Education-National Institute for Disability and Rehabilitative Research (OE-NIDRR) Grants #H133G00079 and #H133G40108.

***For more information, contact the***

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