

Impact of Cognitive Skill Development in Grade 3 on Cognitive and Academic Measures – Study Highlights Huron Superior Catholic District School Board



Study Abstract

In the 2013-2014 school year, the Huron Superior Catholic District School Board in Ontario, Canada undertook a multi-school Grade 3 pilot study of BrainWare SAFARI. The study was implemented under the direction of William Mansfield, SLP. Selected Grade 3 classes used BrainWare SAFARI cognitive skills development software in the fall (treatment group). Each treatment group class was paired with a comparison class (in one case, within the same school and otherwise at another school) which served as the no-treatment group. Students in the no-treatment group then used BrainWare SAFARI in the spring.

The study examines improvements on cognitive measures for all students who used BrainWare SAFARI, compares improvements on cognitive measures of the treatment and no-treatment groups between the beginning of the year and the middle of the year following the treatment group's use of BrainWare SAFARI. The analysis also looks at end-of-year results on cognitive and academic measures for the treatment group.

Sample and Treatment: In the fall, the classrooms assigned to the treatment condition used BrainWare SAFARI, while the classrooms assigned to the no-treatment condition did their regular classwork without adding anything to the schedule. In the spring, the comparison classes used BrainWare SAFARI while the original treatment group classes went back to their normal routine. All eight classrooms were tested in September, January and June, using both cognitive and academic assessments as described below. To be included in the analysis, students had to have completed at least 25 sessions of BrainWare SAFARI and/or at least 9 weeks of use, as well as having scores on all three administrations of the cognitive and/or academic assessments.

Assessments. The Canadian Cognitive Abilities Test (CCAT) by Nelson Education was used as the cognitive measure. The CCAT is a group-administered cognitive abilities test comprised of three subtests: Verbal (V), Quantitative (Q), and Nonverbal (NV), with scores on each subtest and a calculated Composite (C) score. The scores are expressed as an Age Percentile Rank (APR, percentile for the student's age). The CCAT measures learning ability and is predictive of future academic performance. The Canadian Tests of Basic Skills (CTBS), also a group-administered test by Nelson Education, was used as the academic measure. The CTBS is divided into three areas – Reading (R), Language (L) and Math (M) – with scores in each area and a calculated overall Composite (C) score. The scores are expressed as Grade Equivalent (GE).

BrainWare SAFARI (BWS) Use. All of the individual classes used BWS according to the recommended protocol of 30-minute sessions, 3 to 5 times a week, for 10-14 weeks (a target of 30 sessions in 10 weeks at a minimum). The fall treatment classes had a median of 46 sessions in 13 weeks, and completed 114 of the 168 levels in BWS on average. The average number of levels completed is an indicator of good engagement by the students, since the median number of levels completed at 3rd grade from multiple previous studies is 104 levels. The students who used BWS in the spring also got good frequency and intensity consistent with the recommended protocol. When students get good frequency (number of sessions over the target number of weeks) and good intensity (number of levels completed) in using BWS, significant improvement has been shown previously on both cognitive and academic measures.

Summary of Findings. The Grade 3 students who used BrainWare SAFARI experienced significant cognitive growth compared to those who did not. After using BWS, 50% of the students scored at the 70th percentile or above on the CCAT. For those students who used BWS in the fall, improvements were evident immediately following use and also at the end of the school year with stronger cognitive skills providing better-than-expected academic gains. Reading and Math scores increased 1.4 and 1.6 GE, respectively, when students used BWS in the fall. Students with accommodations experienced significant increases in cognitive skills and also performed at Grade Level on academic tests in June despite starting the year below expectations.

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Cognitive Impact for All Grade 3 Students

Figure 1 shows the pre and post median APR for all 169 3rd graders combined, regardless of whether they used BWS in the fall or the spring. The pre score is the APR on the test that was taken just prior to using BWS and the post score is the one just after using BWS.¹

Figure 1 shows the change (Δ – Delta) in APR between the pre- and post-test on each of the CCAT subtests. These are significant increases in a 4-month period and correspond with previous BWS studies that used the Cognitive Abilities Tests (CogAT), a cognitive test administered in the U.S. after which the CCAT was modeled.²

Figure 1: CCAT Pre v Post All 3rd Graders

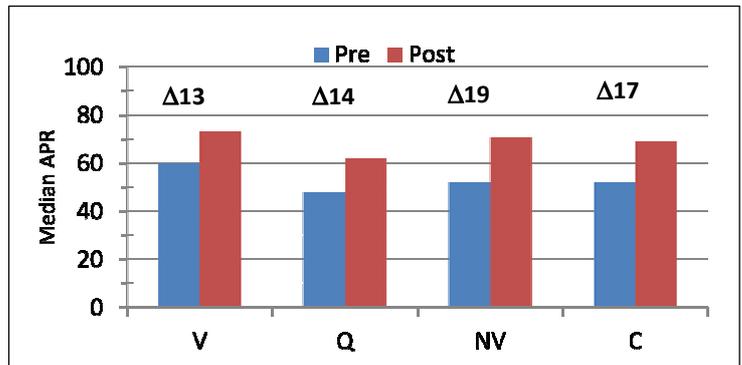
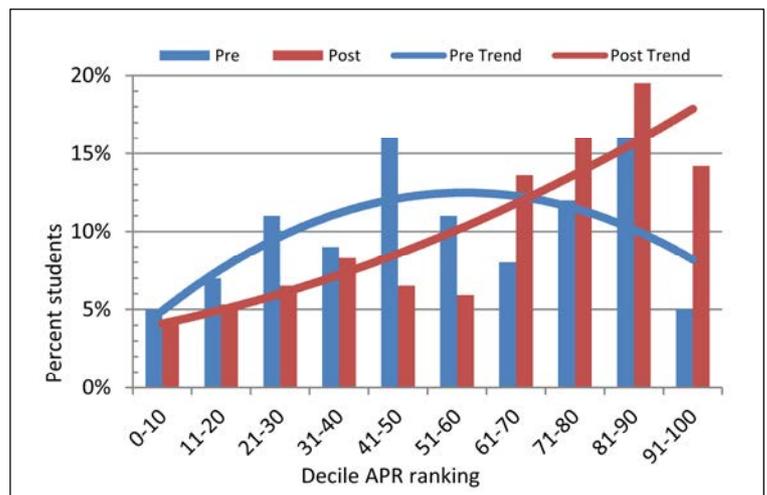


Figure 2 shows the percentage of students scoring in percentile ranges on the CCAT Composite score.³ The blue bars and trendline in figure 2 represent the students' cognitive ability before using BWS. Before BWS, 23% of the students scored below 30 APR, 44% scored in the 30-69 APR range and 33% scored at 70 APR or higher, with 5% scoring at the 90th percentile or above. The red bars and trendline represent the students' cognitive ability after using BWS. After BWS, the percentage below 30 APR dropped to 16%, 35% scored in the 30-69 APR range, and 50% of the students scored at 70 APR or higher, with 14% at the 90th percentile or above. Not only did students' scores increase significantly, the impact is apparent at all levels of ability. The percentage of students receiving low scores decreased and the percentage of students receiving high scores increased. The profile of the classes who used BWS shifted significantly following the use of BWS.

Figure 2: Composite APR Rankings – 3rd Grade



The results show a significant change in scores between pre and post across all CCAT subtests for students who used BrainWare SAFARI, and in the overall distribution of scores, with dramatically fewer students scoring in the lower percentile ranges and dramatically more students (50%) performing at the 70th percentile or above on the Post test.

1. This combination of the two cohorts can be done with the CCAT using the APR score. It cannot be done for CTBS with Grade Equivalents.

2. For more information on previous studies with BWS, please see MyBrainWare.com/safari/research.

3. The Composite scores are considered to be a measure of the overall ability of the students.

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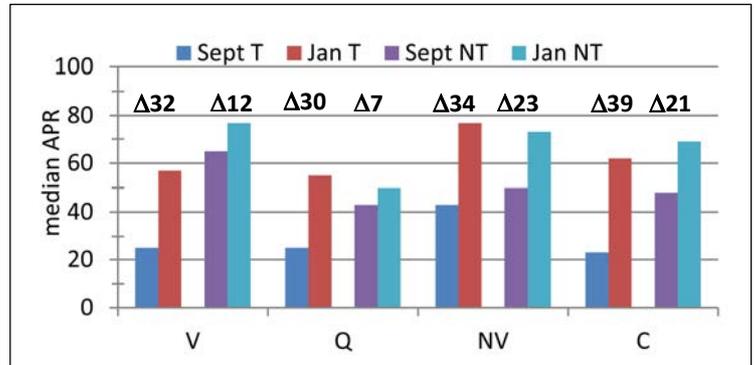


Treatment v. No-Treatment Comparison Classrooms

Treatment (T) and no-treatment (NT) classrooms were matched a priori by school characteristics and demographics. Of the four treatment-comparison classroom pairs, two resulted in comparable matches based on the test data.⁴

Figure 3 shows the CCAT scores for the first pair of treatment (T) and no-treatment (NT) classes (both at School 1)⁵ in September (pre-test) and January (post-test). On the pre-test, the scores in all areas except Nonverbal were significantly lower for the treatment class. The differences, especially the disparity on the composite indicates that, while the classrooms were matched on grade level and on other available demographic data, they were not cognitively matched.

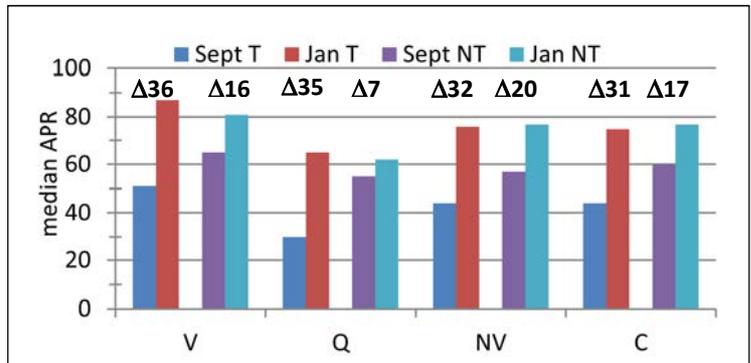
Figure 3: School 1 T vs NT- CCAT APR



Despite the disparity on pre-test, the increases for the treatment class are significantly different from the no-treatment class, as shown by the Δ (Delta) values in figure 3.⁶

Similarly significant results were seen for the second matched comparison classrooms (School 2, the treatment classroom, and School 3, the no-treatment classroom), as shown in figure 4. As in the case of the School 1 paired classrooms, the treatment classroom in School 2 performed lower on all CCAT subtests on the pre-test than the no-treatment classroom from School 3. Following their use of BWS, the treatment group's scores were comparable across the board to the scores of the no-treatment group.

Figure 4: School 2 T vs School 3 NT – CCAT APR



The results show a significant difference in cognitive growth between the treatment and no-treatment classrooms across all CCAT subtests for students who used BrainWare SAFARI, with the performance of the treatment group rising to be comparable to the no-treatment group despite being significantly behind at the time of the pre-test.

Maintenance of Cognitive Gains

A total of 74 students used BWS in the fall as part of the treatment classrooms. They were all tested on the CCAT in September (before using BWS), in January (after finishing BWS) and in June (5 months following the end

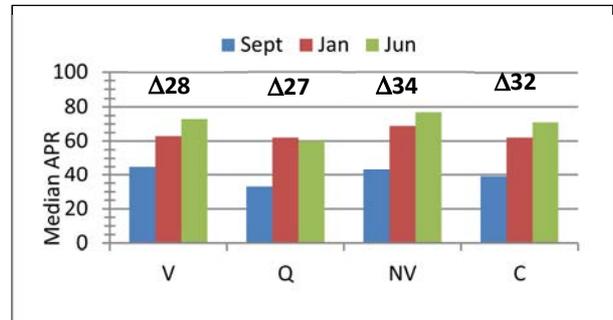
4. The third matched pair comprised a no-treatment group that performed much lower than the treatment group on pre-test. The comparison classroom in the fourth pair had some anomalous data in parts of the testing and could not be compared on all measures.
5. Schools are identified in the report provided to the district, but are excluded in this summary because of the small size of the schools and the sample.
6. The larger than expected increase on the Nonverbal scores for the No-Treatment class is likely due to practice effect on a test that was a novel experience for the students when they first took it. Even with that unexpected increase, the Treatment class's gain was significantly greater.

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of their BWS use). Figure 5 summarizes the CCAT results for the students in the treatment classes, with the Δ s (Deltas) denoting the overall change from September to June.⁷

The results show that the initial cognitive gains achieved by the students were maintained or continued to improve following the use of BWS. This finding is consistent with results seen in a previous study with BrainWare SAFARI in the U.S. using the Woodcock-Johnson III Cognitive Battery as the cognitive measure.⁸

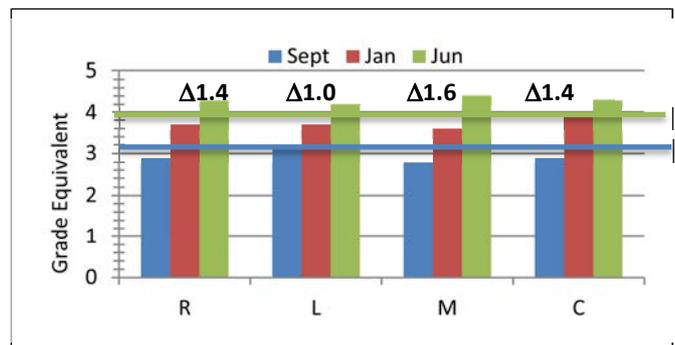
Figure 5: Fall BWS CCAT APR Scores



Impact of Cognitive Skills Improvement on Academic Performance

Figure 6 illustrates the academic changes exhibited on the CTBS by the 4 classes who used BWS in the fall from the September to the January. Figure 6 shows September, January and June GE scores. The benchmark GEs at the time of the September and June testing are indicated by the blue (September) and green (June) lines. Overall the students who used BWS in the fall started 3rd grade below grade level on Reading and Math. Their Language score was just at grade level.

Figure 6: BWS Fall CTBS Grade Equivalent



The Δ s in figure 6 show the changes that occurred from September to June. Over the course of the year, the students who used BWS increased significantly more than expected (the expectations would be for the students to increase 1.0 GE during a single school year). The gains were 1.4 GE and 1.6 GE in Reading and Math, respectively, and 1.4 GE on the overall Composite score.

The strong cognitive gains experienced by the students who used BrainWare SAFARI translated into better-than-expected academic performance improvements, enabling the students who started the year behind grade level to complete the year above grade level in all areas.

Conclusions

The Grade 3 students who used BrainWare SAFARI experienced significant cognitive growth compared to those who did not. After using BrainWare SAFARI, 50% of the students scored at the 70th percentile or above on the CCAT. For those students who used BWS in the fall, improvements were evident immediately following use and also at the end of the school year with stronger cognitive skills providing better-than-expected academic gains. Reading and Math scores increased 1.4 and 1.6 GE, respectively, when students used BWS in the fall. Students with accommodations experienced significant increases in cognitive skills and also performed at Grade Level on academic tests in June despite starting the year below expectations.⁹

7. It may be noted that the cognitive gains for the students using BWS in the fall were substantially higher than the gains for the total group of Grade 3 students. This reflects the lower measured gains for the cohort of students who used BWS in the spring, a phenomenon believed to be related to the confounding effect of provincial testing at the time of spring post-testing.

8. "Pilot of BrainWare SAFARI with Students in a Title I School," 2010. (<http://www.mybrainware.com/safari/research>)

9. Data not discussed in this summary.