Testing a New Kernel of Practice Focused on Children's Executive Function and Self-Regulation: Preliminary Findings from a 3-School Pilot Study

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Background Information

- A number of classroom-based interventions have been shown to improve EF and regulation-related skills as well as academic achievement and behavior (Bierman et al., 2008; Diamond et al, 2007; Raver et al., 2011).
- Comprehensive social-emotional learning (SEL) programming has been found to improve the culture and climate of schools and classrooms and children's social, emotional, behavioral, and academic outcomes (Durlak et al., 2011; Jones et al., 2011).
- Yet, a number of barriers undermine efforts to bring SEL programming to scale, including: implementation challenges; limited local buy-in; lack of financial, personnel, and structural resources; and poor integration into standard practices and therefore low sustainability.
- This study responds to a pressing need to develop, test, and scale less intensive strategies that are easy to implement outside the context of a comprehensive program while still achieving meaningful outcomes for children – referred to as **kernels of practice** (Jones & Bouffard, 2012).
- Developed by Dr. Stephanie Jones, **Brain Games** are fun, motivating, often physically engaging games that stand alone as a kernel of practice and are designed to build and practice children's executive function and self-regulation skills (e.g., working memory, inhibition, and attention control).

Research Questions

1. What is the nature of Brain Game implementation over the course of the school year?
2. What is the nature of change in student and classroom outcomes over the course of the school year?

Sample, Data Collection & Measures

Sample & Data Collection Procedure:

Brain Games were implemented in 3 low-income schools in a southern state over the course of the 2015-2016 school year.

- Total number of participating students = 1,248
- Total number of participating classrooms = 47
- Teachers and staff from Schools 1 and 2 were trained in Fall 2015 and participated in a booster training in Winter 2016
- School 3 teachers and staff were trained in January 2016
- All schools participated in three waves of data collection: Fall 2015, Winter 2016, and Spring 2016

Measures:

- *Weekly Implementation Logs*
- *Teacher Ratings of Child Regulation Skills*
- *Teacher-Reported Discipline Rates*
- *Observations*. Trained observers rated (a) Teaching Strategies and Classroom Practices and (b) The Proportion of Children Displaying Regulated Behavior

Results

Research Question 1: What is the nature of Brain Game implementation over the course of the school year?

What was the pattern of game play over the course of the year?

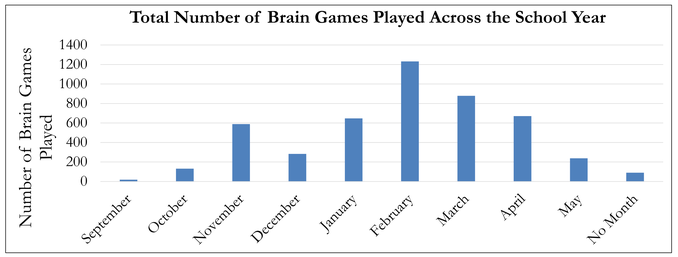
- Across the three schools, Brain Game play peaked after the initial trainings and mid-year booster sessions.
- For example, the peak in November followed the September and October trainings at Schools 1 and 2, and the peak in February followed the initial training in School 3 and the boosters at Schools 1 and 2.

Which games were played most often?

- Teachers most frequently played games from the Starter Deck: Simon Says (722 times), Head, Shoulders, Knees and Toes (619 times), Freeze (612 times), and I Spy (350 times).

How often did teachers engage in pre- and post-game talk?

- School 1 teachers engaged in the most pre-and post-game talk, roughly 56% and 68% of the time, respectively.
- Teachers in Schools 2 and 3 engaged in pre- and post game talk approximately half the time they played the games.



	Total Number of Games Played	Average number of Games per Week	Average Number of Games Per Week, Per Teacher
School 1	367	11	1.6
School 2	3130	125	5.0
School 3	1281	71	4.7

Research Question 2: What is the nature of change in student and classroom outcomes over the course of the school year?

Note: only data from Schools 2 and 3 were included in the analysis and results below.

Student Outcomes

- In each school, students showed increasing levels of Regulation Skills over the course of the school year. The mean difference between the Fall and Spring assessments is statistically significant at both schools.
- Between Fall and Winter, both schools showed statistically significant growth in student Regulation Skills. However, due to scheduling complications, School 3 did not receive training until January and did not implement Brain Games in the Fall. This allows us to compare the natural growth of Regulation Skills with the growth of Regulation Skills among children who played Brain Games. Importantly, students in School 2 showed substantially greater improvement in this time period (Fall to Winter) compared to students in School 3.
- Across the school year, as children's Regulation Skills increased, teacher-reported Discipline Rates tended to decrease. As shown in Table 2, the size of the correlations between Regulation Skills and reduced Discipline Rates grow larger over the school year.

Table 1. Means and Standard Deviations of Student Outcomes at Each Wave by School

School		Regulation Skills Fall	Regulation Skills Winter	Regulation Skills Spring
School 2	N	548	526	451
	Mean (SD)	**3.39** (0.95)	**3.61** (0.86)	**3.59** (0.95)
School 3	N	391	358	270
	Mean (SD)	**3.67** (0.91)	**3.74** (0.89)	**3.86** (0.89)

Table 2. Correlation Coefficients of Regulation Skills and Discipline Rates

	Regulation Skills Fall	Regulation Skills Winter	Regulation Skills Spring
Sent to Principal's Office	-0.14	-0.30	-0.30
Sent to In-School Suspension	-0.14	-0.23	-0.23
Removed from School	-0.01	-0.17	-0.17
Sent to Alternative Classroom	-0.13	-0.27	-0.27

Classroom Outcomes

- Mean levels of both classroom outcomes increased over the school year, and the mean differences between Fall and Spring are statistically significant.
- In other words, classroom practices became more positive (e.g., teachers were employing more positive discipline strategies and were more effectively supporting executive function and self-regulation), and classrooms overall displayed more regulated behavior as the school year progressed.

Table 3. Means and Standard Deviations of Classroom Outcomes at Each Wave by School

School		Positive Classroom Practices Fall	Positive Classroom Practices Winter	Positive Classroom Practices Spring	Classroom Regulation Fall	Classroom Regulation Winter	Classroom Regulation Spring
School 2 (N = 25)	Mean (SD)	3.07 (0.44)	3.24 (0.39)	3.47 (0.56)	61.82 (15.48)	71.85 (13.85)	73.88 (15.22)
School 3 (N = 15)	Mean (SD)	3.16 (0.56)	3.35 (0.59)	3.76 (0.42)	80.5 (9.51)	81.7 (8.27)	88.99 (6.28)

Methods

- Paired samples t-tests were used to examine the statistical significance of the Fall to Spring difference, as well as the change between each wave.
- To confirm results, we employed a regression model using standard regression with post (Spring or Winter) scores as the dependent variable and a school dummy (School 2 vs. School 3) and the relevant pre-test (Fall or Winter) as predictors. For student outcomes, findings were confirmed using mixed effects regression in which the standard errors are adjusted for the clustering of students in classrooms.

Limitations and Future Research

- Unable to make causal inferences because schools and classrooms were not randomly assigned and there is no control.
- School 1 was not included in the analyses due to a small sample size (n = 7 classrooms) and inconsistent implementation.
- Limited external validity because only 3 schools were included in the study and demographic data was not available from schools.
- Future studies of Brain Games should seek to (a) employ a randomized design, (b) choose a larger representative sample, (c) collect demographic data to improve external validity and for statistical control purposes, and (d) include academic achievement data.

Summary & Discussion

- Teachers were able to implement BGs in their classrooms many times a week and found them useful and fun to do.
- Teachers played Brain Games most frequently after the initial training and booster session, suggesting that some form of ongoing support for implementation is important.
- The implementation logs suggest that teachers were more likely to play games that were familiar to them.
- Across all outcomes, in both schools, there were statistically significant improvements from Fall to Spring.
- Greater growth in School 2, which implemented the BGs for a longer period of time, suggests that the length of exposure may be significant for improving student skills.
- The inverse relationship we found between Regulation Skills and Discipline Rates supports the theory that children with increased regulation have fewer discipline problems.
- Together, these results suggest that Brain Games are a feasible and effective kernel of practice to improve executive function, self-regulation skills, and positive behavior in schools.

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