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The Delayed Effects of Implementing a Modified Copy, Cover, Compare Procedure with Hand over Hand Prompting and Dot to Dot Tracing to Teach Basic Shapes to a Three-Year-Old Child with Level One Autism

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Abstract

The purpose of the study was to evaluate the effectiveness of using a modified Copy, Cover, Compare (CCC) procedure on the ability to accurately draw three basic shapes with at least 75% accuracy. The data was gathered during twenty-four sessions with the participant. Each session involved the participant forming a circle, square, and triangle on a blank sheet of paper or a modified CCC sheet created by the first author. Once the participant had completed drawing the three shapes, they were graded and the score for each shape was recorded. The goal of intervention was to increase the correct formation for circle, square, and triangle formation was implemented to allow the participant to focus on shape formation for only one shape at a time. Hand-over-hand guidance, verbal cues, verbal praise, and prizes were used to encourage the implementation of CCC during intervention. The outcome of the study indicated that the implementation of CCC through hand-over-hand guidance, verbal cues, verbal praise, and prizes increased the participant's accurate shape formation for square and triangle. Further research would need to be done to show the effects of using hand-over-hand guidance, verbal cues, verbal praise, and prizes to increase the participant's accurate shape formation for circle.

Keywords: level 1Autism Spectrum Disorder (ASD), shapes, Copy-Cover-Compare (CCC), preschooler, multiple baseline design

Introduction

The first few years of a child's life are critical and can shape the child's future development. Within these few years of life, a child's future health, happiness, growth, development and learning achievement at school, in the family and community, and in life in general are molded. In fact, the first three years of a child's life are when their brain begins to develop and grow the most. What the child experiences early on in life will provide the base for the brain's organizational development and functioning throughout life. All of these factors can have a direct impact on how children develop learning skills.

Understanding the stages of early childhood development can greatly impact a child in the classroom. Having a better understanding of this concept can help teachers know what to expect and how to best support the child as he or she grows and develops. Copy-Cover-Compare or cover, copy, compare (CCC) is a student managed academic self-tutoring procedure that has been show to increase academic skills. This intervention has been evaluated using multiple academic subjects, including spelling, geography, handwriting, and mathematics (1, 2, 3, 4).

CC procedures have been replicated several times by different school personnel (5, 6, 7, 8, 9). A wide range of student populations ranging from students with behavior disorders (10, 11, 9), elementary students with autism (12, 13), learning disabilities (14), those at-risk for school failure (15), typically developing students (15, 16) and students with multiple disabilities (17). According to advocates of CCC is a simple, efficient, self-managed academic intervention that has been used to improve accuracy, fluency, and maintenance across students, curricula objectives, academic skill domains, and settings (4).

Allowing students to have an ample amount of time for practice is important to help develop ideas and skills learned in the classroom. The quick and efficient learning trials associated with the CCC procedure allows for many practice opportunities, as well as time for over-learning (4). Due to the repetition of the intervention procedure, students are more likely to

imbed the method into their learning. This helps students throughout their learning and gives them the opportunity to self-correct. Another important component of the CCC intervention is retention. Asking the students to write the word, math fact, or in this case, shape from memory, helps them retain the information they are learning. The more opportunities students have to practice with retention, the quicker a skill can become imbedded into their long-term memory.

CCC has been viewed by many school-based researchers as an evidence-based procedure to teach various discrete skills. These skills have included spelling (12, 18, 14) geography, (9) and math facts (5, 19), and current events (20). The goal of CCC is for the student to gain independence and take responsibility for their learning (1). CCC is a selfmanagement strategy that allows students to practice academic skills repeatedly and to self-correct and to correct when prompted (2, 4). This component allows the students to receive immediate feedback so that they do no repeatedly practice a skill incorrectly. The student copies the skill to be taught as prompted by having the student copy the example, the student covers the example, and has to reproduce the problem and must reproduce the correct response. If the student makes an error, she or she are required to write or say the problem or word and provide the correct spelling, pronunciation, or solution (4). By reviewing their work after each trial, the student is ensured that they practice correctly the skill being reviewed or taught.

The purpose of this study was to determine the effectiveness of CCC procedure to teach the correct formation for circle, square, and triangle shapes to a three and a half year old male student with level 1 ASD. Learning these skills would be important for his future learning in school. Tracing and forming basic shapes is an entry-level skill that students must learn. This skill can help the students development other basic skills needed to future their growth and education, such as proper writing techniques. A final purpose was to implement and replicate (21, 22) the use of CCC with a very young preschooler. The use CCC with very young children has been rate (23). In that case report, the preschool child was typically developing and the research was carried out in the home by the grand parent.

Method

Participant and Setting

Our participant was a three and a half year old male at the beginning of the study and attended an early childhood center for preschool children with special needs. At birth, the participant was admitted into the neonatal intensive-care unit (NICU) for hypoglycemia. The participant was also diagnosed with level 1 autism spectrum disorder at the age of two and a half. In addition, the participant received occupational therapy and behavioral therapy outside of the early childhood center for preschool children with special needs. The participant lived with both parents and had a younger brother. His mother was very involved with his learning, looking for any way to improve his developmental levels both academically and socially. The participant's attitude varied depending on the day. Some days he would be cooperative and excited to participate and other days he would be distracted and emotional. When reminded of the prize he would earn at the end of the day if he completed all his work, he was often more willing to participate and complete each task.

The study took place in an early childhood center for preschool children with special needs. The participant was in the classroom every Monday and Tuesday evening during the semester from 4:00pm to 5:50pm. The number of students in the classroom with him varied depending on the day. Some days there would only be three other students in the classroom with him and other days there would be up to either other students in the classroom with him. The schedule of the preschool classroom remained the same throughout the entire study, which was: free play, opening circle, rotating table centers, bathroom, snack, gross motor, and closing circle. During the study, there were typically about ten teacher candidates in the classroom along with a master teacher. The first author would take the participant to a separate table in the classroom to conduct the research in order to minimize distractions and disruptions. When the first author and the participant were practicing the formation of basic shapes, the other students in the classroom would be participating in free play. Each session lasted anywhere from five to ten minutes, depending on the day and the willingness of the participant to participate. The first author conducted the study in order to complete the requirements for a Precision Teaching class taught at a local private university.

Materials

Throughout the study, a variety of different materials were used. During baseline, the first author used small square sheets of paper to collect data from the participant. For intervention, the first author created a modified CCC worksheet for each shape. Samples of these materials can be seen in Appendices B through E. In addition, the participant used the same marker during each session to control the consistency of the lines he drew. The first author also created data sheets to record the accuracy of each shape during baseline and intervention. Both the first author and the reliability person used these data sheets to record their data.

Dependent Variable and Measurement

The target behavior is this study was for the participant to be able to correctly form three different shapes without handover-hand guidance from the first author. The participant's shapes were graded on a four-point scale based on straightness of lines, shape size, correct number of edges, and consistency of lines. One point was awarded for the straightness of the line, if the line extended from one side of the shape to the other. In addition, the line needed to be formed with at least 90% straightness; no curves were counted as correct unless a circle was being graded. Another point was awarded for the size of the shape. The size of the shape drawn by the participant needed to be similar in size to the given shape on the CCC worksheet. A third point was awarded for the correct number of corners clearly drawn for each shape. Four corners must be drawn for square, three corners but be drawn for triangle, and rounded edges must be drawn for circle. The last point was awarded for the consistency and hardness of each line drawn. In other words, the participant's marker needed to stay on the paper and could not be lifted until the line was completed. The skill of accurately drawing each shape could be considered mastered if the participant scored at least a three or a four on each shape, three sessions in a row.

For each session, only the first author was involved in asking the participant to draw shapes. At the beginning of each session, the participant was handed a marker and the sheets he would be drawing with for that session. When the participant had completed the task of drawing all three shapes, he was

rewarded with verbal praise. The shapes were then taken from the participant and graded based on the guidelines previously discussed.

Data Collection and Inter-observer Agreement

Inter-observer reliability was conducted during every baseline session, as well as during every intervention session. In total, reliability was taken during twenty-four sessions. During each session, the participant produced a permanent product for all three shapes. The second observer could later look through each session and record the accuracy of the child's responses. The first author's family member was the second observer throughout the entire study. Scoring for the participant's responses remained the same for both the first author and the second observer. Dividing the number of total agreements from the two observers by the number of agreements plus the number of disagreements, and then multiplying by one hundred calculated the percent of inter-observer agreement. The average inter-observer agreement for all twenty-four sessions was 94.44%, with the range being 66%-100%. The percentage of sessions that had inter-observer agreement was 100%, meaning all twenty-four sessions had reliability data taken.

Experimental Design and Conditions

A multiple baseline and ABA single case design (21, 24) was used to evaluate the effectiveness of using a CCC procedure for shape formation in a three and a half year old boy. Three sessions of baseline were taken before entering intervention of CCC for circle. However, due to lack of results from intervention on circle, the first author chose to reverse circle and place it back in baseline. Circle remained in baseline for sessions ten through twenty-four. Nine sessions of baseline were taken for square and eighteen days of baseline were taken for triangle. Square was in intervention for nine sessions before intervention of CCC was implemented for triangle.

Baseline. During baseline, the participant was handed three small square sheets of paper and a marker. He was asked by the first author to draw a circle on the first sheet of paper, a square on the second sheet of paper, and a triangle on the third sheet of paper. Once the participant completed the task, the first author rewarded him with verbal praise. Baseline was in effect three sessions and fifteen sessions for circle, nine sessions for square, and eighteen session fourteen due to lack of results from intervention of CCC. The number of sessions in baseline ranged from three to eighteen depending on the shape.

CCC + hand over hand prompting + dot to dot tracing. A modified CCC procedure was used to help the participant master formation of basic shapes. The sheet for each shape included a picture of the shape with solid lines, a picture of the shape with dotted lines, and two blank spaces for the student to draw the shape (see appendices 5, 6 or 7). The first author began intervention of CCC on circle during session four. The first author would have the participant complete the baseline shapes first, and then have the participant complete the intervention worksheet for circle. The participant would trace the picture of the circle with solid lines and then trace the picture of the circle with dotted lines. Afterwards, the participant would use the circles he had just traced to draw his own circle in the space next to them (the third portion on the CCC worksheet). Lastly, the three previously traced/drawn circles were covered and the participant was asked to draw a

circle from memory. When the participant had completed this task, the worksheet was completely unfolded and the circles were compared. Unfortunately, intervention on circle did not yield the results necessary and the first author chose to reverse circle formation back into baseline at session nine. During session ten, square was placed in intervention. Once the participant showed 75-100% accuracy of square formation during three sessions in a row, the next shape was placed in intervention. Triangle was placed in intervention during session nineteen.

Results

The number of correctly formed shapes by the participant during baseline and intervention using the CCC procedure are shown in Figure 1. An analysis of baseline for circle, square, and triangle shows that the participant stayed at or below 50% accuracy for formation. During baseline for all three shapes, the participant had difficulty focusing and completing the task without being redirected. This could be the cause of accuracy being low, as well as the lack of skills required to complete the task. From the baseline results, it was clear that the participant struggled with drawing shapes according to the four-point scale created by the first author.

The mean score during baseline for square was 0.88 points out of 4 points (range: 0-2). This improved to an average of 2.13 points out of 4 points during intervention using the CCC procedure (range: 0-4). For triangle, the mean score during baseline was 0.78 points out of 4 points (range: 0-2). This increased to a mean of 2.33 points out of 4 points (range: 0-4). Lastly, the mean score during baseline for circle was 0.61 points out of 4 points (range: 0-2). When placed in intervention the first time, the average score for circle was 0.83 (range: 0-2). However, the participant showed lack of consistency with this shape and it was reversed back into baseline. Further research would need to be performed to show the improvements a CCC procedure could make for circle.





Appendix A. Blank data recording sheet used during each session to record shape accuracy for circle, square, and triangle. Each shape was graded on a four-point scale based on straightness of lines, shape size, correct number of edges, and consistency of lines. The first author would write "B" under the phase line section on the data table if the sessions were in baseline and "CCC" if the sessions were in intervention.

	S.1	10/28	8.2	10/28	8.3	10/29	8.4	11/3
	Phase	Score	Phase	Score	Phase	Score	Phase	Score
Circle								
Square								
Triangle								
	8.5	11/4	8.6	11/10	S.7	11/10	S.8	11/11
	Phase	Score	Phase	Score	Phase	Score	Phase	Score
Circle								
Square								
Triangle								
	S.9	11/11	S.10	11/17	S.11	11/17	S.12	11/17
	Phase	Score	Phase	Score	Phase	Score	Phase	Score
Circle								
Square								
Triangle								
	8.13	11/18	S.14	11/18	8.15	11/18	S.16	12/1
	Phase	Score	Phase	Score	Phase	Score	Phase	Score
Circle								
Square								
Triangle								
	S.17	12/1	S.18	12/1	S.19	12/2	S.20	12/2
	Phase	Score	Phase	Score	Phase	Score	Phase	Score
Circle								
Square								
Triangle								
	S.21	12/8	S.22	12/8	S.23	12/9	S.24	12/9
	Phase	Score	Phase	Score	Phase	Score	Phase	Score
Circle								

Appendix A.1. Data recording sheet the first author used during each session to record shape accuracy for circle, square, and triangle. Each shape was graded on a four-point scale based on straightness of lines, shape size, correct number of edges, and consistency of lines. "B" stands for baseline and "CCC" stands for copy, cover, compare. Data taken by the first author has been added to the table.

Square Triangle

	S.1	10/28	S.2	10/28	S.3	10/29	S.4	11/3
	Phase	Score	Phase	Score	Phase	Score	Phase	Score
Circle	В	1	В	1	В	0	CCC	1
Square	В	1	В	0	В	1	В	1
Triangle	В	0	В	0	В	1	В	1
					~ -			
	S.5	11/4	S.6	11/10	S.7	11/10	S.8	11/11
<i>a</i>	riase	Score	rnase	Score	Flase	Score	Fliase	Score
Circle	CCC	1	CCC	0	000	0	CCC	1
Square	В	0	В	1	В	2	В	0
Triangle	В	0	В	1	В	2	В	1
	S.9	11/11	S.10	11/17	S.11	11/17	S.12	11/17
	rnase	Score	Fnase	Score	Fnase	Score	rnase	Score
Circle	CCC	2	В	0	В	0	В	1
Square	В	2	CCC	0	CCC	0	CCC	0
Triangle	В	0	В	1	В	0	В	1
					1			
	S.13	11/18	S.14	11/18	S.15	11/18	S.16	12/1
	Phase	Score	Phase	Score	Phase	Score	Phase	Score
Circle	В	0	В	0	В	1	В	1
Square	CCC	1	CCC	0	CCC	1	CCC	2
Triangle	В	0	В	3	В	3	В	1
	-							
							0.00	
	S.17	12/1	S.18	12/1	S.19	12/2	5.20	12/2
	S.17 Phase	12/1 Score	S.18 Phase	12/1 Score	S.19 Phase	12/2 Score	Phase	12/2 Score
Circle	S.17 Phase B	12/1 Score 2	S.18 Phase B	12/1 Score 1	S.19 Phase B	12/2 Score 0	Phase B	12/2 Score 0
Circle Square	S.17 Phase B CCC	12/1 Score 2 3	S.18 Phase B CCC	12/1 Score 1 4	S.19 Phase B CCC	12/2 Score 0 3	B CCC	12/2 Score 0 3
Circle Square Triangle	B B CCC B	12/1 Score 2 3 1	S.18 Phase B CCC B	12/1 Score 1 4 0	S.19 Phase B CCC CCC	12/2 Score 0 3 0	B CCC CCC	12/2 Score 0 3 1
Circle Square Triangle	S.17 Phase B CCC B	12/1 Score 2 3 1	S.18 Phase B CCC B	12/1 Score 1 4 0	S.19 Phase B CCC CCC	12/2 Score 0 3 0	B CCC CCC	12/2 Score 0 3 1
Circle Square Triangle	S.17 Phase B CCC B	12/1 Score 2 3 1 12/8	S.18 Phase B CCC B	12/1 Score 1 4 0	S.19 Phase B CCC CCC S.23	12/2 Score 0 3 0	S.20 Phase B CCC CCC S.24	12/2 Score 0 3 1 12/9
Circle Square Triangle	S.17 Phase B CCC B S.21 Phase	12/1 Score 2 3 1 12/8 Score	S.18 Phase B CCC B S.22 Phase	12/1 Score 1 4 0 12/8 Score	S.19 Phase B CCC CCC S.23 Phase	12/2 Score 0 3 0 12/9 Score	S.20 Phase B CCC CCC S.24 Phase	12/2 Score 0 3 1 12/9 Score
Circle Square Triangle Circle	S.17 Phase B CCC B S.21 Phase B	12/1 Score 2 3 1 12/8 Score 0	S.18 Phase B CCC B S.22 Phase B	12/1 Score 1 4 0 12/8 Score 0	S.19 Phase B CCC CCC S.23 Phase B	12/2 Score 0 3 0 12/9 Score 1	S.20 Phase B CCC CCC S.24 Phase B	12/2 Score 0 3 1 12/9 Score 2
Circle Square Triangle Circle Square	S.17 Phase B CCC B S.21 Phase B CCC	12/1 Score 2 3 1 12/8 Score 0 4	S.18 Phase B CCC B S.22 Phase B CCC	12/1 Score 1 4 0 12/8 Score 0 3	S.19 Phase B CCC CCC S.23 Phase B CCC	12/2 Score 0 3 0 12/9 Score 1 4	S.20 Phase B CCC CCC S.24 Phase B CCC	12/2 Score 0 3 1 12/9 Score 2 4

Appendix B. Data recording sheet the second observer used during each session to record shape accuracy for circle, square, and triangle. Each shape was graded on a four-point scale based on straightness of lines, shape size, correct number of edges, and consistency of lines. "B" stands for baseline and "CCC" stands for copy, cover, compare. Data taken by the second observer has been added to the table.

		10/20	5.4	10/28	5.3	10/29	5.4	11/3
	Phase	Score	Phase	Score	Phase	Score	Phase	Score
Circle	В	1	В	1	В	0	CCC	1
Square	В	1	В	0	В	1	В	1
Triangle	В	0	В	0	В	1	В	1
	S.5	11/4	S.6	11/10	S.7	11/10	S.8	11/11
	Phase	Score	Phase	Score	Phase	Score	Phase	Score
Circle	CCC	1	CCC	0	CCC	0	CCC	1
Square	В	0	В	1	В	2	В	0
Triangle	В	0	В	1	В	2	В	1
	S.9	11/11	S.10	11/17	S.11	11/17	S.12	11/17
	Phase	Score	Phase	Score	Phase	Score	Phase	Score
Circle	CCC	2	В	0	В	0	В	1
Square	В	2	CCC	0	CCC	0	CCC	0
Triangle	В	0	В	1	В	0	В	1
	S.13	11/18	S.14	11/18	S.15	11/18	S.16	12/1
	S.13 Phase	11/18 Score	S.14 Phase	11/18 Score	S.15 Phase	11/18 Score	S.16 Phase	12/1 Score
Circle	S.13 Phase B	11/18 Score 0	S.14 Phase B	11/18 Score 0	S.15 Phase B	11/18 Score	S.16 Phase B	12/1 Score
Circle Square	S.13 Phase B CCC	11/18 Score 0 1	S.14 Phase B CCC	11/18 Score 0 0	S.15 Phase B CCC	11/18 Score 1 1	S.16 Phase B CCC	12/1 Score 1
Circle Square Triangle	S.13 Phase B CCC B	11/18 Score 0 1 0	S.14 Phase B CCC B	11/18 Score 0 0 2	S.15 Phase B CCC B	11/18 Score 1 1 2	S.16 Phase B CCC B	12/1 Score 1 1
Circle Square Triangle	S.13 Phase B CCC B	11/18 Score 0 1 0	S.14 Phase B CCC B	11/18 Score 0 2	S.15 Phase B CCC B	11/18 Score 1 2	S.16 Phase B CCC B	12/1 Score 1 1 1
Circle Square Triangle	S.13 Phase B CCC B S.17	11/18 Score 0 1 0 12/1	S.14 Phase B CCC B	11/18 Score 0 0 2 12/1	S.15 Phase B CCC B	11/18 Score 1 2 12/2	S.16 Phase B CCC B	12/1 Score 1 1 1 1 12/2
Circle Square Triangle	S.13 Phase B CCC B S.17 Phase	11/18 Score 0 1 0 12/1 Score	S.14 Phase B CCC B S.18 Phase	11/18 Score 0 2 12/1 Score	S.15 Phase B CCC B S.19 Phase	11/18 Score 1 1 2 12/2 Score	S.16 Phase B CCC B S.20 Phase	12/1 Score 1 1 1 1 12/2 Score
Circle Square Triangle Circle	S.13 Phase B CCC B S.17 Phase B	11/18 Score 0 1 0 12/1 Score 2	S.14 Phase B CCC B S.18 Phase B	11/18 Score 0 2 12/1 Score 1	S.15 Phase B CCC B S.19 Phase B	11/18 Score 1 2 12/2 Score 0	S.16 Phase B CCC B S.20 Phase B	12/1 Score 1 1 1 1 1 2/2 Score 0
Circle Square Triangle Circle Square	S.13 Phase B CCC B S.17 Phase B CCC	11/18 Score 0 1 0 12/1 Score 2 4	S.14 Phase B CCC B S.18 Phase B CCC	11/18 Score 0 2 12/1 Score 1 4	S.15 Phase B CCC B S.19 Phase B CCC	11/18 Score 1 1 2 12/2 Score 0 3	S.16 Phase B CCC B S.20 Phase B CCC	12/1 Score 1 1 1 1 12/2 Score 0 3
Circle Square Triangle Circle Square Triangle	S.13 Phase B CCC B S.17 Phase B CCC B	11/18 Score 0 1 0 12/1 Score 2 4 1	S.14 Phase B CCC B S.18 Phase B CCC B	11/18 Score 0 2 12/1 Score 1 4 0	S.15 Phase B CCC B S.19 Phase B CCC CCC	11/18 Score 1 2 12/2 Score 0 3 0	S.16 Phase B CCC B S.20 Phase B CCC CCC	12/1 Score 1 1 1 1 2/2 Score 0 3 1
Circle Square Triangle Circle Square Triangle	S.13 Phase B CCC B S.17 Phase B CCC B	11/18 Score 0 1 0 12/1 Score 2 4 1	S.14 Phase B CCC B S.18 Phase B CCC B	11/18 Score 0 2 12/1 Score 1 4 0	S.15 Phase B CCC B S.19 Phase B CCC CCC	11/18 Score 1 2 12/2 Score 0 3 0	S.16 Phase B CCC B S.20 Phase B CCC CCC	12/1 Score 1 1 1 1 12/2 Score 0 3 1
Circle Square Triangle Circle Square Triangle	S.13 Phase B CCC B S.17 Phase B CCC B	11/18 Score 0 1 0 12/1 Score 2 4 1 12/8	S.14 Phase B CCC B S.18 Phase B CCC B	11/18 Score 0 2 12/1 Score 1 4 0	S.15 Phase B CCC B S.19 Phase B CCC CCC CCC	11/18 Score 1 1 2 12/2 Score 0 3 0	S.16 Phase B CCC B S.20 Phase B CCC CCC S.24	12/1 Score 1 1 1 1 2/2 Score 0 3 1 1 2/9
Circle Square Triangle Circle Square Triangle	S.13 Phase B CCC B S.17 Phase B CCC B S.21 Phase	11/18 Score 0 1 0 12/1 Score 2 4 1 1 12/8 Score	S.14 Phase B CCC B S.18 Phase B CCC B S.22 Phase	11/18 Score 0 2 12/1 Score 1 4 0 0 12/8 Score	S.15 Phase B CCC B S.19 Phase B CCC CCC S.23 Phase	11/18 Score 1 1 2 12/2 Score 0 3 0 0 12/9 Score	S.16 Phase B CCC B S.20 Phase B CCC CCC S.24 Phase	12/1 Score 1 1 1 1 2/2 Score 0 3 1 1 12/9 Score
Circle Square Triangle Circle Square Triangle Circle	S.13 Phase B CCC B S.17 Phase B CCC B S.21 Phase B S.21 Phase B	11/18 Score 0 1 0 12/1 Score 2 4 1 1 12/8 Score 0	S.14 Phase B CCC B S.18 Phase B CCC B S.22 Phase B	11/18 Score 0 2 12/1 Score 1 4 0 0 12/8 Score 0	S.15 Phase B CCC B Phase B CCC CCC CCC S.23 Phase B	11/18 Score 1 1 2 12/2 Score 0 3 0 0 12/9 Score 1	S.16 Phase B CCC B S.20 Phase B CCC CCC CCC S.24 Phase B	12/1 Score 1 1 1 12/2 Score 0 3 1 1 12/9 Score 2
Circle Square Triangle Circle Square Triangle Circle Square	S.13 Phase B CCC B S.17 Phase B CCC B S.21 Phase B CCC B	11/18 Score 0 1 0 12/1 Score 2 4 1 1 2/8 Score 0 4	S.14 Phase B CCC B S.18 Phase B CCC B S.22 Phase B CCC	11/18 Score 0 2 12/1 Score 1 4 0 12/8 Score 0 3	S.15 Phase B CCC B S.19 Phase B CCC CCC S.23 Phase B CCC	11/18 Score 1 1 2 Score 0 3 0 0 12/9 Score 1 2/9 Score	S.16 Phase B CCC B S.20 Phase B CCC CCC S.24 Phase B CCC	12/1 Score 1 1 1 1 2/2 Score 0 3 1 1 2/9 Score 2 4

Appendix C. The small square sheets of paper used by the participant during baseline. These squares were the same size as the boxes on the CCC worksheet.



Appendix D. The modified Copy, Cover, Compare worksheet for square:

The portion of the worksheet that the participant could see when tracing the square ("Copy" part of CCC):



The portion of the worksheet that the participant could see when forming the square on his own ("Cover" part of CCC):



The portion of the worksheet that the participant could see when he was finished with drawing square ("Compare" part of CCC):



Appendix E. The modified CCC worksheet for triangle: The portion of the worksheet that the participant could see when tracing the triangle ("Copy" part of CCC):



The portion of the worksheet that the participant could see when ______forming the triangle on his own ("Cover" part of CCC):______



The portion of the worksheet that the participant could see when he was finished with drawing triangle ("Compare" part of CCC):



Appendix F. The modified CCC worksheet for circle: The portion of the worksheet that the participant could see when tracing the circle ("Copy" part of CCC):



The portion of the worksheet that the participant could see when forming the circle on his own ("Cover" part of CCC):



The portion of the worksheet that the participant could see when he was finished with drawing circle ("Compare" part of CCC):



Discussion

The use of a modified CCC procedure for circle, triangle, and square proved to be successful overtime. The longer the program was implemented with each shape, the more improvements our participant made. Our data also shows that the participant made dramatic improvements, specifically during sessions 17 through 24 for both square and triangle. Implementation of the modified CCC procedure for square took more sessions to reach mastery than the implementation for triangle. This may indicate that our participant gained proficiency in using the procedure to correctly form his shapes.

When the first author first began working with the participant, he was easily distracted and unwilling to participate. He also struggled with holding his marker with the correct grip; instead of resting the marker on his middle finger or ring finger while writing, the participant gripped the marker with all of his fingers. Once the participant was shown how to appropriately hold his marker, he had no difficulty repeating each step. In additon, foam stickers were used as reward for the participant when he completed the worksheets emitting appropriate behaviors. Praise from the first author to particiapnt when he was was exhibiting positive behaviors was also very important throughout this study. If the participant was focused on the task, he received praise. If the participant was drawing his lines neatly and consistently, he received praise. This may help our participant to respond to teacher attention and praise. This should assist him in learning a wide range of skills.

There were several strengths in this study. First, the materials needed for the participant during this study were easily created and modified by the first author. Before the study began, the first author created each CCC shape worksheet using a word document. In addition, the first author found that very little time was needed to complete each session using this procedure. The participant never exceeded beyond ten minutes for any given session. This saved the first author valuable time while working with the student and allowed for more sessions to occur within a given day. In fact, research on CCC has shown that students are able to complete more learning trials in a brief period of time since the learning trials take up very little time (1, 2). Finally, the conclusions drawn from this study support the use of the CCC procedure for shapes with our participant.

There were limitations that occurred during the study, but these limitations never caused the first author to experience any major setbacks. First, implementation using the modified CCC procedure was originally planned for circle, not square. Due to lack of improvements made by the participanton circle, the first author chose to reverse intervention for circle and begin intervention on square. This lost the first author four days of worth valuable work time with our participant. Second, the availability of the participant did not allow for consistent data. Since the early childhood center for preschool children with special needs has only in session on Mondays and Tuesdays from 4:00 p.m. to 5:50 p.m, the first author was unable to track progress for a typical schoolweek (Monday through Friday). This also forced the first author to run multiple sessions within a given school day, which overwhelmed the participant at times.

The delayed improvements in our participant's performance warrants further analysis. We have employed such procedures as DI flashcards (16) with young preschool students and have reported delayed effects (25). We have also found delayed effects with DI flashcards and CCC for students with learning disabilities or behavior disorders (26, 27, 28). This issue needs further analysis and clarification. One of the important aspects of evaluating outcomes with single case designs revolves around the immediacy of the change in performance (29, 21, 24). This differential outcomes may well indicate that other variables are at work. These could include the ability of the teacher or student to implement the procedure correctly, the level of cognitive functioning or age of the participant. This appears to be an interesting area for future research.

The first author would suggest conducting further studies on the impact of the CCC procedure on square, triangle, and circle formation. While the procedure did result in positive outcomes for square and triangle formation, more sessions would be needed to show the effects it would have on circle formation. To continue this study, the first author would recommend using the same CCC worksheet used in this study. However, she suggests working with the participant in a separate room outside of the preschool to limit the number of distractions. If possible, the first author also suggests conducting sessions Monday through Friday, instead of only on Mondays and Tuesdays. This change would help the first author gather more consistent data throughout the week and spread the sessions out across multiple days. This would be an option to discuss with the participant's parents.

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