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FLUENCY TRAINING THE CORRECT USE OF "TO LIE" AND "TO LAY"

by

Jessica L. Willadsen

A Thesis Submitted in

Partial Fulfillment of the

Requirements for the Degree of

Master of Science

in Psychology

at

The University of Wisconsin-Milwaukee

August 2014

ABSTRACT

FLUENCY TRAINING THE CORRECT USE OF "TO LIE" AND "TO LAY"

by

Jessica L. Willadsen

The University of Wisconsin-Milwaukee, 2014
Under the Supervision of Marshall L. Dermer, Ph.D.

Proper English is an important skill, but using "to lie" and "to lay" correctly appears challenging, as even college students misuse these verbs. The current project assessed a treatment package that included fluency-based software to train three participants to correctly use "to lie" and "to lay." For each verb several meanings were identified. Model sentences were constructed from the definitions to form basic units. Each basic unit included examples (correct sentences) and non-examples (incorrect sentences) for one of the meanings of each verb. Participants practiced with each basic unit until fluent and then completed a cumulative unit based on all previous units before moving to a new basic unit. To assess whether the treatment package was effective, the units were embedded in a non-concurrent multiple-baseline design replicated across participants. The treatment package appeared to improve verb use for two participants and paradoxically worsened verb use for one participant. These findings and the implications for further research were discussed.

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ACKNOWLEDGMENTS

I thank John and Lynn Schiek for their financial support without which this thesis would not have been possible.

Fluency Training the Correct Use of "to lie" and "to lay"

It may be unfair, but people incorrectly using the verbs "to lie" and "to lay" may be judged uneducated or even mentally or morally deficient (Williams, 2005). Consequently, people may avoid these verbs and communicate awkwardly (Wilson, 1993). Most confusing is that the past tense of "to lie" is identical to the present tense of "to lay" as depicted in Table 1. Also, people may mistakenly use "laying" when "lying" is appropriate as in saying "The book is laying on the table" as well as using "laid" when "lain" is appropriate as in saying "The book had laid on the table."

Table 1

Forms of "To lie" and "To lay" as a Function of Tenses

Tense	Simple		Progressive		Perfect		Perfect Progressive	
	to lie	to lay	to lie	to lay	to lie	to lay	to lie	to lay
Present	lies	lays	am/is/ are lying	am/is/ are laying	have/ has lain	have/ has laid	have/ has been lying	have/ has been laying
Past	lay	laid	was/ were lying	was/ were laying	had lain	had laid	had been lying	had been lying
Future	will/ shall lie	will/ shall lay	will be lying	will be laying	will have lain	will have laid	will have been lying	will have been laying

These verbs fundamentally differ: "to lay" is transitive and "to lie" is intransitive. A transitive verb requires a direct object, whereas an intransitive verb does not. For example, "I lay my head on my pillow" illustrates "to lay" and its object "head," whereas "I lie down on my pillow" illustrates "to lie" and the absence of an object.

So, how has using of "to lie" and "to lay" been taught? Instructional procedures may require students to define each verb (Simmons, 2012), recite that "to lay" requires a direct object whereas "to lie" does not (LessonSnips, n.d.), recite the verbs' principal parts (Warriner, 1987), substitute "recline" for "to lie" and "place" for "to lay" (Dubois, 1983), or complete a few dozen incomplete sentences whose verbs have been omitted (Warriner, 1987).

Related to completing a few sentences is repeatedly completing many sentences. Drills may include responding orally to flash cards presented by a teacher (Gianella, 1916) or choral repetition where students imitate a speaker (BusyTeacher, n.d.; Kaukonen, 1944).

Because drills have appeared ineffective, contemporary methods of language instruction apparently do not often use drills. But aspects of drills are features of fluency training, a procedure much used by behavior analysts with apparent effectiveness (Eshelman, 2000). Fluency training requires extensive practice so that performances become automatic, much like those of an expert (Binder, 1993). Presumably, a skill taught to fluency produces three outcomes: retention (i.e., behavior can occur long after instruction has ended), endurance (i.e., behavior can occur for long durations even with distracters present), and application (i.e., the target behavior can combine with other

behaviors to form behavior compounds). These three outcomes are often denoted by "REA," and the performance standards that produce them "PS," so we have the acronym REAPS (Binder, 1993; Binder, 1996).

Fluency presumably produces REA (Binder, 1993; Binder, 1996). However, the basic research exploring these effects has not been extensive, and it is unclear whether mere extended practice or extended practice that also produces rapid responding mediates fluency training's presumed effects (Chase, Doughty, & O'Shields, 2005). Among experimental psychologists there is little debate, however, about practice enhancing learning (Ericsson, Krampe, & Tesch-Romer, 1993), particularly when practice requires verbal behavior that is closely related to subsequent verbal tests (Roediger, Agarwal, McDaniel, & McDermott, 2011; Roediger, McDermott, & McDaniel, 2011; McDaniel, Agarwal, Huesler, McDermott, & Roediger, 2011;).

Fluency training requires making different responses to different stimuli with feedback regarding correct and incorrect responding (i.e., multiple discrimination training). Often the stimuli and response are verbal, and practice requires reviewing a deck of cards. In the deck, each card has a printed verbal stimulus on the front and a printed verbal prompt on the back. Fluency is achieved when the cards' fronts alone evoke correct responses at rates that satisfy a fluency aim. These aims are often based on the performances of experts.

Fluency procedures have improved the reading of students with dyslexia (Spence, 2002) and the speech intelligibility of a child with autism (Fabrizio, Pahl, & Moors, 2002). They have enhanced the taxonomy-related verbal skills of 6th grade students

studying biology (Clorfene, Matsumoto, Bergman, Zhang, & Merbitz, 1998) and the editing skills of undergraduates who write inconcisely (Dermer, Lopez, & Messling, 2009).

Fluency training is often combined with cumulative practice (Culyer, 1982). Using cumulative practice with a set of instructional units, a student only advances to unit n+1, if the student has mastered the preceding n units individually and cumulatively.

So, for example, a student might master unit 1, then unit 2, then a cumulative unit that combines unit 1 and unit 2, then unit 3, then a unit that combines the first three units, etc. Such cumulative units enhance solving algebra problems where the notation can be confusing as in "X * Y" versus "X ** Y" (Mayfield & Chase, 2002). Cumulative practice helps students respond appropriately, that is not be confused, by gradually expanding multiple discriminations and so is highly relevant to teaching use of "to lie" and "to lay."

Besides being combined with cumulative practice, fluency training is most often used with a system that measures learning and facilitates instructional decisions Precision Teaching (PT). PT measures learning in terms of rates of correct and incorrect responding. Often at the end of a day of instruction a student completes a test, usually for 1 min, that assesses these rates. Rates are then plotted on a special graph, the Standard Celeration Chart (SCC), which permits visually assessing whether rates of corrects are increasing and rates of incorrects are decreasing. Absent such a learning picture, training procedures are modified, for example, by further analyzing composite skills into

component skills, practicing with a few items, or practicing for short intervals (Binder, Haughton, & Bateman, 2002).

Although there are similarities between fluency training when combined with PT and mere drills, there are also important differences (Eshleman, 2000). First, drills are mainly used a few times to prepare for a test, whereas fluency training involves daily practice. Second, drills measure learning in terms of accuracy, whereas PT uses accuracy plus rate. Third, PT uses fluency aims, whereas drills need not. Fourth, PT involves tracking performances, whereas drills need not. Finally, drills provide inadequate or no data regarding learning, whereas PT combined with fluency training permits plotting data to make instructional decisions. Together these procedures provide two forms of feedback: (a) prompts at the back of cards and (b) plotted data that permit measuring learning and tweaking procedures that are ineffective or inefficient.

Besides using fluency training and PT, the current study used concept learning procedures. A concept is a response under appropriate stimulus control. Concepts can be taught by differentially reinforcing responses to examples and non-examples. To produce discrimination it it's important to include stimuli that appear atypical but are examples and stimuli that appear typical but are non-examples. To produce generalization of discriminative control it is important to include many examples and non-examples whose concept-irrelevant features vary considerably (Miller & Weaver, 1976; Tiemann & Markle, 1990).

So, the current project explored the utility of combining fluency training, PT, cumulative practice, and concept learning procedures to teach use of "to lie" and "to lay."

Besides the goal of teaching use, this research may serve as a model for future procedures to enhance verbal behavior.

To develop instructional materials for each verb, exemplary sentences were based on the major meanings of "to lay" and "to lie" and were constructed using pairs of model sentences that appear otherwise similar. The ten such exemplary pairs are shown in Table 2. For example, the verb "to lie" can mean "to be in a more or less horizontal position on some supporting surface." This meaning is represented in Table 2 by the first three exemplary sentences for "to lie." The corresponding sentences for "to lay" means "to place." This meaning is represented by the first three exemplary sentences for "to lay." Note also, how the pairs of sentences are otherwise similar. Besides these six pairs, four exemplary sentences were constructed. So, "to specify or impose" is exemplified by the sentence in row 4 for "to lay": "The mother lays down her rules"; and "to place oneself" is exemplified by the sentence in row 7 for "to lay": "The boy lays himself on the ground until the coast is clear."

Table 2

Exemplary Sentence Pairs from Training Units with Corresponding Test Sentences in Italics

	Verbs	
Pair	to lay	to lie
1	Presently, the child lays her shirt on the ground. *Presently, the teacher lays her book on the table.*	Presently, the child's shirt lies on the ground. *Presently, the teacher's book lies on the table.*
2	Presently, the chef lays the cookies on the counter. *Presently, the*	Presently, the cookies lie on the counter. *Presently, the hammer lies on the bench.*

carpenter lays the hammer on the bench.

3	Presently, the chickens lay eggs in the nest. *Presently, the grocer lays bananas in the basket.*	Presently, the chicken's eggs lie in the nest. *Presently, the grocer's bananas lie in the basket.*
4	Presently, the mother lays down the rules. *Presently, the judge lays down the law.*	Presently, the rule lies in the mother's mind. *Presently, the law lies on the judge's schedule.*
5	Presently, the sailors lay rafts on the ship's deck. *Presently, the mother lays blankets on the children's beds.*	Presently, the rafts lie on the ship's deck. *Presently, the blankets lie on the children's beds.*
6	Presently, the workers lay track between Milwaukee and Madison. *Presently, the landscaper lays bricks between the fence and the sidewalk.*	Presently, the track lies between Milwaukee and Madison. *Presently, the bricks lie between the fence and the sidewalk.*
7	Presently, the boy lays himself on the ground until the coast is clear. *Presently, the firefighter lays himself under the tree to avoid falling debris.*	Presently, the boy lies on the ground until the coast is clear. *Presently, the firefighter lies under the tree to avoid falling debris.*
8	Presently, the children lay themselves down for a nap. *Presently, the peacekeepers lay themselves down to protest.*	Presently, the children lie down for a nap. *Presently, the peacekeepers lie down to protest.*
9	Presently, the worker lays the toy car on the conveyor belt. *Presently, the baker lays the bread on the baking sheet.*	Presently, the toy car lies on the conveyor belt. *Presently, the bread lies on the baking sheet.*
10	Presently, Chicago lays claim to water near the southern tip of Lake Michigan. *Presently, Mr. Smith lays claim to the house to the north.*	Presently, Chicago lies near the southern tip of Lake Michigan. *Presently, the house lies to the north.*

For each model sentence a basic unit was constructed by transforming a sentence in Table 2 as per the major verb tenses and using sentences that included the infinitive, gerund, and interrogative forms. Each such unit contained a nearly identical non-example. For half of these basic units all the examples were forms of "to lie" and all the non-examples were forms of "to lay"(Lie Units); for the other half of these units all the examples were forms of "to lay" and all the non-examples were forms of "to lie" (Lay Units). Once a participant achieved a fluency aim for a basic unit, the participant advanced to a new basic unit. The units alternated between Lie Units and Lay Units. However, before advancing to a new basic unit the participant completed a cumulative unit that included all previously mastered units.

To assess whether training was effective, participants repeatedly completed a paper-based, transfer test that included novel examples and non-examples of "to lie" and "to lay." The basic sentences for the sentences that appeared on the transfer test appear in italics in Table 2. Testing and training were arranged according to a non-concurrent multiple baseline design replicated across participants where the dependent variable was accuracy data on transfer tests.

<div align="center">Method</div>

Participants

Three participants Don (29 years old), Laura (22 years old), and Jane (20 years) participated. Don had an associate's degree and Jane and Laura had some college education. They were native English speakers who had completed a screening test to verify difficulty using "to lie" and "to lay" and had provided informed consent.

Materials

    Consent Form. The consent form provided information about the experiment and the principal investigators (See Appendix A). Participants learned that fluency software was being evaluated that teaches correct use of "to lie" and "to lay," the locations of the study, the study's duration, and the opportunity to earn $5 per hour and double this amount if they complied with all study procedures. In this case they could earn up to $150 on completing the study. They learned that they would be completing a series of 5-min tests during which they would be asked to specify verbs. Participants learned of the daily time commitment, the frequency of weekly meetings and how the software works.

    Consent Form for Screening Test. This form provided information about the screening test (See Appendix B). Participants learned that a 5- min test would identify individuals who had difficulty with "to lie" and "to lay" and who were, therefore, qualified to participate in the main study. They learned that the main study would use fluency software and the study's duration was 3 weeks.

    Software. A Visual Basic program presented the instructional frames.[1] Upon activating the program, participants could choose one of two modules, specify session duration, and select an instructional unit. For each unit, the program presented frames in a random order.

    The computer interface included three windows. The top window displayed instructions and text, the middle permitted typing responses, and the bottom window displayed answers. Below the answer window, the interface also included three buttons:

---

[1]The Visual Basic® software is available, for research purposes, from the author.

a Previous Button that presented the previous frame, a Stop Button that stopped the instructional unit, and an Answer Button that displayed an answer. Depressing the Answer Button produced three more buttons. Right and Wrong Buttons permitted scoring a response and a Remove Button permitted removing a frame. Removed frames could be reinstated.

When a session timed out, the software displayed the date, the unit's name, the unit's aim, the number of frames in a unit, the number of correct responses per minute, the number of incorrect responses per minute, and the session's duration. The software stored these summary data in a folder.

Basic and Cumulative Units. The most frequent meanings of the two verbs were identified and a model sentence was constructed for each meaning [Note: The author attempted to include a nearly identical corresponding sentence for each verb, but some constructions were omitted because the constructions did not make sense for "to lie" sentences.]. These sentences appear in regular font in each of the cells of Table 2. Corresponding to each of these sentences a basic training unit was constructed by transforming a sentence in one of the cells in Table 2 per the tenses in Table 1. Transformations also included interrogative sentences and sentences including the infinitive and gerund forms. Where necessary, markers were added to denote tense, such as "presently" and "yesterday." For every correct sentence in a unit (an example) an incorrect sentence (a non-example) was constructed using the alternative verb. For example, for column 1, row 1 an example was "Presently, the child lays her shirt on the ground" and a non-example was "Presently, the child lies the shirt on the ground."

The units were essentially ordered in terms of the rows of Table 2. For a given row, a basic "to lay unit" preceded a basic "to lie unit" and once the units in a row were completed the units in the next row followed. However, cumulative practice units were interspersed. So, when a row was completed, a cumulative unit followed that included the units for that row. When two rows had been completed, a cumulative unit followed that included the units for those two rows, etc. The overall sequence is detailed in Table 3.

Table 3

Sequence of Basic and Cumulative Training Units

Unit	Model Sentences for Training Units
1-1A	Presently, the child lays her shirt on the ground.
2-1B	Presently, the child's shirt lies on the ground.
3-Practice 1	Cumulative practice for Units 1-1A and 2-1B
4-2A	Presently, the chef lays the cookies on the counter.
5-2B	Presently, the cookies lie on the counter.
6-Practice 2	Cumulative practice for Units 4-2A and 5-2B
7-Practice 1-2	Cumulative practice for Units 1-1A-5-2B
8-3A	Presently, the chickens lay eggs in the nest.
9-3B	Presently, the chicken's eggs lie in the nest.
10-Practice 3	Cumulative practice for Units 8-3A and 9-3B
11-Practice 1-3	Cumulative practice for Units 1-1A-9-3B

12-4A	Presently, the mother lays down the rules.
13-4B	Presently, the rule lies in the mother's mind.
14-Practice 4	Cumulative practice for Units 12-4A and 13-4B
15-Practice 1-4	Cumulative practice for Units 1-1A-13-4B
16-5A	Presently, the sailors lay rafts on the ship's deck.
17-5B	Presently, the rafts lie on the ship's deck.
18-Practice 5	Cumulative practice for Units 16-5A and 17-5B
19-Practice 1-5	Cumulative practice for Units 1-1A-17-5B
20-6A	Presently, the workers lay track between Milwaukee and Madison.
21-6B	Presently, the track lies between Milwaukee and Madison.
22-Practice 6	Cumulative practice for Units 20-6a and 21-6B
23-Practice 1-6	Cumulative practice for Units 1-12A-21-6B
24-7A	Presently, the boy lays himself on the ground until the coast is clear.
25-7B	Presently, the boy lies on the ground until the coast is clear.
26-Practice 7	Cumulative practice for Units 24-7A and 25-7B
27-Practice 1-7	Cumulative practice for Units 1-1A-25-7B
28-8A	Presently, the children lay themselves down for a nap.
29-8B	Presently, the children lie down for a nap.
30-Practice 8	Cumulative practice for Units 28-8A and 29-8B
31-Practice 1-8	Cumulative practice for Units 1-1A-29-8B

32-9A	Presently, the worker lays the toy car on the conveyor belt.
33-9B	Presently, the toy car lies on the conveyor belt.
34-Practice 9	Cumulative practice for Units 32-9A and 33-9B
35-Practice 1-9	Cumulative practice for Units 1-1A-33-9B
36-10A	Presently, Chicago lays claim to water near the southern tip of Lake Michigan.
37-10B	Presently, Chicago lies near the southern tip of Lake Michigan.
38-Practice 10	Cumulative practice for Units 36-10A and 37-10B
39-Practice 1-10	Cumulative practice for Units 1-1A-37-10B

Fluency aims for training units. Each unit's aim was based on the author's best performance using the see/say channel (Lin & Kubina, 2004) for many 1-min tests while working with the last cumulative unit, a unit that included all (900) frames. That rate was 17 correct and 0 incorrect per minute. Therefore a unit was deemed mastered when a participant attained this aim while using the see/say channel for three, 1-min tests.

Instructions on how to use "to lie" and "to lay." This handout (See Appendix D) instructed participants on how to use "to lie" and "to lay." The verbs' definitions, examples of correct use, and a table of the most common verb forms were provided. Next participants practiced, by specifying verbs for 20 sentences that used "to lie" and "to lay." On completing practice, feedback was provided.

Logs and celeration charts. The log, a summary sheet, had eight columns corresponding to the date, unit name, frames remaining in a unit, corrects per min,

incorrects per min, duration of current session, cumulative time practicing a unit, and

whether a test was administered by the participant or second party (see Appendix E).

Data from the log sheet was recorded on the four-cycle, semi-logarithmic chart in

Figure 1.
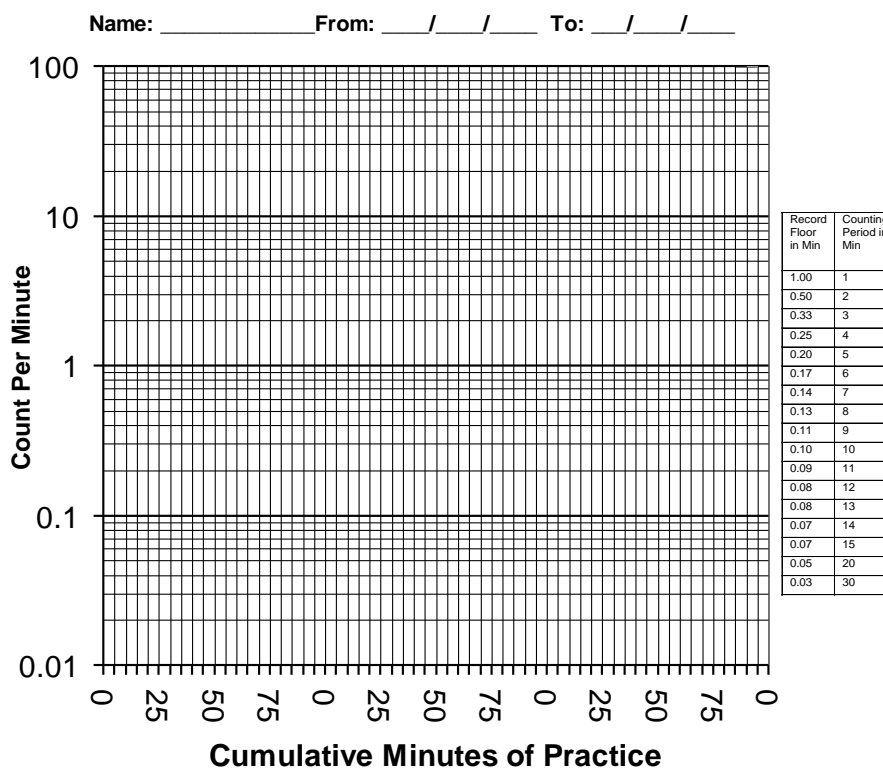
Figure 1. Four-cycle log chart for displaying correct and incorrect responses per min as a function of the number of cumulative minutes of practice within a

Verification Test. The verification tests were 1-min tests conducted with a

recently completed unit. They were, in principle, identical to the training sessions

conducted by participants outside the laboratory, but now the researcher held the mouse

and scored the responses in the laboratory.

Transfer test. Corresponding to the basic sentences in Table 2 are the novel sentences from which the transfer test was constructed (See Appendix F; Note: The answers are present in the appendix, but were not presented to participants.) These novel sentences are italicized in Table 2 and had been transformed, as had been the basic sentences for the training units, and 102 resulting sentences were sampled. For each of these test sentences the verb was removed. If there was some ambiguity about tense, then a temporal marker such as "presently" was included. The transfer test was used to screen participants; and to collect baseline, post-training, and maintenance data. (See Appendix G for screening, baseline, and post-training test instructions.)

To construct the test, sentences were ordered so that each six-sentence block included three "to lie" sentences and three "to lay" sentences. Within a block the sentences were randomly ordered. Participants had 5 min to write the missing verbs and were to work as accurately and as quickly as possible. They were to start with the first sentence and not skip sentences.

Design

The transfer tests and training sessions were arranged to form a non-concurrent multiple baseline design. In the basic design, three participants were assigned to complete 3, 5, or 7 baseline tests every two to three days. Post training all participants completed from four to six tests. The three post-training tests occurred about every three days after training; the one maintenance test occurred about three weeks after training.

Procedure

Participants first read the consent form for screening applicants. Applicants were given 5 min to complete the screening test. Applicants who incorrectly responded to 25% or more items were identified as having difficulty with "to lie" and "to lay" were recruited.

Qualified participants then reviewed the consent form for the main study with the researcher and were also given the handout with instructions on how to use "to lie" and "to lay" and completed the exercises. Participants were also told to study the handout during the baseline phase. They were given a few days to decide if they wanted to participate. Those who had signed the form were assigned to complete the series of 3, 5, or 7 baseline tests.

To collect these baseline data, participants came to the laboratory about every three days. These 15-min sessions were scheduled about the same time daily and participants did not receive any formal feedback about their test performances. After completing the baseline, participants were next trained how to use the software, log and chart performances, and proceed through the units. Participants were to train 20-min daily, at least five days per week, but it was suggested that participants practice daily. [Note: Participants were told they could do multiple 5-min sessions throughout the day and training]. Participants were to end the day's training with a 1-min test. If participants believed they could meet a unit's aim, participants were to complete three 1-min sessions for that unit. For these last three tests, if they met the aim they moved to the next unit, but if they did not meet the aim, they were to continue training with the current unit.

For each training session, participants were instructed to copy the summary data from the program onto a log sheet, and chart their performances as a function of minutes spent training in a unit, with dots indicating rates of corrects and X's indicating rates of incorrects.

During the intervention phase there were no transfer tests, but the participants continued returning to the laboratory about every three days to verify practice. During these twice-weekly verification meetings, the author met with the participant for about 30-min to review the logs and graphs. If visual inspection revealed the rates of corrects were not increasing or the rates of incorrects were not decreasing, the participant was asked to train to achieve accuracy before attempting to improve fluency, reduce session duration, or temporarily reduce the number of frames in a unit.

Next, the participant used the software to complete a 1-min verification test. During the test the participant overtly responded while the author scored responses with the mouse. For the first verification meeting, participants completed the verification test on a current unit, but for the subsequent verification meetings participants completed the verification test on the last unit trained. If a participant met or exceeded that rate logged for that unit, the participant was congratulated, otherwise the test was re-administered. If participants scored 0 incorrect responses on the second test they were told to continue training on their most current unit. If after administering the second test, the participant still did not meet the aim the participant returned to that unit and trained until the aim was met.

In this way participants trained outside of the laboratory and returned for verification tests until a prescribed number of units were completed. Don completed all units through 15-Practice 1-4. Laura and Jane completed all units through 19-Practice 1-5. On completing these units, all participants returned to the laboratory about every three days to complete the series of post-training tests and three weeks post-training to complete the maintenance test.

Importantly, although Don and Laura completed three post-training tests, Jane completed six such tests. Jane's performance on the first two post-tests was surprisingly worse than her performance on the baseline tests despite Jane doing well on the training units and on the verification tests. When Jane was informed of her results, she reported having difficulty answering the items on the transfer test because the items differed from those in the training units. She reported responding to the items on the post-training tests to the best of her knowledge and she reported believing she had correctly completed the tests. Given this surprising outcome, Jane was asked to re-do the first two post-tests. Before starting these tests, the instructions for completing the tests were reviewed, as with the other tests, and Jane was asked to carefully read each test items before writing in the verb.

Scoring Tests and Interobserver Agreement

For the tests, only the sentences the participants attempted, including skipped sentences, were scored. Responses were scored as either correct or incorrect as per the answer key (see Appendix D). For each test, the number of correct responses and the

number of incorrect responses were divided by the test's duration, 5-min. These rates were plotted on the four-cycle log paper.

A second observer, uninformed about experimental conditions, independently scored 25% of the tests. For corrects:incorrects interobserver agreement was calculated by dividing the number of agreements by the sum of the number of agreements plus the number of disagreements and multiplying by 100% (see Bailey & Birch, p.). For Don all agreement measures were 98% and for Laura and Jane all agreement measures were 100%.

Results

Don

Training. Don trained for over 6 days, 20 min/day, for a total of 107 min. His performances are summarized in Table 4, which shows each unit's name and aim, initial corrects per minute, final incorrects per minute, the celeration for corrects between initial and final correct per min, initial incorrects per minute, final incorrects per minute, the celeration for incorrects between initial and final incorrects per min, and minutes of training per unit. Don trained for 1-min sessions and typically trained with a unit from 3 to 5 min before reaching a unit's aim. Unit 3-Practice 1 was exceptional, requiring 55 min. For this unit, initial rates of corrects were high as were rates of incorrects, so Don removed the correct frames and trained only with the incorrect frames until he achieved the aim. Next he reinstated the removed frames and trained with all the frames until he met the aim. Worth noting is that as Don trained, he tended to complete conceptually

similar units more rapidly. For example, for Units 1-1A, 2-1B, and Unit-3 Practice 1 he

trained for a total of 63 min. For Units 4-2A, 5-2B, and 6-Practice 2 he trained for just a

total of 12 min. For Units 8-3A, 9-3B, and 10-Practice 3 he trained for a total of 12 min .

Finally, for Units 12-4A, 13-4B, and 14-Practice 4 he trained for a total of just 9 min.

Table 4

For each Unit a Summary of Don's Performances

Unit	Aim Corrects: Incorrects /Min	Initial Correct /Min	Final Correct /Min	Cel.	Initial Incorrect /Min	Final Incorrect /Min	Cel.	Training Min
1-1A	17:0	6	28	4.7	2	0	0	4
2-1B	17:0	9	24	2.7	1	0	0	4
3-Practice 1	17:0	6	17	2.8	4	0	0	55
4-2A	17:0	17	18	1.1	0	0	0	3
5-2B	17:0	8	20	2.5	2	0	0	4
6-Practice 2	17:0	12	17	1.4	1	0	0	5
7-Practice 1-2	17:0	14	18	1.3	1	0	0	4
8-3A	17:0	17	17	1.0	0	0	0	3
9-3B	17:0	16	17	1.1	0	0	0	4
10-Practice 3	17:0	18	18	1.0	2	0	0	5
11-Practice 1-3	17:0	17	19	1.1	0	0	0	4
12-4A	17:0	21	19	.90	0	0	0	3
13-4B	17:0	18	17	.94	0	0	0	3
14-Practice 4	17:0	17	21	1.2	0	0	0	3
15-Practice 1-4	17:0	17	21	1.2	0	0	0	3

To augment the molar analysis above, consider Don's rates of corrects (●'s) and incorrects (X's). Below, his rates are plotted as a function of cumulative minutes of training within a unit. Figure 2 presents a typical pattern, in this case for Unit 1-1A which Don completed in 4 min. This unit was based on the model sentence "Presently, the child lays her shirt on the ground." ; in this unit only forms of "to lay" were correct.
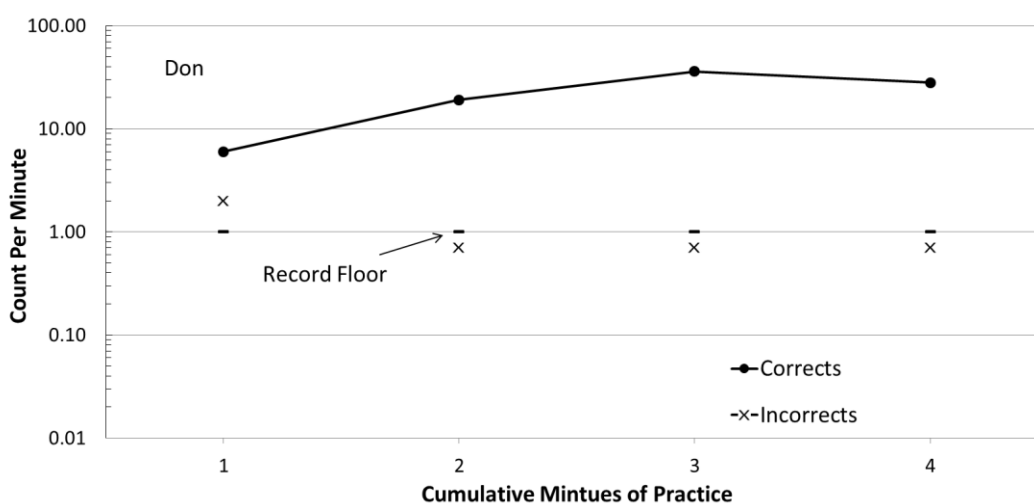
Figure 2. Don's rates of corrects (●'s) and incorrects (X's) as a function of cumulative minutes training in Unit1-1A.

As noted above, his performance was exceptional for Unit 3-Practice 1, the first cumulative unit. Figure 3 reveals that although Don responded rapidly he was not accurate until he had trained 55 min. Across sessions Don's rates of corrects appear to increase linearly, but his rates of incorrects cluster around 4.5 per min until 45 min of training when they drop and eventually reach zero. This cumulative unit included all frames from Unit 1-1A and Unit 2-1B. The latter unit was based on the model sentence

"Presently, the child's shirt lies on the ground."; in this unit only forms of "to lie" were correct.
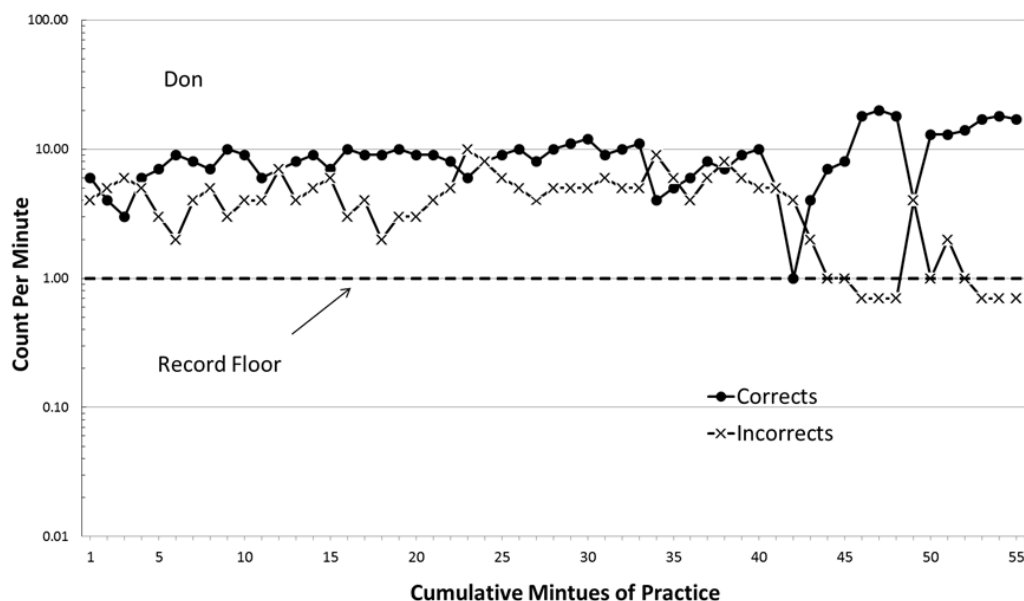
Figure 3. Don's rates of corrects (●'s) and incorrects (X's) as a function of cumulative minutes training in Unit 3-Practice 1.

Transfer. Performance on the transfer tests can be examined from the standpoint of accuracy and rates. Figure 4 shows Don's rates of corrects (●'s) and incorrects (X's) as a function of the tests before and after training. On the pretest, Don's rate of corrects, 4.5/min, were only slightly higher than his rate of incorrects, 4/ min. But after he was instructed on the use of these verbs, the baseline tests reveal his corrects improved to an average of 6.8/min and his incorrects averaged 5.7/min. Post training his average rates of corrects were about on average 6.5/min with a rate of 7.4/min at maintenance. However, his incorrects decreased to 2.7/min with a rate of 1/min at maintenance. Most striking is that although Don's corrects did not change from baseline to post training his incorrects decreased by almost 50%.
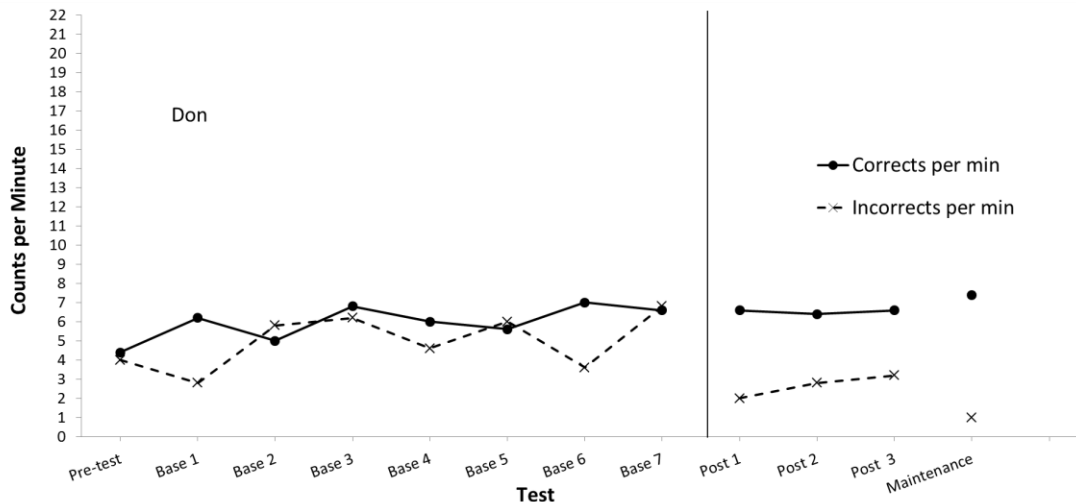
Figure 4. Don's rates of corrects (●) and incorrects (X) for the pre-test, baseline tests, post-training tests, and maintenance test.

Figure 5 show's Don's accuracy for each test. On the pre-test, Don's accuracy was 52%. During baseline, Don's average accuracy improved slightly to 55%. Post-training, his average accuracy was 71% for the three post-training tests and at maintenance his accuracy was at its highest at 88%.
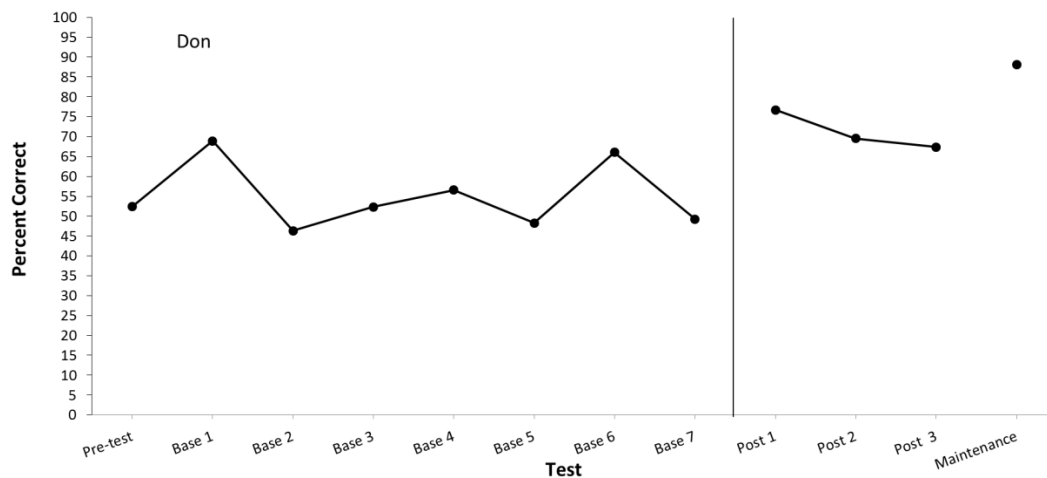
Figure 5. Don's accuracy for the pre-test, baseline tests, post-training tests, and maintenance test.

Before conducting the experiment we had asked about a dozen native English speakers to complete the transfer test and we found their use of "to lie" was typically less accurate than their use of "to lay." So, a more fine-grained analysis was conducted. Worth noting is that some transfer items could be answered with both forms of "to lie" and "to lay," so these items were excluded. Figure 6 presents accuracy separately for "to lie" and "to lay" items as a function of the pre-test, baseline, and post-training tests.

Figure 6 reveals that Don almost always was more accurate with "to lay" items (A's) than he was with "to lie" items (I's). Of greater interest, Don's accuracy for the "to lay" items increased from an average of 72% during baseline to 90% post-training. Post training, accuracy for "to lie" items also increased, but the improvement was not consistent. Accuracy for the "to lie" items was quite high on the first post-training test and the maintenance test, but low for the remaining post-training tests. Overall, accuracy for these items averaged 65% post-training compared to 55% during baseline.
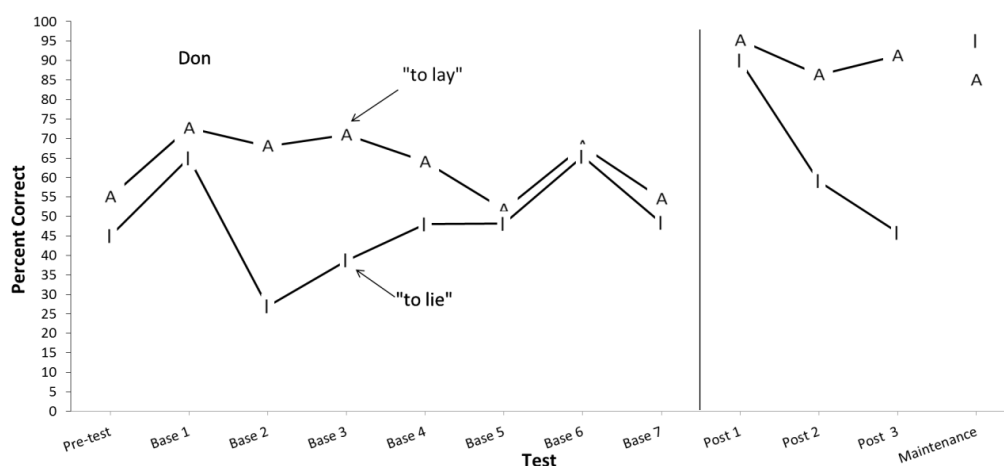
Figure 6. Don's accuracy for "to lie" items (I) and "to lay" (A) items as a function of pre-test, baseline, post-training tests, and maintenance test.

Laura

Training. Laura trained for 4 days, 20 min/day, for a total of 80 min.   Her

performances are summarized in Table 5. Laura trained for 1-min sessions and trained

with each unit from 3 to 6 min before reaching a unit's aim. Laura appeared to complete

conceptually similar units only slightly more rapidly as she trained. For example, on

Units 1-1A, 2-1B, and Unit 3-Practice 1 she trained for a total of 15 min. On Units 4-2A,

5-2B, and 6-Practice 2 she trained for a total of 14 min. On Units 8-3A, 9-3B, and 10-

Practice 3 she trained for a total of 14 min. For Units 12-4A, 13-4B, and 14-Practice 4

she trained for a total 10 min. Finally, on Units 16-5A, 17-5B, and 18-Practice 5 she

trained for a total of 10 min.

Table 5

For each Unit a Summary of Laura's Performances

Unit	Aim Corrects: Incorrects /Min	Initial Correct /Min	Final Correct /Min	Cel.	Initial Incorrect /Min	Final Incorrect /Min	Cel.	Training Min
1-1A	17:0	16	31	1.9	2	0	0	5
2-1B	17:0	8	43	5.3	2	0	0	6
3-Practice 1	17:0	24	26	1.1	4	0	0	4
4-2A	17:0	17	27	1.6	4	0	0	5
5-2B	17:0	12	49	4.1	6	0	0	5
6-Practice 2	17:0	28	30	1.7	0	0	0	4
7-Practice 1-2	17:0	25	30	1.2	2	0	0	6
8-3A	17:0	32	35	1.1	0	0	0	5
9-3B	17:0	30	56	1.9	1	0	0	4
10-Practice 3	17:0	31	23	.74	2	0	0	5

11-Practice 1-3	17:0	28	27	.96	0	0	0	3
12-4A	17:0	29	27	.93	0	0	0	4
13-4B	17:0	24	28	1.2	0	0	0	3
14-Practice 4	17:0	23	44	1.9	0	0	0	3
15-Practice 1-4	17:0	31	21	.68	0	0	0	4
16-5A	17:0	52	49	.94	0	0	0	4
17-5B	17:0	51	58	1.1	0	0	0	3
18-Practice 5	17:0	24	25	1.04	0	0	0	3
19-Practice 1-5	17:0	27	24	.89	1	0	0	4

Laura's performance for Unit 9-3B was typical. She completed this unit in 4 min, and her plot of her rates of corrects (●'s) and incorrects (X's) appears in Figure 7 as a function of cumulative minutes of training. This unit was based on the model sentence "Presently, the chicken's eggs lie in the nest."; in this unit only forms of "to lay" were correct.
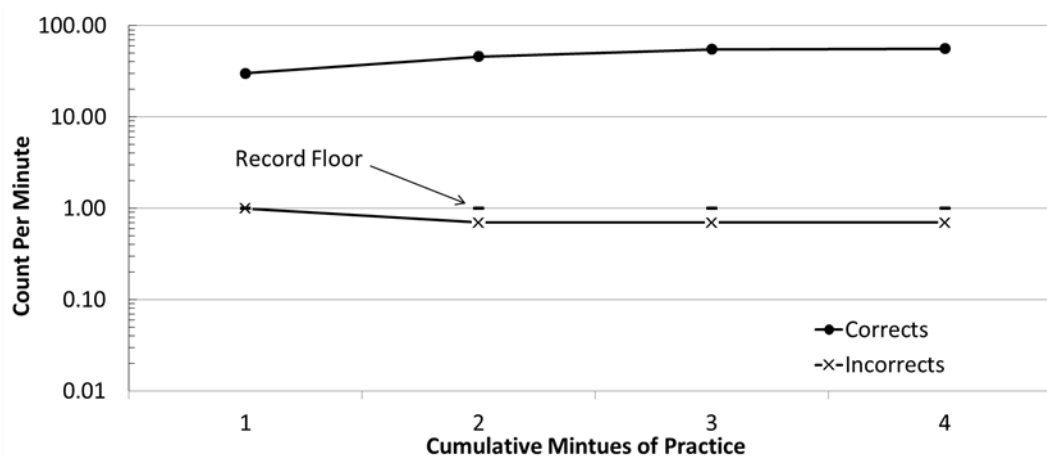
Figure 7. Laura's rates of corrects (●'s) and incorrects (X's) as a function of cumulative minutes training in Unit 9-3B.

Transfer. Figure 8 show's Laura's rates of corrects (●'s) and incorrects (X's) as a function of the tests before and after training. On the pretest, Laura's rate of corrects per minute, 4.6/min, was higher than her rate of incorrects, 2/min. After instruction on using these verbs, Laura's rate of corrects on the baseline tests improved to on average to 6.8/min. However, Laura's rates of incorrects also increased to on average to 3/min. Post training her rates of corrects continued to improve to an average of 9.1/min with a rate of 11/min at maintenance and her rates of incorrects decreased to an average of 2.5/min with a rate of 2.8/min at maintenance. Most notable about Laura's rates are that post-training her improving rates of corrects appear to follow the trend established before training, in contrast, post training her improved rates of incorrects depart from the trend established before training.
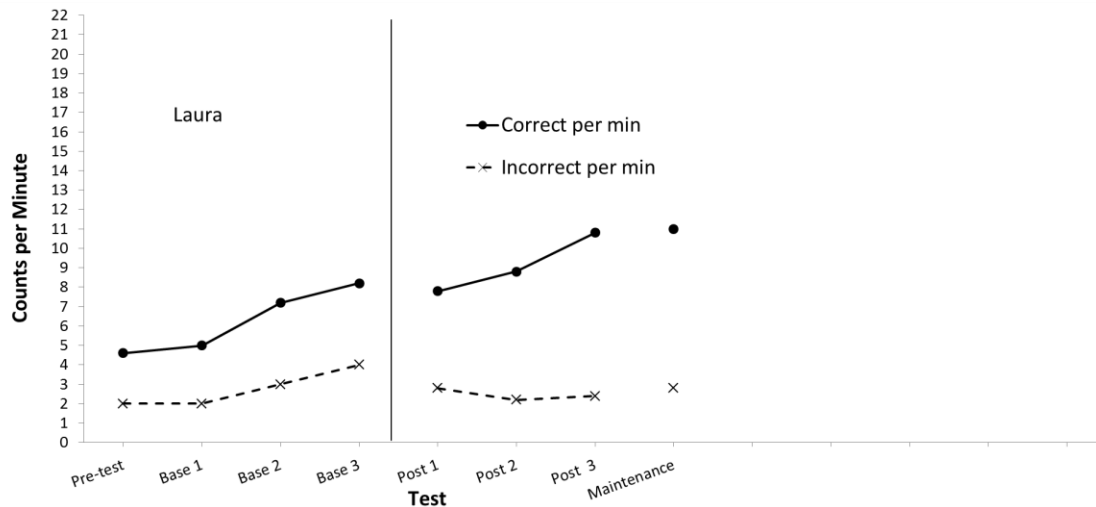
Figure 8. Laura's rates of corrects (●'s) and incorrects (X's) for the pre-test, baseline tests, post-training tests, and maintenance test.

Laura's accuracy for all items is presented in Figure 9 for the pre-test, baseline tests, and post-training tests. On the pre-test and baseline tests, Laura's accuracy averaged 70%. Post-training, her accuracy on the three post-training tests increased to 79% as was her accuracy at maintenance.
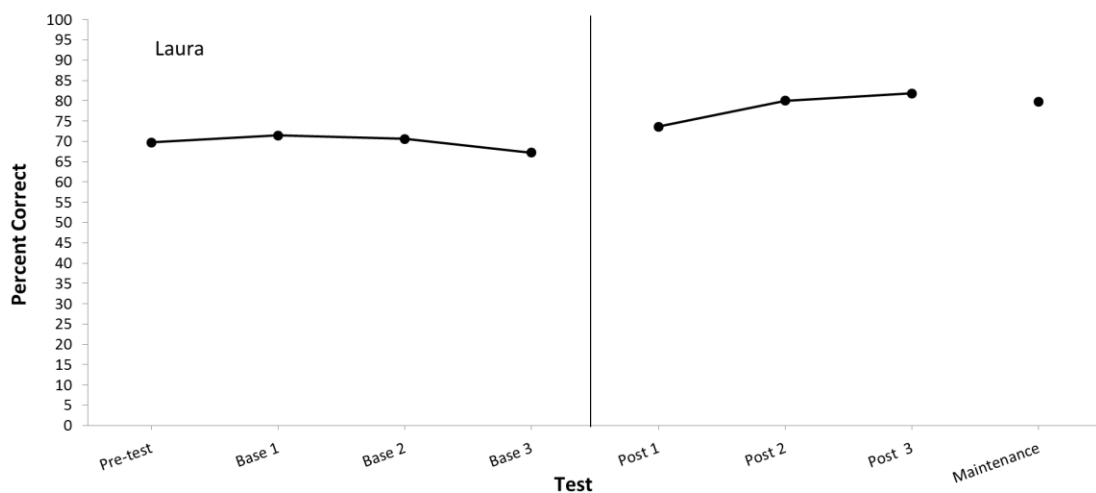
Figure 9. Laura's accuracy for the pre-test, baseline tests, post-training tests, and maintenance test.

As with Don, Laura's accuracy was computed for "to lay" items and "to lie" items. All measures are presented in Figure 10. Laura was more accurate with "to lay" items (A's) than she was with "to lie" items (I's). Laura's accuracy with the "to lay" items did not change from an average of 91% during baseline to an average of 90% post-training. But her accuracy with the "to lie" items improved from an average of 45% during baseline to an average of 65% post-training.

Figure 10. Laura's accuracy for the pre-test, baseline tests, post-training tests, and maintenance test.

Jane

Training. Jane trained for 5 days, 20min/day, for a total of 68 min. Her performances are summarized in Table 6. Jane trained for 1-min sessions and trained with each unit 3 to 5 min before reaching a unit's aim.

Table 6

For each Unit a Summary of Jane's Performances.

Unit	Aim Corrects: Incorrects /Min	Initial Correct /Min	Final Correct /Min	Cel.	Initial Incorrect /Min	Final Incorrect /Min	Cel.	Training Min
1-1A	17:0	4	22	5.5	1	0	0	5
2-1B	17:0	16	23	1.4	0	0	0	4
3-Practice 1	17:0	17	23	1.4	0	0	0	3
4-2A	17:0	20	24	1.2	0	0	0	3
5-2B	17:0	25	29	1.2	0	0	0	4
6-Practice 2	17:0	19	21	1.1	0	0	0	3
7-Practice 1-2	17:0	23	20	0.9	0	0	0	3
8-3A	17:0	16	25	1.6	1	0	0	4
9-3B	17:0	24	25	1.04	0	0	0	3
10-Practice 3	17:0	22	19	.9	1	0	0	4
11-Practice 1-3	17:0	22	21	.95	0	0	0	3
12-4A	17:0	10	20	2.0	2	0	0	4
13-4B	17:0	23	27	1.2	0	0	0	4
14-Practice 4	17:0	15	24	1.6	4	0	0	5
15-Practice 1-4	17:0	20	27	1.4	0	0	0	3
16-5A	17:0	27	30	1.1	0	0	0	3
17-5B	17:0	27	33	1.2	1	0	0	4
18-Practice 5	17:0	24	27	1.1	0	0	0	3
19-Practice 1-5	17:0	24	25	1.04	0	0	0	3

Jane's performance in Unit 16-5A was typical. She completed it in 3 min. Jane's rates of corrects (●'s) and incorrects (X's) are shown in Figure 11. This unit was based on the model sentence "Presently, the sailors lay rafts on the ship's deck."; in this unit only forms of "to lay" were correct.
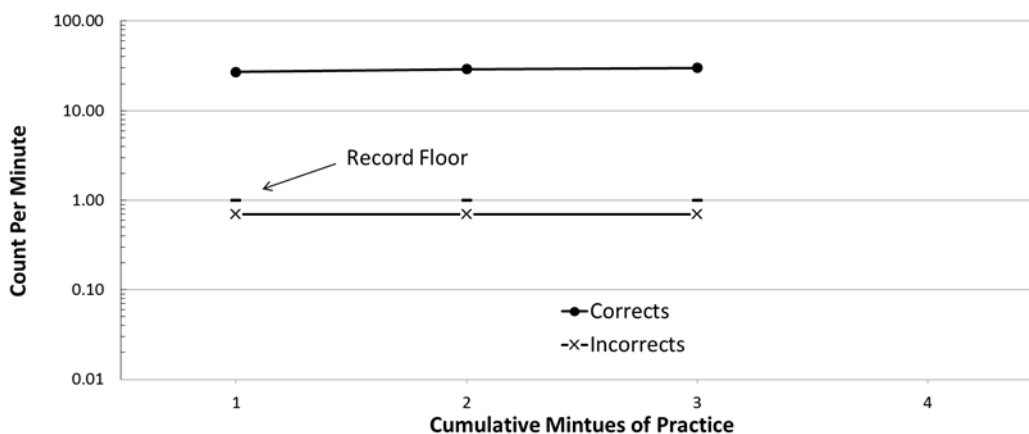

Figure 11. Jane's rates of corrects (●'s) and incorrects (X's) as a function of cumulative minutes training in Unit 16-5A.

Transfer. Figure 12 show's Jane's rates of corrects (●'s) and incorrects (X's) as a function of the tests before and after training. On the pretest, Jane's rate of corrects 3.2/min, was only slightly higher than her rates of incorrects, 2.4/min. After instruction on using the verbs, on the baseline tests Jane's rates of correct remained the same, on average 3/min, but her rates of incorrects surprisingly increased to an average of 7.1/min. Post training her incorrects jumped up and averaged 13.8/min with a rate of 15.4/ min at maintenance. Post training her corrects remained on average at 3.1/min with a rate of 3/min at maintenance. Most striking is that although Jane's corrects did not change from baseline to post training her incorrects surprisingly more than doubled.
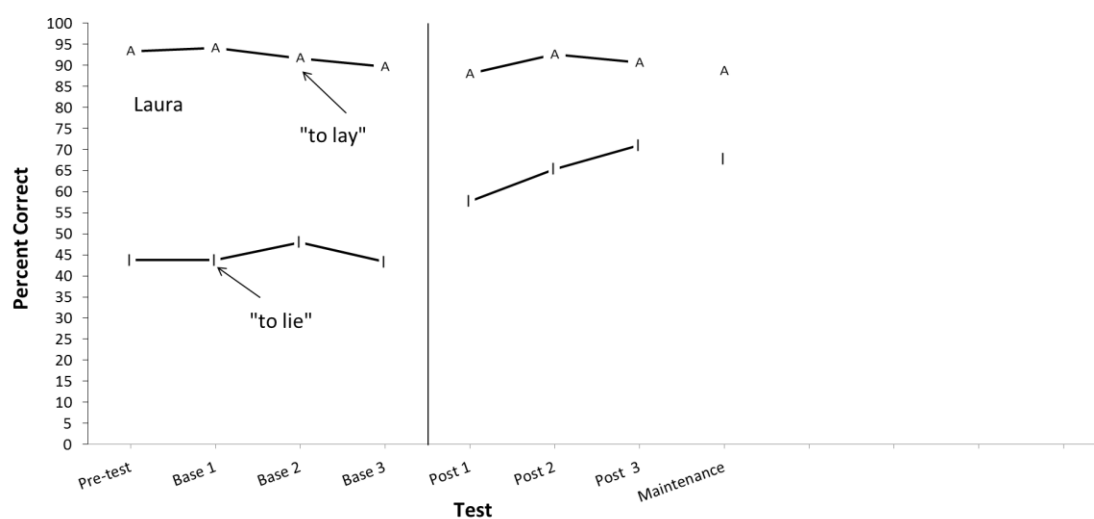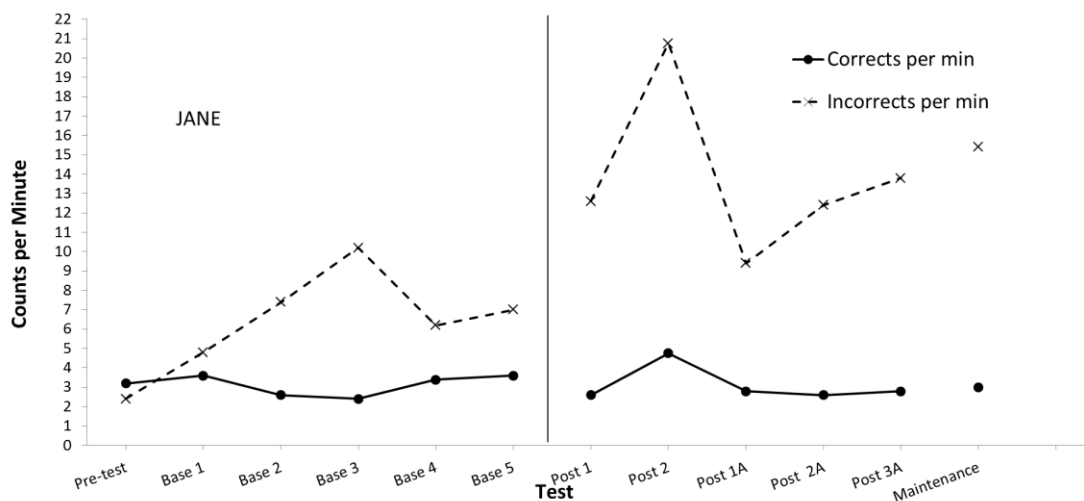
Figure 12. Jane's rates of corrects (●'s) and incorrects (X's) for the pre-test, baseline tests, post-training tests, and maintenance test.

Jane's accuracy for all items on the pre-test, baseline tests, and post-training is presented in Figure 13. On the pre-test, Jane's accuracy was 57%, but decreased for the first baseline test. Her accuracy continued to decrease for baseline tests 2 and 3, but increased for baseline tests 4 and 5. Overall average accuracy for all items on the baseline tests was 31%. Post-training Jane's accuracy continued to decrease to an average of 19% for post-training tests and 16 % for maintenance.
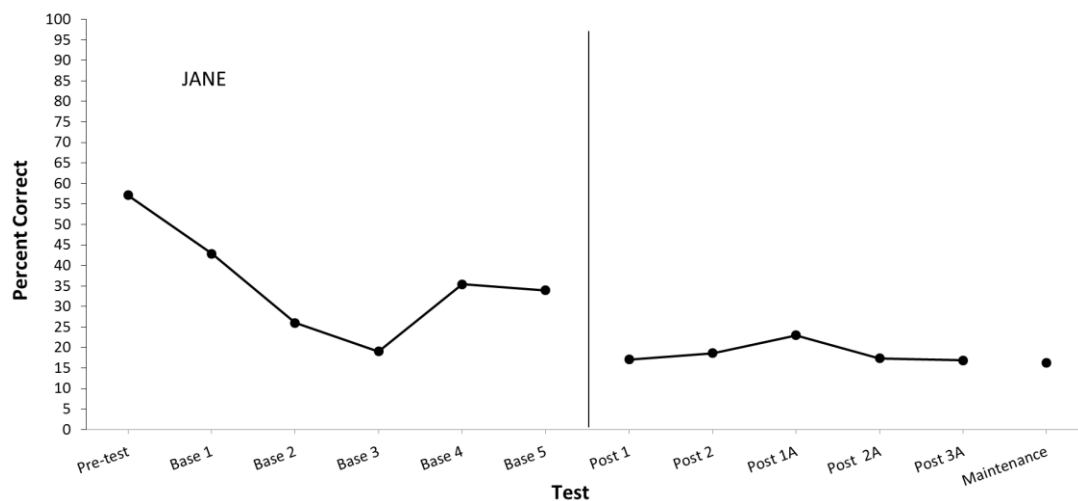
Figure 13. Jane's accuracy for the pre-test, baseline tests, post-training tests, and maintenance test.

Jane's accuracy for "to lay" items (A's) and "to lie" items (I's) are presented in Figure 14. On the pre-test Jane was more accurate with "to lay" items than she was with "to lie" items. Her accuracy for the "to lay" items was 92% and her accuracy for "to lie" items was 23%. However, after she was instructed on correct use her performance drastically deteriorated on the baseline tests. For the "to lay" items her accuracy plummeted to an average of 29.8% during baseline, a difference from the pre-test of -64.2%. For the "to lie" items her accuracy during baseline was variable averaging 34.4%. Post training her accuracy for "to lay" items was 23.8% even less than the 29.8% during baseline and 21.3% at maintenance. Post training her accuracy for "to lie" items was 14.2% and 12.2% at maintenance.
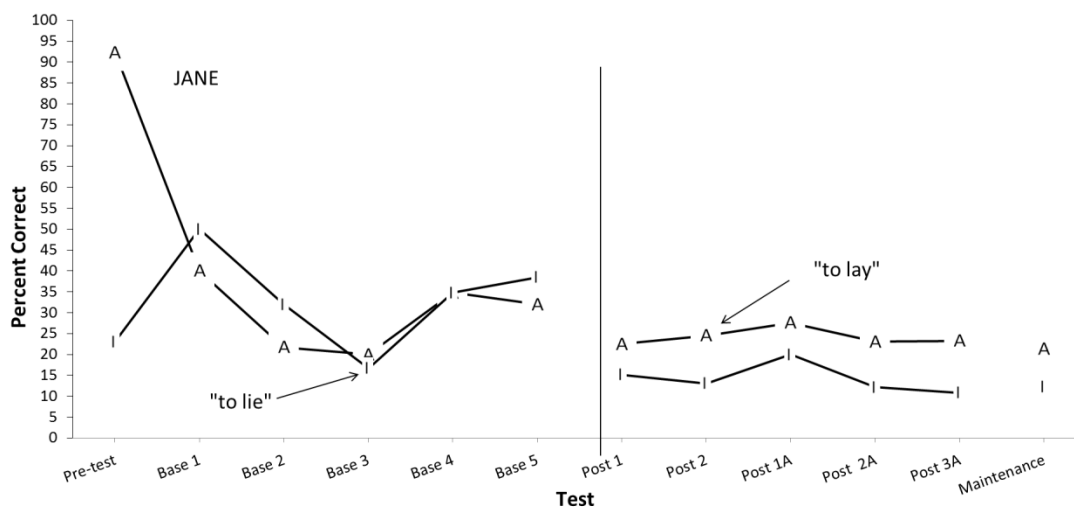
Figure 14. Jane's accuracy for "to lie" items (I) and "to lay" items (A) as a function of pre-test, baseline, and post-training tests.

Training Effectiveness

Did the training improve use? The accuracy data described above, in part, answer this question. But to rule out plausible alternative explanations the accuracy data are arranged below as per the non-concurrent multiple baseline design.

Figure 15 shows that Laura's accuracy systematically improved only after training (beginning with Test 5). For Jane and Don systematic changes also only occurred after training. Jane's accuracy systematically decreased after training (beginning with Test 7) and Don's accuracy systematically increased after training (beginning with Test 9). Because accuracy systematically changed following training, various potential explanations for the changes appear implausible such as repeated testing with transfer tests.
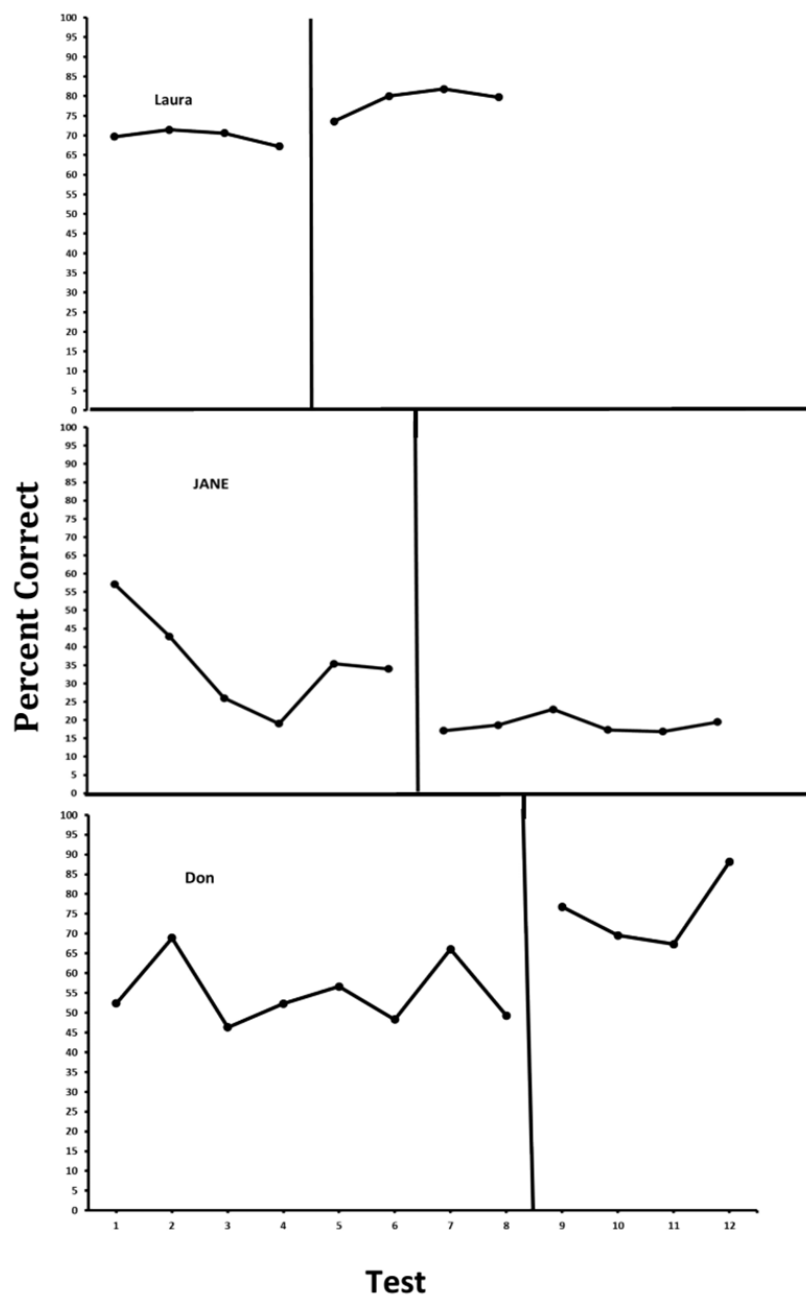
Figure 15. Accuracy for the pre-test, baseline tests, post-training tests, and maintenance test for Laura, Jane, and Don.

Figure 16 shows that for only "to lie" items did Laura's accuracy systematically improve after training (beginning with Test 5). Much like the previous analysis for all

test items, for Jane and Don systematic changes only occurred after training. For both "to lie" and "to lay" items, Jane's accuracy systematically decreased after training (beginning with Test 7) whereas for both verbs Don's accuracy increased after training (beginning with Test 9). Worth noting, is that Don's post-training gains were more systematic for the "to lay" items than for the "to lie" items.
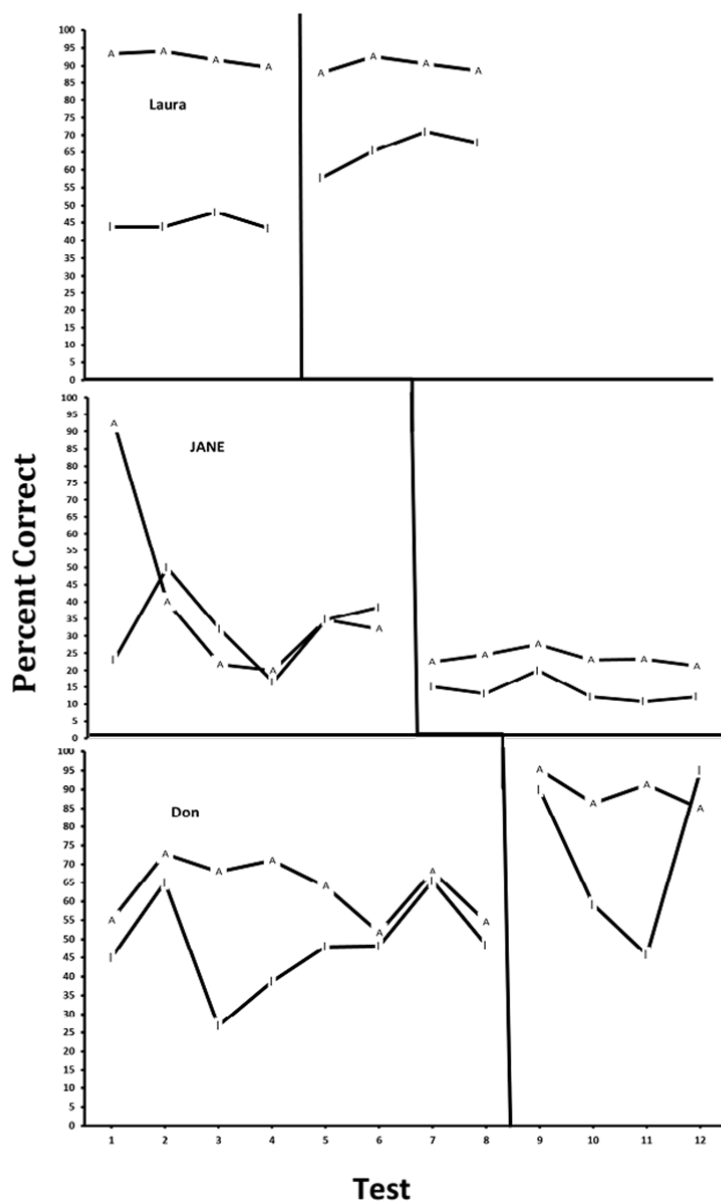
Figure 16. Accuracy for "to lay" and "to lie" items as a function of test for Laura, Jane, and Don.

Discussion

Students who had difficulty correctly using "to lie" and "to lay" participated in a study that explored whether a treatment package enhanced verb use. Each participant completed a pretest and from three to five baseline tests, then completed fluency training, and finally from four to six post-training tests. Visual inspection of each participant's rates of corrects and incorrects revealed changes post training. For two participants, rates tended to improve. For one participant, rates, particularly incorrects, dramatically worsened. Visual inspection of each participant's accuracy data revealed patterns similar to the rate data. Next, the accuracy data were visually inspected per the non-concurrent multiple baseline design. For two participants the treatment package appears to have enhanced either use of "to lie" or "to lay" or use of both verbs. For one participant, Jane, correct use of "to lie" and "to lay" surprisingly decreased substantially after training.

First, let's consider the results for Jane. Her post-training accuracy decreased for both verbs. Inspection of all of her tests revealed that on her post-training tests, Jane only wrote "lie" or "lay" for each test item. She often specified the correct verb, but failed to mark the verb's tense or person. Perhaps Jane's accuracy on the post-training tests would have been better, had her responses been more carefully monitored and had she received feedback. Although the researcher had spoken with Jane after she had completed the first two post tests, the researcher had not noticed that Jane had ceased marking tenses or persons until the experiment had been completed.

It is important to note that Jane appeared capable of doing well on the post-training tests. When training, she reported having attained the aims for each unit within

3-5 min and as she advanced from unit to unit she reported attaining the aims more rapidly. Also during the twice weekly meetings with the researcher, she responded fluently on the verification tests. Perhaps better instructions would have helped, but Jane appears to have not been motivated in which case monetary payment for correct performances on tests may have enhanced outcomes.

Now consider the outcomes for the other participants. The training package appears to have enhanced accuracy, but 100% accuracy was not attained. Although high accuracy plus rapid responding defines fluency, and a fluency aim was used to determine when training was completed, a better measure of learning may be examining whether initial rates for novel but conceptually identical units are improving (Fabrizio & Stahr, 2005). Such a measure, of course, assesses transfer: the extent correct responding produced by training occurs to conceptually identical but operationally different material. In this regard, it is worth noting that the participants completed at most 19 units although the software includes 39 units. So, higher levels of accuracy may have been achieved had participants completed more units.

In this experiment, however, not even 50 % of the units had been completed because a good estimate of the time for participants to achieve each unit's fluency aim was unavailable and it was feared that more units would preclude the experiment's completion in a timely way. A good estimate is provided by this experiment on average participants required about 15 min to achieve a fluency aim. Given this information, the duration of an experiment can now be better anticipated and so more units can be assigned. This would likely enhance accuracy to close to 100%, a socially valid level.

      In conclusion, this study revealed that the treatment package can enhance verb use, but it would be desirable to increase the number of units participants complete, only deem training to be completed when participants can complete novel units with increasing rapidity, provide monetary payment based on how well participants do on each test, and more carefully inspect the outcome measures to verify participants are following instructions and are motivated.

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Appendix A: Consent Form for Main Study

UNIVERSITY OF WISCONSIN – MILWAUKEE

CONSENT TO PARTICIPATE IN RESEARCH

1. General Information

Study title: Fluency Training the Correct Use of "to lie" and "to lay"

Person in Charge of Study (Principal Investigator):

Marshall Lev Dermer, Ph.D., Associate Professor of Psychology

Student Principal Investigator:

Jessica Willadsen, BA, Master's Student in Psychology

2. Study Description

We are developing software that runs on MS-Windows® computers to help first-language English speakers, who read rapidly, to correctly use "to lie" and "to lay." The verbs and their tenses appear below:

Table 1

Forms of "To lie" and "To lay" as a Function of Tense

Tense	Simple		Progressive		Perfect		Perfect Progressive	
	to lie	to lay	to lie	to lay	to lie	to lay	to lie	to lay

			am/is/ are lying	am/is/ are laying	have/ has lain	have/ has laid	have/ has been lying	have/ has been laying
Present	lies	lays	am/is/ are lying	am/is/ are laying	have/ has lain	have/ has laid	have/ has been lying	have/ has been laying
Past	lay	laid	was/ were lying	was/ were laying	had lain	had laid	had been lying	had been lying
Future	will/ shall lie	will/ shall lay	will be lying	will be laying	will have lain	will have laid	will have been lying	will have been laying

To teach correct use, we will use fluency training and concept learning procedures that have effectively taught other language skills. You will learn to fluently use these verbs across many kinds of sentences.

About three students will participate. The study will be conducted in at participants' apartments or homes in a quiet room as well as at the UWM psychology department on MS Windows®-based computers. There are four phases to the study: introduction, baseline, training, and post training.

So far, you have completed the introduction. You have come to the laboratory for *1, one-hour* session. During this session we assessed your reading skill and skill at using the verbs. We also reviewed this consent form and asked you to read it carefully in the laboratory and then at home.

We are now meeting, a day or so later, because you appear qualified for this study. We are meeting today to see if you will consent to participate.

Basically the study will require from 14 to 15 hours of your time. This is a substantial time commitment. So, we seek highly motivated persons, who are rapid readers, who live close to UWM.

To further motivate participants we will pay them about $5 per hour (not including travel time) and double this amount if they comply with all study procedures. We estimate that participants who complete the study will earn about $10 per hour. We can pay each participant up to $150 but only if they complete the entire study. [Note to IRB reviewer: If a participant has a personal relationship with the PI or SPI then that participant will not receive pay for participation. So, before the participant signs this consent form all dollar values will have be crossed out and "$0" will have been inserted.]

If participants discontinue participation, by choice or by the researches' decision, and if they provide the researchers with all the digital and paper records of their participation then they will earn about $5 per hour (not including travel time).

If you are in a course that offers credit for participation we can award such credit.

---

3. Study Procedures

Here is what we will ask you to do and the time estimates:

- During the **baseline phase** you will complete either 3, 5, or 7 tests. To complete these tests, you will come to the laboratory every two or three days. Each test is 5 minutes long and each test session is about 15 minutes long. So depending on the number of baseline tests, this phase could be as *short as 3 days * 15 minutes/day which is 45 minutes or ¾ hour, or as long as 7 days * 15 minutes/day which is 105 minutes or about **1 ¾ hour***.

- Second, we will meet with you again in the laboratory and give you a copy of our software to install on your computer, review how to use it, and explain how to graph your work. During **this training phase,** we will ask you to use our software for 20 minutes daily, from 5 to 7 days per week.

 Our software provides plenty of practice for correctly using the appropriate verbs. Like an old-fashioned "drill," our software will ask you to repeatedly use "to lie" or "to lay" until you are 100% correct. But our software aims to do much more. Our software will teach you to respond rapidly. Responses that are correct and rapid are called fluent.

How does our software promote fluency? Before working on a unit, you will set the software's timer. If the timer is set for, say, 1 minute then after 1 minute the software will stop and indicate how many correct and incorrect responses you achieved per minute.

We would like you to work on a unit until you can respond quickly and accurately, that is, you are fluent. Training to fluency is a major way our software differs from other approaches for teaching complex verbal skills. For each unit, fluency is achieved when you reach an aim of 17 correct responses and 0 incorrect responses per minute for three, 1-minute sessions. This aim is defined in terms of your privately saying (thinking) the answers and *not* publically saying the answers.

So you will have a better idea of what you will be doing, if you participate, let's review the kind of tasks you would complete.

Here is a frame from a unit that involves correct use of "to lie." First, you will see this:

> **Read the sentence. If the verb is right
> hit Answer. If the verb is wrong,
> correct it while reading and hit Answer.**
>
> **Presently, the child's shirt lies on the
> ground.**

When you touch an Answer Button you will see:

> **right (to lie)**

Score your response correct if you said "Presently, the child's shirt lies on the ground" or just "Presently the child's shirt lies."

In a unit involving incorrect use of "to lie" you will see this:

> **Read the sentence. If the verb is right hit
> Answer. If the verb is wrong, correct it while
> reading and hit Answer.**
>
> **Presently, the child's shirt lays on the
> ground.**

When you touch the Answer Button you will see:

> **Presently, the child's shirt lies on
> the ground. (to lie)**

Score your response correct if you said "Presently, the child's shirt lies on the ground" or just "Presently, the child's shirt lies."

Let me now show you the software. [Researcher activates software.]

For five to seven days per week, we would like you to study for about 20 minutes. The lengths of these study sessions are up to you. We have found that four, 5-minute sessions work well. Another approach is to conduct twenty, 1-minute sessions.

At the end of each session, the computer presents the number of correct and incorrect responses per minute. We will show you how to record and graph these rates so you can determine if you are progressing.

If you are not progressing we will show you how you can change the procedure. For example, we might ask you to train to respond correctly with the timer off, before you train to work rapidly. Or, you might temporarily reduce the number of frames in a unit. Once you master these frames, you should reintroduce the frames.

Your training sessions can exceed 1 minute but our fluency aims are defined in terms of privately saying (thinking) answers for 1-minute sessions. So, when you believe that you can satisfy the fluency aim for a unit conduct three, 1-minute sessions to verify that you have satisfied the unit's aim. *Only if your rates meet the aim for three, 1-minute sessions should you move on to the next unit*.

Worth noting is that if your training sessions are 1-minute long then for sure you will have ended the day's training with a 1-minute session! In fact, by the time you have trained for 20 minutes, you may have satisfied the aim for three, 1-minute sessions. Note the aim is *not* defined in terms of consecutive 1-minute sessions.

During this training phase, twice a week, at your convenience, we would like to meet and verify that you are progressing. During these verification meetings we will review your log and graphs and discuss your progress. Next, we will "warm up" our computer and ask you to complete a 1-minute test with a current unit. You performance on this test will be compared to the performance you have been logging at home. During the test you will be saying the answers out loud, so your rates may not be quite as good as your rates while training but your public rates should be consistent with your private rates. Also, with your permission, we may want to record your responses during some of the verification meetings. Verification meetings will last no longer than 30 minutes.

You can work from 5 to 7 days per week. If you worked 7 days per week, you would spend about 20 minutes/day * 7 days + 30 minutes/session * 2 sessions or 200 minutes or about 3 2/3 hours per week. Under this circumstance, we estimate that the training phase would last for about 3 weeks so you would spend 200 minutes /week * 3 weeks + 60 minutes (for instructions) which equals 660 minutes or *11 hours.* It is important to note that if you spend more time each day studying, or pick up the skill quickly then this phase will be shorter.

- Finally, during the post-training phase you will complete three tests, about two tests per week. About three weeks after training is finished, you will complete a fourth test to see whether you can still use the verbs correctly. Each test session is about 15 minute long. So this phase will require 4 days* 15 minute per day or 1 **hour**.

Worth noting is that you are free to use our instructions about verb use throughout the study **but** you should only use the software during the training phase. Finally, please do not use other sources to help you use these verbs.

4. Risks and Minimizing Risks

We do not foresee any risks for participating.

We will be making separate graphs from each participant's data, but we will neither identify participants on the graphs nor in publications unless participants grant permission in writing.

We will ask participants to choose an alias for identifying their digital data and conventional, written records. Digital data will be recorded on a disk or other storage device that participants own and on our computers. Conventional records, such as graphs and logs, will be kept by participants and shared with us. We will maintain a code sheet that links their name to the alias.

We will destroy the links between your name and your alias once you have completed participation. At that time, copies of the digital data will be stored on our computers and copies of the conventional records will be stored in the researchers' office files indefinitely.

5. Benefits

You can earn about $5 per hour (not including travel time) and can double this amount if you comply with all study procedures. We estimate that participants who complete the study will earn about $10 per hour. We can pay each participant up to $150 but only if they complete the entire study.

Also, if participants' classes offer credit, they can credit.

Other benefits include merely using our software. It may seem strange that practice can be enjoyable but without a grade "hanging over your head" working on a unit can induce a desirable state of consciousness called "flow" where time passes quickly! Moreover, graphing and viewing your progress can be quite rewarding.

The most important benefit, however, is that you will likely acquire an important skill that indicates mastery of a difficult aspect of English.

6. Study Costs

You will not be responsible for any of the costs for taking part in this research except for traveling to and from our campus laboratory.

7. Confidentiality

All information collected during the study will be confidential to the extent permitted by law. Only Marshall Dermer (the principle investigator), Jessica Willadsen (who helped construct the software and is testing the software as part of her thesis), and a student research assistant (not yet identified) will access the information. However, the Institutional Review Board at UW-Milwaukee or appropriate federal agencies like the Office for Human Research Protections may review your records at any time.

Your identity will only be evident via the e-mail address participants may use in exchanging information about this study, your signing your name on this consent form, and the check you can receive on completing this project. Otherwise, you and the researchers will all be using an alias to identify your written and computer records.

Your paper records will be stored in a locked university office indefinitely. Your computer records will be stored on password-protected computers indefinitely.

We may decide to present our findings to others or publish our results in scientific journals or at scientific conferences. Our findings will include tables and graphs of your performance, but we will not identify you unless you grant such permission in writing.

8. Alternatives

If you are in a course that offers credit for participation we can award such credit, but the non-research option for students who decide to not participate is determined by the instructor accepting credit for participation.

9. Voluntary Participation and Withdrawal

Your participation is entirely voluntary. You may choose not to take part, or if you decide to take part, you can later withdraw. You are free to not answer any questions or withdraw at any time. Your decision will not change any present or future relationships with the University of Wisconsin Milwaukee and will not affect your grade or class standing. The investigator, Marshall Dermer, may stop your participation in this study if he feels this is necessary.

If you withdraw or the investigator terminates your participation, we will ask for a copy of your up-to-date digital data and conventional records. We will also use all other information collected up to your withdrawing. If your instructor offers credit for participation, we will provide credit in terms of your number of hours of participation. However, if you withdraw you will only receive about $5 per hour for your time.

You will only be awarded $10 per hour, if you complete *all* tests and reach the fluency aims associated with each training unit as described above. We can pay you up to $150 for participation.

10. Questions

For more information about the study or the study procedures or treatments, or to withdraw from the study, contact:

Marshall Lev Dermer, Associate Professor

Department of Psychology

Garland Hall

PO Box 413

Milwaukee, WI 53201-0413

Office: 414-751-0213

Home: 414-332-8606

E-mail: dermer@uwm.edu

or:

Jessica Willadsen, BA

Department of Psychology

Garland Hall

PO Box 413

Milwaukee, WI 53201-0413

Home: 608-445-0784

E-mail: willads2@uwm.edu

If you have questions about your rights or want to complain about your treatment as a research subject contact the Institutional Review Board (IRB). The IRB's representative may ask your name, but all complaints are kept in confidence.

Institutional Review Board

Human Research Protection Program

Department of University Safety and Assurances

University of Wisconsin – Milwaukee

P.O. Box 413

Milwaukee, WI 53201

(414) 229-3173

11. Signatures

Research Subject's Consent to Participate in Research:

To voluntarily agree to take part in this study, you must sign on the line below. If you choose to take part in this study, you may withdraw at any time. You are not giving up any of your legal rights by signing this form. Your signature below indicates that you have read or had read to you this entire consent form, including the risks and benefits, and have had all of your questions answered, and that you are 18 years of age or older.

_____

Printed Name of Subject/ Legally Authorized Representative

_____   _____

Signature of Subject/Legally Authorized Representative   Date

Research Subject's Consent to Audiotaping:

I consent to my responses from the verification meetings being audiotaped and used in publications, and consequently that some people may be able to identify me.

Please initial: _____ Yes _____ No

Research Subject's Consent to Name Appearing in Publications:

I consent to my name appearing in publications that report my data.

Please initial: _____ Yes _____ No

Principal Investigator (or Designee)

I have given this research subject information on the study that is accurate and sufficient for the subject to fully understand the nature, risks, and benefits of the study.

_____   _____

Printed Name of Person Obtaining Consent   Study Role

_____   _____

Signature of Person Obtaining Consent   Date

Appendix B: Consent Form

Consent to Complete: (1) a Test of Speed of Reading, (2) a Preliminary Test

of Using 'to lay'' and ''to lie'' Correctly, and (3) a Background Survey

Study Title: Fluency Training the Correct Use of "to lie" and "to lay"

Persons Responsible for Research: Marshall Dermer, Ph.D., Associate Professor, UWM Department of Psychology and Jessica Willadsen, BA, Master's Student in Psychology

Descriptions of the instruments:

The reading test involves reading a short passage online with a timer going and answering a few comprehension questions.

The test of ''to lie'' and to ''to lay is 5-minutes long. Although the test includes 102 sentences, we do not expect you or experts to complete all the sentences. We just expect you to do your best.

The background survey asks five questions.

Risks / Benefits: The risks associated with completing these tests are minimal and no course credit is offered for completing them. Completing the tests may qualify you for the main study where you could improve your use of these verbs and earn money for participation provided that you are at least 18 years old, English is your first language, and you can access a computer using MS Windows ® in a quiet area in your home or apartment.

Confidentiality: In completing the lie/lay test, we will ask you to use an alias. *We will only link your alias with your name and e-mail address if you later consent to the main phase.* Otherwise, the completed test will be stored in a locked file, in a locked university office indefinitely, and computer records will be stored on password-protected computers indefinitely.

Voluntary Participation: Your completing these tests is voluntary. You may choose to not answer any item and discontinue participation at any time without penalty. Your decision will not change any present or future relationship with the University of Wisconsin Milwaukee.

Who do I contact for questions about the study: For more information about the study or study procedures, contact:

Marshall Lev Dermer, Associate Professor

Department of Psychology

Garland Hall

PO Box 413

Milwaukee, WI 53201-0413

Office: 414-751-0213

Home: 414-332-8606

E-mail: dermer@uwm.edu

Who do I contact for questions about my rights or complaints towards my treatment as a research subject? Contact the UWM IRB at 414-229-3173 or irbinfo@uwm.edu.

Research Subject's Consent to Participate:

Completing these instruments indicates that you have read this consent form and that you have voluntarily agreed to participate, have had all of your questions answered, and that you are 18 years of age or older.

Thank you!

Appendix C: Background Survey

Fluency Training the Correct Use of "to lie" and "to lay"

1. Alias (Do Not write your name here): _____

2. Age: _____

3. Sex: Male ____   Female ____

4. Highest Level of Formal Education: _____

5. Reading rate on Staples' test _____ Number of comprehension questions correct ____

6. Is there anything you can tell us that would help us understand problems you are facing with using "to lie" and "to lay"?

Appendix D: Instructions on how to use "to lie" and "to lay"

Using "To Lay" and "To Lie"

Below we describe the use of "to lay" and "to lie" and provide a set of exercises. You can print these materials and use them when you are training but do not use them when testing for fluency.

I. Which Verb?

The verb "to lay" (often meaning to place or to put) acts upon its object. To better see this, I've italicized the verb, boldfaced its object, and inserted an arrow to indicate direction of action:

I *lay* the **pen** on the table.

Jack *lays* his **coat** on the chair.

Max *lays* his dog **bone** in his crate.

The verb "to lie" (often meaning to recline or to rest) describes the verb's subject. To better see this, I've italicized the verb, underlined the verb's subject, and inserted an arrow to indicate that the subject of "to lie" is being described:

The pen *lies* on the table.

Jack's coat *lies* on the chair.

Max's dog bone *lies* in his crate.

Now you should better understand the difference between the verbs "to lay" which acts upon its object, and "to lie" which describes its subject.

II. Which Verb Form?

To use the correct form, review this table:

The Most Common Verb forms of "To lay" and "To Lie"				
Infinitive	Present Tense	Past Tense	Present Participle	Past Participle
to lay	lay	laid	laying	laid
to lie	lie	lay	lying	lain

The arrow above indicates that the present tense of "to lay" (lay) is the same as the past tense of "to lie" (lay). Now that you know; don't be confused.

The present participles are pretty easy. For "to lay" the past participle is "laying" and for "to lie" the present participle is "lying."

The past participles can be tricky. For "to lay" the past participle is "laid" and for "to lie" the past participle is "lain."

III. Examples:

Below are examples. For each verb carefully review the four sentences to see how the verb form *changes with tense*:

"To lay"

Present Tense: Daily, I *lay* myself on the bed by 10 P.M.

Past tense: Yesterday, I *laid* myself on the bed by 10 PM.

Present Participle: For the past week, I have been *laying* myself on the bed by 10 PM.

Past Participle: For the past week, I had *laid* myself on the bed by 10 PM.

"To lie"

Present Tense: Daily, I *lie* on the bed by 10 P.M.

Past tense: Yesterday, I *lay* on the bed by 10 PM.

Present Participle: For the past week, I have been *lying* on the bed by 10 PM.

Past Participle: For the past week, I had *lain* on the bed by 10 PM.

Below are the same examples. For each tense, carefully review how the verb form *changes with the meaning* ("to lay" versus "to lie"):

Present Tense

To Lay: Daily, I lay myself on the bed by 10 P.M.

To Lie: Daily, I *lie* on the bed by 10 P.M.

Past Tense

To Lay: Yesterday, I laid myself on the bed by 10 PM.

To Lie: Yesterday, I lay on the bed by 10 PM.

Present Participle:

To lay: For the past week, I have been laying myself on the bed by 10 PM.

To Lie: For the past week, I have been *lying* on the bed by 10 PM.

Past Participle

To Lay: For the past week, I had laid myself on the bed by 10 PM.

To Lie: For the past week, I had lain on the bed by 10 PM.

IV. Exercises

On the next page there is a set of 20 sentences. Using MS Word, complete each sentence by typing the correct verb form in column C

The answers appear in column D but you can't see them because they are in white. When you have finished completing all the sentences, left click each cell in column D and go to the Home tab in MS Word and use Font Color button to make the answers appear in black. Then compare your answers and see if further instruction and practice would help you master this skill.

Practice at Using to Lie and to Lay

A	B	C Your Answers	D Correct Answers	E
1.	Presently, Dave wants to		lay	down a wager.
2.	Is the cat		lying	on the couch?
3.	Is the weightlifter		laying	himself down to do a push up?
4.	The baby is		lying	in the crib.
5.	The surgeon was		laying	her tools on the surgical table.
6.	Exhausted, Vanessa		lay	on the ground trying to catch her breath.
7.	Heather		laid	her wet clothes on the radiator to dry.
8.	The hockey player had		lain	on the ice for several minutes.

9.	It is helpful to	lay	your clothes out before work.
10.	Debris	lay	on the ground after the tornado.
11.	Tomorrow, the husband will	lie	down to watch television.
12.	Kara had	laid	claim to the $20 bill on the ground.
13.	The butter needs to	lie	on the counter for 15 minutes to soften.
14.	The mechanic had	laid	the engine into the car.
15.	Mary will	lay	herself on the bed to rest.
16.	Had the toys	lain	on the floor?
17.	Being very tired I'm going to	lie	down for a nap.
18.	Tomorrow, I shall	lie	about my apartment.
19.	Presently, Marc	lays	claim to the winning ticket.
20.	Yesterday, the photographer	laid	the pictures in the frames.

Appendix E: Log sheet

Name _____   Year _____

Date	Unit	Frames Remain-ing	Right or Corrects/ Min	Wrong or Incorrects/ Min	Time in Unit in Min	Cumulative Time in Unit in Min	Independent Test? Yes/No Initials

Counting Period in Mins	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Record Floor in Mins	1.0	.50	.33	.25	.20	.17	.14	.13	.11	.10	.09	.08	.08	.07	.07

Appendix F: Transfer Test

1.	Presently, the peacekeepers want to	lay	themselves down to protest.
2.	Is the bread	lying	on the baking sheet?
3.	Is the firefighter	laying	himself under the tree to avoid falling debris?
4.	The law is	lying	on the judge's schedule.
5.	The teacher was	laying	her book on the table.
6.	Had the house been	lying	to the north?
7.	The landscaper will have been	laying	bricks between the fence and the sidewalk.
8.	The grocer's bananas had	lain	in the basket
9.	Is	laying	blankets on the children's beds helpful?
10.	The teacher's book has been	lying	on the table.
11.	Tomorrow, the peacekeepers will	lie	down to protest.
12.	Mr. Smith had	laid	claim to the house to the north.
13.	The firefighter will be	lying	under the tree to avoid falling debris.
14.	The baker had	laid	the bread on the baking sheet.
15.	The grocer will	lay	bananas in the basket.
16.	Had the hammer	lain	on the bench?
17.	The judge has	laid	down the law.
18.	Tomorrow, the blankets shall	lie	on the children's beds.
19.	Presently, Mr. Smith wants to	lay	claim to the house to the north.
20.	The carpenter had been	laying	the hammer on the bench.
21.	Yesterday, the bricks	lay	between the fence and sidewalk.
22.	The teacher's book is	lying	on the table.
23.	Had the law been	lying	on the judge's schedule?
24.	The peacekeepers will have been	lying	down to protest.
25.	The grocer's bananas had been	lying	in the basket.
26.	The bread had	lain	on the baking sheet.
27.	Will the mother have	laid	blankets on the children's beds?
28.	Presently, the firefighter wants to	lay	himself under the tree to avoid falling debris.
29.	The house will have	lain	to the north.
30.	The landscaper has	laid	bricks between the fence and the sidewalk.
31.	Yesterday, did the peacekeepers	lay	down to protest?
32.	The judge was	laying	down the law.
33.	The blankets will have	lain	on the children's beds.
34.	Presently, the carpenter	lays	the hammer on the bench.
35.	The grocer will have been	laying	bananas in the basket
36.	The teacher's book has	lain	on the table.

37.	Was the baker	laying	the bread on the baking sheet?
38.	The firefighter will have	lain	under the tree to avoid falling debris.
39.	The bricks will be	lying	between the fence and the sidewalk.
40.	Had Mr. Smith	laid	claim to the house to the north?
41.	The mother had been	laying	blankets on the children's beds.
42.	Tomorrow, the law shall	lie	on the judge's schedule.
43.	Will the teacher	lay	her book on the table?
44.	Yesterday, did the hammer	lie	on the bench?
45.	The peacekeepers have	laid	themselves down to protest.
46.	Presently, the grocer's bananas	lie	in the basket.
47.	Had the house	lain	to the north?
48.	Did the firefighter	lay	himself under the tree to avoid falling debris?
49.	The bread will have	lain	on the baking sheet.
50.	The law has	lain	on the judge's schedule.
51.	The carpenter had	laid	the hammer on the bench.
52.	The landscaper is	laying	bricks between the fence and the sidewalk.
53.	Were the blankets	lying	on the children's beds?
54.	Tomorrow, Mr. Smith will	lay	claim to the house to the north.
55.	Does the grocer want to	lay	bananas in the basket?
56.	Tomorrow, the firefighter shall	lie	under the tree to avoid falling debris.
57.	Has the judge	laid	down the law?
58.	Presently, the teacher	lays	her book on the table.
59.	The peacekeepers have	lain	down to protest.
60.	The hammer was	lying	on the bench.
61.	The bricks were	lying	between the fence and sidewalk.
62.		Laying	the bread on the baking sheet is helpful.
63.	The house is	lying	to the north.
64.	Had the mother	laid	blankets on the children's beds?
65.	The teacher's book will have been	lying	on the table.
66.	The firefighter has been	laying	himself under the tree to avoid falling debris.
67.	Will the carpenter be	laying	the hammer on the bench?
68.	Do the peacekeepers want	to lay	themselves down to protest?
69.	Mr. Smith will be	laying	claim to the house to the north.
70.	The grocer's bananas will be	lying	in the basket.
71.	Yesterday, the bread	lay	on the baking sheet.
72.	The bricks had	lain	between the fence and the sidewalk.
73.	Yesterday, the blankets	lay	on the children's beds.
74.	The judge was	laying	down the law.
75.	The teacher has	laid	her book on the table.

76.	Tomorrow, the firefighter will	lay	himself under the tree to avoid falling debris.
77.	Presently, the hammer	lies	on the bench.
78.	The peacekeepers are	lying	down to protest.
79.	Will the landscaper be	laying	bricks between the fence and the sidewalk?
80.	The baker was	laying	the bread on the baking sheet.
81.	The house was	lying	to the north.
82.	Yesterday, the grocer	laid	bananas in the basket.
83.	The firefighter will have been	lying	under the tree to avoid falling debris.
84.	Presently, the law	lies	on the judge's schedule.
85.	Yesterday, the teacher's book	lay	on the table.
86.	Presently, the mother	lays	blankets on the children's beds.
87.	Are the peacekeepers	lying	down to protest?
88.	Had the bricks	lain	between the fence and the sidewalk?
89.	Mr. Smith has been	laying	claim to the house to the north.
90.	Yesterday, the judge	laid	down the law.
91.	The hammer will have been	lying	on the bench.
92.	Has the grocer been	laying	bananas in the basket?
93.	Had the firefighter been	lying	under the tree to avoid falling debris?
94.	Will the teacher have been	laying	her book on the table?
95.	Does the baker want to	lay	the bread on the baking sheet?
96.	Are the blankets	lying	on the children's beds?
97.	Did the landscaper	lay	bricks between the fence and the sidewalk?
98.	Is	laying	down the law helpful?
99.	Did the peacekeepers	lay	themselves down to protest?
100.	Yesterday, the house	lay	to the north.
101.	Were the grocer's bananas	lying	in the basket?
102.	Tomorrow, the bread will	lie	on the baking sheet.

Appendix G: Instructions for Screening Test, Baseline, and Post-Training Tests

Using "to lay" and "to lie" Correctly

For each item on this test, please print a correct form of "to lie" or "to lay."

For example, if the item were:

1. Yesterday, the cat was ____ on the couch.

then neatly print:

> *lying*

If the item were:

2. The student ___ his backpack on the desk.

then neatly print:

> *laid*

You will have 5 minutes to complete this test. We will score your responses in terms of correct and incorrect responses per minute. Please start with the first item and do not skip items.

We are interested in your both correctly and rapid responding. Please do not speed up if this will reduce your accuracy. *Try to work at the fastest pace that permits your accurate responding!*

Wait for the signal before turning the page and beginning