School-based Mindfulness Training to Promote Healthy Behaviors in Adolescents: a Pilot Study

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FUNDED BY NHLBI GRANT R21HL119665
TO DRS. PBERT & SALMOIRAGO-BLOTCHER

Background

- Poor diets and physical inactivity are modifiable risk factors for the development of cardiovascular disease
- Less than 1/3 of adolescents meet current physical activity and dietary recommendations (AHA 2015)
- Traditional health education has only modest and short-term effects on behaviors

Background (cont.)

- Impulsiveness and poor planning skills important predictors of unhealthy behaviors among adolescents
- Observational evidence (cross-sectional surveys) for inverse association between impulsiveness and healthy behaviors
- Observational studies (college students) have linked higher mindfulness levels with healthier dietary and exercise behaviors and with lower impulsiveness
- Role of mindfulness training in promoting healthy behaviors among teenagers unexplored

What happens if we add the "Mindfulness Training" ingredient to Health Education?

Primary outcome: feasibility and acceptability of school-based mindfulness training in adjunct to health education

Secondary (exploratory) outcomes: estimates of effect size on impulsiveness scores, diet, physical activity

Design & Population

- 9th graders
- Cluster RCT
- 2 high schools in central MA randomized to:
  - ✓ Standardized health education plus mindfulness training (HEM)
  - ✓ Standardized health education plus attention control (HEAC)
- Assessments at baseline, end of the intervention (2 months post-baseline), and at 8 months FU

Schedule

Intervention schedule by treatment allocation

HEM school	HEAC school
Diet and PA-related health education 8 consecutive 45-min sessions	Diet and PA-related health education 8 consecutive 45-min sessions
Mindfulness training One 35-min session/week for 8 weeks	Attention control One 35-min session/week for 8 weeks
15 min mindfulness practice in class 5 days/week	-
15 min mindfulness practice at home 5 days/week	-

HE Curriculum (both schools)

- Diabetes Prevention Program (DPP)
- Standard curricula for school-based health education
- Current AHA recommendations

- Topics:
  - ✓ Increasing fruit and vegetable intake
  - ✓ Reducing sugar sweetened drinks
  - ✓ Decreasing intake of refined carbohydrates
  - ✓ Decreasing intake of sodium
  - ✓ Managing hunger and appetite
  - ✓ Engaging in at least one hour of MVPA most days of the week
  - ✓ Building physical activity into everyday lifestyle
  - ✓ Reducing sedentary behavior

Mindfulness Curriculum

Based on traditional Mindfulness-Based Stress Reduction training curriculum, adapted for teens

- ✓ 'Body scan', a technique based on the cultivation of attention to bodily sensations
- ✓ Awareness of the sensation of breathing
- ✓ Learning to direct the attention to sounds, visual objects, thoughts and emotions
- ✓ 'Open awareness'
- ✓ Simple mindful movement practice (standing and walking)

Attention Control Curriculum

- Excluded active components of either the health education intervention (i.e., diet, and physical activity) or mindfulness training
- Engaged students in interactive activities

  - ✓ Health risk factors
  - ✓ Health literacy
  - ✓ Mental and emotional health
  - ✓ Self-confidence
  - ✓ Self-esteem

Assessments

Primary outcomes (Feasibility, acceptability)

- Enrollment & retention rates
- Attendance (n sessions attended/n sessions)
- Adherence (n times listened to mindfulness recording)
- Satisfaction (% "somewhat" to "very satisfied" with interventions)

Secondary (exploratory) outcomes

- Diet: 24 hour recall
- Physical activity (PA): 7 day recall (PAR)
- Impulsiveness: Barratt scale

- Pre-post intervention changes in PA, diet and impulsiveness, adjusted for baseline differences associated with outcomes

Baseline Characteristics

	HEM	HEAC	p[b]
	n (%)	n (%)	
Female (n, %)	10 (43.5%)	21 (70%)	0.09
Hispanic (n, %)	11 (47.8%)	9 (30%)	0.26
White (n, %)	12 (52.2%)	20 (66.7%)	
African American (n, %)	0 (0%)	1 (3.3%)	
Other (n, %)	5 (21.7%)	4 (13.3%)	
Impulsivity scores (mean, SD)	51.9 (6.8)	52.2 (8.1)	0.97
MVPA(min/day) (mean, SD)	63.1 (47.8)	68.6 (84.8)	0.66
Fruit and vegetable intake (servings/day) (mean, SD)	3.8 (3.5)	2.4 (2.4)	0.11
Sugar sweetened beverages (servings/day) (mean, SD)	1.2 (1.1)	1.7 (2.4)	0.88
Sodium (mg/day) (mean, SD)	3,021 (1,392)	2,621 (1,521)	0.19

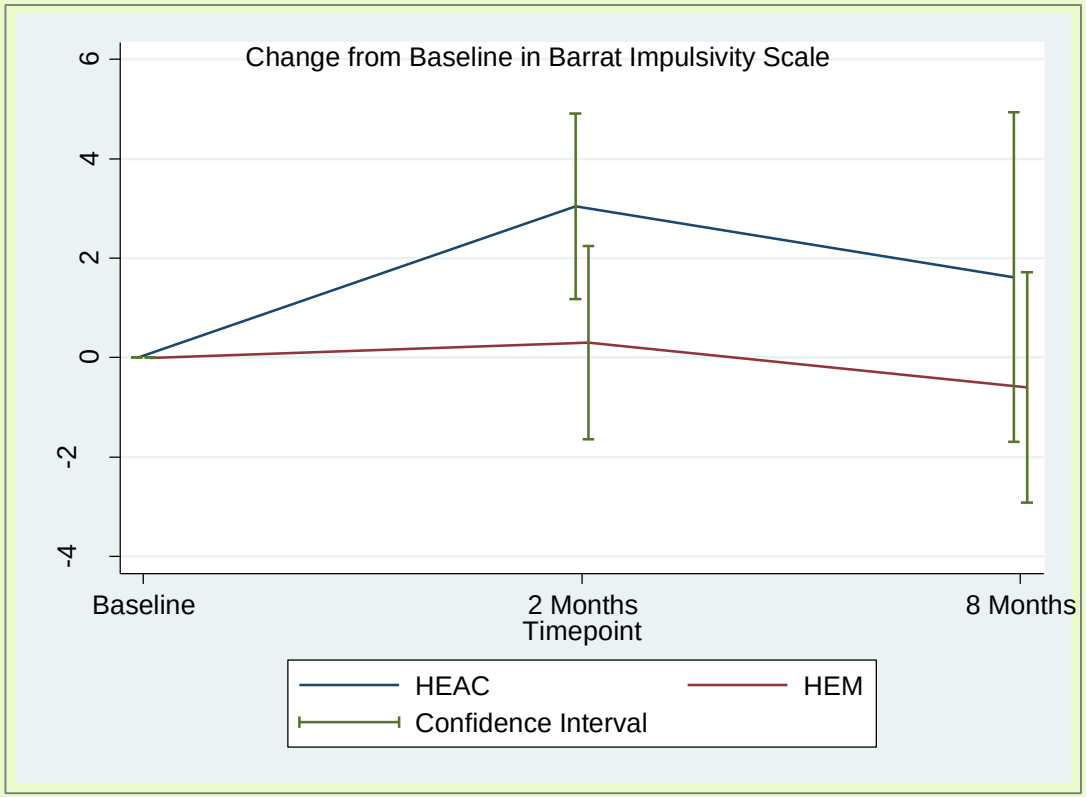
Results

- 201 students screened; 53 (26%) enrolled (30 HEM, 23 HEAC)
- *Retention* 2 m = 100%; 8 m = 96%
- *Class attendance* = 96% (both conditions)
- *Adherence* (n times listened to study recording) = 5 (SD 2.9) times/week (HEM)
- *Satisfaction* (% students somewhat to very satisfied)
  - Health education: HEM = 91%; HEAC = 90%
  - Mindfulness: HEM = 77%

Impulsiveness (Barratt scores)

Adjusted difference, HEM vs. HEAC:

- 2 months: -2.8; CI: -6.0, 0.3
- 8 months: -2.3, CI: -5.5, 0.9



Physical Activity (7 day PAR)

Change from baseline MVPA (minutes/day)

2 months: -21.5 (HEM), -28.3 (HEAC)
Adjusted difference, HEM vs. HEAC: 2.2; CI: -16.9, 21.3

8 months: -9.0 (HEM); -20.6 (HEAC)
Adjusted difference, HEM vs. HEAC: 6.2; CI: -13.2, 25.5

Fruit & Vegetable Intake (24 hour recall)

Change from baseline fruit & vegetable intake, servings/day

- 2 months = -1.4 (HEM); -0.3 (HEAC)
  Adjusted difference: -0.2; CI: -1.1, 0.7

- 8 months = -1.0 (HEM); -0.6 (HEAC)
  Adjusted difference: 0.6; CI: -0.3,1.5

- At 2 months, both groups had a decrease in servings of fruit and vegetables; HEM had a slightly greater decrease
- At 8 months, both groups had a decrease in servings of fruit and vegetables; HEM had less of a decrease than HEAC

Sugar-Sweetened Beverages

Change from baseline intake of sweetened beverages, servings/day

- 2 months : 0.1 (HEM); -0.7 (HEAC)
  Adjusted difference = 0.4; CI: -0.4, 1.2

- 8 months: -0.4 (HEM); -0.6 (HEAC)
  Adjusted difference = -0.3; CI: -1.1, 0.5

- At 2 months, n of sugar-sweetened drinks decreased in HEAC
- At 8 months, both groups had a decrease, and HEM had a slightly greater decrease

Sodium Intake

Change from baseline sodium intake, mg/day

- 2 months: -447 (HEM); -255 (HEAC)
  Adjusted difference: 50.5; CI: -674, 775

- 8 months: -276 (HEM); -69 (HEAC)
  Adjusted difference: -10.8; CI: -752, 730

- At 2 months, HEM had less of a decrease vs. HEAC
- At 8 months, HEM had a greater decrease in sodium intake

Strengths

- School-based program
- Integration with school curriculum
- Collaboration with health education teachers
- High retention rates, attendance, adherence, and program satisfaction
- 100% data collection for 7-day PAR and 24 hour dietary recall

Limitations

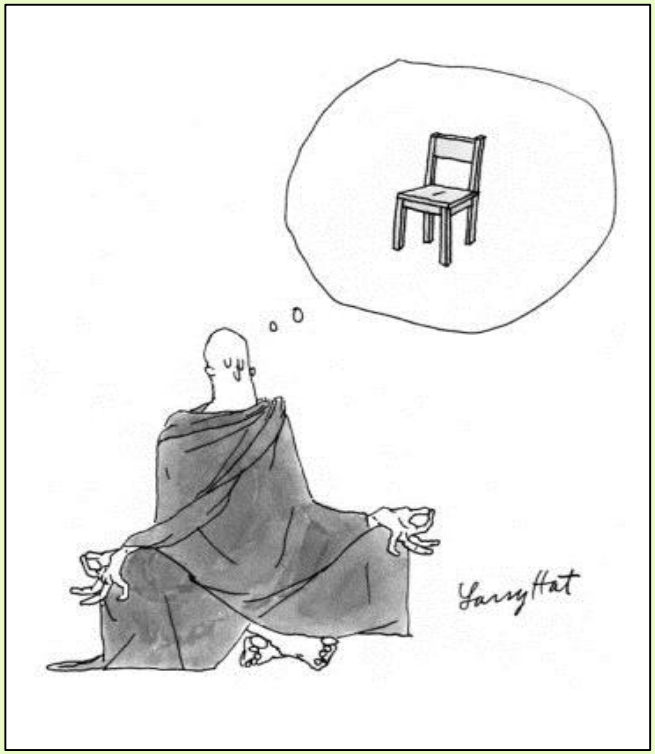
- 25% provided assent/consent
  - Beginning of school year problematic
  - First year of high school (but HE offered only in 9th grade in MA)
- One 24 hour dietary recall; seasonal effects
- Challenges in assessment of physical activity (self-report/over-estimation; seasonal effects)

Conclusions

- School-based mindfulness training feasible and acceptable
- Study not powered to detect between-group differences or mediation BUT:
  - Impulsiveness increased in HEAC, while it remained stable in HEM, differences maintained at 8 m
  - PA decreased in both groups; returned to baseline at 8 m in HEM but not in HEAC
  - Overall, no dietary differences

Study Team

- Lori Pbert and Elena Salmoirago-Blotcher, Principal Investigators
- Susan Druker, Project Director
- Dante Simone, Research Coordinator
- Florence Mayer, Co-Investigator
- Sybil Crawford, Biostatistician
- Leslie Smith Frank, Mindfulness Instructor
- Christine Frisard, Data Analyst
- Beth Bock, Consultant



Thank you!

American Heart Association Recommendations

Physical activity
One hour of moderate to vigorous physical activity/day

Diet
Fruit and vegetables: >4.5 cups/d
Fish: > 2 servings/week (preferably oily fish)
Fiber-rich whole grains: three 1-oz-equivalent servings/d
Sodium: <1500 mg/d
Sugar-sweetened beverages: <450 kcal (3 cans)/week

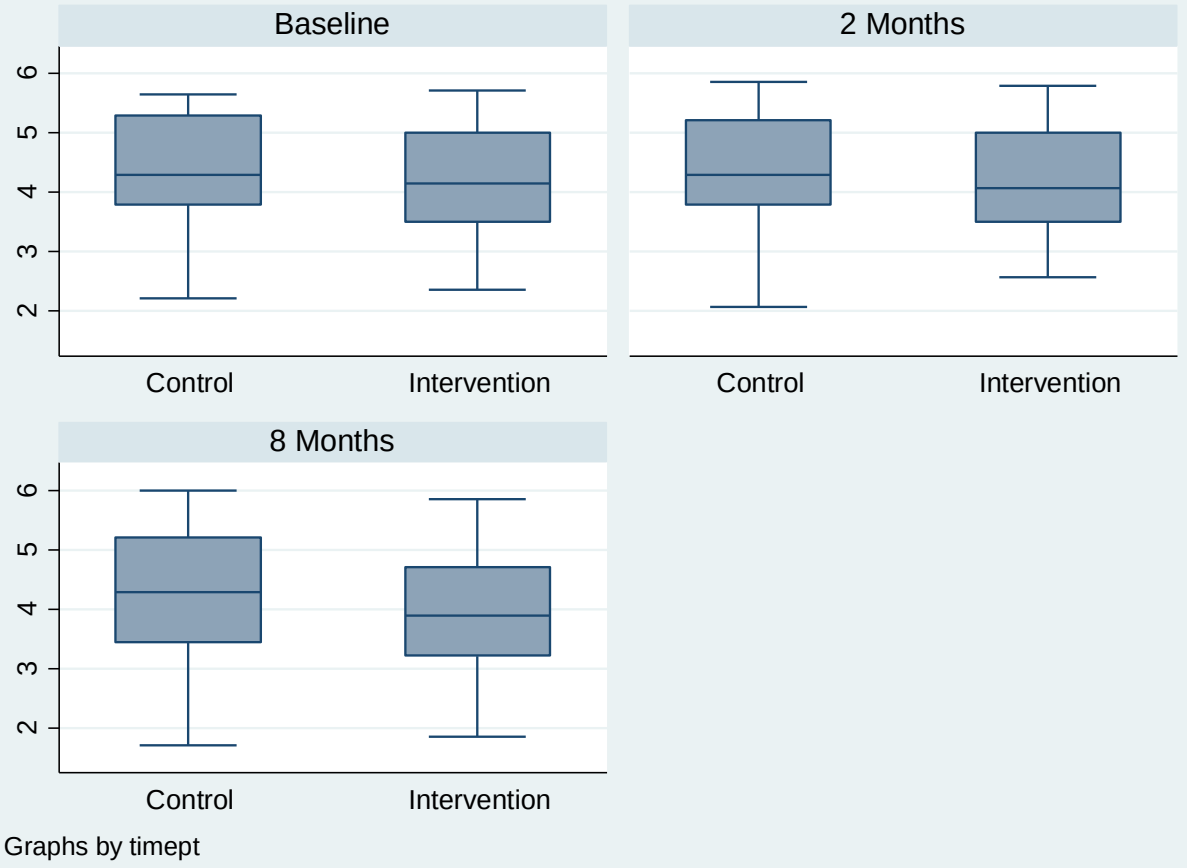
Ideal: Diet Score 4–5
Intermediate: Diet Score 2–3
Poor: Diet Score 0–1

Lessons learned: Mindfulness Assessments

- No changes in pilot study (MAAS)
- BUT we observed changes in impulsiveness
- Explanations:
  - Teens did not understand content?
  - Few data on pre-post intervention changes in literature

DO WE NEED A DIFFERENT MEASURE? IF SO, WHAT?

Mindfulness (MAAS Scores)



Lessons Learned: Accelerometry

Accelerometry

- Seasonal variations in PA
- Poor compliance
- Parameters for analysis of accelerometry data not standardized

Possible solutions:

- Incentives
- Use 7 Day PAR only?

Fish Intake – kids did not eat fish!

Servings of fish	Timepoint		
	Baseline	2 Months	8 Months
0	52	49	49
.8	0	1	0
1.1	0	1	0
1.6	0	0	1
2.9	0	1	0
3.0	0	1	0
7.9	0	0	1
8.5	1	0	0
Total	53	53	51