

# Measuring the Efficacy and Sustainability of a Mindfulness-Based In-Class Intervention

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# Preface

- The goal of this presentation is to give a candid overview of the design, methodology, results, and lessons from the largest randomized controlled study on mindfulness and at-risk children to date, completed over the 2011-12 school year.
- This study is notable for its **size**, the **at-risk population served** by the intervention, and the fact that **no students or teachers were excluded** by any selection process.
- Our hope is that the information we learned will help others in the field who are designing their own studies.
- *Please keep in mind that a lot of the discussion is simplified for brevity.*
- A journal write-up on the study is in progress and will be released when available.
- We have received a great deal of interest about this study, so we are considering a video conference to discuss it further and to answer questions. If you'd like to participate, please fill out [this short form](#).

# For More...

- If you would like to be notified when our **journal paper** is available, please [join our newsletter list](#) or [like us on Facebook](#).
- Due to the interest in this study, we are considering a **video conference presentation** to discuss it further and to answer questions. To participate, please [fill out this short form](#).
- If you are interested in **funding or partnering with us** on a future study, please contact us at [research@mindfulschools.org](mailto:research@mindfulschools.org).
- If you have used or plan to use the Mindful Schools curriculum in a study, please let us know what you found at [research@mindfulschools.org](mailto:research@mindfulschools.org).

# Topics

- **Background**
  - Overview
  - Description of the Intervention
  - Research Questions
- **Study Design**
  - Related Work
  - Constraints
  - Methodology
  - Measures
- **Results**
  - Detailed Measure Descriptions
  - Results of Study
  - Factors Affecting the Results
- **Future Improvements**



# A Little Background

- In 2011, Mindful Schools had taught in-school programs to over 11,000 children and 550 teachers in 41 schools, 71% serving predominantly at-risk children
  - We had **extensive qualitative evidence** and plenty of pilot survey data from students and teachers, but **little controlled, quantitative evidence**
  - We wanted to **test our curriculum** in a real-world environment
- 
- **Important Note:** Today, Mindful Schools is fully focused on training educators and youth service providers in mindfulness and how to teach it to children and adolescents. [Learn More](#)

# Research Questions

- **Outcome-Based:**

- What are the benefits of the Mindful Schools curriculum?
- Which is more sustainable: weekly follow-ups or teacher training?
- What happens to the children over the school year?
- What programmatic improvements can we make?

- **Design & Logistics:**

- What are the best design/measure choices to use in practice?
- How can a study like this be cost-effectively implemented in the public school system?
- How can we improve future studies?

# Study Design

- **Goal:** use a randomized-controlled design to learn about the **efficacy** and **sustainability** of the Mindful Schools **in-class intervention**.
  - Randomized by classroom
  - No students or teachers excluded
- To accomplish this, we divided our study into two phases:
  - **Phase 1: Evaluate program efficacy**  
Perform the in-class intervention, taking measurements before (“Time 1”) and after the intervention (“Time 2”)
  - **Phase 2: Evaluate program sustainability**  
Try two different sustainability interventions, and take measurements before (“Time 2”) and after (“Time 3”)

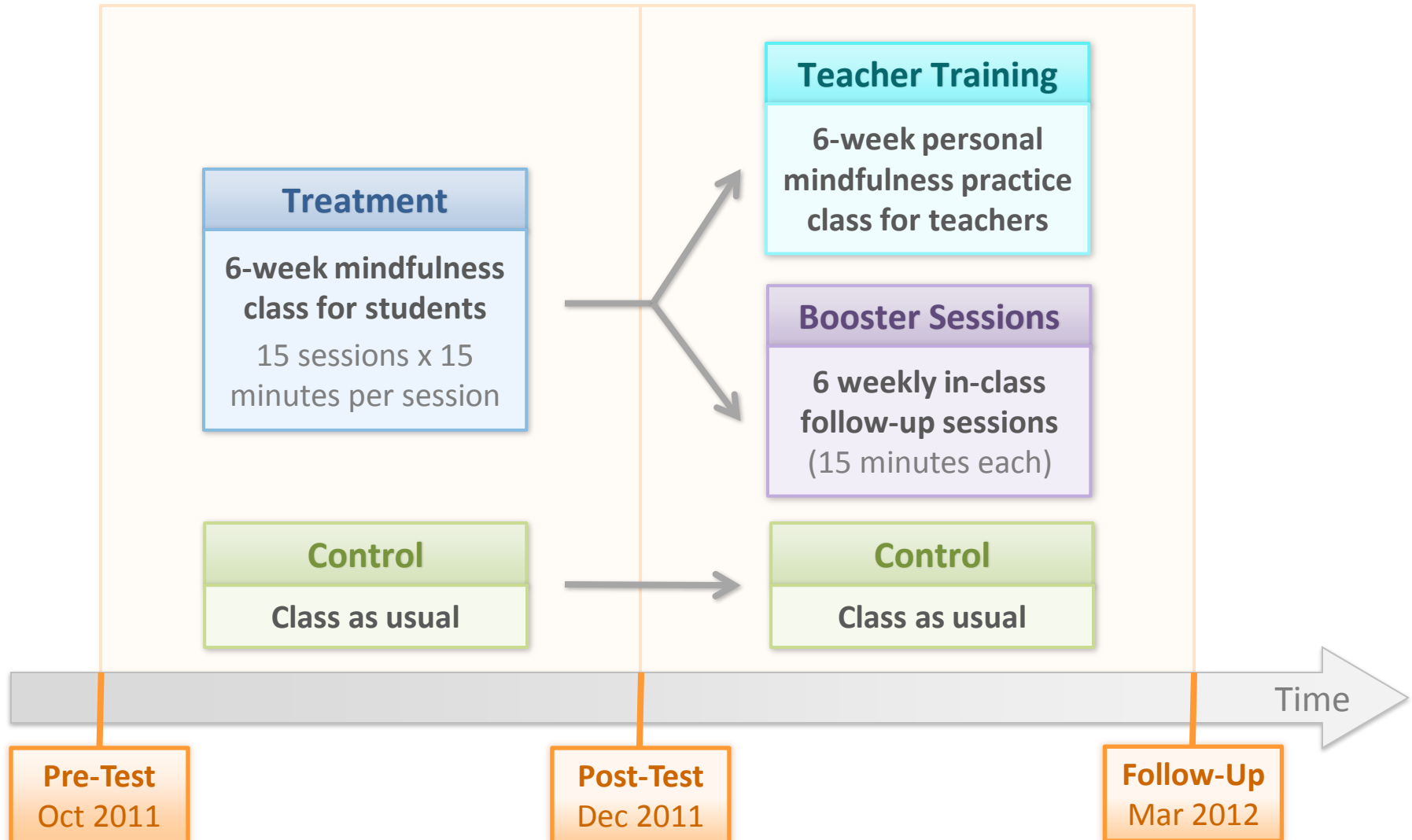
# Study Design

937 students, 47 teachers  
3 Oakland public schools

Randomized  
by Classroom

## Phase 1: EFFICACY

## Phase 2: SUSTAINABILITY





# Intervention Descriptions

## In-Class Program (Phase 1 Treatment)

- 15 lessons, each lasting 15 minutes, taught 2 to 3 times per week over 6 weeks
- Lessons include mindful breathing, listening, eating, test taking, empathy, etc...
- Teachers receive a bell for each classroom and brief training with it
- Students receive workbooks and complete short exercises after each session

## Teacher Training (Phase 2 Treatment Branch)

- Scaled-down version of our Mindfulness Fundamentals course
- Reduced it to only 6 one-hour sessions to cater to teacher schedules
- Goal was to help teachers develop a personal mindfulness practice
- Only 6 of 16 teachers attended all classes (most attended 5 of the 6 classes) despite receiving stipends for their time -- teachers are busy and burnt out
- Effects could be stronger with higher attendance and larger dose

## Booster Sessions (Phase 2 Treatment Branch)

- Similar to in-class program, but only one session per week for 6 weeks

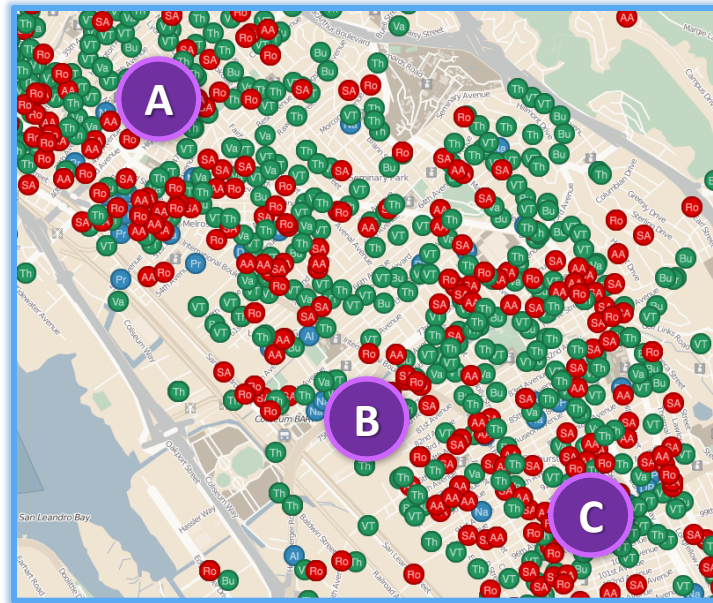
# School Demographics

- Oakland had **4<sup>th</sup> highest in violent crime** in the United States in 2010 ([http://en.wikipedia.org/wiki/United\\_States\\_cities\\_by\\_crime\\_rate](http://en.wikipedia.org/wiki/United_States_cities_by_crime_rate))
- **15.3 violent crimes per 1,000 people** in 2010
- All three elementary schools are in relatively **high crime areas**

## Oakland Crime Map

Oakland had 2,487 crimes over *just 3 weeks* (Nov – Dec 2011)

Public Schools  
in Our Study:



	CRIME TYPE	Show All   Hide All
161	AA Aggravated Assault	<input checked="" type="checkbox"/>
1	Mu Murder	<input checked="" type="checkbox"/>
218	Ro Robbery	<input checked="" type="checkbox"/>
321	SA Simple Assault	<input checked="" type="checkbox"/>
51	DP Disturbing the Peace	<input checked="" type="checkbox"/>
61	Na Narcotics	<input checked="" type="checkbox"/>
6	Al Alcohol	<input checked="" type="checkbox"/>
14	Pr Prostitution	<input checked="" type="checkbox"/>
533	Th Theft	<input checked="" type="checkbox"/>
519	VT Vehicle Theft	<input checked="" type="checkbox"/>
231	Va Vandalism	<input checked="" type="checkbox"/>
358	Bu Burglary	<input checked="" type="checkbox"/>
13	Ar Arson	<input checked="" type="checkbox"/>

# 2010 School Demographics (All K-5)

	School A	School B	School C	Overall
<b>K-5 Students</b>	243	348	324	915
<b>Teachers</b>	12	17	18	47
<b>Average Class Size</b>	20	20	18	19
<b>2010 API Score</b>	807	728	739	-
<b>Free Lunch</b>	82%	81%	92%	85%
<b>Reduced Lunch</b>	6%	9%	2%	6%
<b>% of Parents w/o HS Diploma</b>	41%	41%	65%	49%
<b>English Learners</b>	64%	53%	86%	68%
<b>Hispanic</b>	80%	56%	97%	77%
<b>African-American</b>	13%	20%	2%	12%
<b>Asian</b>	3%	9%	1%	5%
<b>Other</b>	4%	15%	0%	7%

# Study Design: Constraints

- We wanted to test our program in **Oakland public schools**, where mindfulness could have tremendous benefit.
- But Oakland Unified School District had a **\$122 million budget cut** in the 2011-12 school year...
- We knew **teachers were stressed and had very limited time** to complete measurement instruments
- We had to work with schools who were willing to undertake this study on relatively short notice
- We had only a few months to design the study and **get IRB approval before the school year began**, since it had two phases that would require the whole school year

# Study Design: Methodology

- Schools have an enormous amount of statistical noise
- Randomize at the **classroom level** or the **school level**?
  - Unit of randomization is critical (# of classrooms or # of schools)
  - **Until you have several schools in your study, or your schools really are very uniform (highly unlikely), randomization at the classroom level makes much more sense**
  - Randomization at classroom level may bias against the treatment group (since information diffuses to the control group, potentially raising their scores)
  - Trading off diffusion effect for statistical strength
- **Child-level** randomization was not an option
  - Typically infeasible in school settings
  - Can introduce major knowledge diffusion risk
- Target was **60 classrooms**
  - Ended up with 47 due to time frame, school availability, and budget constraints
- Why three groups?
  - Two would have been statistically stronger, but we wanted to respect our grant's intent (to explore sustainability in addition to efficacy)
  - Timing was unfortunate and didn't give us an option to modify the design
  - But three treatment groups allowed us to explore more combinations

# Measure Choices

- Initial idea: use as many validated measures as possible to answer our research questions
- Need for fast IRB approval (to fit our study into the school year) necessitated removing some of the more invasive measure questions
  - For example: “I am not as productive at work because I am losing sleep over traumatic experiences of a person I help.”
- Also had to trim as much as we could due to the intense time pressure teachers face
  - SESBI-R removed since it required several minutes per student
  - In retrospect, the trimming was very helpful precisely because teachers are so stretched

# Study Measures - Oakland Unified School District (Fall 2011)

The table below shows the extensive list of measures we tried to use. The following slides explain some key results, as well as why some measures didn't work out in practice.

Measure	Completed by?	Assessment Points	Sampling
<b>1. Child Behavior</b>			
A Kinder Associates Behavioral Rubric	Teacher	1, 2, 3	All children
<b>2. Child Attention</b>			
B ANT-C	Child	1, 2, 3	10 children per classroom
<b>3. Mindfulness</b>			
C Mindful Attention Awareness Scale (MAAS) [Subset]	Teacher	1, 2, 3	All teachers
D Attitude towards mindfulness	Teacher	1, 2, 3	All teachers
E Mindfulness Sustainability Questionnaire	Teacher	1, 2, 3	All teachers
F Child Acceptance & Mindfulness Measure (CAMM) [Subset]	Child	1, 2, 3	All 4th and 5th graders
<b>4. Teacher Well-Being</b>			
G Professional Quality of Life Scale (ProQOL) [Subset]	Teacher	1, 2, 3	All teachers
<b>5. Classroom Management</b>			
H Teachers' Sense of Efficacy Scale (TSES) [Subset]	Teacher	1, 2, 3	All teachers
I Time taken for transitions within school day	Teacher	1, 2, 3	All teachers
<b>6. Teachers' Perceptions of Program &amp; Impact</b>			
J Focus groups	Teacher	1, 2, 3	Treatment teachers only

# Results: Kinder Associates Behavioral Rubric

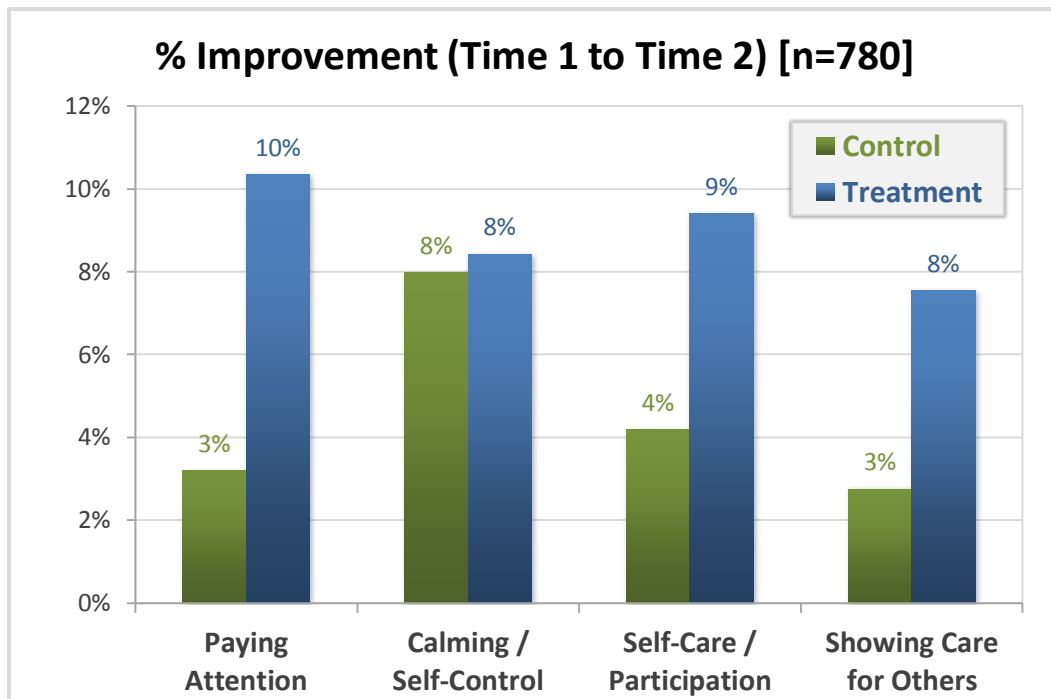
Score	<b>Mental</b> Paying Attention	<b>Emotional</b> Self-Calming/ Self-Control	<b>Physical</b> Self-Care/ Participation	<b>Social</b> Shows Care for Others
<b>4</b>	<b>Pays attention all of the time</b>	<b>Demonstrates calmness and self-control</b>	<b>Physically engages in all activities</b>	<b>Shows care and respect for teachers &amp; students</b>
<b>3</b>	↑ ↓	↑ ↓	↑ ↓	↑ ↓
<b>2</b>				
<b>1</b>	↑ ↓	↑ ↓	↑ ↓	↑ ↓
<b>0</b>	<b>Made no attempt to pay attention</b>	<b>Made no attempt to calm or control one's own behavior</b>	<b>Made no attempt to participate in class activities</b>	<b>Made no attempt to show care and respect for teachers and students</b>

Our Highland pilot study data (Spring 2011) with 419 students indicated that the four items combined have good internal consistency reliability (Cronbach's alpha: pretest = .83, post-test = .87, follow-up = .86) and the sum of these four items demonstrates adequate test-retest reliability (r for pretest with 5 week post-test = .51,  $p < .001$ ; pretest with 12 week follow-up = .57,  $p < .001$ ; 5 week post-test with 12 week follow-up = .77,  $p < .001$ ).

*Behavioral rubric developed and trademarked by Kinder Associates LLC, Wellness Works in Schools™*



# Randomized Controlled Trial Results: Kinder Associates Behavioral Rubric (Time 1 to Time 2)



<b>p-value</b>	<b>0.004</b>	<b>0.800</b>	<b>0.026</b>	<b>0.165</b>
<b>Z-score</b>	<b>-2.89</b>	<b>-0.25</b>	<b>-2.23</b>	<b>-1.34</b>
<b>r</b>	<b>-0.10</b>	<b>-0.01</b>	<b>-0.08</b>	<b>-0.05</b>

*r = effect size for Mann-Whitney analysis*

## Group-By-Time

### Notes

Teachers gave each student 4 simple sub-scale ratings using 5-point scales:

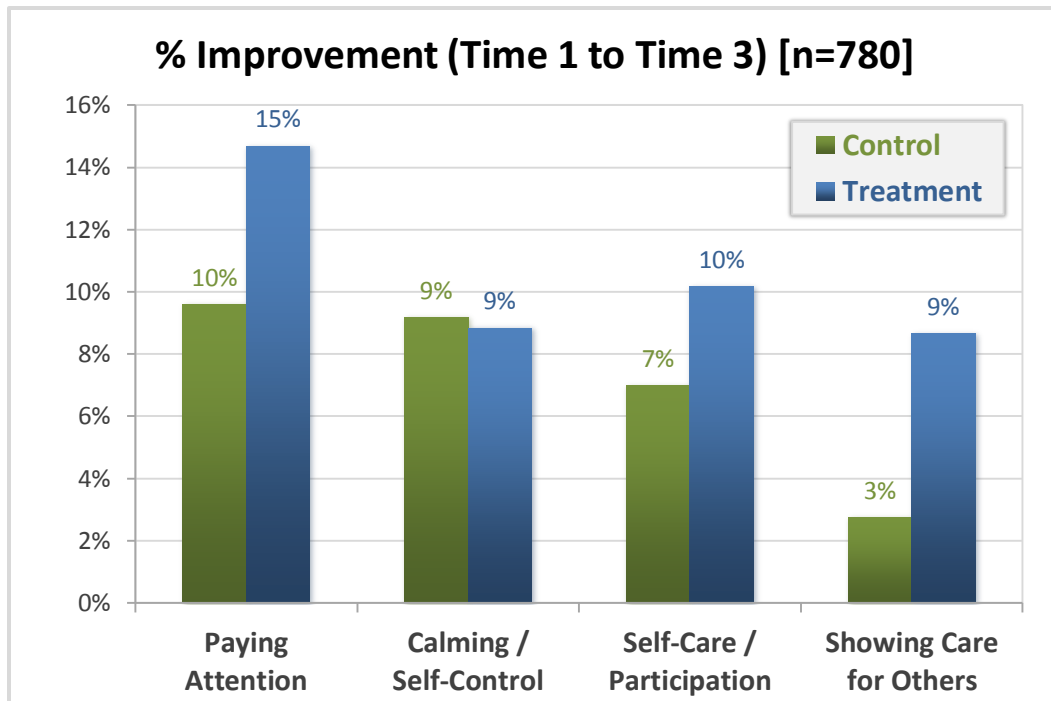
- Paying Attention
- Calmness / Self-Control
- Self-Care / Participation
- Care and Respect for Others

**Time 1** was before the in-class program

**Time 2** was immediately after the in-class program (6 weeks after Time 1)

Only students with complete scores at all three measurement periods were used.

# Randomized Controlled Trial Results: Kinder Associates Behavioral Rubric (Time 1 to Time 3)



<b>p-value</b>	<b>0.05</b>	<b>0.77</b>	<b>0.48</b>	<b>0.01</b>
<b>Z-score</b>	<b>-1.95</b>	<b>-0.29</b>	<b>-0.71</b>	<b>-2.56</b>
<b>r</b>	<b>-0.07</b>	<b>-0.01</b>	<b>-0.01</b>	<b>-0.01</b>

*r = effect size for Mann-Whitney analysis*

## Group-By-Time

### Notes

Teachers gave each student 4 simple sub-scale ratings using 5-point scales:

- Paying Attention
- Calmness / Self-Control
- Self-Care / Participation
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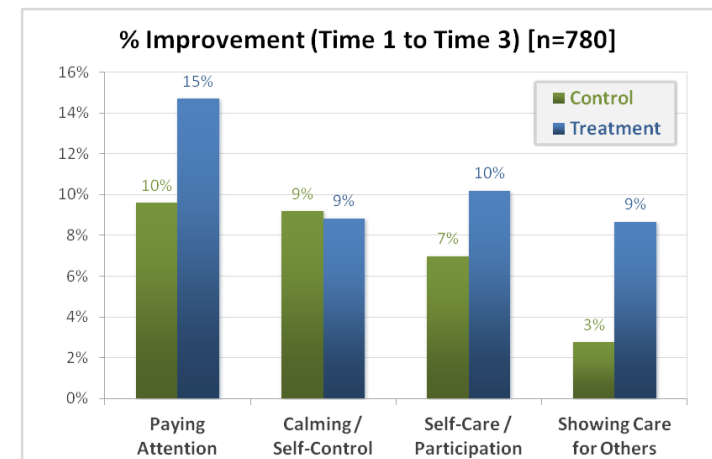
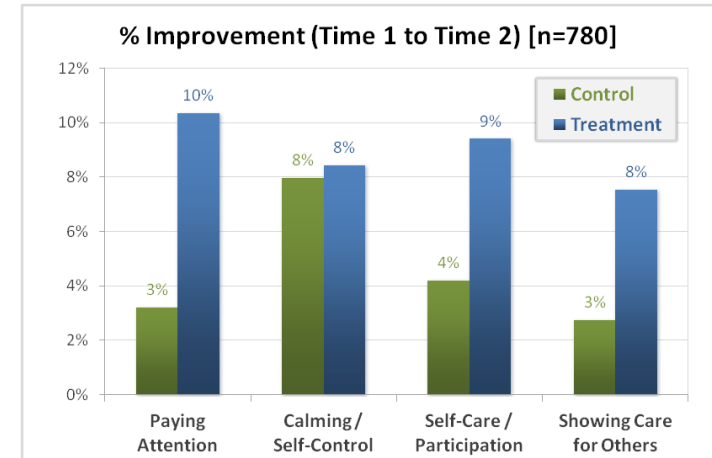
**Time 1** was before the in-class program

**Time 3** was 3 months after the in-class program (~18 weeks after Time 1)

Only students with complete scores at all three measurement periods were used.

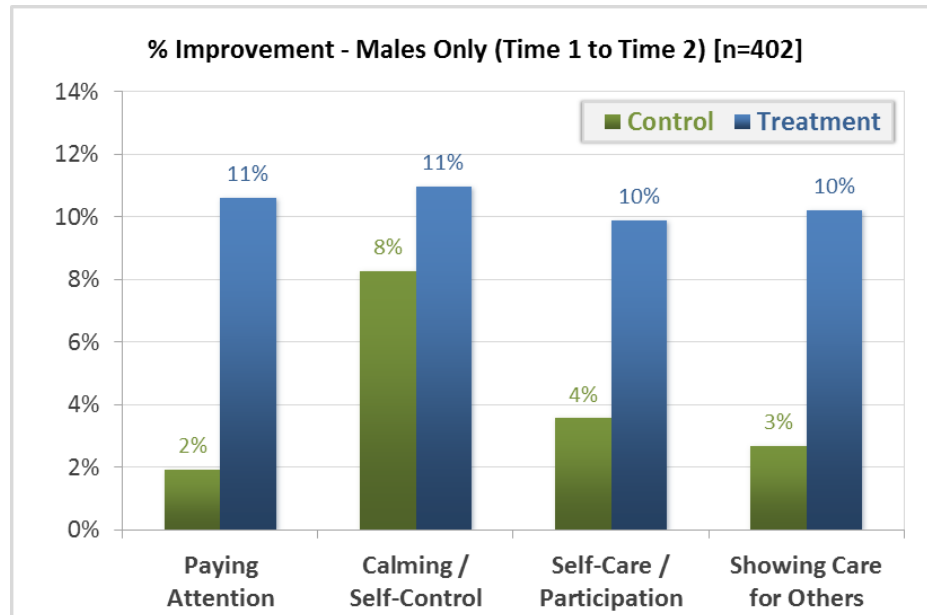
# Discussion: Kinder Associates Behavioral Rubric Results

- Significant result even though we had a huge % of English Language Learners... and diffusion effect helping the control groups
- Schools were very well behaved – so self-control was not as big an issue
- Would have expected calming/self-control to be higher, based on numerous past anecdotes (it's one of the most common anecdotes we hear from teachers/parents)
- Perhaps calming is harder for teachers to evaluate (since it's more internalized)



# Kinder Associates Behavioral Rubric – Boys Only

- We found that gender was a strong covariate – boys (both treatment and control) scored .255 standard deviations below average
- So we took a look at the effect of the treatment on boys only, and found that the differences were further amplified
- This is important because boys tend to be more disruptive in class



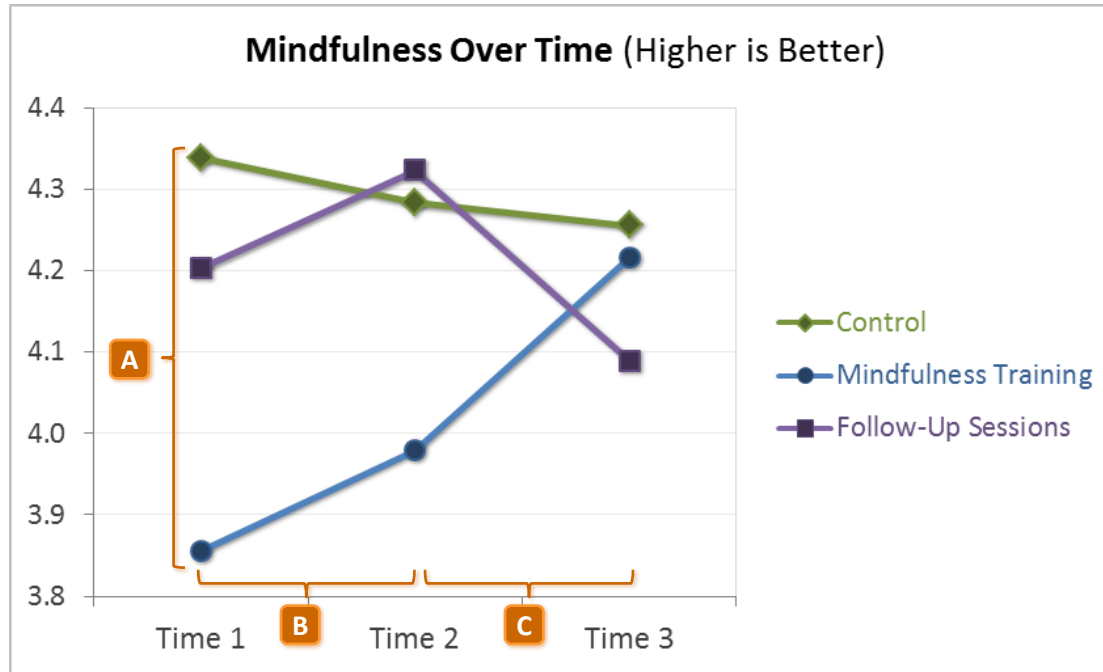
<b>p-value</b>	<b>0.013</b>	<b>0.439</b>	<b>0.090</b>	<b>0.035</b>
<b>Cohen's d</b>	<b>0.27</b>	<b>0.09</b>	<b>0.19</b>	<b>0.23</b>

*Analysis done with t-tests*

**Group-By-Time**

# Personal Mindfulness - Overall Results

Scores derived from a subset of the MAAS measure



## Notes on the Graph

- A** The initial gap between the groups is because the control group had a smaller % of grade 3-5 teachers. Our analysis showed that grade 3-5 teachers had mindfulness scores that were .438 standard deviations lower than grade K-2 teachers (short term) and .608 standard deviations lower (long term).
- B** Between Time 1 and Time 2 (when the treatment groups received the same in-class) program, teachers' mindfulness benefited along with their kids.
- C** Between Time 2 and Time 3, the teachers who received the mindfulness course continued to increase their mindfulness.

## Analysis (Controlling for Covariates)

- **The treatment group had a statistically significant effect** in the short term after controlling for grade level taught (a major factor) and years of teaching experience. The long term effect was suggestive but not statistically significant.
- Larger sample size would help to get more statistically significant results.
- **Group-by-time short term (Time 1 to Time 2):**  $\beta = .326$ ,  $p = .054$
- **Group-by-time long-term (Time 1 to Time 3):**  $\beta = .314$ ,  $p = .192$

## Conclusions & Lessons Learned

- Teachers improve their level of mindfulness as the in-class program takes place (teachers participate along with their students)
- The teachers who received our mindfulness course benefited considerably (this is supported by the focus group responses), where teachers provided strong positive feedback about the mindfulness training they received)
- Combining the in-class program with mindfulness training can produce cost-effective combined effects

# Non-Statistically Significant Results

- **Burnout**

- Grade 3-5 teachers had burnout scores that were .315 standard deviations higher than grade K-2 teachers in the short term, and .363 standard deviations higher in the long term.
- Short term data suggests that adding any program during the school day impacts teachers, particularly grade 3-5 teachers
- For future studies, need to have an active control group to separate out the effects of our intervention

- **Compassion/Satisfaction**

- Our analysis showed that grade 3-5 teachers had compassion satisfaction scores that were .209 standard deviations lower than grade K-2 teachers (short term) and .184 standard deviations lower (long term).
- The general downward trend continued as the school year progressed

- **Teaching Efficacy**

- Lightweight mindfulness training alone (as we did for this study) is insufficient to strongly impact teaching efficacy.
- Explicit training is necessary to help teachers use mindfulness to improve their classroom management.
- We will explore this in a future study where we test our Curriculum Training course, which is aimed at helping teachers bring mindfulness into their classrooms to aid in classroom management

# Measures That Didn't Work Out

- **Transition Times from Breaks**

- We asked teachers how many minutes it took to transition from recess/lunch back to classwork (teachers responded approximately, without using stopwatches)
- Data had to be discarded because some teachers included mindfulness time in “transition time” while others did not
- **Reuse in future?** Might be a useful measure with a larger sample size, stopwatches, and clearer wording to ensure that mindfulness practice time is consistently accounted for

- **Child Mindfulness Measure (CAMM)**

- Needed to translate the survey and simplify language to be age-appropriate

- **ANT-C (Computerized Test)**

- Found a statistically significant result for the “alerting” test, but do not feel it is a meaningful result
- Probably not designed for testing groups of children simultaneously
- Challenges with differences in equipment, children distracting each other
- Takes 15 minutes per child – very resource-intensive
- Not recommended – there are shorter, more robust computer measures

# Focus Group Highlights

Here are a few anecdotes from teachers who received the Mindfulness Training (one third of the teachers in the study):

- One teacher mentioned how her confidence in leading her class grew tremendously after the course
- One teacher mentioned how he was able to respond more skillfully when challenged by students
- One teacher showed a video of a student taking a mindful breath after stumbling during a poem recitation in front of 300 students
- One teacher showed a video of a child kicking chairs after getting a spelling quiz answer wrong, then suddenly stopping, putting his hand on his anchor spot, taking a few breaths, and picking up the chairs
- Several teachers reported being able to access mindful breathing during the day, as well as to have more compassion for themselves as teachers
- One teacher realized that one of her students was just slow because he was being more mindful



# Factors Affecting Overall Results

- **Working against the treatment group**

- Diffusion of mindfulness across classrooms helps the control group when randomizing by classroom
- Treatment teachers considerably less favorable towards mindfulness before the intervention started (**3.52** vs. **3.90** for control group, on a scale of 1 [very unfavorable] to 4 [very favorable])
- Higher percentage of grade 3-5 teachers in the treatment group (this is important because several teacher measures were negatively impacted) – we tried to control for this in most of the analysis
- Only 6 teachers in the Mindfulness Training group attended all six adult mindfulness classes (though most teachers attended five of six classes)
- Needed a few sessions from substitute mindfulness teacher
- Some control teachers were already mindfulness practitioners (and at least one was already using it in their classroom)
- High percentage of English language learners (68% in the three schools)
- Coming in as an outside instructor
- Lack of an active control (for example, with burnout caused by adding work for teachers)

- **In favor of the treatment group**

- Lack of an active control (for example, if the novelty of a new program was helping)
- Teachers may want to please principals, who agreed to the study (though principals were told to stay neutral, and teachers were told that the goal was to explore IF mindfulness was helpful, rather than to prove that it was)

# Factors Affecting Results (Cont'd)

- **Increasing General Statistical Noise in the System**
  - Low statistical power with only 47 teachers instead of 60
  - Post-testing was done in the last week of school before the winter break (lots of unusual school activity that week – book fairs, parties, etc...)
  - 1 control teacher left for maternity leave in November
  - 1 or 2 children in each classroom either changed schools/classes or were otherwise missing in rubric evaluations

# Logistical Tips

- The following slides detail a number of logistical tips that we noted while conducting this study (some of which we knew, and some that we learned).
- In short, conducting a study of this size in a public school system presents numerous challenges, many of which can be addressed with careful planning and attention to detail.
- We hope that sharing this level of information will help others conduct similar studies with less stress. 😊

# Logistical Tips

- **School Partnerships**
  - Make sure principals know exactly what they're signing up for
  - Present to entire staff to get buy-in (top-down is often not the best way to get genuine cooperation)
  - Give a clear document to teachers so they know what they need to do and how stipends will work (include this when initially presenting to staff)
  - Communicate research results to staff after the study completes
- **Stipends**
  - Very important incentive to complete measures
  - All groups must get stipends (including control, of course)
- **Communication with School Staff**
  - It takes *numerous* mailings to get things done – everyone is busy
  - Important to send someone to the school and track down teachers (and principals) as needed, in person
  - Be prepared to have someone spend an afternoon walking classroom to classroom to track down teachers to complete measures

# Logistical Tips

- **Procedures for Staff/Volunteers Helping with Testing/Survey Gathering**
  - Make sure to follow the same procedure with each class
  - Make sure volunteers don't know which classes had what intervention
  - Make sure volunteers don't say anything about the program or mindfulness to kids
- **Data Gathering**
  - Very important to get extensive baseline data since kids will definitely be absent at post testing (particularly around Christmas holidays).
  - Secretaries are critical in helping to gather things – work through them and give them something nice when your study is complete (and maybe even in advance) to thank them for their help
  - Give a checklist to the secretaries to track the measures that teachers are handing in
  - Warn teachers not to over-interpret the questions
  - Find teachers who will help to remind their peers
  - Minimize the total number of documents that need to be filled out
  - One long survey is much better than separate links
  - Use online as much as possible – much easier to track and process
- **Child Surveys**
  - All teachers should read child surveys out loud to help increase comprehension
  - Make sure wording is appropriate for your subjects

# Logistics: Computerized Testing

- **Computer Hardware**
  - Highly desirable to have a lab as part of school agreement
  - Try to make the computers identical to avoid distraction
  - Make sure headphone volumes are correctly adjusted prior to starting
  - Kids will try to unplug the headphones, so keep an eye out for that
- **Instructions**
  - Make sure to follow the exact same procedure with each class
  - Make sure volunteers don't know which classes had what intervention
  - Make sure volunteers don't say anything about the program or mindfulness to kids
- **Logistics**
  - Need to track attendance and any special cases (children switched)
  - Get schools to agree to use computer labs, and test software on the lab computers
  - Place kids with an empty seat between them to minimize distractions.
  - Have two spare computers in case there is a computer malfunction
  - Try to test the same classes at the same time of day at each measurement period
  - Send testing schedules to teachers ahead of time for approval
  - Seat boys and girls alternating (for elementary school kids) to minimize distractions

# Key Takeaways

- This was a real-world study, with no students or teachers excluded by any selection process
- Mindful Schools curriculum produced statistically significant improvements in student behavior
- Boys improved more than girls
- Simply having the Mindful Schools curriculum in their classroom produced statistically significant improvements in teacher mindfulness
- Lots of lessons about design/measures/logistics (not discussed due to time constraints today)
- Strong sustainability support is critical: we need to test our Curriculum Training course, which explains how to establish mindfulness in the classroom, how it can help with classroom management, etc...
- The importance of training for long-term sustainability (while lowering cost) is a main reason why Mindful Schools is now fully focused on adult training (via [Curriculum Training](#) & [Year-Long Certification](#)).

# Future Improvements

- Start planning study longer in advance
- Most important: push hard to get more classrooms (since that is our basic unit of randomization)
- Better measure selection (allocate more time to this)
- Use shorter and more robust computerized measures
- Just two treatment arms
- Start program earlier to avoid winter break challenges
- Independent classroom observers to help calibrate student rating results across teachers (expensive)
- Find better ways of measuring time saved in the classroom and in transitions



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