

Other Uses of Single-Case Designs

Round-Table Discussion

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Besides helping to answer the ubiquitous "Does treatment help the aphasic patient?" question, data from single-case designs can be used to answer more specific clinical questions. Data from three apraxic patients with mild amounts of coexisting aphasia are used to provide information about generalization of apraxia of speech treatment effects and retention of articulatory skills gained from treatment.

Patients

The three patients were diagnosed as being apraxic and aphasic because of their patterns of performance on a standardized battery of tests: the Porch Index of Communicative Ability (PICA) (Porch, 1967), the Token Test (DeRenzi and Vignolo, 1962), The Minnesota Test for Differential Diagnosis of Aphasia (Schuell, 1965), and a motor speech test with spontaneous and imitative portions. Patterns of response were analyzed and diagnoses were made by two speech pathologists at a major metropolitan medical center.

Designs

Data were collected using traditional and slightly modified A-B, A-B-A-B, and multiple baseline designs. Data collection satisfied the requirements specified by Hersen and Barlow (1976). Patients were given standardized test instructions and stimuli (including spontaneous speech, imitation, and reading), and they were naive about the purpose and timing of testing. Responses were tape-recorded under standard conditions and were scored using a multi-dimensional system by trained listeners both at the time of testing and later. Two listeners judged all responses.

Question One: Does treatment of a target in word-initial position generalize to that same target at the end of a word?

Figure 1 shows what happened to initial and final /st/ as measured in the imitative production of single words while it was being treated only in the initial position of syllables and words (treatment and test words were different). The patient was three years duration of apraxia of speech and aphasia subsequent to a cerebrovascular accident. Performance improved in the initial position, as one would expect, and the treatment effect generalized to /st/ in the final position. Figure 2 shows that /tʃ/, treated and tested in the same way, improved in the initial position but that the treatment effect failed to generalize. Replication across sounds and across positions is necessary before we can know as much as we need to about generalization, but these data do suggest that generalization differs for different sounds.

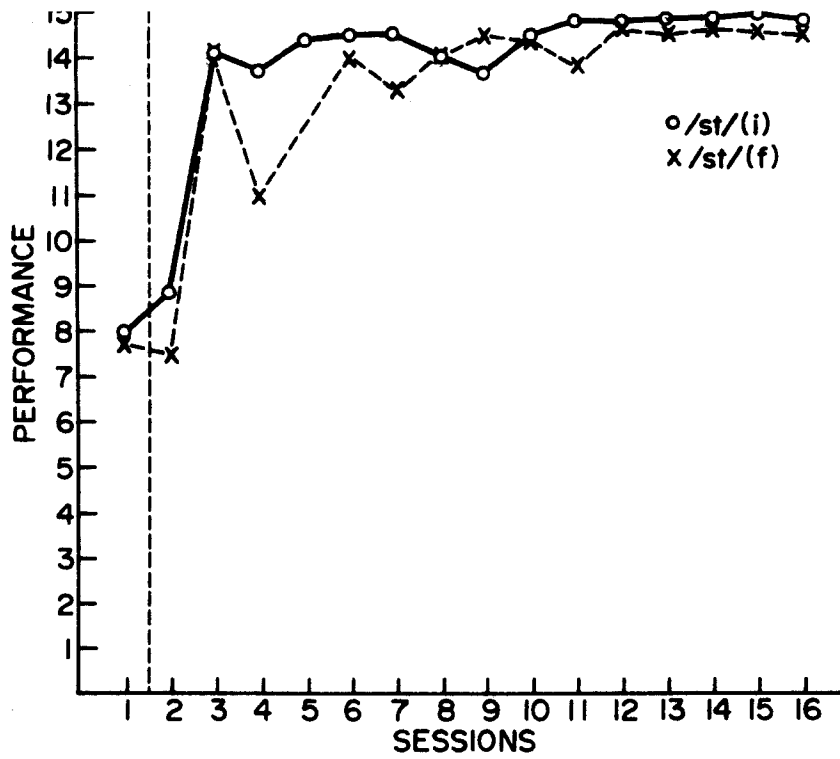


Figure 1. The effects on word-initial and word-final /st/ resulting from treating /st/ only in word-initial position.

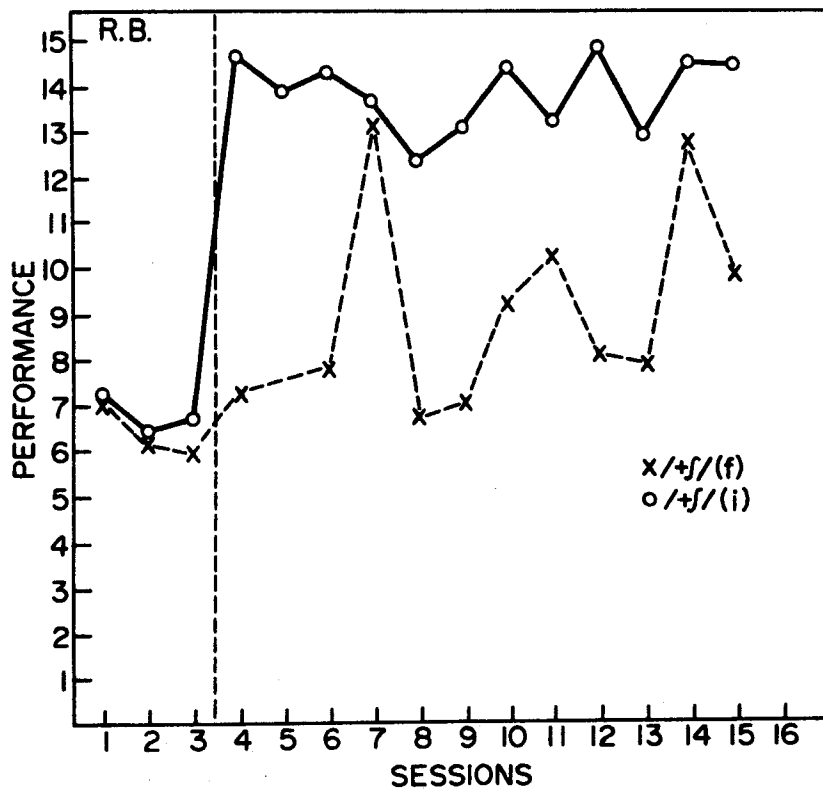


Figure 2. The effects on word-initial and word-final /tʃ/ resulting from treating /tʃ/ only in word-initial position.

Question Two: Does treatment of some sounds generalize to other sounds?

Figure 3 shows multiple baseline data for /s/, /f/, and /θ/ as treated and tested in two severely apraxic patients. These patients were being treated during the second month after left hemisphere cerebrovascular accident. The data from the left hand side of Figure 3 suggest that treatment of initial /s/, while it improves that sound, does not generalize immediately to /f/ and /θ/, also tested in the initial position. Treatment, however, does appear to influence those sounds. To be emphasized, however,

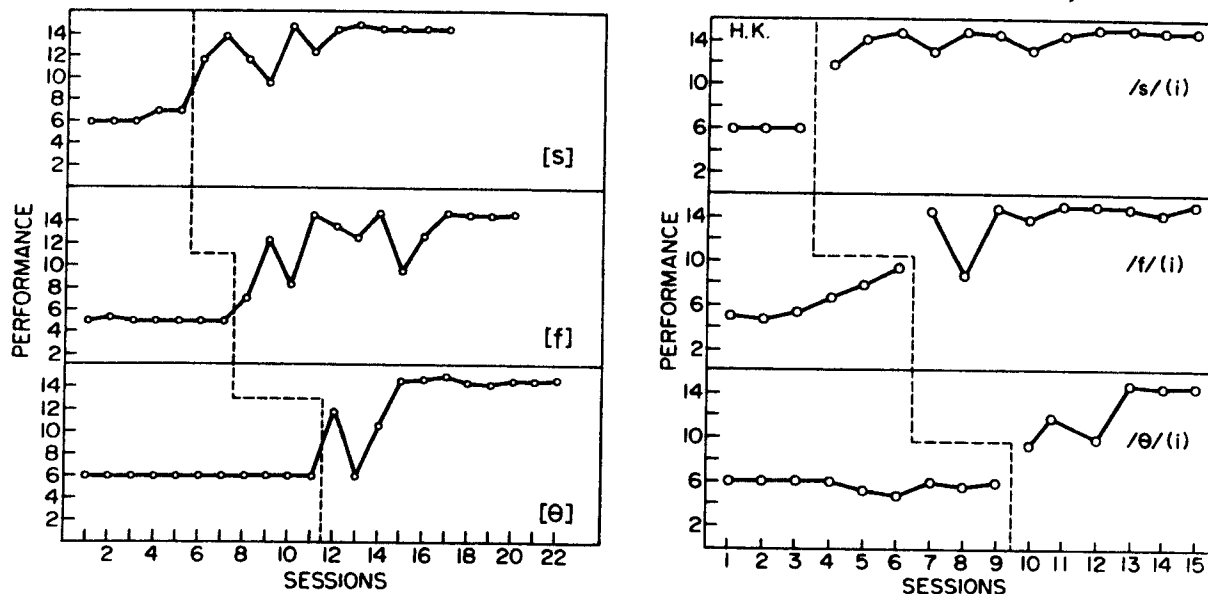


Figure 3. Left—results of treating /s/, /f/, and /θ/ in the context of a multiple baseline design. Right—replication with another patient.

is that the time allowed for generalization was very short. Treatment may generalize if the untreated sounds (in this case /f/ and /θ/ are left untreated for a longer period; and for some, generalization may occur more rapidly. For example, generalization to /f/ may have occurred for the patient whose data are represented on the right hand side of Figure 3, because the patient's production of that sound improved while /s/ was being treated but before treatment had begun on the /f/. It appears that /θ/ was influenced by treatment. The changes in /f/ may also reflect spontaneous physiological improvement. The effects of spontaneous improvement, like treatment effects, may influence certain articulatory gestures before others, so that /f/ was dragged up by spontaneous improvement, while /θ/ was left untouched, at least during the period represented by these data. The best test of generalization of treatment would be with chronic, severe patients. The problem is that chronic, severe apraxic patients are rare. A chronic, severe apraxia is almost inevitably accompanied by a severe aphasia, yielding the syndrome of Broca's aphasia.

Question Three: Does treatment of a target using imitation improve that target in both imitation and reading?

This question is also one of generalization. The patient who produced the data in Figure 4 had a severe apraxia and a moderate aphasia of one

month's duration. Initial /s/, first in isolation, then in syllables and words, was taught using imitation and phonetic placement. His aphasia was not being treated directly during the time the data were collected. Learning was tested by having him name single words presented imitatively and on 3x5 cards. Treatment generalized from the imitative to the reading conditions, but was somewhat more variable in reading, as shown in Figure 4. Again, replication is necessary, but our feeling is that learning does generalize across modalities and test conditions, at least for patients who are on their way to regaining functional speech.

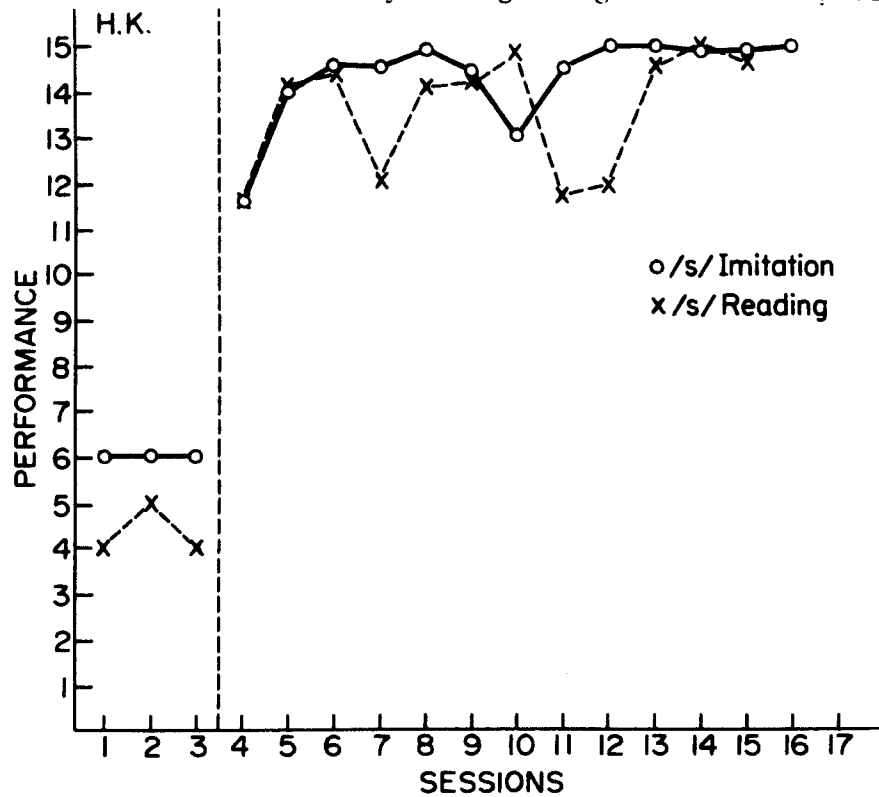


Figure 4. Changes in word-initial /s/, treated primarily with imitation and tested in both imitation and reading.

Question Four: How are responses retained from session to session?

By ignoring the traditional A-B-A-B design's requirement of equal-treatment and no-treatment periods it was possible to collect data on the variability of a treated response during the course of its treatment. The data in Figure 5 show that response adequacy faded when treatment was withdrawn during the early sessions, even though the patient was in the period of spontaneous physiological improvement, only to become more stable as treatment continued. Most clinicians would have predicted as much. One strength of the single-case design is that it can be used to test such intuitions. Such retention data may also predict amount of recovery with patients headed for excellent return showing less sag early than those destined to fall short of functional recovery. That hypothesis is being tested now.

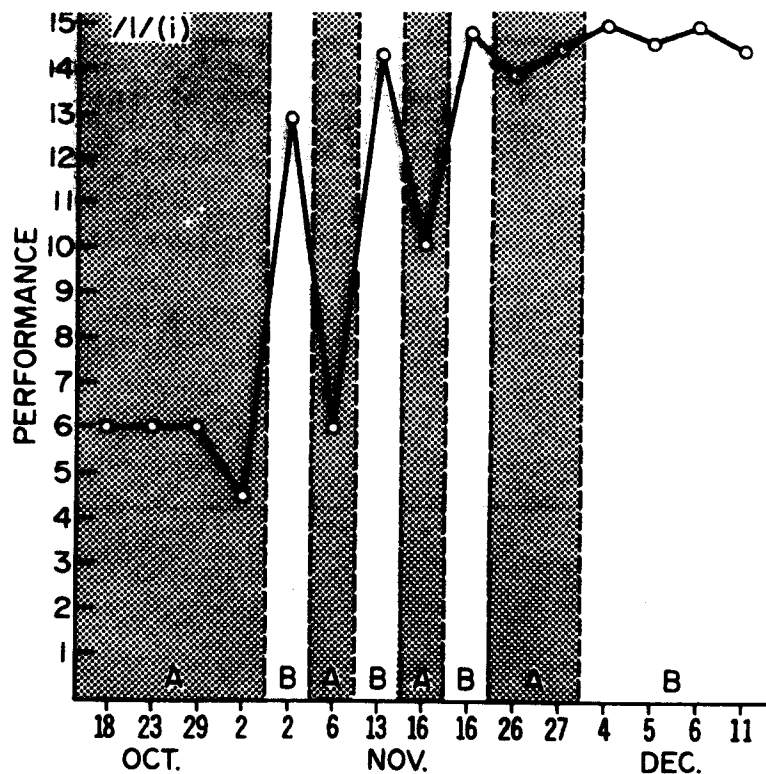


Figure 5. Effects of treatment withdrawal shown in B stages across sessions for /l/ in word-initial position.

Summary

Clinical hunches about how patients respond can be replaced by data-based conclusions. Single-case designs can help provide that data base.

References

- DeRenzi, E. and Vignolo, L.A. The Token Test: A sensitive test to detect receptive disturbances in aphasia. *Brain*, 85, 665-678, 1962.
- Hersen, M. and Barlow, D.H. Single-Case Experimental Design: Strategies for Studying Behavior Change. New York: Pergamon Press, 1976.
- Porch, B.E. Porch Index of Communicative Ability. Palo Alto, CA: Consulting Psychologists Press, 1967.
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Discussion

After a short paper on selected uses of single case designs, the discussion began with a consideration of procedures: The needs for determining predictable baselines, for using a multi-dimensional scoring system, for determining intra- and inter-judge reliability, and for making unobtrusive measures. Baseline measurements were discussed at length. It was suggested that the amount of baseline testing should be decided beforehand. Others disagreed by saying that one value of the single-case design is that it can be responsive to patient differences and to patient changes. All agreed that a stable baseline was best, but it was noted that even upward sloping baselines can be compared statistically with treatment

slopes. Other procedural issues discussed included the necessity of separating treatment stimuli and test stimuli and for being careful to both limit and specify the treatment procedure. This last is especially important because the single-case design is for the testing of techniques and not for the testing of treatment packages. Participants were urged to use a variety of test materials, including those that sample functional communication.

Generalization was discussed. Generalization was agreed upon as being lawful. Several examples of how multiple-baseline designs can be used to discover or confirm relationships among linguistic behaviors were described. Evidence of generalization can also tell the clinician how patients move a particular set of responses toward functional-purpose control.

As usual the withdrawal period in an A-B-A-B design received its share of discussion. One discussant said he liked to see the treated response stay treated; in other words, he didn't want it to sag. Others argued that the value of the sag is as a second piece of evidence that the treated behavior is indeed under the clinician's control; the first bit of evidence is in the behavior's movement during the first treatment period. Sag does cease after longer periods of treatment, or if it does not, the patient's responses are telling you he is a chronic aphasia patient and is probably not going to get any better. The ethics of withdrawal were discussed and several persons thought that short periods of withdrawal were justified if they taught clinicians and students something about the power of specific techniques.

Uses of single-case designs during the period of spontaneous recovery was also discussed. The major issue seemed to be the response of treated behaviors during the withdrawal period. Most agreed that the treated response did not and, in fact, would not return to baseline, but that it would sag if the behavior were difficult enough and if it were under the clinician's control. Another reason for a drop, according to one participant, was that a treated response may drop off a bit as it is being integrated with other responses.

Setting criteria for all kinds of things was discussed at length. Some of the questions were difficult and the group, quite expectedly, had no answers. Typical of this type was the question of how many successful repetitions or sessions should be completed before moving on to a new step or activity. Others were easier to answer; for example, if you change methods to boost a patient's performance, do you need to alter your design? The answer seemed to be that there are rules for continuing and withdrawing treatments and these should be obeyed lest the power of the single-case design to test specific techniques be diluted.

The discussion was notable in that comments and questions showed discussants for the most part had moved beyond the strict textbook understanding of single-case designs and requirements to the creative use of those designs to answer questions in clinical aphasiology.