CHAPTER

19

Replication of a Treatment Protocol for Repetition Deficit in Conduction Aphasia

Lisa C. Beard
Thomas E. Prescott

Conduction aphasia is an acquired language disorder that is diagnosed in approximately 10 percent of aphasic patients. Briefly stated, conduction aphasia is characterized by severe difficulties in repetition of spoken language in the presence of relatively good auditory comprehension and fluent speech. Spontaneous speech often contains numerous literal and verbal paraphasias and/or circumlocutions. Conduction aphasic patients comprehend oral and written material adequately. Visual stimuli are, however, easier to process than auditory stimuli. On the whole, these patients are able to engage in normal interactions and conversations appropriately with relatively little difficulty (Green and Howes, 1977).

Several studies have supported treatment approaches for conduction aphasia that capitalize on the utilization of visual stimuli to facilitate improvement in the auditory and verbal modalities (Boyle, 1988; Joanette, Keller, and Lecours, 1980; Nespoulos et al., 1987). Boyle (1988) states that these investigations are compatible with the theory of intersystemic reorganization, which supports the use of a more intact system (i.e., the visual modality) to facilitate improvement in the impaired system (i.e., the auditory and/or verbal modalities).

The purpose of this study was to replicate the treatment program described by Sullivan, Fisher, and Marshall (1986), which reported success in the treatment of a repetition deficit in one patient diagnosed as exhibiting conduction aphasia. This treatment program utilized auditory-visual-verbal repetition to improve performance of auditory-verbal repetition.

Replication of treatment programs described as being effective are important for determining treatment efficacy, especially when small numbers of subjects are reported. Replication of the Sullivan, Fisher, and Marshall (1986) study was our initial intent. However, the protocol was expanded to include both maintenance and generalization measures. Our treatment program utilized a multiple baseline across varying conditions combined with an ABA withdrawal design (McReynolds and Kearns, 1983).

SUBJECTS

The two patients compared for purposes of this study appeared to be very similar. Sullivan, Fisher, and Marshall (1986) reported a 42-year-old right-handed man (RK) with a left CVA that resulted in right hemiparesis and hemianesthesia. His motor and sensory deficits reportedly resolved quickly. Our patient (NB) was a 44-year-old right-handed man

TABLE 19-1. A COMPARISON OF NB AND RK's SIMILARITIES

	NB	*RK*
Lesion location/ etiology:	Left CVA	Left CVA
Age:	44 years	42 years
Time after onset:	2 months	2 months
Motor and sensory deficits:	Right hemiparesis that quickly resolved	Right hemiparesis and right hemianesthesia that resolved quickly
PICA and BDAE scores:	See Tables 19-2 and 19-3	

TABLE 19-2. A COMPARISON OF NB AND RK's MODALITY MEANS AND PERCENTILE SCORES FROM THE *PORCH INDEX OF COMMUNICATIVE ABILITY* (PORCH, 1967)

	Mean		*Percentile*	
	NB	RK	NB	RK
Overall	12.68	13	72	76
Writing	10.9	11.23	81	82
Copying	13.3	13.35	69	70
Reading	14.9	13.6	95/96	73
Pantomime	13.2	12.25	89	76/77
Verbal	11.08	12.78	52	65
Auditory	13.8	13.8	43	64/72*
Visual	15	15	35/99	35/99

*These are figures reported by Sullivan, Fisher, and Marshall (1986); a review of the raw scores indicates that the normative value for a mean score of 13.8 results in a percentile score of 43.

with a left CVA resulting in conduction aphasia and mild right hemiparesis that quickly resolved. Tables 19-1 through 19-3 present comparison data and PICA and BDAE data for the two patients. We were impressed with the similarities (age, time after onset, PICA scores, BDAE scores, etc.) between the two patients. Consequently, a replication of the Sullivan, Fisher, and Marshall project allowed for comparison of the two subjects' performances.

TABLE 19-3. A COMPARISON OF NB AND RK's RESULTS OF THE INDEPENDENT MEASURES TAKEN FROM THE *BOSTON DIAGNOSTIC APHASIA EXAMINATION* (GOODGLASS AND KAPLAN, 1972 AND 1983)

Subtest	*Percentile*	
	NB	RK
Paraphasia:		
Neologistic	70	70
Literal	10	10
Verbal	30	30
Extended	20	50
Oral reading:		
Word reading	90	90
Oral sentence	80	75
Repetition:		
Words	30	40
High probability	30	10
Low probability	50	50

SPEECH AND LANGUAGE EVALUATION

The Porch Index of Communicative Ability (PICA) (Porch, 1981), the Western Aphasia Battery (WAB) (Kertesz and Poole, 1974), and the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan, 1972 and 1983) were administered to NB. Results from the PICA (Table 19-2) corresponded closely to those of RK, which were obtained by Sullivan, Fisher, and Marshall (1986). NB obtained an overall percentile score of 72 as opposed to RK's overall percentile score of 76. NB's modality mean scores also were characterized by delays and incomplete responses, with the exception of the visual modality, which indicated no difficulties. Scores for both NB and RK ranged from the 43rd to the 99th percentile.

NB obtained an aphasia quotient of 69.4 and a cortical quotient of 74.3 on the WAB. The profile of scores indicated a diagnosis of conduction aphasia. This test was not administered to RK.

The profile of scores on the BDAE (Table 19-3) indicated a diagnosis of conduction aphasia and corresponded closely to results obtained for RK. RK had more difficulty with the repetition of high-probability words, obtaining a percentile score of 10, as opposed to NB's percentile score of 30. NB's speech contained more extended paraphasias, as indicated by a percentile score of 20, as opposed to RK's percentile score of 50. NB's speech was fluent, but was frequently contaminated by literal and verbal paraphasias and a mild degree of circumlocution. He had striking difficulties in auditory-verbal repetition compared with relatively mild auditory comprehension and word-finding difficulties. The BDAE further demonstrated NB's intact oral reading ability. This corresponds with Sullivan, Fisher, and Marshall's characterization of RK's communicative abilities.

METHOD

BASELINE

Baseline measures of auditory-verbal repetition ability were obtained for two lists of 10 sentences and questions (Table 19-4). The stimuli were those utilized by Sullivan, Fisher, and Marshall (1986), with slight modifications. List 1, sentence 6, "I am a painter," was changed to "I was a postman." Sentence 7, "My name is Ron," was changed to "My name is Nolan." According to Sullivan, Fisher, and Marshall, stimuli were designed to be "functional" monosyllabic and bisyllabic words of no more than five syllables. The clinician read the sentence at a normal rate, which the patient repeated (no pause). Measures also were obtained for 5- and 10-second delay conditions in which the clinician read the sentence at a normal rate and the patient waited for 5 or 10 seconds before

TABLE 19-4. THE TWO LISTS OF STIMULI UTILIZED FOR TREATMENT

List 1	*List 2*
1. I want to leave.	1. Where is the bathroom?
2. I need to eat.	2. May I sit down?
3. I'm very hungry.	3. The sink is dirty.
4. Bring me my pills.	4. I need my coat.
5. How are you feeling?	5. Let's have some dinner.
6. I was a postman.	6. We should get gas.
7. My name is Nolan.	7. It's a nice day.
8. How much is it?	8. We went last night.
9. Turn on the lamp.	9. Would you like coffee?
10. I had a stroke.	10. Will you call me?

Note: These were modified slightly in order to pertain to NB.

repeating. Treatment began on list 1 (no pause condition) when stable measures of three consecutive identical responses had been obtained. List 2 never received any treatment, and baseline measures were taken throughout the program for all three conditions to determine possible generalization.

TREATMENT

Treatment commenced on list 1 (no pause) by having NB read the sentence aloud three times from a typed (uppercase) 3 by 5-inch index card. If the third reading was inaccurate, he was instructed to read the sentence again until an accurate reading was accomplished. No more than one extra reading of a sentence was ever required. The subject was then instructed to turn the card over and immediately repeat the stimulus sentence without the benefit of visual imput. This continued until a criterion of 90 percent accuracy or above was achieved on three consecutive sessions.

At the same time that treatment was being administered for list 1 (no pause), baseline measures for list 1 (5-second and 10-second delays) were obtained and for list 2 for all three conditions (no pause and 5-second and 10-second delays). Once criterion was achieved for list 1 (no pause), treatment was withdrawn. Treatment immediately began for list 1 (5-second delay), and baselines were collected on all other lists and conditions (Figs. 19-1 and 19-2).

RESULTS

Figure 19-1 presents NB's percent correct repetitions for list 1 for the baseline, treatment, and withdrawal phases in all conditions. Figure 19-1 also shows a celeration-line approach (Ottenbacher, 1986) and visually demonstrates baseline data compared to changes in the client's performance during the intervention and/or withdrawal phase. Ottenbacher has described the use of a celeration- or trend-line approach with data of this nature. This analysis is based primarily on the binomial test (Siegel, 1956) to establish probability that trends do or do not differ. Ottenbacher (1986) has provided a probability table to be utilized with celeration-line data. The table probabilities are more conservative than probabilities generated with the binomial test. "The celeration line approach was developed primarily to display trend and describe the

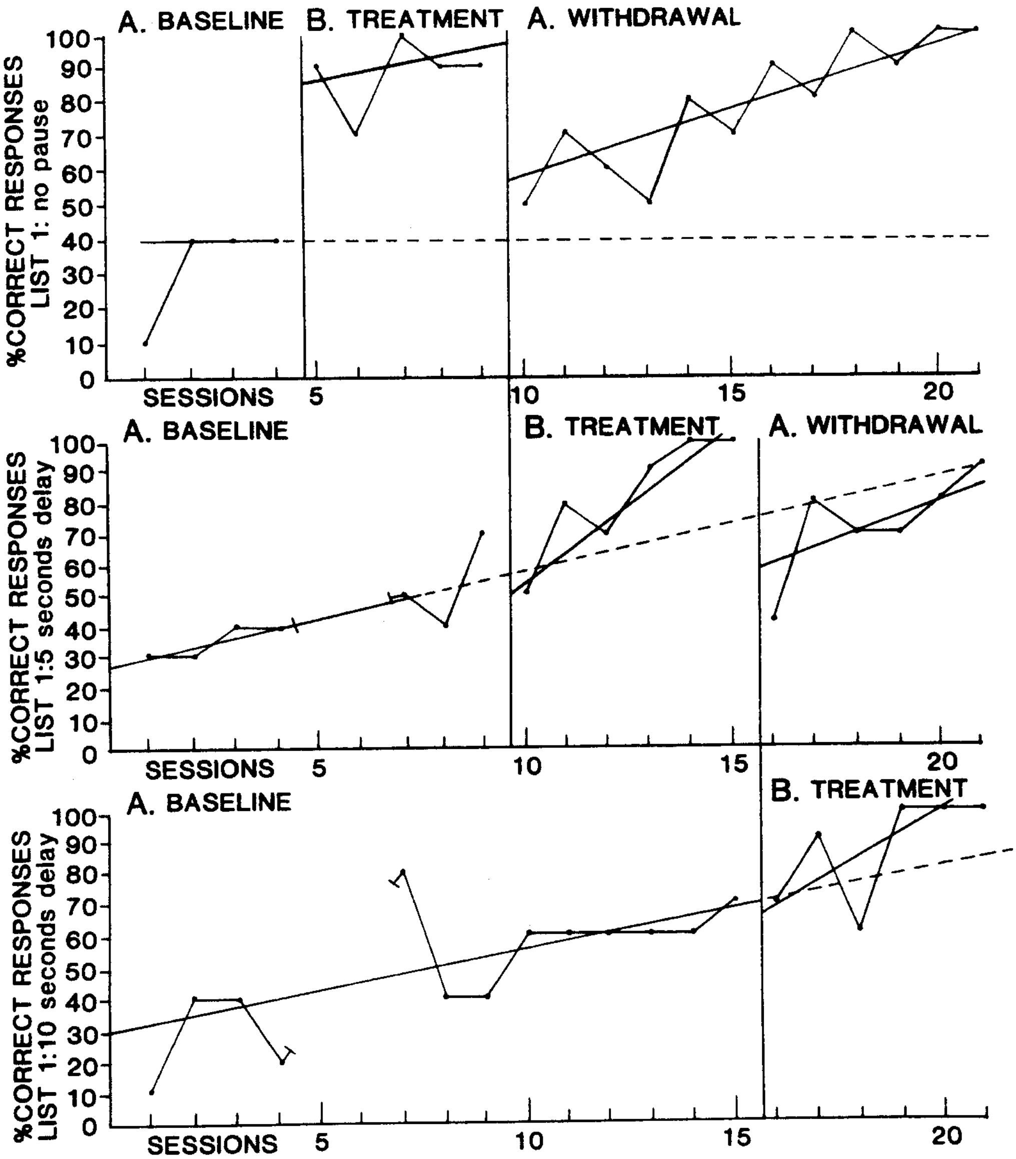

Fig. 19-1. Percent correct repetitions, list 1, all conditions, with celeration lines.

phases of change across phases . . ." (p. 185). The reader is referred to Ottenbacher (1986) for a complete description of celeration-line analysis. For list 1 (no pause), the addition of treatment resulted in an increase in correct responses that was statistically significant ($p < .05$). The withdrawal of treatment resulted in a statistically significant ($p < .05$) reduction in the correct response slope. However, a comparison of pretreatment and post-treatment withdrawal indicated that post-treatment correct responses were still statistically significantly higher ($p < .05$) when compared to pretreatment correct responses. This indicated that the patient learned the task at a level superior to the pretreatment level

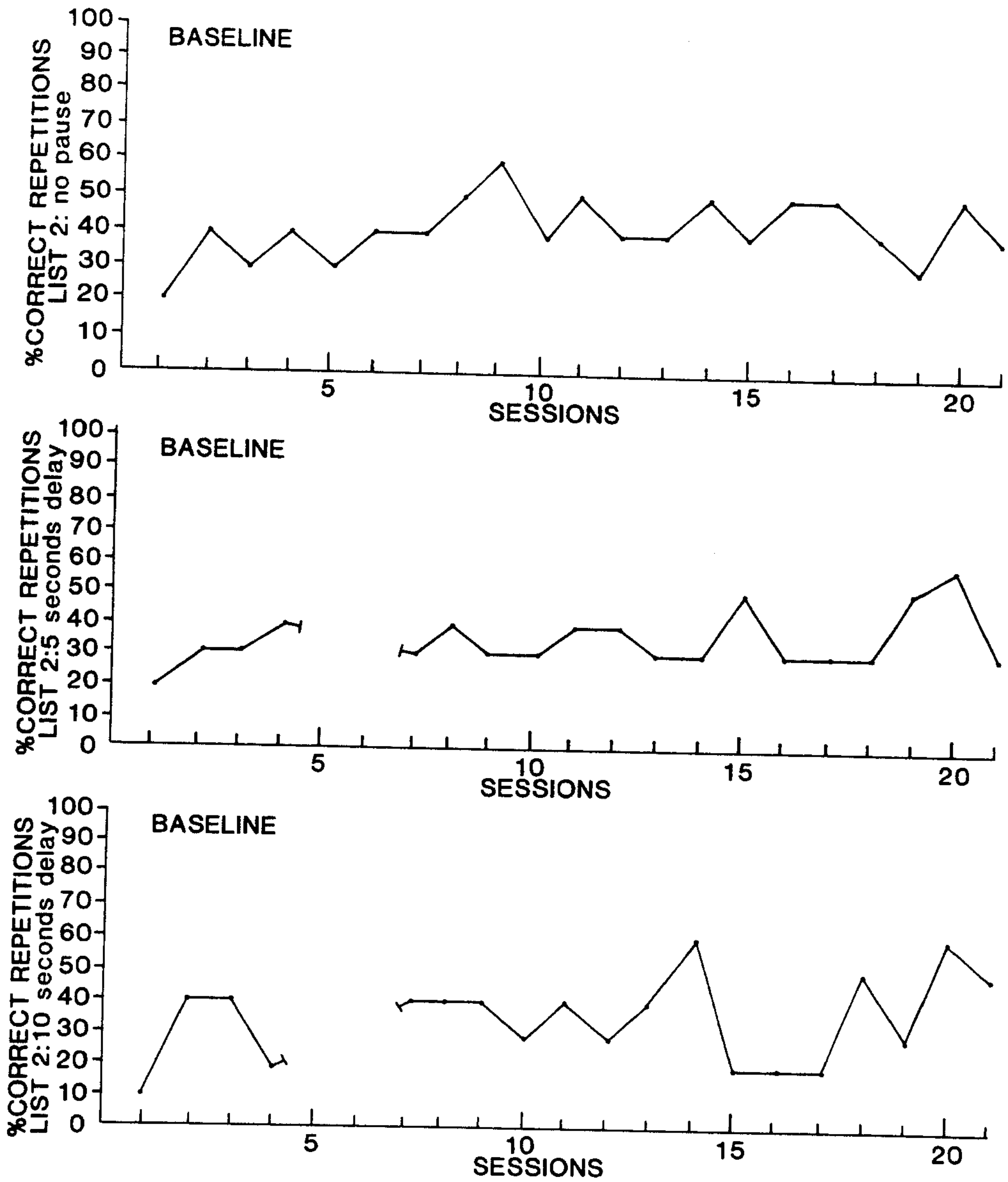

Fig. 19-2. Percent correct repetitions, list 2, all conditions, with celeration lines.

but showed some reduction in ability when treatment was removed. However, he still maintained levels superior to the pretreatment levels obtained. With regard to response delays, NB demonstrated no statistically significant differences (.05) between the conditions. Figure 19-2 shows the baseline measures obtained on list 2 over the course of the treatment program. The list 2 data contained enough data points to compare a C statistic (Tryon, 1982) where the list 1 data did not. The C statistic described by Tryon (1982) constitutes a method for assigning a probability to baseline data trend changes. Utilizing this method of time-series analysis, there were no statistically significant trends (0.05) or changes for list 2 (untreated) stimuli over time.

TABLE 19-5. NB's PRETEST AND POSTTEST RESULTS OF THE INDEPENDENT MEASURES TAKEN FROM THE *BOSTON DIAGNOSTIC APHASIA EXAMINATION* (GOODGLASS AND KAPLAN, 1972 AND 1983)

Subtest	*Pretreatment* PERCENTILE 7-27-88	*Post-treatment* PERCENTILE 9-12-88	*Post-treatment* PERCENTILE 4-12-89
Paraphasia:			
Neologistic	70	70	50
Literal	10	10	50
Verbal	30	20	25
Extended	20	40	50
Oral reading:			
Word reading	90	90	85
Oral sentence	80	80	80
Repetition:			
Words	30	35	40
High probability	30	55	60
Low probability	50	50	75

Table 19-5 shows NB's pretest and posttest results for the independent measures taken from the BDAE. A change in scores occurred in the decrease of errors on the repetition of high-probability words. Extended paraphasias in speech decreased, but verbal paraphasias in speech increased. Errors in the repetition of words decreased. These scores were not tested statistically; however, it may be that the repetition scores improved because the treatment protocol focused on repetition of grammatically correct sentences.

Table 19-6 shows that NB's pretest PICA percentiles were 72 and 75, while the two posttest PICA percentiles were each 84. In our opinion, these scores indicated the pretest and posttest stability of our patient and reflect an overall positive treatment effect, but generalization specific to the tasks treated was not noted.

DISCUSSION

The results of this investigation were consistent with the original hypothesis of Sullivan, Fisher, and Marshall (1986) that an intact visual-verbal system can improve performance of an impaired auditory-verbal

TABLE 19-6. NB's PRETEST AND POSTTEST RESULTS OF THE INDEPENDENT MEASURES TAKEN FROM THE *PORCH INDEX OF COMMUNICATIVE ABILITY* (PORCH, 1981)

Subtest	*Pretest* PERCENTILE 6-17-88	*Pretest* PERCENTILE 7-26-88	*Posttest* PERCENTILE 9-14-88	*Posttest* PERCENTILE 2-9-89
Overall	72	75	84	84
Writing	81	80	88	90
Copying	69	86	94	68
Reading	95/96	78	87	94
Pantomime	89	73	78	60
Verbal	52	65	72	82
Auditory	43	54	59/62	63
Visual	35/99	35/99	18	18

system for the type of task within the scope of this treatment protocol. Thompson (1988), in her review of generalization research, stated, "If response generalization (the emergence of untrained language responses) does not occur as a result of treatment, then, in theory, clinicians must endeavor to train all responses that the aphasic patient will use" (p. 1). In other words, intervention that does not demonstrate generalization can be considered a questionable therapeutic technique because it is impossible to teach every combination of desired responses.

Our data (Table 19-7), collected at 8 months following the completion of the study, indicated that NB learned the task, retained his learning 8 months later, but still did not generalize to untrained lists. PICA data, however, suggest that our patient did improve as a result of completing this task (72nd to 84th percentiles) and that these gains were maintained. It may be that our patient benefited from the stimulation received during the treatment. Again, our patient learned the task, maintained his learning, but did not generalize to untrained, equated stimuli.

A question therefore exists as to whether or not the focus of this treatment is functional and appropriate for the remediation of a patient diagnosed with conduction aphasia. While the repetition deficit is important for the identification of conduction aphasia, there are other symptoms of the disorder (i.e., literal and verbal paraphasias) that may be more functional to target for remediation. Paraphasias may interfere with conveying a meaningful message and are often reported by patients to be their main source of frustration. It may, however, be more beneficial for these tasks not to be the entire focus of a treatment program. Repetition activities may be helpful in facilitating other aspects of

TABLE 19-7. NB's PERCENT CORRECT RESPONSES FOR ALL LISTS AND CONDITIONS OBTAINED AT THE END OF TREATMENT AND EIGHT MONTHS POST-TREATMENT

	List 1		*List 2*	
	9-7-88	4-12-89	9-7-88	4-12-89
No pause	100%	90%	40%	50%
5-second delay	90%	100%	30%	50%
10-second delay	100%	70%	50%	50%

oral expression. A case study by Sanders, Davis, and Hubler (1979) demonstrated that a treatment program that included both repetition and word-retrieval activities had a positive impact on the patient's verbal output.

Finally, our data point out the need for replication and verification of results for studies with small numbers of subjects. Further studies of past and present clinical works are warranted.

REFERENCES

Boyle, M. (1988). Reducing phonemic paraphasias in the connected speech of a conduction aphasic subject. In T. E. Prescott (Ed.), *Clinical aphasiology,* Vol. 18 (pp. 379–393). Austin, TX: PRO-ED.

Goodglass, H., and Kaplan, E. (1972 and 1983). *The assessment of aphasia and related disorders.* Philadelphia: Lea & Febiger.

Green, E., and Howes, D. H. (1977). The nature of conduction aphasia: A study of anatomic and clinical features and of underlying mechanisms. In H. Whitaker and H. Whitaker (Eds.), *Studies in neurolinguistics,* Vol. 3 (pp. 123–156). New York: Academic Press.

Joanette, Y., Keller, E., and Lecours, A. R. (1980). Sequences of phonemic approximations in aphasia. *Brain and Language, 11,* 30–44.

Kertesz, A., and Poole, E. (1974). The aphasia quotient: The taxanomic approach to measurement of aphasic disability. *Canadian Journal of Neurological Sciences, 1,* 7–16.

McReynolds, L. V., and Kearns, K. P. (1983). *Single-subject experimental designs in communicative disorders.* Austin, Texas: PRO-ED.

Nespoulos, J. L., Joanette, Y., Ska, B., Caplan, D., and Lecours, A. R. (1987). Production deficits in Broca's and conduction aphasia: Repetition versus reading. In E. Keller and M. Gopnik (Eds.), *Motor and sensory processes of language.* Hillsdale, NJ: Erlbaum Associates.

Ottenbacher, K. J. (1986). *Evaluating clinical change: Strategies for occupational and physical therapists.* Baltimore, MD.: Williams & Wilkins.

Porch, B. E. (1981). *Porch index of communicative ability*. Palo Alto, CA: Consulting Psychologists Press.

Sanders, S. B., Davis, G. A., and Hubler, V. (1979). A study of the interdependence of word retrieval and repetition in conduction aphasia. In R. H. Brookshire (Ed.), *Clinical aphasiology*, Vol. 9 (pp. 270–277). Minneapolis, MN:BRK Publishers.

Siegel, S. (1956). *Nonparametric statistics for the behavioral sciences*. New York: McGraw-Hill.

Sullivan, M. P., Fisher, B., and Marshall, R. C. (1986). Treating the repetition deficit in conduction aphasia. In R. H. Brookshire (Ed.), *Clinical aphasiology*, Vol. 16 (pp. 172–180). Minneapolis, MN: BRK Publishers.

Thompson, C. K. (1988). Generalization research in aphasia: A review of the literature. In T. E. Prescott (Ed.), *Clinical aphasiology*, Vol. 18 (pp. 195–222). Austin, TX: PRO-ED.

Tryon, W. W. (1982). A simplified time-series analysis for evaluating treatment interventions. *Journal of Applied Behavioral Analysis, 15*, 49–55.