

DOSING OF A CUED PICTURE NAMING TREATMENT FOR ANOMIA

Introduction

Constrain Induced Language Therapy (CILT) has spurred discussion of treatment “intensity” in aphasia research, as clinicians and researchers began asking about the important features of CILT, and whether the principle of massed practice was in fact the driving force behind the treatment technique. However, as studies began addressing intensity of treatment, the need for consistent terms with regard to dosage in aphasia treatment research became apparent. Cherney, Patterson & Raymer (2011) reviewed the literature on CILT and highlight the importance of considering different aspects of dosage with regard to specific therapy approaches. Warren, Fey & Yoder (2007) identified these dosage parameters as dose form, dose, dose frequency, total intervention duration, and cumulative intervention intensity. The purpose of the present study was to identify dosing effects of a cued picture naming treatment, using the terminology proposed by Warren et al. (2007), on word finding abilities in individuals with anomia.

Method

Eight individuals who presented with chronic, stable, word finding deficits post-stroke participated in two weeks of a computerized, therapist delivered cued picture naming treatment. All subjects had significant but not profound anomia as indicated by a raw score of less than 46 but greater than three on the Boston Naming Test (BNT; Kaplan, Goodglass & Weintraub, 1983).

During treatment, each participant was asked to name black and white pictures of nouns on eight consecutive presentations of the same picture with a different cueing strategy for each

presentation (Gilbert, Kendall, Raymer, Rose & Gonzalez Rothi, 2009). The therapist delivered the following sequential cues: (1) independent naming (2) orthographic cueing, (3) repeating, (4) naming after a three second delay, (5) semantic cueing, (6) phonological cueing, (7) repeating, and (8) naming after a three second delay. Participants were always given the opportunity to name the item independently or after the cue, but in the event they were unable to produce the word after approximately 15 seconds, the therapist modeled the word and the participant attempted to repeat the word. Therefore, each participant attempted to name/repeat each word on every trial. All eight presentations of the same picture occurred regardless of the correctness of the participant's response.

Dosing parameters for each session were eight presentations of 50 pictures, totaling 400 teaching episodes per 60 minute session. The dosage rate was 6.67 teaching episodes per minute. Table 1 outlines the dosage parameters of the present study.

Picture naming probes were delivered before treatment each day to determine the effect of the teaching episodes from the prior treatment session on picture naming abilities. All subjects participated in therapy for one hour, four days per week, for two weeks. Thus, the maximum time in therapy was eight hours of treatment or a cumulative intervention intensity of 3200 teaching episodes. Picture naming abilities were assessed by probe data at baseline, before each treatment session, post treatment, and eight weeks following completion of treatment.

Results

Data were analyzed on an individual subject basis. The mean and standard deviation of baseline naming abilities were calculated from baseline naming probes delivered until the C statistic indicated stability of naming performance; which was nine to 13 times for all subjects.

Using critical thresholds for the t-distribution, we evaluated whether performance after each session (or each 400 teaching episodes) was significantly greater than baseline for two consecutive sessions at $p=0.05$ and $p=0.01$. If two consecutive sessions were significantly greater than baseline, we indicated the first session as the point of increase. See Table 2 for session numbers preceding first significant increase in naming probes.

Results revealed that six out of eight subjects achieved significant increases from baseline on trained items ($p=0.05$) after 400 teaching episodes (i.e. after the first treatment hour), and all 8 achieved significant increases from baseline ($p=0.05$) after 1200 teaching episodes (i.e. after the third treatment hour). Four out of eight subjects demonstrated significant increases from baseline ($p=0.01$) on trained items after 400 teaching episodes (i.e. after the first treatment hour), and seven out of eight achieved significance ($p=0.01$) after 2000 teaching episodes (i.e. after the fifth treatment hour). The subject who did not show improvement at $p=0.01$ also demonstrated the most severe naming deficits prior to beginning treatment (BNT=4).

Untrained pictures were also included in the naming probe list. After the eight treatment sessions, five out of eight subjects did not show significant increases in naming untrained probes ($p=0.05$). The three subjects who did show significance increases in naming untrained probes did so after sessions two, four, and six (on the 16th, 18th, and 20th attempt at naming untrained probes respectively). Six out of eight subjects did not show significant increases in naming untrained probes ($p=0.01$). The two subjects who did show increases ($p=0.01$) in naming untrained probes did so after session seven (on the 21st attempt at naming untrained probes), potentially due to repeated exposure of the stimuli during probe sessions.

Follow up probe data were collected eight weeks after finishing treatment for seven out of eight subjects.¹ For items that were trained in therapy, six out of seven subjects maintained significant improvement from baseline ($p=0.05$) and five out of seven subjects maintained significant improvement from baseline ($p=0.01$) for at least two consecutive probes out of nine-13 probes delivered at follow up. For untrained items, three out of seven subjects showed significant improvement from baseline ($p=0.05$) and one out of seven subjects showed significant improvement from baseline ($p=0.01$).

Conclusions

The present study investigated increases in picture naming performance after a therapist delivered, computerized picture naming treatment for word-retrieval difficulties. We examined the number of sessions/teaching episodes required for each subject to demonstrate significant increases in picture naming at the $p=0.05$ and $p=0.01$ levels. The high density of teaching episodes within the treatment session may have contributed to the statistically significant behavioral gains demonstrated by all participants in the study and the early treatment gains demonstrated by some of the participants after only one hour of therapy, due to the repeated practice of lexical retrieval. Follow up data indicate that six out of seven subjects maintained significant improvements in naming abilities from baseline ($p=0.05$) and five out of seven maintained significant improvements from baseline ($p=0.01$). This is consistent with a hypothesis by Monfils, Plautz and Kleim (2005) and highlighted in Kleim and Jones (2008, p.s229), who state that "...the plasticity brought about through repetition represents the

¹ It is worth noting that although the subjects did not participate in any speech or language therapy between post testing and follow up testing, they did participate in either an exercise intervention or stretching protocol with a therapist as part of a larger study.

instantiation of skill within neural circuitry, making the acquired behavior resistant to decay in the absence of training”.

It should be noted that clinical significance of treatment gains was not addressed in the present study, as the aim was to investigate statistical significance of dosing parameters on naming performance. Moreover, due to the small sample size, effects of this particular treatment should be interpreted with caution; however, the present study provides evidence that treatment approaches with a high density of teaching episodes within the therapy session may produce statistically significant treatment gains that are maintained after therapy ends.

References

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Table 1: Dosage Parameters for the Cued Picture Naming Treatment

Dosage terms	Term definitions	Term values for present study
Dose form	The therapeutic task or activity that delivers the teaching episodes. <i>Teaching episodes include the active ingredients of the intervention.</i>	Dose form= <u>picture naming</u> Active ingredients= cueing in the form of semantic cues, phonemic cues, orthographic cues, repetition, and naming after a delay.
Dose	The number of times a teaching episode or active ingredient occurs per session. <i>The dosage rate specifies the number of teaching episodes per unit of time.</i>	Dose= 50 pictures x 8 cues/presentations = <u>400 teaching episodes</u> Dosage rate= 400 teaching episodes per 60 minutes= <u>6.67 episodes per minute</u>
Dose frequency	The number of intervention sessions per unit of time	Dose frequency= <u>4 times per week</u>
Total intervention duration	The total period of time in which a particular intervention is provided	Total intervention duration = <u>2 weeks</u>
Cumulative intervention intensity	The product of dose x dose frequency x total intervention duration	Cumulative intervention intensity= 400 teaching episodes x 4 times per week x 2 weeks = <u>3200 teaching episodes</u>

Table 2: Session number preceding first significant increase in treatment probes

Subject	Trained (p=0.05)	Trained (p=0.01)	Untrained (p=0.05)	Untrained (p=0.01)
s05	1	1	6	7
s07	3	5	4	n/a
s11	2	2	2	7
s12	1	1	n/a	n/a
s13	1	1	n/a	n/a
s14	1	1	n/a	n/a
s104	1	4	n/a	n/a
s102	1	n/a	n/a	n/a

Note: Each session included 400 teaching episodes.