El cole de Celia y Pepe and Arrowsmith Program Pilot Project

November 2024

ARROWSMITH

Pilot Project: Motor Symbol Sequencing Cognitive Function Enhancement Outcomes

In November 2023, staff from Arrowsmith Program and El cole de Celia y Pepe (https://coledeceliaypepe.org/) agreed to implement one of the Arrowsmith cognitive exercises with two students at the school. Staff at El cole de Celia y Pepe selected the two students. The two students had severe language and communication disorders impacting reading and writing competencies. The pilot program ran from February to May 2024.

Motor Symbol Sequencing Program Description

Tracing, one of the two exercises designed to strengthen the Motor Symbol Sequencing (MSS) cognitive function, was selected for this study. This function is responsible for motor planning involved in eye-tracking required for reading and in developing the automatic motor plans required for writing. To learn more, please read Motor Symbol Sequencing.

Tracing is a pen and paper exercise that requires students to follow a prescribed motor pattern requiring eye-hand coordination. Time on task and accuracy of performance are tracked by a trained teacher. The students were scheduled to work on the exercise for a 30-minute period each day. The goal of the pilot was to increase the students' engagement in the exercise over time, leading to improved motor planning required for writing and for eye-tracking in reading along with improvement in their attention span.

The Tracing exercise has several levels of increasing complexity. The students began at the preliminary level of the exercise. The teacher monitored the quality of the work each day and recorded the number of units completed per day. When a student reaches the required accuracy for mastery, they are moved to the next level of challenge in the exercise.

Student Outcomes

Student 1 Male, Age 12

Time Engaged in the MSS Cognitive Program: 17 Weeks

Data collected shows the following changes.

Average Time on Task

Initial time on task	7 minutes per day
End time on task	15 minutes per day
Change	Time on task improved by 47%

Average Accuracy of Performance

Initial	60% accuracy
End	80% accuracy
Change	Accuracy of performance improved by 25%

The student worked on three levels of the exercise.

Motor Symbol Sequencing Survey Observations

Parent observations on the Motor Symbol Sequencing survey at the end of the program identified the following improvements:

- Writes more quickly and accurately
- Writes more legibly
- Better able to express self in writing
- Now more able to complete written tasks within a time limit
- Reads more quickly and accurately
- Shows more uniformity in the size and spacing of letter/number formation
- More able to write words correctly in everyday writing
- Communicates verbally with less hesitation in speech
- Better able to complete tests, assignments, and homework on time
- More able to complete written mathematics work accurately

"He has definitely improved a lot! We are delighted!"

Teacher observations on the Motor Symbol Sequencing survey at the end of the program identified the following improvements:

- Writes words more correctly in everyday writing
- Shows more uniformity in the size and spacing of letter/number formation
- Greater ability to complete written tasks within a time limit

"From the beginning, he maintained great interest in completing the program. There was significant improvement during the course in terms of writing and reading."

Conclusion

This student's performance in the Tracing exercise showed improvements in both accuracy and time on task.

Parent observations show improvements in his writing with respect to accuracy, speed, legibility, uniformity in symbol formation, and written expression. He also made improvements in homework completion, ability to complete written tasks within time limits, accuracy in written math work, reading speed, and verbal communication.

Teacher observations show that he has more uniformity in the size and spacing of letter/number formation; he is completing tasks within a time limit, and he is writing words correctly in everyday writing.

The improvements on the exercise in conjunction with the observed outcome improvements reported by his teacher and parents indicate improvement in the Motor Symbol Sequencing cognitive function.

Engaging in the Motor Symbol Sequencing cognitive exercise yielded positive benefits for a student with severe language and communication disorders by improving his attention span and motor planning for writing and for eye-tracking in reading.

Student 2 Female, Age 9

Time Engaged in the MSS Cognitive Program: 17 Weeks

Data collected shows the following changes.

Average Time on Task

Initial time on task	3 minutes per day
End time on task	12 minutes per day
Change	Time on task improved by 75%

Average Accuracy of Performance

Initial	50% accuracy
End	80% accuracy
Change	Accuracy of performance improved by 38%

The student worked on three levels of the exercise.

Motor Symbol Sequencing Survey Observations

Parent observations on the Motor Symbol Sequencing survey at the end of the program identified the following improvements:

- Shows more uniformity in the size and spacing of letter/number formation
- Reads more quickly and accurately

"She is reading better and writing smaller. She has participated with joy."

Teacher observations on the Motor Symbol Sequencing survey at the end of the program identified the following improvements:

- Better able to complete tests, assignments, and homework on time.

"Her performance has been variable; however, I can confirm that she has met the objectives set for each session."

Conclusion

This student's performance in the Tracing exercise showed improvements in both accuracy and time on task.

Parent observations show that she has more uniformity in the size and spacing of letter/number formation and she is reading more quickly and accurately.

Her teacher observes improvements in completing tests, assignments or homework on time.

The improvements on the exercise in conjunction with the observed outcome improvements reported by both her parents and teacher are indicators of improvement in the Motor Symbol Sequencing cognitive function.

Engaging in the Motor Symbol Sequencing cognitive exercise yielded positive benefits for a student with severe language and communication disorders by improving her attention span and motor planning for writing and for eye-tracking in reading.

Summary

Engaging in the Motor Symbol Sequencing cognitive program for two students with severe language and communication disorders impacting their reading and writing skills led to significant improvements in the Motor Symbol Sequencing cognitive function as evidenced by their improvements in time on task, accuracy of performance and parent and teacher observations. Gains were reported in writing and reading related to this cognitive function which were in line with their improvements on the cognitive exercise. Engaging in the Motor Symbol Sequencing cognitive program showed positive benefit for both students.