Title: Impact of DBS on Independence in Conversation Following SPEAK OUT! Therapy.

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Summary: This study examines whether individuals with Parkinson's Disease (PD) who have undergone Deep Brain Stimulation (DBS) require different levels of cueing to maintain "speaking with intent" compared to those without DBS, following eight sessions of SPEAK OUT! Therapy. Knowing that DBS can cause dysarthria, we wanted to examine any differences in outcomes from SPEAK OUT! between both groups. We hypothesized that people with DBS might demonstrate different outcomes from the therapy. A decision was made to examine the levels of cueing needed between the two groups. In this study, we examined 17 participants diagnosed with PD, 6 implanted with a DBS, and 11 without. Both groups received 30-minute sessions, 2x weekly for 4 weeks. An unvalidated rating scoring system was developed to differentiate levels of cueing needed in SPEAK OUT! Therapy for participants to speak with intent, ranging from 0 (independent; no verbal cues necessary) to 5 (maximal cueing; 5 or more cues per exercise). Results of the study indicated that those participants with PD and DBS initially required a greater amount of cueing in the early phases of therapy. Following completion of 8 sessions, there was no significant difference in the amount of cueing needed by the groups. Individuals with a DBS implantation essentially "caught up" with those without. There are several limitations in this study, including a small sample size, which limits generalizability. There was no measure of participants' severity at entry into therapy, and perhaps those with DBS were at a higher level of acuity than those without DBS. The study results aim to inform the clinician's prognosis in the use of SPEAK OUT! Therapy in this population. This study is the first to examine differences in people with and without DBS in the implementation and outcome of SPEAK OUT! Therapy.

Methods: Seventeen participants, ages 39-82 years, with a diagnosis of Parkinson's Disease. Participants were grouped as those implanted with

DBS before beginning treatment (N=6), and those without DBS (N=11). The severity of dysphonia was rated using the CAPE-V (Kempster et al., 2009) prior to starting SPEAK OUT! Therapy. Eight 30-minute individual therapy sessions were delivered via telehealth over 4 weeks by a SPEAK OUT! certified clinician per protocol. Cueing required for the conversational task was defined and rated for each patient at each treatment session.

Results: There was a significant difference ($t= 2.7116$, $df= 5$, $p<0.05$) in the degree of cueing needed for the conversational task in the first session only between people with and without DBS. There was a significant difference ($t= 4.7239$, $df= 7$, $p<0.05$) in the amount of cueing needed in the conversational task following 8 sessions of SPEAK OUT! Therapy in those with and without DBS. From the first to the last session, there was a significant difference ($t= 3.3127$, $df= 5$,$p<0.05$) in the amount of cueing needed for those with and without DBS. No correlation ($r= 0.2406$, $p>0.05$) was found between the severity of dysphonia at the first session and the amount of cueing needed for the conversational tasks at the first session.

Discussion: Results of this small cohort study suggest that people with DBS may require more cueing in the early stages of SPEAK OUT! Therapy. In this study, people with DBS had a greater change in their level of independence from the first to the last session, suggesting that those with DBS can "catch up" to those without DBS by the end of therapy. In this study, the severity of dysphonia did not impact the level of cueing needed. The primary limitation of this study is the small sample size making generalization limited.