A Moderately Intensive Functional Treatment
For Severe Auditory Comprehension Deficits Associated with Aphasia

Severe, chronic, auditory comprehension deficits secondary to aphasia can adversely impact an individual's quality of life by limiting successful communication interactions (Bose et al., 2009). Furthermore, individuals lacking awareness of comprehension deficits may be less inclined to compensate for communication breakdowns (Knollman-Porter, Dietz, & Groh, 2012).

Interventions utilizing intense and repetitive stimulation are recommended to promote neuroplasticity, and therefore, language function following a stroke (Kleim & Jones, 2008; Kurland et al., 2012). More specifically, highly intensive treatment protocols (two hours a day, five days a week for three weeks) for severe comprehension deficits have demonstrated promising gains in word comprehension and awareness with corrective feedback and researcher-selected stimuli (Knollman-Porter et al., 2012).

However, not all clients and caregivers can tolerate intensive treatment protocols. Additionally, the importance of stimuli type, particularly personally relevant stimuli, has been suggested in promoting treatment outcomes (Hinckley & Carr, 2005; McKelvey et al., 2010). Therefore, further research is needed to examine more functional treatment options for individuals with comprehension deficits. This study investigated the impact of a moderately intensive treatment protocol using personally relevant stimuli and corrective feedback on auditory comprehension and self-awareness in individuals with severe, chronic, aphasia.

Methods

Participants

Participants included three adults with aphasia and severe auditory comprehension deficits due to left hemisphere stroke. Participants were at least one year post-onset, had a high school education or greater, were right-handed, native speakers of American English, and demonstrated hearing and vision adequate for experimental tasks. Participants did not exhibit verbal perseverations and could indicate a yes/no response. See Table 1for participant characteristics.

Stimuli Development

Caregivers interacting with the participant at least once a day, five days a week, nominated 50 single personally relevant (PR) words they believed the participant could not comprehend during daily interactions. For each PR word, a corresponding semantic foil, phonemic foil, and computer-generated color image was created.

Experimental stimuli selection. To determine which nominated PR words would be selected for the experimental procedures, participants were shown each PR image three times on non-consecutive occasions. When an image was displayed, researchers would state either the corresponding PR target, semantic foil, or phonemic foil. Participants determined if the spoken word matched the image by responding "yes" or "no". No corrective feedback was provided to participants. For a nominated word to be within the 30 word experimental stimuli set, participants must have incorrectly identified either the PR target, semantic foil, or phonemic foil at least once.

Design

Research questions were examined by following an ABA single-subject design.

Baseline phase. Baselines sessions followed the same protocol used to select experimental stimuli. The number of spontaneous requests for repetition of stimuli was also documented. Participants exhibited stability by demonstrating comprehension accuracy of 50% or lower of the PR stimuli for three consecutive sessions.

Treatment phase. Participants completed nine, two-hour treatment sessions over one month. Sessions followed the same procedure used to select the experimental stimuli. Additionally, participants were notified they could request repetition of verbal stimuli if a breakdown in comprehension occurred. Researchers repeated stimuli only when requested by the participant. Immediate corrective feedback was provided indicating whether responses were correct or incorrect (see Appendix A).

Maintenance phase. Comprehension performance accuracy was assessed one week, three weeks, three months, and six months post-treatment. Procedures followed the baseline phase as participants were not provided feedback or cues to request repetition.

Data Analysis and Reliability

Researchers completed inter-rater reliability measures to assess fidelity of the researchers' ability to follow protocol. The frequency ratio resulted in 90% agreement.

Dependent Variables

Data was analyzed to determine: (1) average percentage comprehension accuracy of responses; (2) average number of repetition requests; and (3) average number of correct versus incorrect responses following repetition.

Results

Single Word Comprehension

Participant 1. Following a relatively stable baseline, a rapid response to intervention was demonstrated (see Figure 1). Improvement in comprehension continued gradually throughout treatment and was maintained six months post-treatment. A large effect size was exhibited (Cohen's d = 7.88) (Cohen, 1988). The trend line slope (3.80) indicates a positive relationship between the introduction of the treatment phase and improved comprehension of stimuli over time.

Participant 2. Average percentage of accuracy remained below 50% during the baseline phase (see Figure 2). Over the course of treatment, a gradual trend of improvement was observed but was variable secondary to fatigue. Performance was maintained six months post-treatment. A large effect size was exhibited (Cohen's d = 2.98) (Cohen, 1988). A positive relationship between the initiation of the treatment phase and increased comprehension was observed by the trend line slope (1.60).

Participant 3. Performance below the required 50% accuracy was maintained during the baseline phase (see Figure 3). A stable trend with more consistent responses was noted during the treatment phase, with the greatest increase in percentage of accuracy observed during the seventh and eighth sessions. Performance was maintained above baseline six months post-treatment. A large effect size was exhibited (Cohen's d = 2.87) (Cohen, 1988). The trend line slope (2.84) suggests a positive relationship between the treatment phase and improved comprehension.

Self-Initiated Compensatory Strategy Use and Effectiveness

Participant 1.

Frequency of repetition requests. A declining trend of requests was noted during baseline (see Figure 4). Treatment resulted in an increasing trend of requests which was maintained above baseline measures six months post-treatment. A large effect size was demonstrated (Cohen's d = 3.66) (Cohen, 1988).

Response accuracy following repetition. A rapid positive trend in number of correct versus incorrect responses following repetition was demonstrated in the second half of the treatment phase. A greater number of correct responses following repetition continued through the maintenance phase. A large effect size was exhibited (Cohen's d = 4.90) (Cohen, 1988).

Participant 2.

Frequency of repetition requests. A positive trend of repetition requests was demonstrated during the baseline phase (see Figure 6). A gradual, declining trend throughout the intervention and maintenance phase was observed. No effect size was demonstrated (Cohen's d = 0) (Cohen, 1988).

Response accuracy following repetition. Throughout all phases, repetition resulted in more correct than incorrect responses (see Figure 7). No effect size was demonstrated (Cohen's d = 0) (Cohen, 1988).

Participant 3.

Frequency of repetition requests. The baseline phase revealed a positive, accelerating trend in number of repetition requests (see Figure 8). The average number of repetition requests increased during the last weeks of treatment, but returned to baseline levels at 6 months. A large effect size was exhibited (Cohen's d = 1.04) (Cohen, 1988).

Response accuracy following repetition. During baseline, response accuracy following repetition was inconsistent (see Figure 9). A relatively stable number of correct versus incorrect responses was maintained during intervention and six months post-treatment. A large effect size was exhibited (Cohen's d = 2.26) (Cohen, 1988).

Clinical Impressions

This investigation confirmed that the auditory comprehension of personally relevant words can improve in individuals with severe, chronic aphasia following a moderately intensive treatment. Additionally, corrective feedback can lead to increases in awareness of comprehension deficits resulting in greater self-initiated compensatory strategy use to enhance comprehension. Although individuals with severe aphasia can improve comprehension of personally relevant words, prospective investigations should explore generalization of these stimuli beyond the clinic and into functional environments.

References

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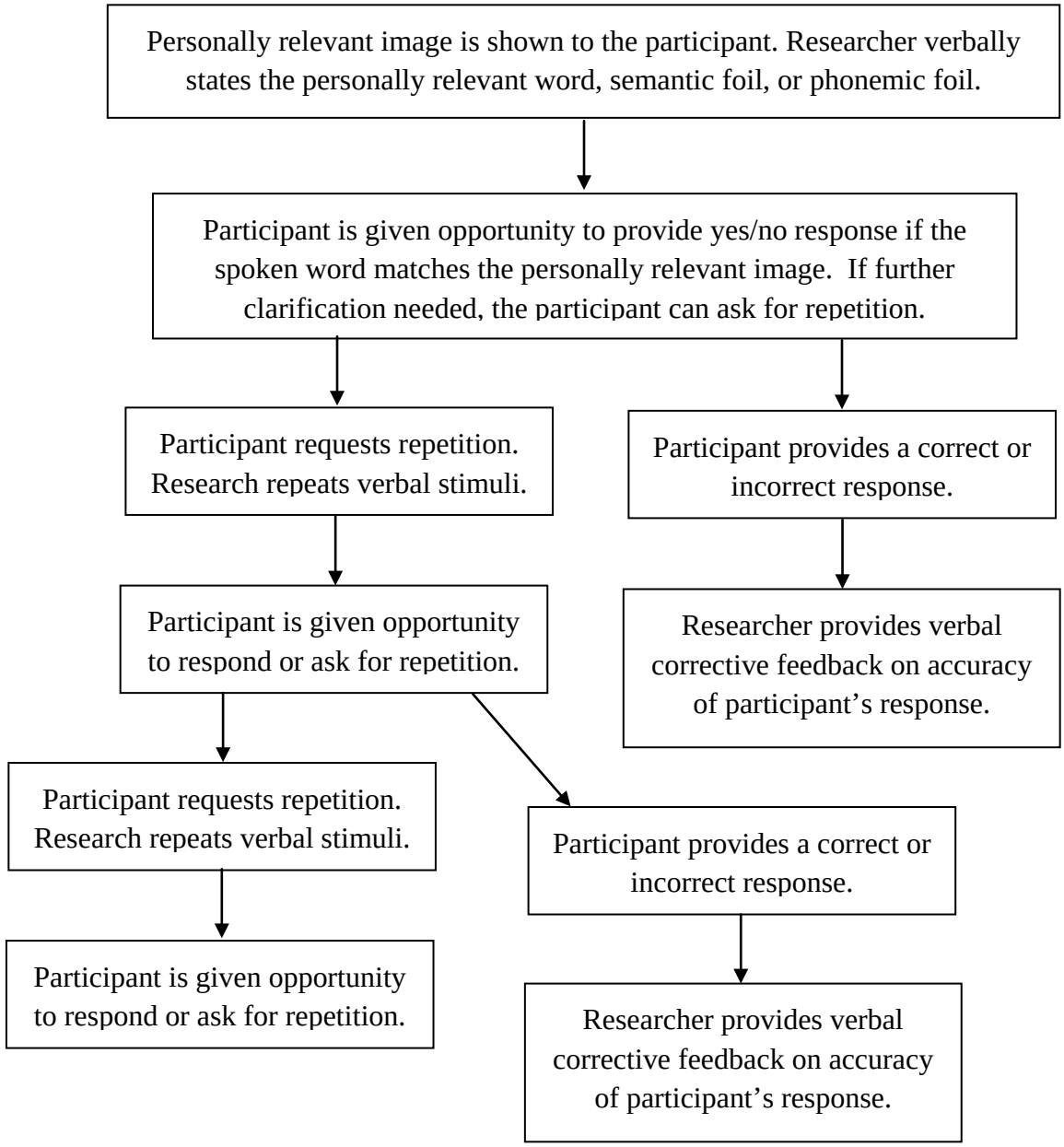
Table 1
Participant Demographic, Aphasia-Related, and Standardized Assessment Data

Variable	S.M.	B.G.	T.G.
Months Post-CVA	35	92	142
Age	54	75	66
Gender	Male	Female	Male
Race	Caucasian	Caucasian	Caucasian
Education	2-Year College	High School	2-Year College
Handedness	Right	Right	Right
Aphasia Type	WR	WR	Global
WAB-R AQ	21.9	48.8	24.8
WAB-R: Auditory Comprehension Score[a]	63	116	72
PPVT-4: Form B[b]	144	65	89
CLQT: Symbol Trials Subtest[c]	11	0	0

Note. Months post-CVA was calculated from the month participants were initially included in the study. WR= Wernicke's Aphasia; WAB-R= Western Aphasia Battery-Revised (Kertesz, 2007); AQ= aphasia quotient (Kertesz, 2007); [a]WAB-R Auditory Comprehension Score (300 Possible); [b]PPVT-4= Peabody Picture Vocabulary Test, 4th Edition (228 Possible) (Dunn & Dunn, 2007). [c]CQLT= Cognitive Linguistic Quick Test: Symbol Trails Subtest (11 Possible) (Helm-Estabrooks, 2001).

Appendix A

Experimental Treatment Protocol



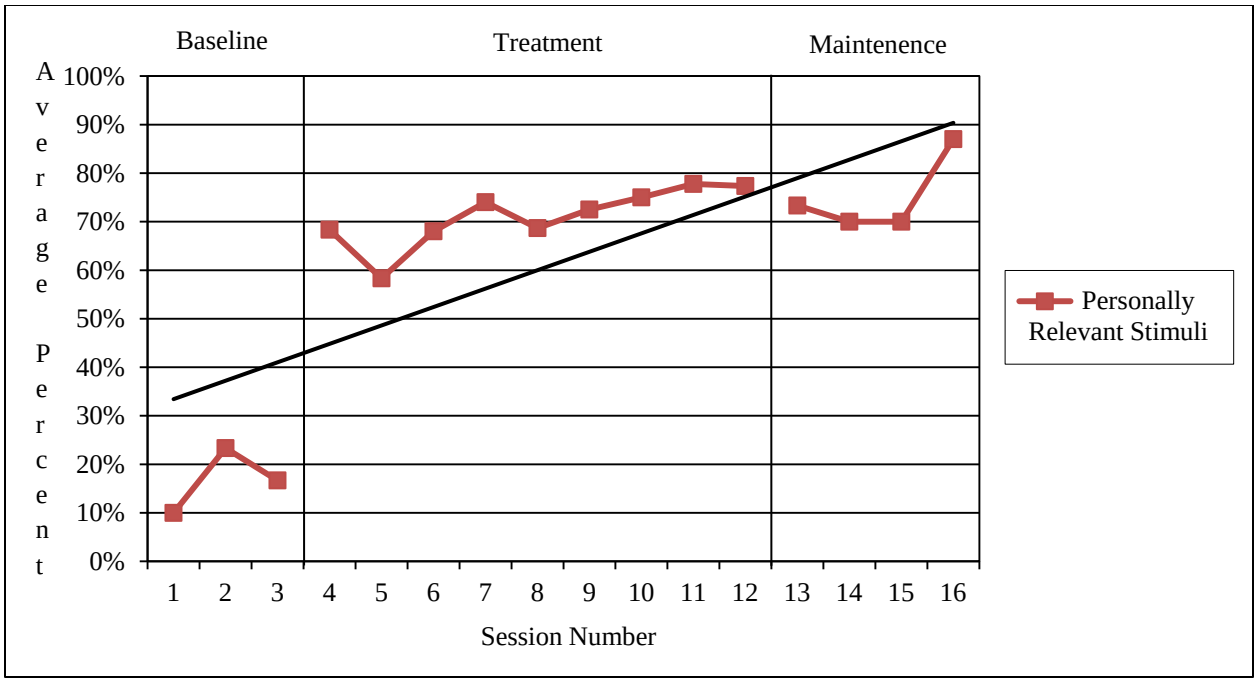


Figure 1. Average percent of correct responses on comprehension tasks by Participant 1. Total possible data value for personally relevant stimuli was 30.

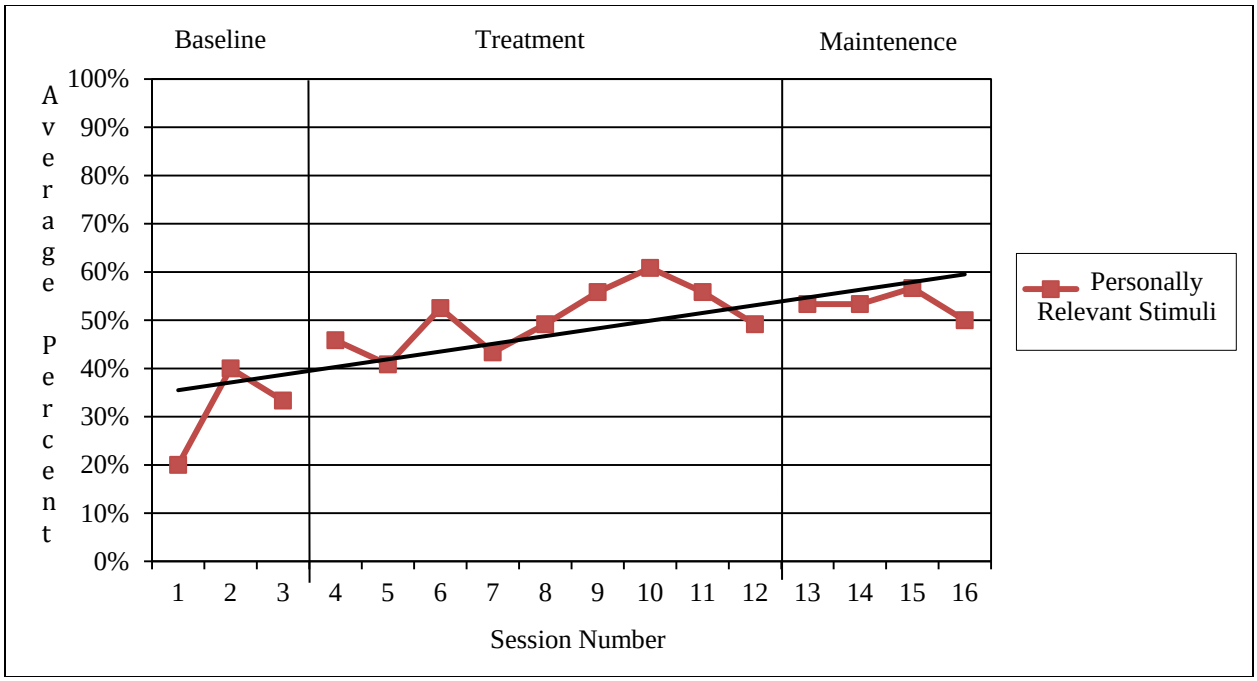


Figure 2. Average percent of correct responses on comprehension tasks by Participant 2. Total possible data value for personally relevant stimuli was 30.

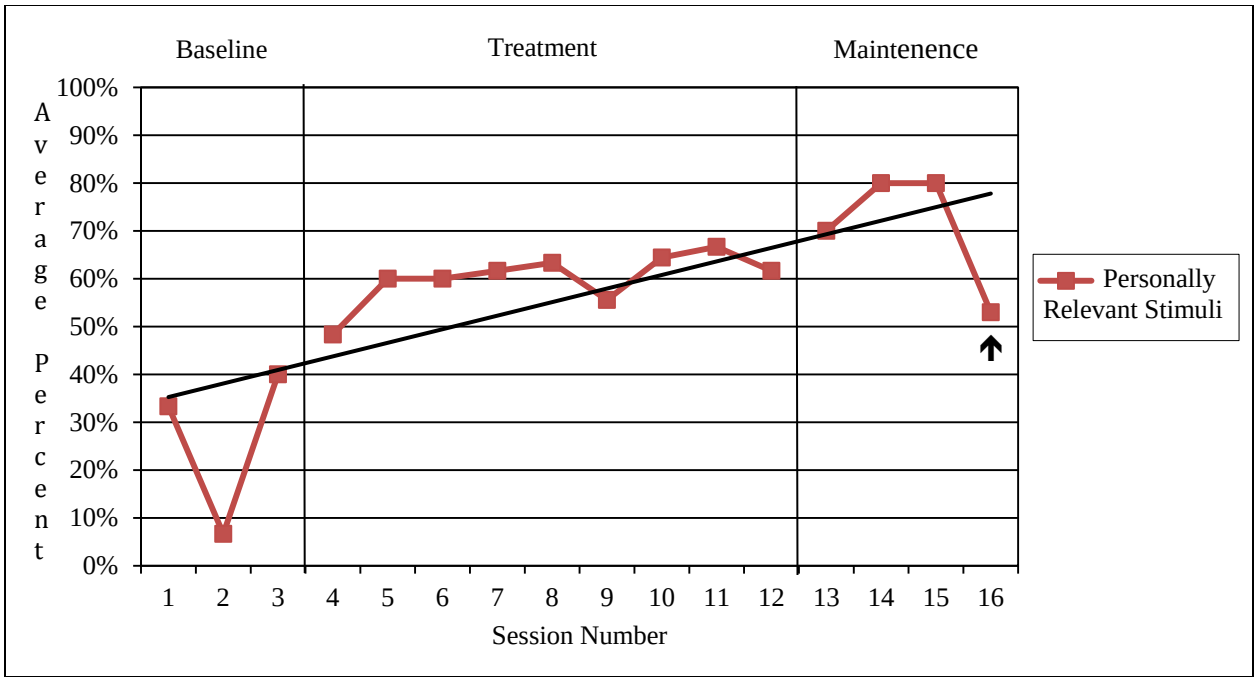


Figure 3. Average percent of correct responses on comprehension tasks by Participant 3. Total possible data value for personally relevant stimuli was 30. Arrow represents that Participant 3 had surgery with complications prior to session 16.

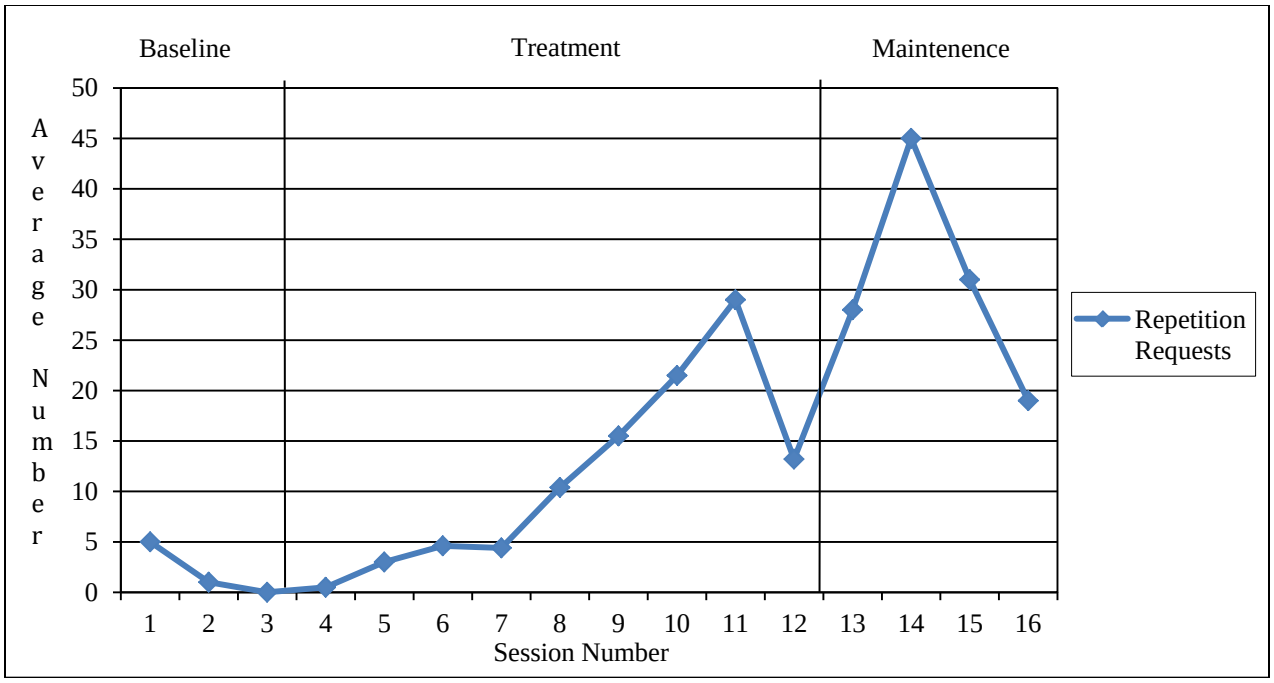


Figure 4. Average number of requests for repetition by Participant 1.

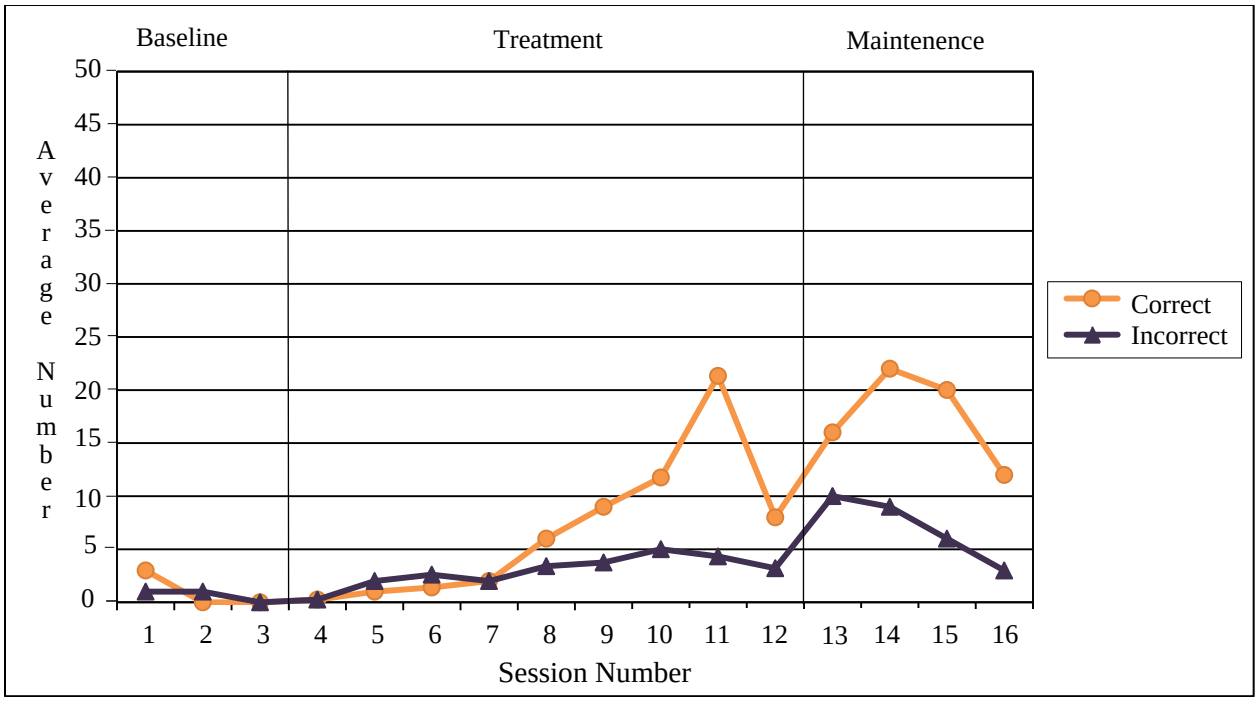


Figure 5. Average number of correct versus incorrect responses to repetition by Participant 1.

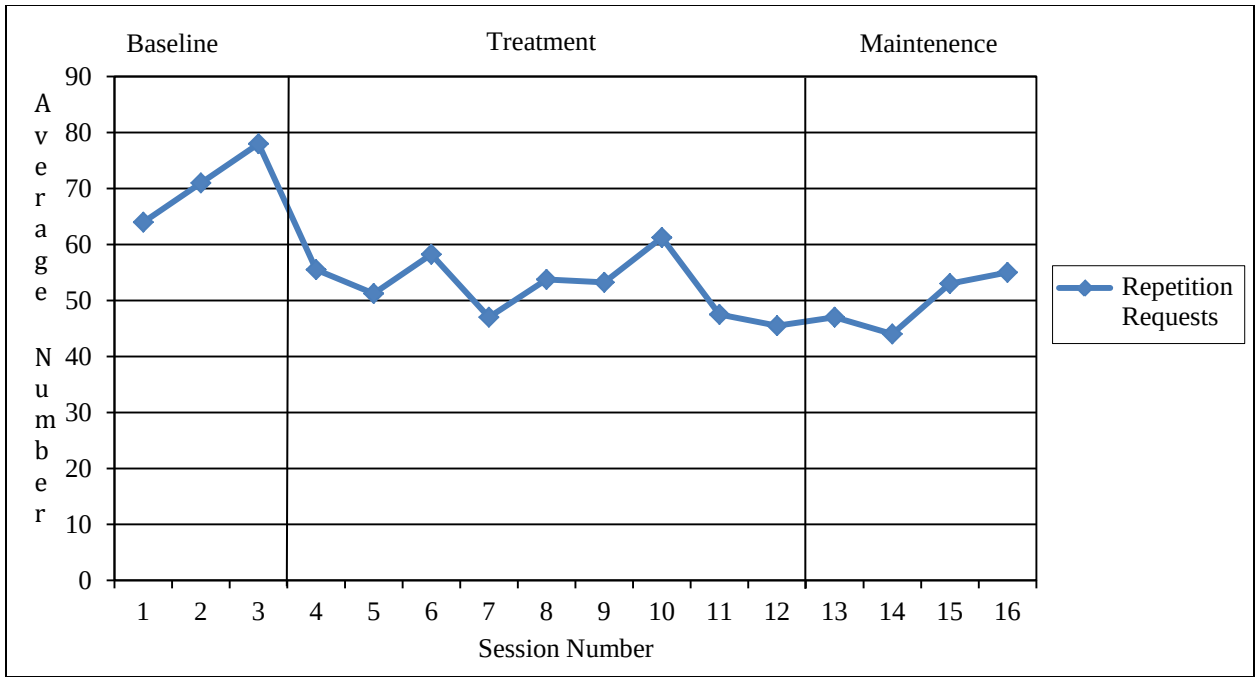


Figure 6. Average number of requests for repetition by Participant 2.

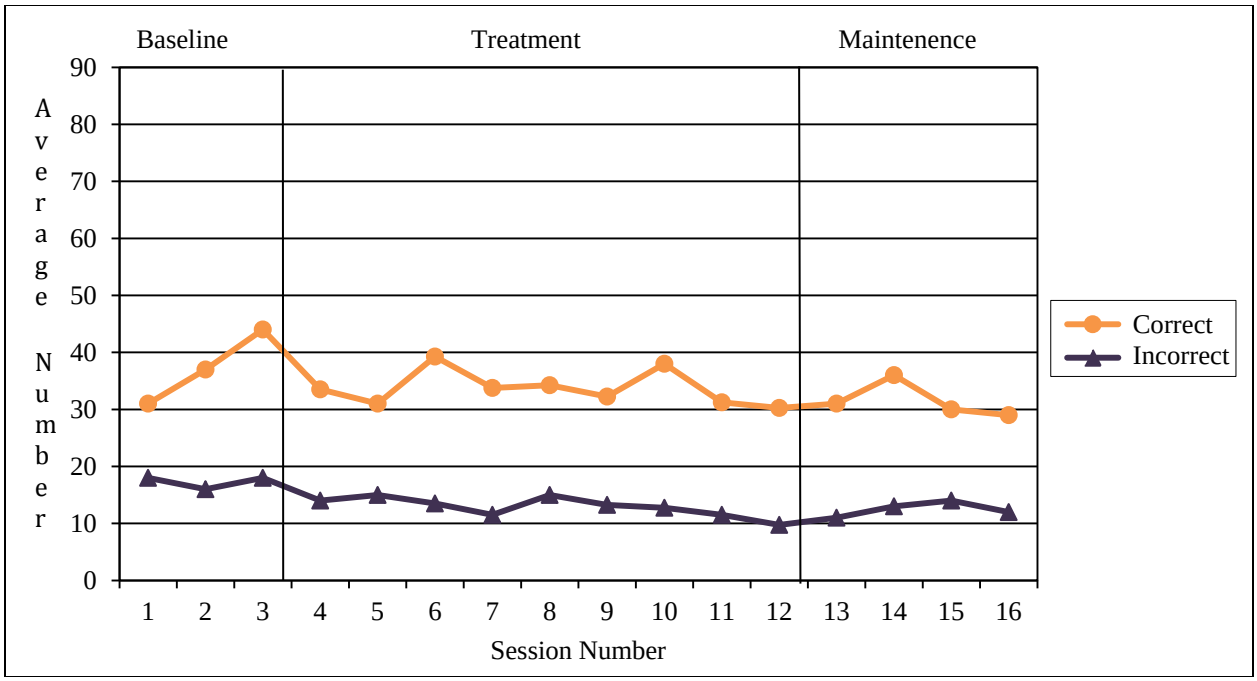


Figure 7. Average number of correct versus incorrect responses to repetition by Participant 2.

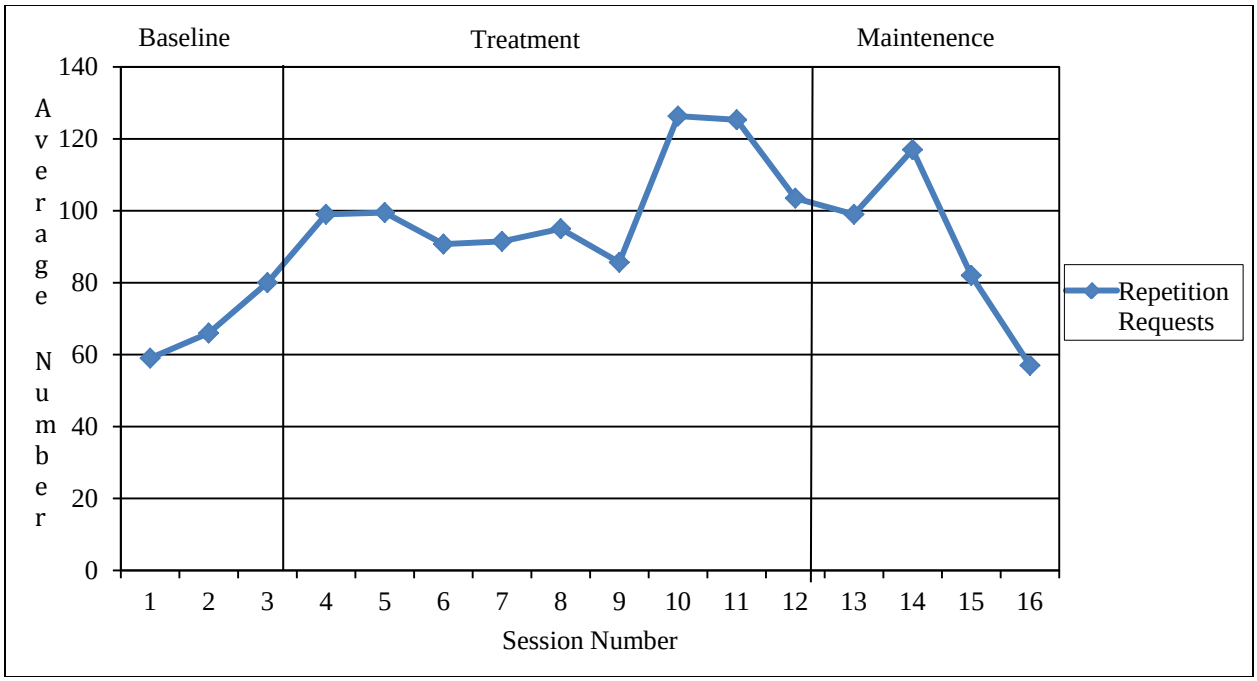


Figure 8. Average number of requests for repetition by Participant 3.

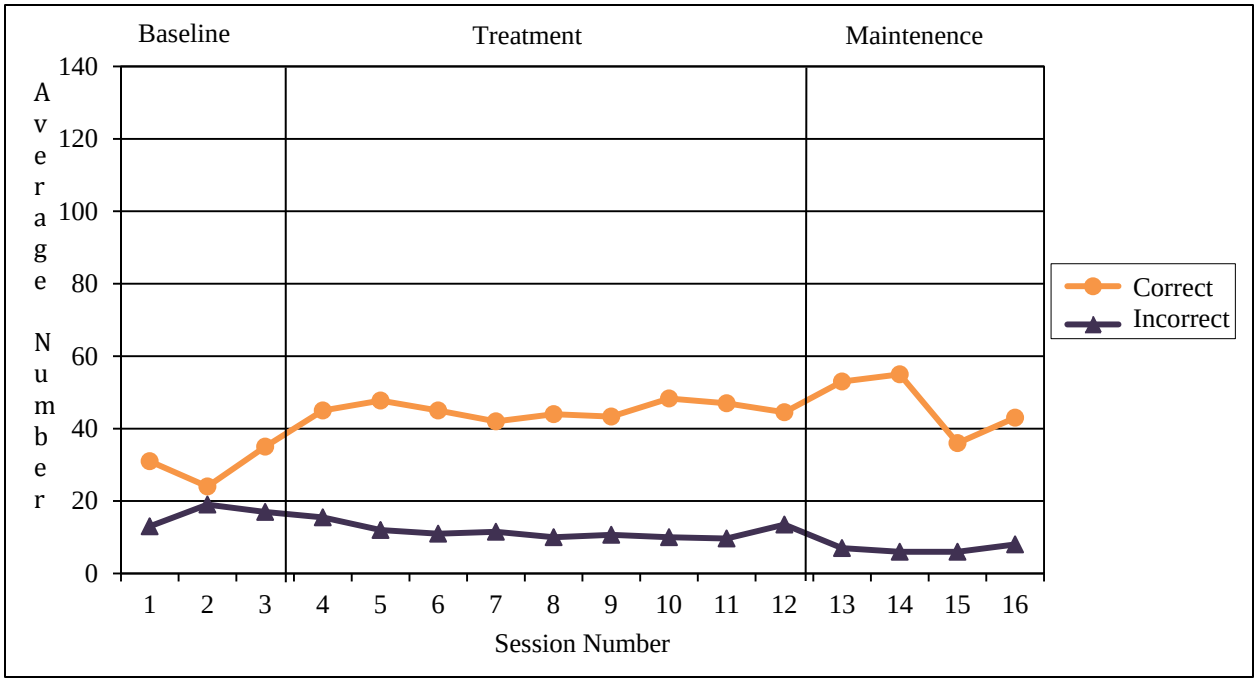


Figure 9. Average number of correct versus incorrect responses to repetition by Participant 3.