LSVT Global® Virtual SLP Mini-Conference

Title: **Improved Verb Use Following Intensive Voice Treatment in Individuals with Parkinson's Disease**

Presenters: Amy Ramage, PhD, CCC-SLP

Date Presented: November 21, 2020

Contact Us:

Web: www.lsvtglobal.com Email: info@lsvtglobal.com

Phone: 1-888-438-5788 (toll free), 1-520-867-8838 (direct)

LSVT Global's Virtual SLP Mini-Conference

Improved Verb Use Following Intensive Voice Treatment in Individuals with Parkinson's Disease

LSVT Innovation in Science. Integrity in Practice.®

1

On-Demand Viewing - Information to Self-Report CE Activity

- The On-Demand version of this webinar is NOT ASHA or state registered for CEUs for speech, physical or occupational therapy professionals, but it may be used for **self-reported CEU credit as a non-registered/non-preapproved CEU activity**. That is, the credit can count towards your CE maintenance progress if you choose to self-report your activity.

- Request certificate by e-mailing webinars@lsvtglobal.com after you have viewed the webinar in full or forward the post-webinar e-mail for your certificate request.

- After your attendance has been verified we will e-mail you a certificate of completion, which will include your name, date of the webinar and the number of hours earned. It may take 1-2 weeks for certificates to be emailed.

- Attendance for the full webinar is required to earn your certificate.

2

On-Demand Viewing - Information to Self-Report CE Activity

- Licensing requirements for CEUs differ by state. Check with your state licensing board to determine if your state accepts non-ASHA registered or non pre-approved CEU activities.

- For more information on including non-ASHA registered CEUs for certification maintenance, visit ASHA's website: http://www.asha.org/Certification/Certification-Maintenance-Frequently-Asked-Questions--Earning-Professional-Development-Hours/#earnASHA

- Completion of the on-demand viewing of this webinar **will not be** reported to the ASHA CE registry by us and cannot be added to the ASHA CE registry by you. It will be your responsibility to retain documentation of completion just as you do with any other non-registered CE activity.

3

Video and Photography Restrictions

All clients shown in videos during this presentation have given consent for their videos to be used for educational purposes.

Any copying of videos or viewing outside of this webinar, is strictly prohibited.

Thank you for respecting the contribution of these clients for allowing their videos to be shared.

4

Logistics

- ✓ Handouts are available in control bar

- ✓ Microphones are all muted

- ✓ You can type in questions at any time, we will answer at the end

5

Polling Question:
Who is joining us today?

- LSVT LOUD certified professional or student

- SLP professional not LSVT LOUD certified

- SLP student not LSVT LOUD certified

- Other

6

Virtual SLP Mini-Conference

Slide 7

Improved verb use in Parkinson's disease following intensive voice treatment

Amy E. Ramage, PhD, CCC-SLP
University of New Hampshire

Slide 8

Learning Objectives

- Identify changes in language production secondary to voice treatment in speakers with Parkinson's disease (PD).
- Define the connections between the motor system and verbs
- Describe increases in syntactic complexity given improved verb use

---

Slide 9

Disclosures

- Dr. Ramage is a full-time employee and receives salary from the University of New Hampshire.

Slide 10

Why would language improve after LSVT?

- Voice is essential to the expression of language and thus optimizing vocal function could conceivably improve language production.
- Verb production is known to be dissimilar in PD relative to that of non-PD (Johari et al., 2019). Differences in verb use are associated with motor impairments, particularly with an individual's location of motor motor impairment (upper vs. lower limbs; Roberts et al., 2017).
- However, verb processing in PD appears unrelated to motor impairment severity, unlike in other motor disorders (e.g., ALS in (Cousins et al., 2018); cervical dystonia in (Bayram & Akbostanci, 2018)). Thus, it remains unclear whether action word processing in PD is the motor system impairment.

Cognitive · Body · Stative · Verb · Agent · Theme

Slide 11

Embodied Cognition Theory

#0 language co
#1 latent seman
#2 conceptual n
#3 self
#4 conversation
#5 gesture

Embodied cognition – the belief that the body, action, perception, and situation are integrated into the learning of information and the cognitive processes involved.

Embodied language cognition claims that systems of body, motor and sensory perception are integral to language processing.

Wang et al., 2018

Slide 12

Dopamine and Language Function in PD

Individuals with PD who are on their dopaminergic medications, compared with those off the medications, produce more motor verbs and motor content in a verbal fluency task (Herrera et al., 2012).

The authors concluded that "the dopamine network from basal ganglia to brain motor areas might play a role in retrieving action verbs with specific semantic representations" (Herrera et al., 2015, 72).

Slide 13

DBS and Language Function in PD

- A small number of studies of language performance pre- and post-surgical placement of deep brain stimulators in the subthalamic nucleus (Zanini et al., 2003; Stefani et al., 2007) and/or the pedunculopontine nucleus (Stefani et al., 2007; Zanini et al., 2009) have found improvements in morpho-syntax with stimulator on vs. off.

- While these studies have been in small numbers of subjects, they indicate a potential advantage of PPN stimulation, relative to STN, for morpho-syntax.

- No changes (good or bad) were observed pre- to post-surgery or on/off stimulation for neuropsychological measures or lexical-semantics.

13

Slide 14

Causal hypothesis

Motor system dysfunction Impairs action word processing	Treatment improves motor system function	Improved motor function also improves access to action words and/or morpho-syntax

14

Slide 15

Can change in one effector system (motor) change another effector system (language)?

An approach that may clarify the language-motor systems in PD is to determine whether treatment affecting motor function is associated with changes in verb production.

Here, we use this approach to:
1. Replicate that verb production differs in PD relative healthy controls using a narrative task.
2. Determine whether participation in an intensive voice treatment improves:
   - Verb production (action verbs, morpho-syntax)
   - Content (main concepts and content units)
   - Efficiency of content (pauses and content/utterance)
   in narratives produced by individuals with PD.

15

Slide 16

Method

Intervention

A 4-week voice treatment (TX) in an IRB-approved randomized controlled voice treatment trial (7).

20 participants with PD (TXPD)
20 untreated PD (UNTXPD)
20 age-matched neurotypical control (HC)

Dependent Variables
- All participants provided 1-minute picture description narratives at baseline (V1) and after 4-weeks of treatment (V2).
- Language samples ("Cookie Theft" picture description from the BDAE) were transcribed by raters blinded to group and analyzed using Computer Language Analysis (MacWhinney, 2000).
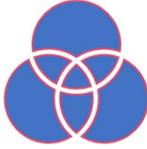
16

Slide 17

Data Analysis

- Pre-TX between-group comparisons established differences in demographic, PD severity, and language variables. Pre-Post within- and between-group comparisons identified effects of visit and isolated treatment effects in the TXPD relative to UNTXPD and HC groups.

- Audio language samples were transcribed using CHAT conventions in the CLAN program (V 30-Jan-2020, MacWhinney, 2000). In addition to running EVAL, other programs such as FLUCALC and frequency of verbs were run for fluency and verb analysis respectively (MacWhinney, 2000).

- Two graduate student transcribers were blinded to participant group and from any other identifying information. Raters were trained with six examples to establish reliability. They then independently transcribed 10 samples each. Once interrater reliability was sufficiently established methods were switched to blocks of 13 transcriptions. This analysis also included point-to-point reliability for utterances, words, and pauses. Consensus transcriptions were then created from reliability. Disagreements were discussed and resolved, and new transcription and coding rules were created (if needed). These new rules were applied to previous transcriptions and all transcriptions following. Finally, raters moved on to the next block.

- Univariate linear models were used to identify whether performance on the MMSE or neuropsychological assessments are predictive of language change (performance at V2 – V1). Variables predicting change at $p < .05$ served as predictors in generalized linear models.

17

Slide 18

Transcription and Segmentation

- Samples were separated into conversational units, or C-units, defined as a main clause (noun + verb) and all dependent clauses attached.

18

Slide 19

Coding of Narrative Samples

- Samples were coded for errors: revisions, repetitions, pauses (filled), and paraphasias using the CHAT coding conventions.
- Unfilled Pauses: Pauses were analyzed by running a script in Praat and reviewing the resulting TextGrid. A pause was defined as lasting a minimum of 0.9 seconds at a maximum intensity of 55 decibels (dB). The minimum length of a pause was increased from 0.39 seconds to 0.9 seconds to be congruent with how pauses were initially coded in CLAN. Pauses between and within utterances were counted if greater than 0.9 seconds.

19

Slide 20

1) The [1]woman is [2]doing [3]dishes.
2) The [1]sink is [2]overflowing.
3) The [1]boy is [2]on a [3]stool.
4) The [1]boy is [2]getting [3]cookies.
5) The [1]stool is [2]tipping.
6) The [1]girl is [2]reaching for a [3]cookie.
7) The [1]woman is [2]not noticing.

Coding of Narrative Samples: Main Concepts Analysis

- Main concepts and content units were coded manually, completed in blocks by the same two graduate research assistants. Main concepts were coded for presence, accuracy, and completeness using the instructions provided in Nicholas and Brookshire (1995).
- Productions coded as accurate and complete had to include each part of the main concept, allowing for alternative productions if they conveyed the same meaning.

20

Slide 21

Coding of Narrative Samples: Content Units

Content units, a measure of information conveyed by a participant, were obtained from Yorkston and Beukelman (1980).

The 56 content units for the Cookie Theft picture were used, and alternative wordings were allowed if they conveyed the same meaning as the content unit listed (Yorkston & Beukelman, 1980, p. 36).
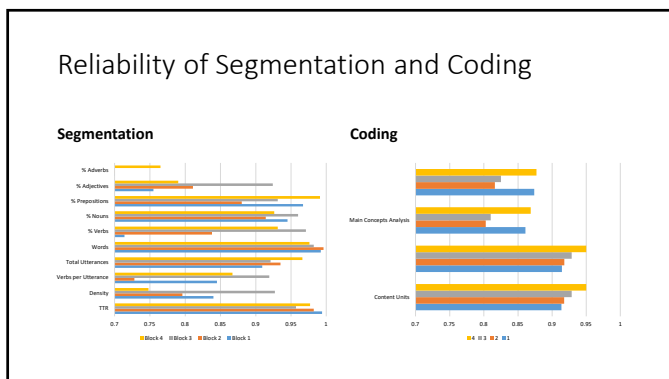
two	saying shhh (keeping him quiet)	with the door open	cookies
children / kids	trying to help / not trying	handing to sister	for himself
little	laughing	little	for his sister
boy	mother	girl	from the jar / jar
brother / son	woman / lady	sister / daughter	on the high shelf
standing	children behind her	by boy	water
on stool	standing	reaching up	overflowing
wobbling/ off balance	by sink "HAS to say "by"	asking for cookie	onto floor
3-legged	washing / doing	has finger to mouth	feet getting wet
falling over	dishes	in the kitchen / indoors	open window / window
on the floor	drying	disaster comment	curtains
hurt himself	faucet on	lean / grass	dirty dishes (left)
reaching up	full blast	sidewalk	
taking/ stealing	ignoring / daydreaming	house next door	
in the cupboard	puddle		

21

Slide 22

	TREATED PD	UNTREATED PD	CONTROL
N	20	20	20
AGE	67 ± 8	65 ± 9	64 ± 9
GENDER (M:F)	16:4	13:7	13:7
HANDEDNESS (R:L)	18:1	16:4	19:1
BECK DEPRESSION INVENTORY II (BDI)*	9.75 ± 6	7.3 ± 5	2.85 ± 3
MINI-MENTAL STATUS EXAM	28.7 ± 1	29.0 ± 1	29.3 ± 1
HOEHN & YAHR SCALE	2.13 ± 0	2.03 ± 1	-
YEARS SINCE DIAGNOSIS	4.99 ± 7	4.73 ± 4	-

Subject Demographics and Scores

22

Slide 23

Reliability of Segmentation and Coding

Segmentation

% Adverbs, % Adjectives, % Prepositions, % Nouns, % Verbs, Words, Total Utterances, Verbs per Utterance, Density, TTR

0.7 0.75 0.8 0.85 0.9 0.95 1

Block 4 Block 3 Block 2 Block 1

Coding

Main Concepts Analysis, Content Units

0.7 0.75 0.8 0.85 0.9 0.95 1

4 3 2 1

23

Slide 24

RQ1: Are there group differences in language variables?

24

Virtual SLP Mini-Conference
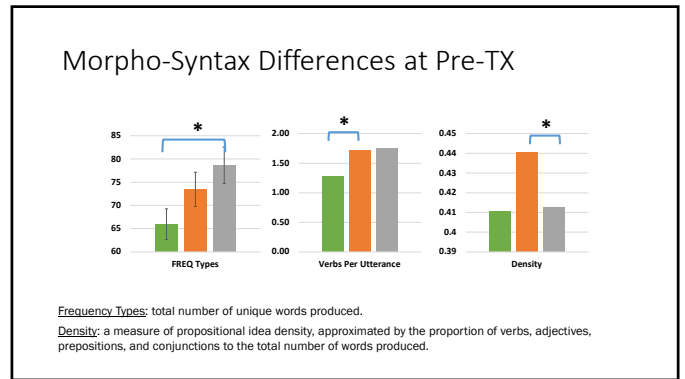
Qualitative Notes

There was one TXPD participant who was 31 years post diagnosis with PD. This participant is an outlier but was included in the study.

Two TXPD participants had high noun:verb ratios (i.e., produced more nouns than verbs) and were outliers, but also included in the study.
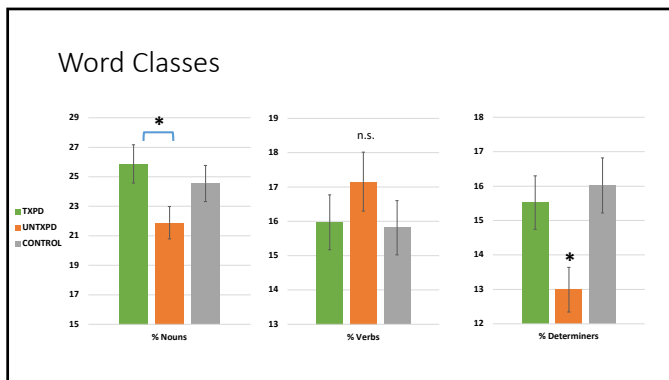
Two UNTXPD participants made 1st person for 3rd person errors.

Only PD participants had phrase repetitions (4 UNTXPD, 2 TXPD).

25

Morpho-Syntax Differences at Pre-TX

Frequency Types: total number of unique words produced.

Density: a measure of propositional idea density, approximated by the proportion of verbs, adjectives, prepositions, and conjunctions to the total number of words produced.

26

Word Classes

27

Language Content

28

Filled and Unfilled Pauses

29

Efficiency of Language Content

30

Slide 31
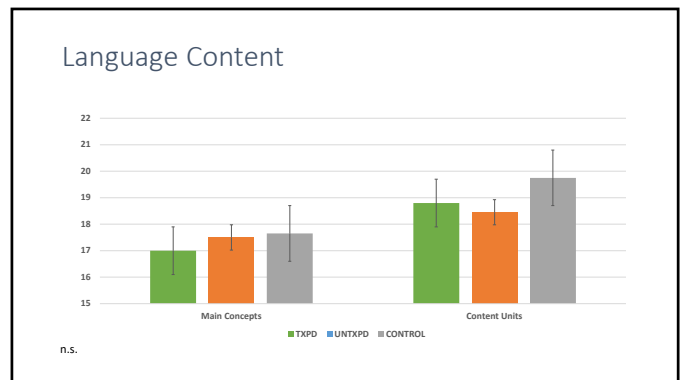
RQ2: Do language metrics change following intensive voice treatment?

31

Slide 32

Change in quantity per time and utterance

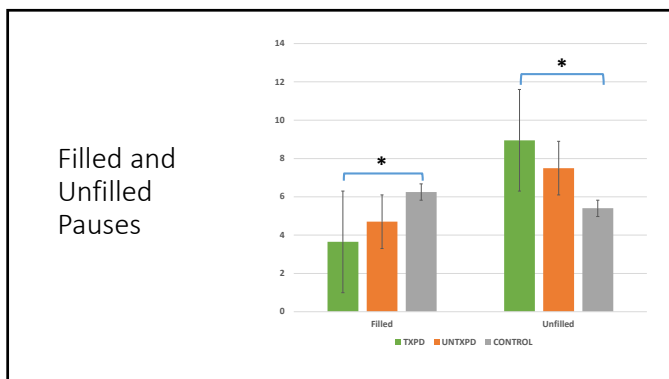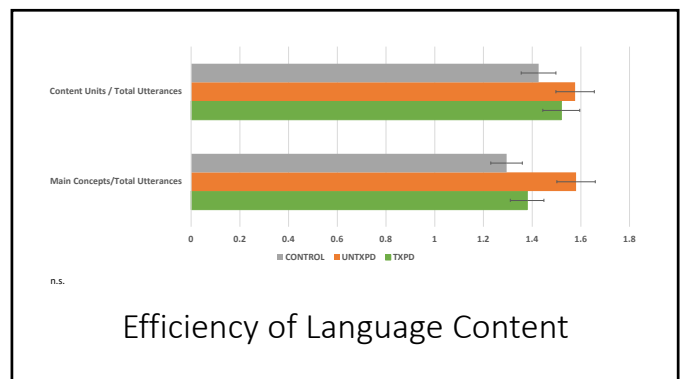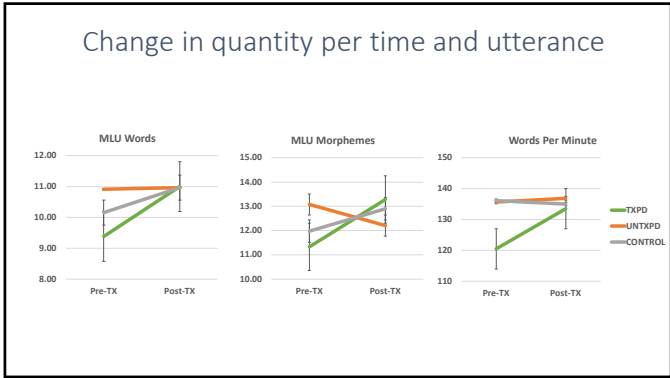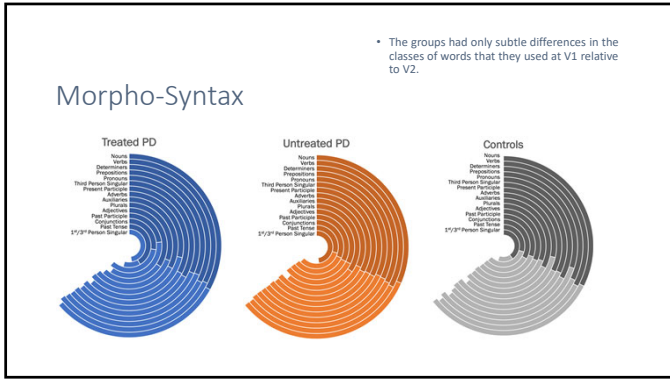MLU Words · MLU Morphemes · Words Per Minute

(TXPD, UNTXPD, CONTROL)

32

Slide 33

Morpho-Syntax

- The groups had only subtle differences in the classes of words that they used at V1 relative to V2.

Treated PD · Untreated PD · Controls

33

Slide 34

% Verbs — n.s.

Verbs Per Utterance — $p = .007$

(TXPD, UNTXPD, CONTROL)

Action – Improved verb <u>use</u> in TXPD

34

Slide 35

Main Concepts

- No group differences at baseline ($p > .33$ at V1; $p > .12$ at V2).
- While the Controls and UNTXPD groups produced more main concepts at V2 than V1, and there was no increase in the TXPD, these changes were not significant, $F(2,57) = .28, p = .76$.

Main Concepts

(TXPD, UNTXPD, CONTROL)

n.s.

35

Slide 36

Content Units

Content Units

(TXPD, UNTXPD, CONTROL)

- The groups did not differ for content units at V1 ($p > .57$) or V2 ($p > .13$).
- All participants provided more content units at V2 than V2 ($F(1,57) = 3.9, p = .05$). No significant group * visit ($p = .73$).

n.s.

36

Slide 37

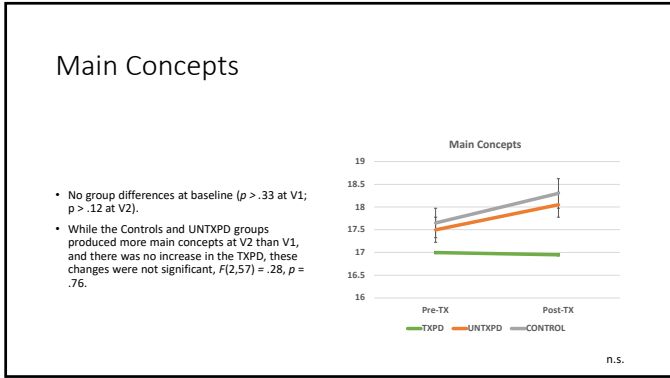## RQ3: Does efficiency or informativeness of language improve following intensive voice treatment?

37

Slide 38

Pauses Over Time

38

Slide 39

Efficiency of Informativeness

39

Slide 40
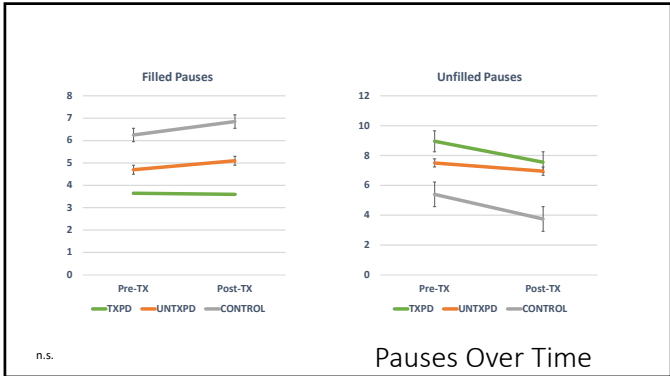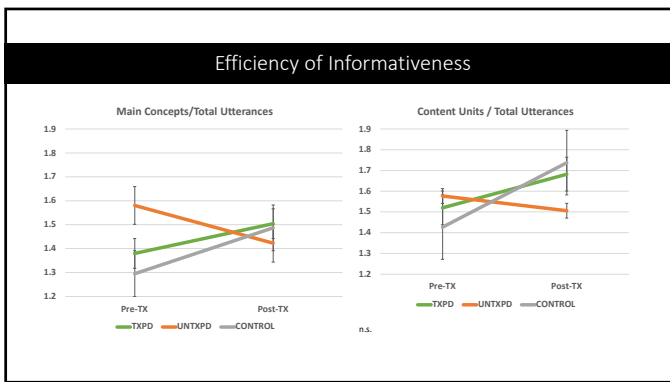
Summary

- Group differences prior to TX replicated previous findings of differences in verb production (verbs per utterance) but did not replicate findings of differences in the informativeness of narratives (Roberts & Post, 2018).
- The TXPD group produced more words/minute, MLU words and MLU morphemes following therapy.
- Intense voice intervention to improve vocal loudness was associated with improved verb use in PD. This was not an increase in the number of verbs used, but likely an index of a change in the richness of the syntactic structure centered on the verb.
- There were no significant changes in measures of the amount of language produced, morpho-syntactic measures or main concepts/content units.

40

Slide 41

Limitations

1 THE STUDY WAS POWERED FOR ITS PRIMARY INTENTION, TO ASSESS CHANGE IN VOCAL LOUDNESS IN PD; HOWEVER, THE OBSERVED POWER FOR SOME OF THE INTERACTIONS IN LANGUAGE METRICS WAS LOW.

2 SIGNIFICANT DIFFERENCES BETWEEN THE TX AND UNTXPD FOR VERBS PER UTTERANCE AND OTHER VARIABLES AT V1 ARE CONCERNING.

3 THERE WAS CONSIDERABLE VARIABILITY IN THE UNTXPD ON THE LANGUAGE METRICS.

41

Slide 42

- Evaluation of the verb types and how specific the improvement in verb use may be to action/body verbs.
- Assessment of the role of cognitive performance

Future Directions

42

Virtual SLP Mini-Conference

Thank you, Collaborators!

From UNH

- Kathryn J. Greenslade
- Kaila Cote
- Jessica N. Lee
- Shannon Bryant
- Stacy Kenney

LSVT Global
- Cynthia M. Fox
- Angela Halpern
- Lorraine O. Ramig

43

Works Cited

- Bayram, E., & Akbostanci, M. C. (2018). Verb naming fluency in hypokinetic and hyperkinetic movement disorders. *Cortex; a Journal Devoted to the Study of the Nervous System and Behavior, 100*, 21–31. https://doi.org/10.1016/j.cortex.2017.06.014
- Cousins, K. A. Q., Ash, S., & Grossman, M. (2018). Production of verbs related to body movement in amyotrophic lateral sclerosis (ALS) and Parkinson's Disease (PD). *Cortex, 100*, 127–139. https://doi.org/10.1016/j.cortex.2017.08.030
- Herrera, E., Cuetos, F., & Ribacoba, R. (2012). Verbal fluency in Parkinson's disease patients on/off dopamine medication. *Neuropsychologia, 50*(14), 3636–3640. https://doi.org/10.1016/j.neuropsychologia.2012.09.016
- Johari, K., Walenski, M., Reifegerste, J., Ashrafi, F., Behroozmand, R., Daemi, M., & Ullman, M. T. (2019). A dissociation between syntactic and lexical processing in Parkinson's disease. *Journal of Neurolinguistics, 51*, 221–235. https://doi.org/10.1016/j.jneuroling.2019.03.004
- MacWhinney, B. (2000). The CHILDES Project: Tools for Analyzing Talk (third edition): Volume I: Transcription format and programs, Volume II: The database. *Computational Linguistics, 26*(4), 657–657. https://doi.org/10.1162/coli.2000.26.4.657
- Nicholas, L. E., & Brookshire, R. H. (1995). Presence, completeness, and accuracy of main concepts in the connected speech of non-brain-damaged adults and adults with aphasia. *Journal of Speech and Hearing Research, 38*(1), 145–156. https://doi.org/10.1044/jshr.3801.145
- Roberts, A., Nguyen, P., Orange, J. B., Jog, M., Nisbet, K. A., & McRae, K. (2017). Differential impairments of upper and lower limb movements influence action verb processing in Parkinson disease. *Cortex, 97*, 49–59. https://doi.org/10.1016/j.cortex.2017.09.022
- Roberts, A., & Post, D. (2018). Information Content and Efficiency in the Spoken Discourse of Individuals With Parkinson's Disease. *Journal of Speech, Language & Hearing Research, 61*(9), 2259–2274. https://doi.org/10.1044/2018_JSLHR-L-17-0338
- Stefani, A., Lozano, A. M., Peppe, A., Stanzione, P., Galati, S., Tropepi, D., Pierantozzi, M., Brusa, L., Scarnati, E., & Mazzone, P. (2007). Bilateral deep brain stimulation of the pedunculopontine and subthalamic nuclei in severe Parkinson's disease. *Brain: A Journal of Neurology, 130*(Pt 6), 1596–1607. https://doi.org/10.1093/brain/awl346
- Wang, H., Yan, X., & Guo, H. (2019). Visualizing the knowledge domain of embodied language cognition: A bibliometric review. *Digital Scholarship in the Humanities, 34*(1), 21–31. https://doi.org/10.1093/llc/fqy010
- Yorkston, K. M., & Beukelman, D. R. (1980). An analysis of connected speech samples of aphasic and normal speakers. *The Journal Of Speech And Hearing Disorders, 45*(1), 27–36.
- Zanini, S., Melatini, A., Capus, L., Gioulis, M., Vassallo, A., & Bava, A. (2003). Language recovery following subthalamic nucleus stimulation in Parkinson's disease. *Neuroreport, 14*(3), 511–516. https://doi.org/10.1097/00001756-200303030-00043
- Zanini, S., Moschella, V., Stefani, A., Peppe, A., Pierantozzi, M., Galati, S., Costa, A., Mazzone, P., & Stanzione, P. (2009). Grammar improvement following deep brain stimulation of the subthalamic and the pedunculopontine nuclei in advanced Parkinson's disease: A pilot study. *Parkinsonism & Related Disorders, 15*(8), 606–609. https://doi.org/10.1016/j.parkreldis.2008.12.003

44

How to Ask Questions

1. **Type in the question box on your control panel**

2. **Raise your hand!**
   - Click on the hand icon
   - Your name will be called out
   - Your mic will be unmuted,
   - Then you can ask your question out loud

3. **Email info@lsvtglobal.com if you think of questions later!**

45

Join us for our virtual SLP mini-conference
November 18-21, 2020

Date	Time (EST)	Title	Presenters
11/18 Wed	6:00-8:00 PM EST	Telepractice in Private Practice and University Clinics for Adults with Neurological Disorders Register: https://attendee.gotowebinar.com/register/6816630554863117965	Lori Ramig, PhD Jessica Galgano, PhD Geralyn Schulz, PhD Deborah Theodoros, PhD
11/19 Thurs	6:00-7:00 PM EST	LSVT LOUD® Applied to Adults with Cerebral Palsy: Two Single-Subject Studies Register: https://attendee.gotowebinar.com/register/6754091432977020429	Gemma Moya-Galé, PhD
11/19 Thurs	7:30-8:30 PM EST	Beyond Parkinson's: Use of Evidence-based LSVT LOUD for Other Movement Disorders, Aging and Children Register: https://attendee.gotowebinar.com/register/1045756919052631623	Cynthia Fox, PhD Angela Halpern, MS
11/20 Fri	12:00-1:00 PM EST	Enhanced Solutions for Voice and Mobility Maintenance Classes: Virtual Discoveries in PD Care! Register: https://attendee.gotowebinar.com/register/2907244394528674831	Angela Halpern, MS Laura Guse, MPT Cynthia Fox, PhD
11/21 Sat	10:00-11:00 AM EST	Improved Verb Use Following Intensive Voice Treatment in Individuals with Parkinson's Disease Register: https://attendee.gotowebinar.com/register/8436832406637468431	Amy Ramage, PhD
11/21 Sat	11:30-12:30 PM EST	Building a data base for automatic speech recognition in Parkinson's disease Register: https://attendee.gotowebinar.com/register/7651336901707853839	Lori Ramig, PhD Bob McDonald, PhD

46

Thank you!

LSVT GLOBAL

info@lsvtglobal.com
www.lsvtglobal.com

**Live viewing: Please complete the survey that will launch when you close the program.
Survey is required for ASHA CE Registry Reporting.**

47