Using Masked Repetition Priming in Treatment of Anomia – A Phase 2 Study

Introduction

Individuals with anomia often demonstrate preserved lexical knowledge, even when they are unable to produce a lexical item. An interactive spreading activation model of lexical processing explains this dichotomy by suggesting that impaired lexical access can result from deficits in the spread of activation between levels of processing or from the maintenance of activation of target representations long enough for them to be selected [1]. In either case, impaired spreading activation is implicated in lexical retrieval impairments.

Spreading activation is a fundamental component of the implicit (unconscious) processing system that supports the rapid, accurate use of language. Implicit and explicit (conscious) processes and representations interact in language production [2], and there is some evidence that the interaction between them may also be impaired in aphasia. For instance, many people with aphasia demonstrate implicit lexical knowledge and/or implicit lexical processing even if they cannot explicitly produce those same items. Most established methods of treatment for anomia are highly explicit, having clients consciously consider a word's meaning, use, or form. If the implicit processing system and/or the interface between explicit and implicit systems is impaired, however, anomia treatment could benefit from finding ways to also address the implicit system more directly.

All treatment approaches recruit both implicit and explicit processes to some extent, due to the highly integrated, interactive nature of the language processing system. The treatment approach described here, however, shifts the therapeutic target from the explicit to the implicit end of the spectrum. We do this by using visual masking to make prime items implicit, and presenting them several times before asking for a naming response to pictures that are presented. While the naming response is an explicit response, the intent of the masked primes is to pre-activate the appropriate implicit lexical representation adequately so that the target word is more readily available when an explicit response is required. This has been demonstrated in principle by a study conducted with a single individual with anomia [3], which showed improved naming when masked primes were presented. The single-subject, multiple baseline study reported here for two participants extends this idea to investigate the effects of masked priming over repeated exposures on 1) trained items; 2) untrained items in the same semantic category; and 3) untrained items across semantic categories.

This is an ongoing project. At this time, data have been collected and analyzed for two participants, reported here. Additional participants will be enrolled in the project in early 2014, with those data included in the conference presentation, as well.

Method

Participants

Data will be reported for two participants, described in Table 1. Both had aphasia but no dysarthria. Participant #1 had a mild-moderate apraxia of speech; Participant #2 had no apraxia of speech.

Stimuli

Training stimuli were color photographs, with two semantic categories for each participant (Participant #1: *produce* and *sports and games*; Participant #2: *occupations* and *vehicles*). These were divided into trained items, untrained-exposed items ("UE"; seen as many times as the trained items, but with no prime presented), and untrained-unexposed items ("UU"; seen only during naming probes) for each category. Lists were matched in terms of frequency, typicality, phonologic neighborhood density, phonotactic probability, imageability, familiarity, number of syllables, age of acquisition and concreteness. Participant #1 had 10 items per condition per category; Participant #2 had 10 trained, 6 UE, and 6 UU items in *occupations*, and 10 trained, 10 UE, and 5 UU items in *vehicles*. These differences occurred because he did not have 30 items in any of the possible categories that were reliably difficult to name over seven baseline probes.

Prior to beginning the training protocol, each participant completed a masked prime visibility assessment, in which they made category membership decisions on masked words. Based on this task, we determined the masked prime exposure duration at which they were no longer reliably able to detect the content of the masked words. This was the exposure duration at which masked primes were presented during the training protocol.

Training protocol

Training for both participants involved repeated exposure (on a computer screen) to masked repetition primes (the picture names) and target pictures. Each trial involved four pairings of the prime and target, as follows (and see Figure 1):

- Forward mask of 12 hash marks (############)
- Prime word (or XG string for untrained words)
- Backward mask identical to forward mask
- Blank screen (prime-target interval)
- Target picture

This sequence was repeated four times consecutively. The target picture was presented for 1,000 msec in the first three presentations of the sequence, with no response required. On the fourth presentation, the response interval, it was presented for 10,000 msec. No feedback was provided at any time. Twelve training sessions occurred for each semantic category.

Outcome measures and analysis

Confrontation naming accuracy for all items was measured with repeated naming probes. Seven baseline probes occurred prior to the start of treatment, treatment probes occurred after every two treatment sessions during the training period (probes during training of Category 1 served as extended baselines for Category 2), and three post-treatment probes were then completed after treatment termination. Participant #1 has also completed a 3-month follow-up assessment. To assess generalization to broader language skills, the Western Aphasia Battery [4], Boston Naming Test [5], and (for Participant #2) conversational discourse questions [6] were administered before, immediately after, and three months after treatment. The Five Point Test [7] served as a non-linguistic control.

Results

Immediately post-treatment, Participant #1 showed a small effect for naming of trained and untrained/exposed *produce* items (ES = 3.56 and 3, respectively), and no effect for untrained unexposed items (ES = .4). He showed a large effect for trained *sports and games* items (ES =

10.21) and no effect for untrained/exposed or untrained/unexposed items (ES = .87 and 2, respectively). A medium effect occurred for generalization to *sports and games* during training of *produce* (ES = 4.36; see Figure 2 for naming probe data). Naming probe data from 3-months post-treatment are not yet available. No significant change was observed in WAB or BNT scores from pre-treatment to immediately post-treatment, but a large increase was noted in the BNT score at 3 months post-treatment (see Table 1). No change was seen in the non-linguistic control task (ES = -.072).

Immediately post-treatment, Participant #2 showed a small effect of treatment for trained items in the second treatment category (*vehicles*), and showed a trend toward an effect for trained items vs. both untrained sets (UE and UU) for *occupations* (*Vehicles*: ES = 2.75, .53, and 1, respectively; *Occupations*: ES = 2.14, 0, and .92 for trained, UE, and UU items, respectively). No cross-category generalization was noted (ES = .62; see Figure 3 for naming probe data), and there was no change in the non-linguistic control task (ES = .26). No significant change was observed in WAB or BNT scores (see Table 1).

Discussion

Data from the first two participants in this early Phase 2 treatment study of masked identity priming have demonstrated some improvement in naming of trained items, with some evidence of both within- and cross-category generalization, though responses have been inconsistent. This poster will present the data, along with discussion of factors that may lead to variability in response to treatment.

References

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Table 1. Participant characteristics and pre-, immediately post-, and 3-month post-treatment test scores. WAB AQ is out of 100 possible points; BNT is out of 60 possible points.

Participant	Age	Dx	Test	Pre-treatment	Immediately post-treatment	3 months post-treatment
#1	60	8 years post-L MCA CVA	WAB AQ	69.1	69.9	71.2
			BNT	15	17	29
#2	61	2 years post-L MCA CVA	WAB AQ	73.9	78.5	Not yet administered
			BNT	30	31	Not yet administered

Figure 1 - Sequence of visual stimuli for a single trial. All stimuli were presented centered on a computer screen. Times shown for each screen are those used for Participant #1, compatible with the 100 Hz refresh rate needed on the computer monitor to accommodate the 10 msec masked prime exposure duration; times were adjusted slightly for Participant #2 to be compatible with a 70 Hz refresh rate used to accommodate the 14 msec masked prime exposure duration.

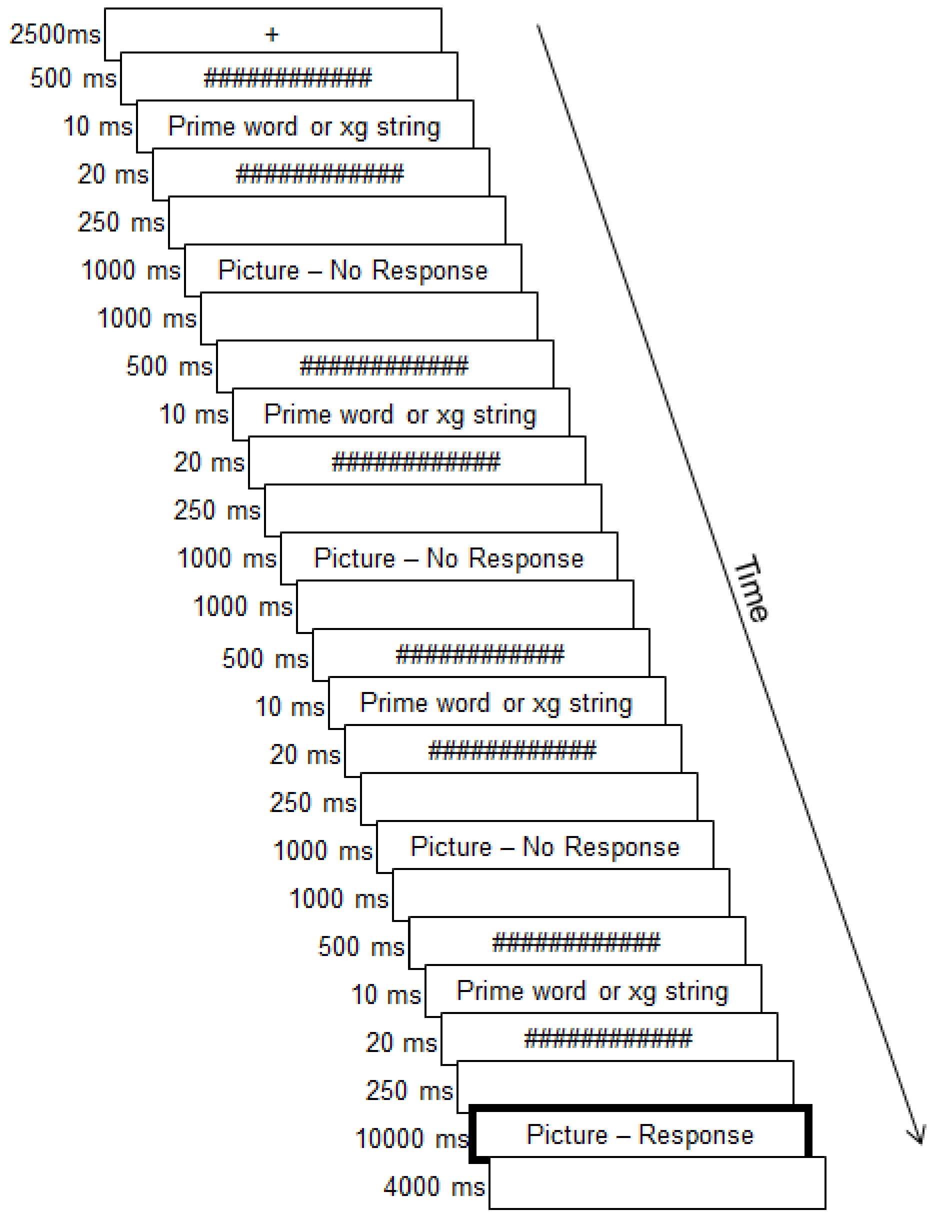

Figure 2 – Repeated probe data for Participant #1

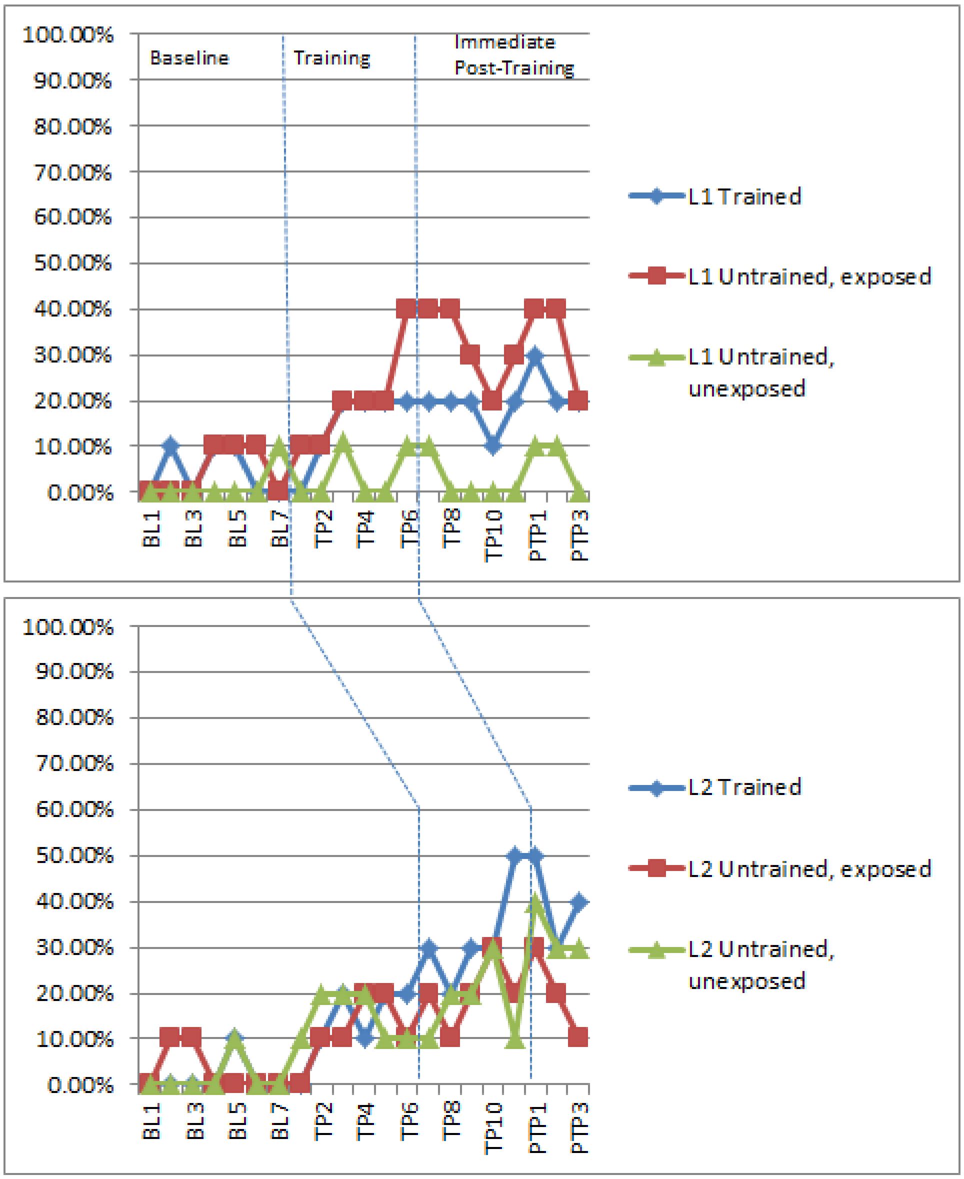

Figure 3 – Repeated probe data for Participant #2