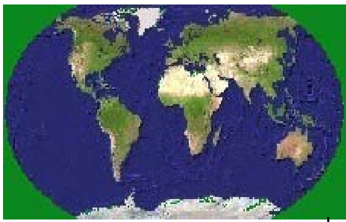
International Journal of Multidisciplinary Research and Development



International Journal of Multidisciplinary Research and Development

Volume: 2, Issue: 10, 458-461
Oct 2015
www.allsubjectjournal.com
e-ISSN: 2349-4182
p-ISSN: 2349-5979
Impact Factor: 5.742

Aspen Edwards
Department of Special Education, Gonzaga University, Spokane, WA 99258-0025, USA

T. Finn
Department of Special Education, Gonzaga University, Spokane, WA 99258-0025, USA

J. Neyman
Department of Special Education, Gonzaga University, Spokane, WA 99258-0025, USA

T. F. McLaughlin
Department of Special Education, Gonzaga University, Spokane, WA 99258-0025, USA

Correspondence
Aspen Edwards
Department of Special Education, Gonzaga University, Spokane, WA 99258-0025, USA

The gradual effects of implementing model-lead-test and child selected rewards in the home to assist a preschool student with basic rote counting

Aspen Edwards, T. Finn, J. Neyman, T. F. McLaughlin

Abstract
The purpose of this study was to evaluate the effectiveness of a model-lead-test paired with contingent rewards on the basic rote counting skills of a four-year-old girl in her home. Our participant attended a university-sponsored preschool twice a week. She also came from a stable household. Before the study began, the participant could not count to 15 without skipping numbers. When rewards and model-lead-test were employed, the participant's counting improved. The efficacy of employing model-lead-test in the home was discussed.

Keywords: model, lead, test, rewards, rote counting, instruction in the home; undergraduate students, single case research, changing criterion design

Introduction

It is essential for basic rote counting to be mastered by all early elementary students in order to advance to further stages of mathematics. Rote counting is the foundation of mathematics and all future mathematics will be built off of basic rote counting [1, 2]. Rote counting can be defined as the memorization and naming of numbers in the correct sequence without the association of the number to an object. The ability to rote count is a prerequisite skill for future math skills. To count rationally means to establish a one-to-one correspondence from a subject of natural numbers onto a set of objects [3]. The mastery of rote counting, number recognition and rational counting are critical math skills and a precursor for success in kindergarten as well as the elementary school curriculum [2, 4]. Silbert, Carnine, and Stein, [5] have suggested that counting skills, are not only important in and of themselves, but are also an important prerequisite skills for many problem-solving strategies that are needed in the later grades.

Rational counting is a skill that is fundamental for carrying out daily activities. Sandler [6] reported counting should be an integral part of even very young children's daily routines. Sandler also suggested that instructions use such methods, having a child look for her two shoes, holding up three fingers to show how old he or she is, or counting to see if she has gotten as many cookies or treats as a sibling or friend. In order to carry out the latter tasks, as well as numerous other daily living skills, an individual would need to have the skills of both rote and rational counting in his or her repertoire.

Research has validated the importance of early experiences in math for lasting positive outcomes [7, 8]. This and other research has noted the importance of early learning in children and the link to future proficiency in mathematics. Children typically develop through a predictable sequence of steps and milestones. However, they may not advance in the same way or at the same time as their peers. Kellar-Guenther *et al.,* [9] suggested the more skills a child has learned when they begin kindergarten can greatly affect their trajectories for success through early elementary school. Therefore, it's important that children start with as many skills as they can. Research has also found that children who could recite and count to 20 in preschool had the highest test scores for math at the end of 1st grade. Typically developing children between ages three and four are able to "count objects or people up to 10 or 20. If a child lacks the skill of rote counting, counting a group of items is going to be difficult for them to master [7].

Our case report implemented and evaluated a teaching strategy called Model-Lead-Test [10]. Model-Lead-Test (MLT) is a highly structured error correction procedure that teaches students to independently correct their errors and provides additional practice for the child to remediate their errors [5, 11, 12]. MLT provides frequent opportunities for students to practice errors correctly, thus reducing the chance that incorrect responses will be learned [13]. When using this strategy the instructor first models the correct use of counting. Next, the student and instructor engage in the correct response together. Finally, the child is required independently say or write the correct response [10, 14]. When their participant was tested, the instructors were able to assess her level of understanding of her location. Peterson *et al.* implemented MLT to teach a student how to appropriately answer her location in her public school. With fading the use of visual prompts upon the MLT intervention, the participant "was taught to answer correctly when prompted to nine different places throughout his school. The participant was able to maintain this skill" [14]. The MLT intervention was paired with contingent rewards. A reward is contingent when a desired object is given to the participant immediately following an appropriate behavior in hopes of increasing the rate of the specified behavior. The use of contingent rewards has been very effective, especially in comparison to non-contingent rewards. Lepper, Deavney, and Drake [15] found that non-contingent rewards generated little change in intrinsic interest for students. In the present study, correct counting in sequence was the academic behavior that was rewarded contingent upon the response.

The purpose of this study was to evaluate the effectiveness of a model-lead-test paired with contingent rewards on the basic rote counting skills of a four-year-old girl in her home. A second purpose was to provide a replication our recent research [16] using MLT in a home setting by a parent. In the present replication, these procedures were implemented and evaluated out by two undergraduate special education candidates completing their program of study at a local private university [17].

Method

Participant and Setting

The participant was a four-year-old typically developing girl with no known disabilities. She attended pre-school and lived in a very stable household with her mother, father, and older brother. Before the study began, the participant counted to the number 15. However, she would skip numbers. It was not that "Ava" lacked the academic understanding or ability to count in the correct sequence, but rather that she was reluctant to because there were certain numbers that she did not "like." She would typically omit numbers, most often fifteen and seventeen. This was considered to be an error because the participant was quickly approaching kindergarten and according to the state core content, students in kindergarten are expected to "rote count by ones forward from 1 to 100. Until the participant counts in the proper sequence, she is not going to be able to effectively gain new counting skills or advance to further stages of mathematics.

The study was conducted in the living room of the participant's home located in Spokane, Washington. During each session, the participant and researcher were the only individuals in the room. On average, there were two sessions per week with each session lasting approximately 20 minutes.

Materials

The materials in the present case report included the following: (a) the data collection sheet, a ball, various rewards, and the camcorder on the cell phone belonging to one of the first two authors. The ball was used during intervention. The researcher and participant would sit on the carpet of the living room and roll the ball back and forth, saying the following number in the sequence with each roll. Our rewards included Chapstick® and or chewing gum. These rewards were selected by our participant before each session took place. The camcorder was used during each session to for reliability of measurement.

Dependent Variable

The target behavior measured was how many numbers in order that "Ava" counted without making an error. Correct answers were defined as the highest number that the participant counted to in the proper sequence without skipping any numbers. This was the number that was recorded for each session. Errors were defined as skipping a number, mixing up the order of the numbers, or saying a number that did not belong in the sequence. There was not a specified amount of time that the participant was required to respond within.

Data Collection and Inter-observer Agreement

Data were collected through event recording. For each session, the researchers recorded the highest number that the participant correctly counted to on a data collection sheet. Each session was recorded. For reliability purposes, the second researcher viewed the recording of each session and recorded the highest number that she believed the participant to have reached. The researchers were in agreement across all sessions. The mean agreement was 100% with a range of 100%.

Experimental Design

A changing criterion design [18, 19] was used in the present study. This design was chosen because the counting limit could not be determined. This also allowed for the researchers to teach "Ava" to count to a number based on her performance during the prior sessions. Each time the participant correctly counted to a number for two consecutive sessions, the criterion line moved up by one. This meant that during intervention, "Ava" was instructed on the next number in the set through Model-Lead-Test method and was then tested on her knowledge of the new number, which was recorded. The changing criterion began at 15 since the participant correctly counted to 14 during at least two sessions of baseline.

In the present study, the researcher and participant rolled the ball back and forth. For each roll that was made, "Ava" was required to say the succeeding number. When she said the incorrect number or did not know the next number in the set, one of the first two authors would stop the participant and implement MLT. When "Ava" correctly counted to the specified number, she received a stick of Chapstick® or a piece of gum depending upon her choice of a reward for that day.

Baseline

During baseline, the researcher would direct the participant to count as high as she could after the prompt, "Count as high as you can." We never stopped or corrected "Ava" when she counted during baseline. After each session of baseline was complete, the participant was given praise for her counting. The participant correctly counted to 14 for all four sessions of baseline.

Model-Lead-Test

When the participant said an incorrect number or did not know the next number in the set, the researcher would stop her and model how to correctly count to that number, with emphasis on the specified number. The researcher would then lead the participant in reaching that number by counting to the fixed number with her while rolling the ball back and forth. Following this, first two authors prompted our participant to count to that particular number on her own, which was the "test" part of the intervention. Eight criterion changes were employed during this condition.

Data Collection and Inter-observer Agreement

Data were collected through event recording. For each session, the researchers recorded the highest number that the participant correctly counted to on a data collection sheet. Each session was recorded. For reliability purposes, the second researcher viewed the recording of each session and recorded the highest number that she believed the participant to have reached. The researchers were in agreement across all sessions. The mean agreement was 100% with a range of 100%.

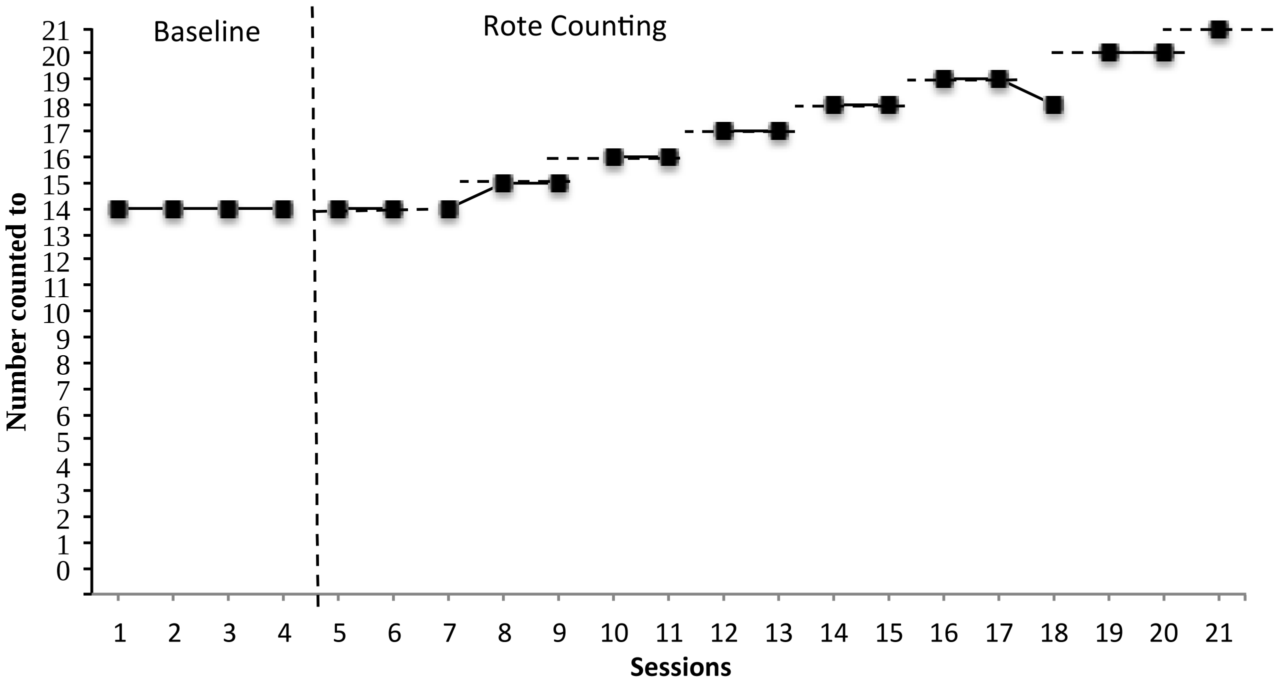


Fig l: The number of numbers counted up to during baseline and the eight criterion changes (horizontal dashed lines) with model, lead, and test.

Results

The results for our participant are shown in Figure 1. The mean number that the participant correctly counted to during baseline was 14 with a range of 14. When counting for baseline sessions, "Ava" counted to 21, but skipped the numbers 16, 18, 19, and 20. The trend during baseline was neither increasing nor decreasing but rather consistent across all four sessions. The mean number that the participant correctly counted to during MLT increased. The grand mean was 17.1 numbers in sequence (range: 14 to 21). The trend during the Model-Lead-Test was increasing and stable. On May 1st, or the fourth to last data point during intervention, the subject was sick with a fever, explaining the decrease in the number which she was able to reach during data collection.

Discussion

The present outcomes indicated that MLT was an effective intervention to teach a young typically developing child to rote count. Our results showed that during baseline the participant successfully counted to 14 without making any errors. After the MLT intervention, our participant successfully counted to 21 without making any errors. The use of the changing criterion design was able to document these changes.

The present study was straightforward to implement and was cost-efficient. Prior to the study, the participant would skip numbers. However, the researchers were still able to get a rough estimate for how far she could count. Another strength of the study was that it was a Model-Lead-Test intervention, meaning the correction procedure was simple to implement. When an error was made, the researcher would simply go back to the number before error and begin to count, putting emphasis on the number that the participant made a mistake on.

There were a couple of weaknesses in this case report. The first two authors were only able to meet with the participant twice a week. In order to see more extensive results however, more than twice a week is needed. The participant that the study was conducted on was extremely stubborn and made mistakes on purpose. Another weakness of the study was during Session 18, the participant was sick with a fever and a severe cold. This resulted her only being able count to 18, even though she had reached 19 in the previous sessions. Also the first two authors had set the criterion at 20, so was below that for that session. The first two authors chose to keep the criterion at 20 since the previous two data points indicated that she was able to count to 19 correctly. More confidence in the MLT procedure would have been to decrease one of the criterion ceilings [18, 20]. Unfortunately, this did not take place. Therefore we would recommend that this should take place in another replication of these procedures. Having the participant mirror the criterion ceiling when it was reduced would have added additional confidence to the present outcomes.

The results of the study show that our intervention became successful. The present study was only conducted in the living room of the participant's home. If the study was to be replicated, it should take place across multiple settings to ensure generalization [21, 22]. If the first two authors had not run out of time, they could have assessed maintenance of treatment gains of the rote counting skills by returning to baseline several weeks following the study or simply probed rote counting in other settings. The graduate improvement after the first criterion was developed remains an issue.

Maybe, if our MLT intervention could have taken place four or five days a week rather than just two days, our results would have been less gradual.

The results for the study showed an improvement of seven numbers. During baseline the participant could only count to 14 without skipping any numbers. After intervention, she successfully counted to 21 without skipping any numbers. During baseline when the participant would count as high as she could, she would say "13, 14, 16, 18, 19, and 20" and continue up to 30. The participant consistently skipped the numbers 15 and 17. This is why the first 6 data points are 14. Getting the participant to say 15 took multiple sessions, but once she reached 15 the rest of the sequence got easier.

The outcomes also replicated our prior research employing MLT [11, 14, 16, 23, 24, and 25]. As with come of our other research, special education candidates were able to implement and evaluate an academic intervention. Finally, most of the research has employed a wide range of students with disabilities. In the present case report a typically developing child was employed. This type of replication adds to the power of the reported outcomes [18]. Clearly, with only on participant, further research may wish to employ more participants with a wide range of skills.

References

1. Charlesworth R. *Experiences in math for young children.* Belmont, CA: Wadsworth Publishing 2011.
2. Frank AR. Counting skills--A foundation for early mathematics. The Arithmetic Teacher 1989; 37(1):14.
3. Ogletree EJ, Rackauskas JA, Buergin TF. Teaching number sense through rhythmical counting. The Elementary School Journal 1970; 71:1-11.
4. Blank M. *Teaching learning in the preschool: A dialogue approach*. Columbus, OH: Charles E. Merrill 1973.
5. Silbert J, Carnine DW, Stein M. *Direct instruction mathematics* (2nd. ed.). Englewood Cliffs, NJ: Prentice-Hall 1990.
6. Sadler FH. Help! They still don't understand counting. TEACHING Exceptional Children Plus 2009; 6(1):2-12.
7. Audrey C, Godfrey R, Dahl S. Early mathematics development and later achievement: A further analysis. Mathematics Education Research Journal 2006; 18:27-46.
8. Stood S, Jitendra AK. A comparative analysis of a number sense instruction in reform-based and traditional mathematics textbooks. Journal of Special Education 2007; 41:145-157.
9. Kellar-Guenther Y, Rosenberg,SA, Block SR, & Robinson CC. Parent involvement in early intervention: what role does setting play?, Early Years: An International Research Journal,2014; 34:1, 81-93
10. Marchand-Martella NE, Slocum TA, Martella R. (Eds.), *Introduction to direct instruction*. Boston, MA: Pearson Education, Inc 2004.
11. Shouse H, Weber KP, McLaughlin TF, Riley S. The effects of model, lead, and test and a reward to teach a preschool student with a disability to identify colors. Academic Research International 2012; 2(1):477-483.
12. Stein M, Kinder D, Silbert J, Carnine DW. *Designing effective mathematics instruction: A Direct Instruction approach* (4th ed.). Upper Saddle River, NJ: Pearson Education, Inc 2006.
13. Sayeski K, Paulsen KJ. Mathematics reform curricula and special education: Identifying intersections and implications for practice. Intervention in School and Clinic 2010; 46(1):13-21.
14. Peterson L, McLaughlin TF, Weber KP, Anderson H. The effects of model, lead, and test technique with visual prompts paired with a fading procedure to teach "where" to a 13-year-old echolalic boy with autism. Journal of Developmental and Physical Disabilities 2008; 20:31-39.
15. Lepper MR, Keavney M, Drake M. Intrinsic motivation and extrinsic rewards: A commentary on Cameron and Pierce's meta-analysis. Review of Educational Research 1996; 66(1):5-32.
16. Aldahri M, McLaughlin TF, Derby KM, Belcher J, Weber KP. An evaluation of the direct instruction model-lead-test procedure and rewards on rote counting, number recognition and rational counting with a preschool student with developmental delays. International Journal of Basic and Applied Science 2013; 2(1):98-109.
17. McLaughlin TF, Williams BF, Williams RL, Peck SM, Derby KM, Bjordahl JM, Weber KM. Behavioral training for teachers in special education: The Gonzaga University program. Behavioral Interventions 1999; 14:83-134.
18. Kazdin AE. *Single case research designs: Methods for clinical and applied settings* (2nd. ed.). New York, NY: Oxford University Press 2011.
19. McLaughlin TF. An examination and evaluation of single subject designs used in behavior analysis research in school settings. Educational Research Quarterly 1983; 7:35-42.
20. Cooper J, Heron T, Heward WL. *Applied behavior analysis* (2nd ed.). Upper Saddle River, NJ: Prentice-Hall/Pearson Education 2007.
21. Stokes TF, Baer DM. An implicit technology of generalization. Journal of Applied Behavior Analysis 1977; 10:349-367.
22. Stokes TF, Baer DM. Mediated generalization: An unfinished portrait. In K. S. Budd & T Stokes (Eds.), *A small matter of proof: The legacy of Donald M. Baer* (pp. 125-138). Reno, NV: Context Press 2003.
23. Aldahri M, Weber KP, McLaughlin TF. Differential effects of direct instruction model, lead, test procedure with and without a reward on rote counting, number recognition, and rational counting with a young child. International Journal of English and Education 2013; 2(3):451-461.
24. Bechtoldt S, McLaughlin TF, Derby KM, Blecher J. The effects of direct instruction flashcards and a model, lead, and test procedure on letter recognition for three preschool students with developmental disabilities. Journal on Developmental Disabilities 2014; 20(1):5-15.
25. Bulkley L, McLaughlin TF, Neyman J, Carosella M. The effects of a model, lead, and test procedure to teach letter name and sound identification to elementary school students with learning disabilities. Electronic International Journal of Educational Research 2012; 3(4):50-64.