



# Behavioral Vaccines for Prevention of Mental, Emotional, Behavioral and Related Physical Disorders

HEALTH PROMOTION CONFERENCE  
Tallin, Estonia • 2015



Dennis D. Embry, Ph.D., president/senior scientist, PAXIS Institute;  
Co-investigator, Johns Hopkins Center for Prevention & Intervention;  
Co-investigator, Manitoba Centre for Health Policy

[https://www.researchgate.net/profile/Dennis\\_Embry](https://www.researchgate.net/profile/Dennis_Embry)

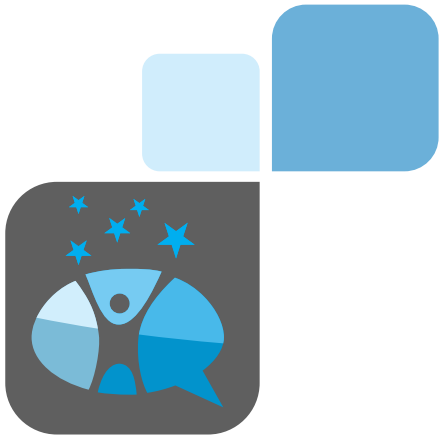


## Nurturing Environments...

- Can evolve the future
- Change the expression of genes and wiring of the brain, and those changes can directly and indirectly change the expression of genes in next generation(s)
- Alter behavior for a lifetime including educational outcomes
- Can protect against multiple mental, emotional, behavioral and related physical disorders
- Cut across scientific disciplines and both challenges existing theories and integrates diverse scientific findings across specialty fields

Read more at: [http://www.researchgate.net/profile/Dennis\\_Embry](http://www.researchgate.net/profile/Dennis_Embry)

Note: You have to join and you don't have to be "researcher"





Suitcases for children's lives

in 1938





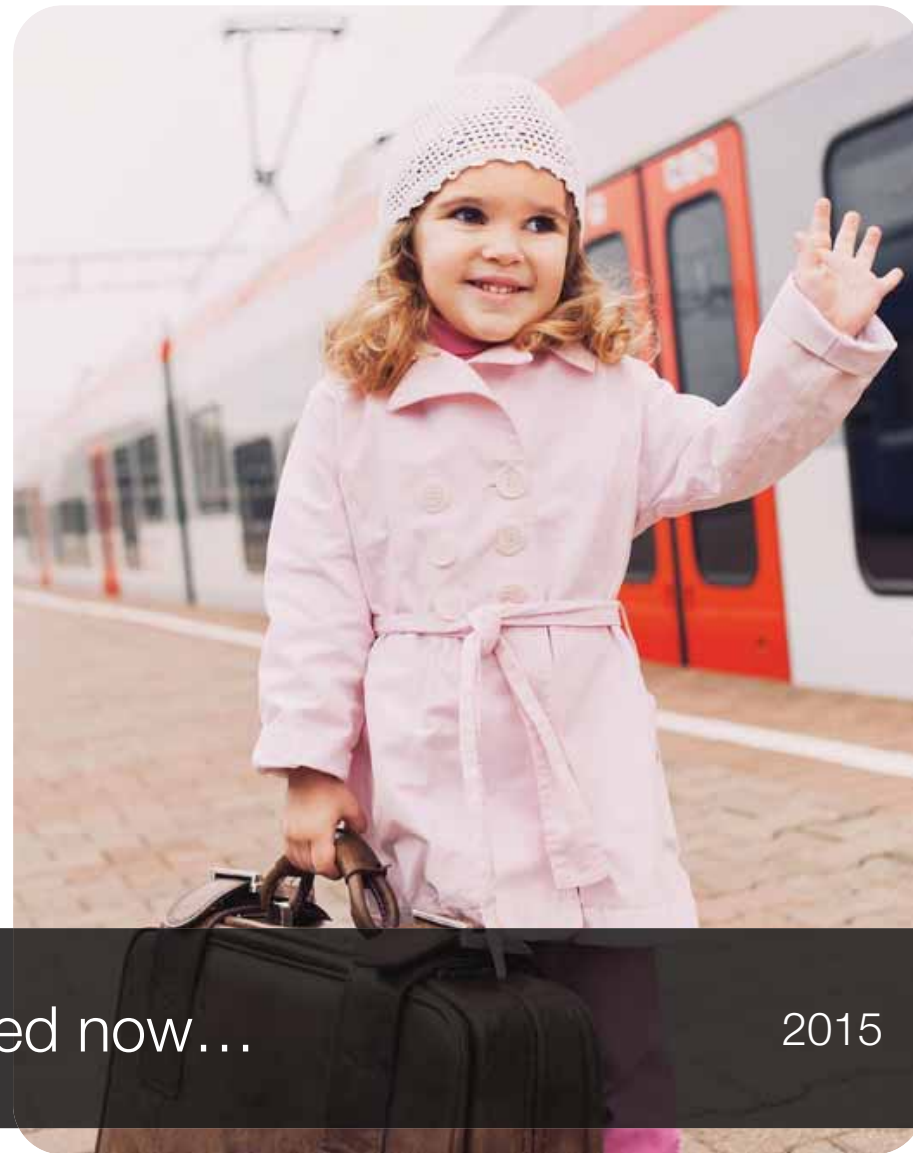
Estonia's Futures are being packed now...

2015





A shared responsibility to fill well



Estonia's Futures are being packed now...

2015



#1

#3

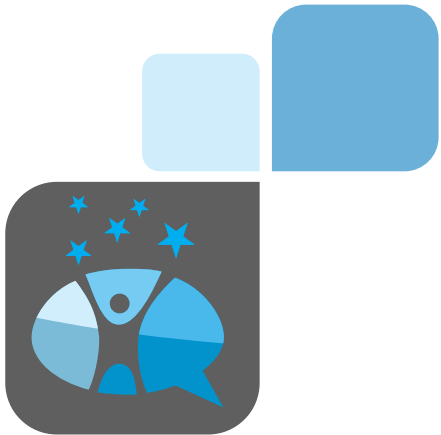
#2

#4



Biglan et al., American Psychologist, (4), 2012

## Principles of Nurturing Environments



Richly Reinforce  
Prosocial  
Behaviors

#3

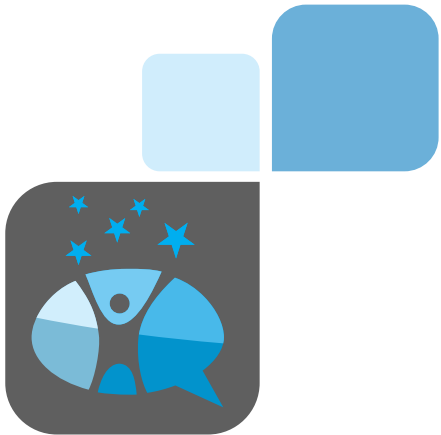
#2



#4

Biglan et al., American Psychologist, (4), 2012

Principles of Nurturing Environments



Richly Reinforce  
Prosocial  
Behaviors

#3

Limit  
Problematic  
Behaviors

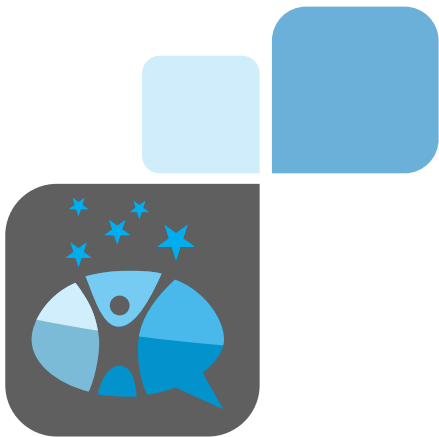
#4



**Creating  
Nurturing  
Environments**

Biglan et al., American Psychologist, (4), 2012

Principles of Nurturing Environments





Richly Reinforce  
Prosocial  
Behaviors

Limit  
Problematic  
Behaviors

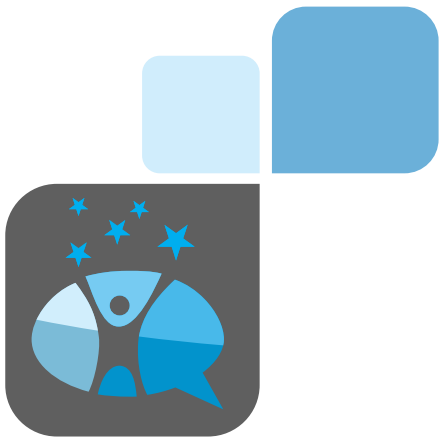


Reduce/minimize  
All Toxic  
Influences

#4

Biglan et al., American Psychologist, (4), 2012

Principles of Nurturing Environments



Richly Reinforce  
Prosocial  
Behaviors

Limit  
Problematic  
Behaviors

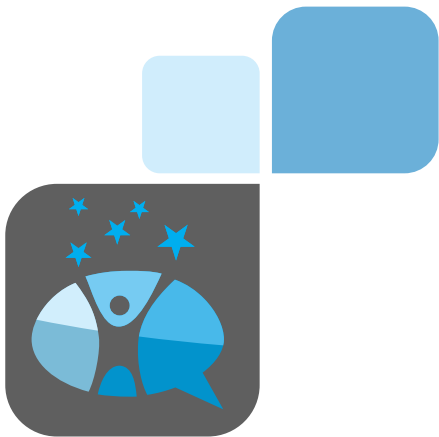


Reduce/minimize  
All Toxic  
Influences

Increase  
Psychological  
Flexibility

Biglan et al., American Psychologist, (4), 2012

## Principles of Nurturing Environments

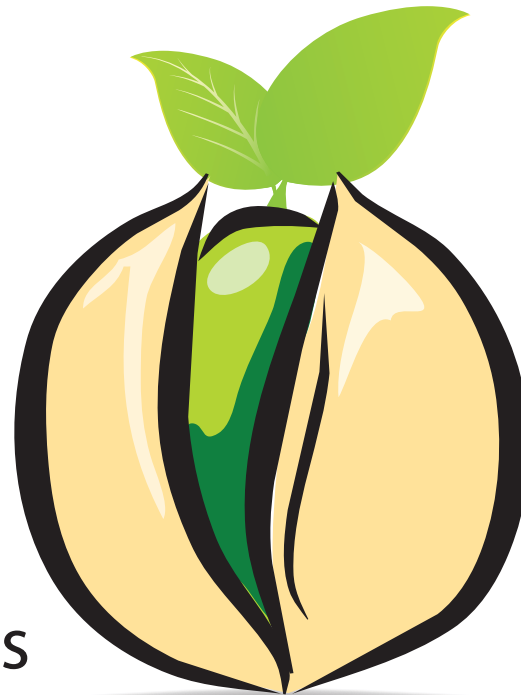


Antecedent  
Kernels

Reinforcement  
Kernels

Relational  
Frame Kernels

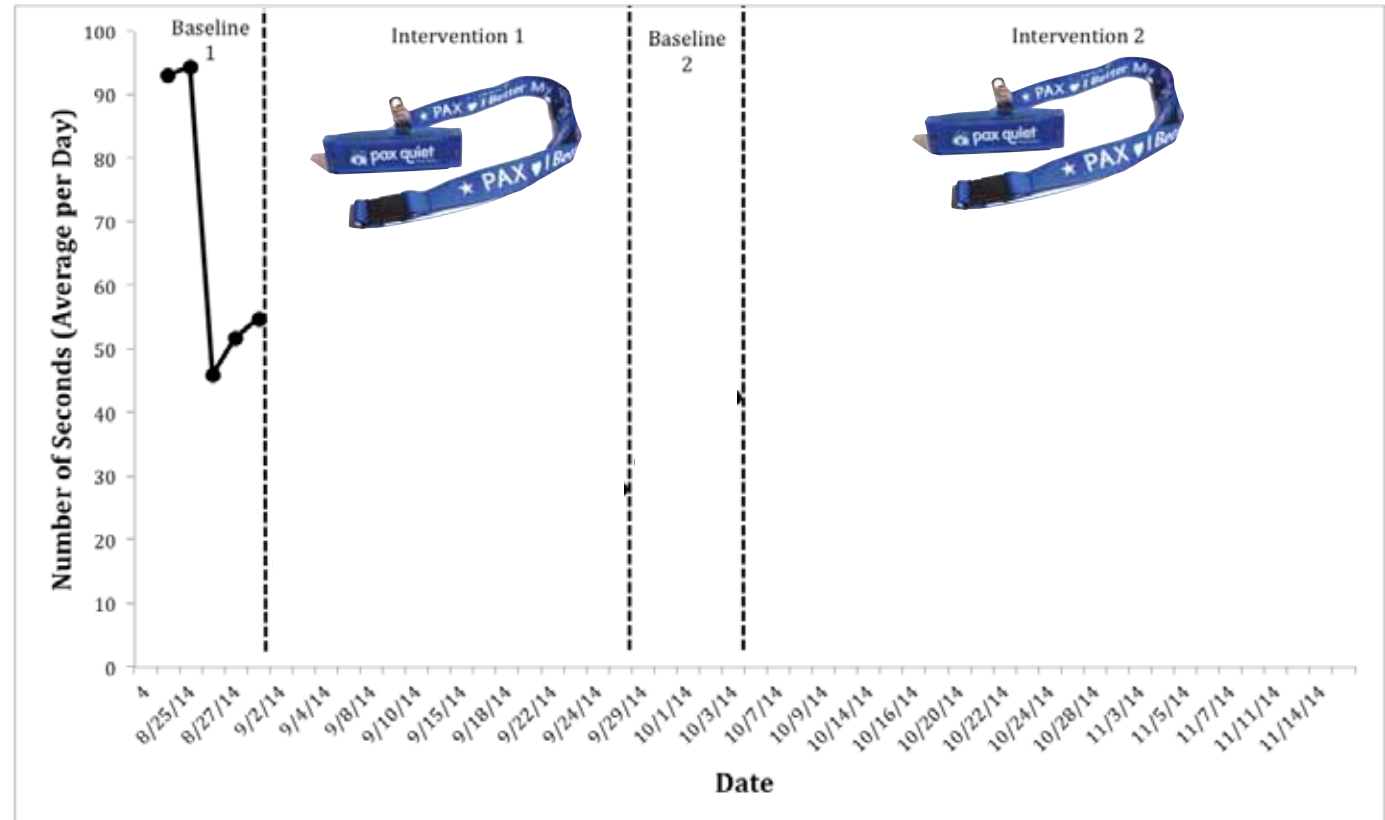
Physiological  
Kernels



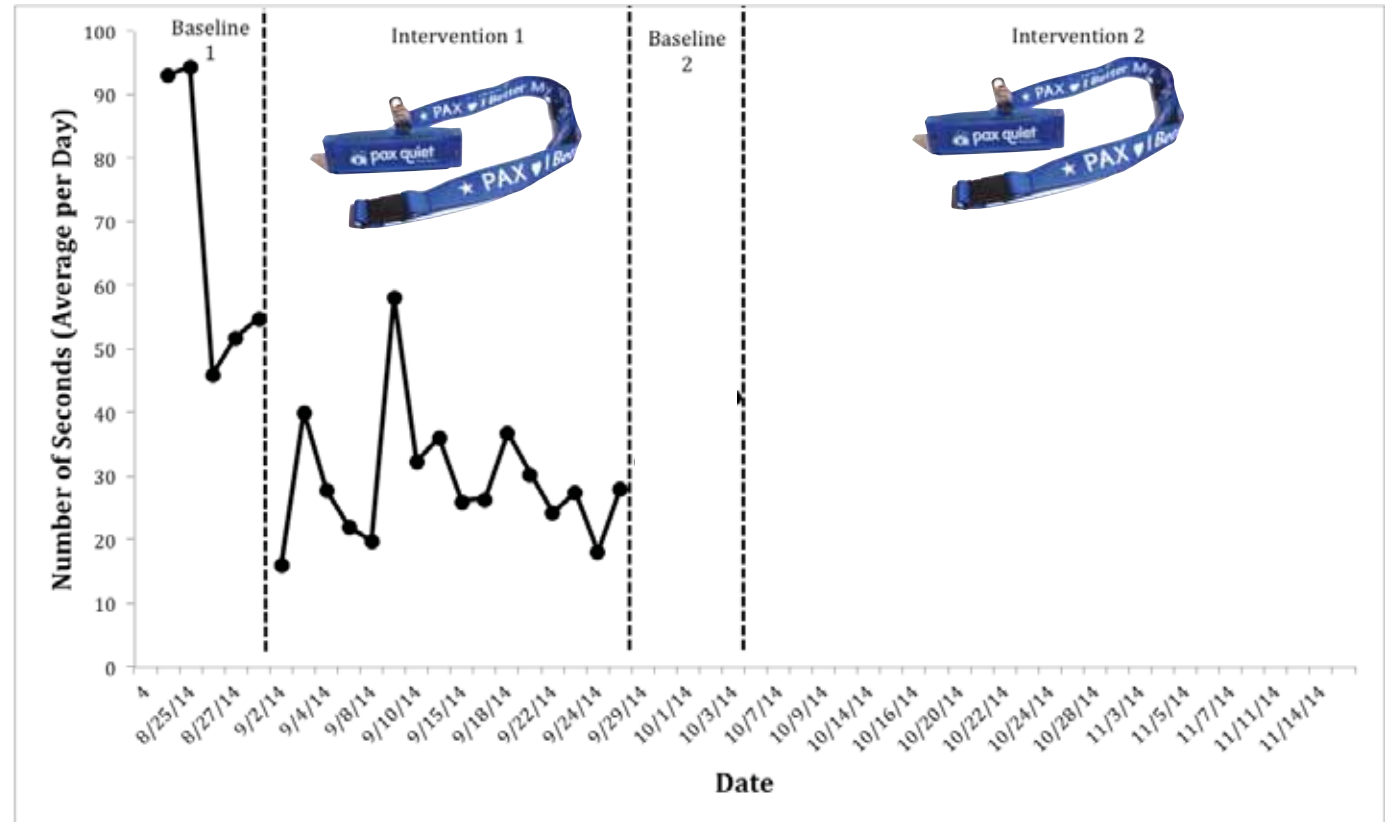
Embry & Biglan, Clinical Child & Family Psychology Review 11(3), 2008

Evidence-Based Kernels: Smallest Proven  
Unit of Growing Nurturing Environments



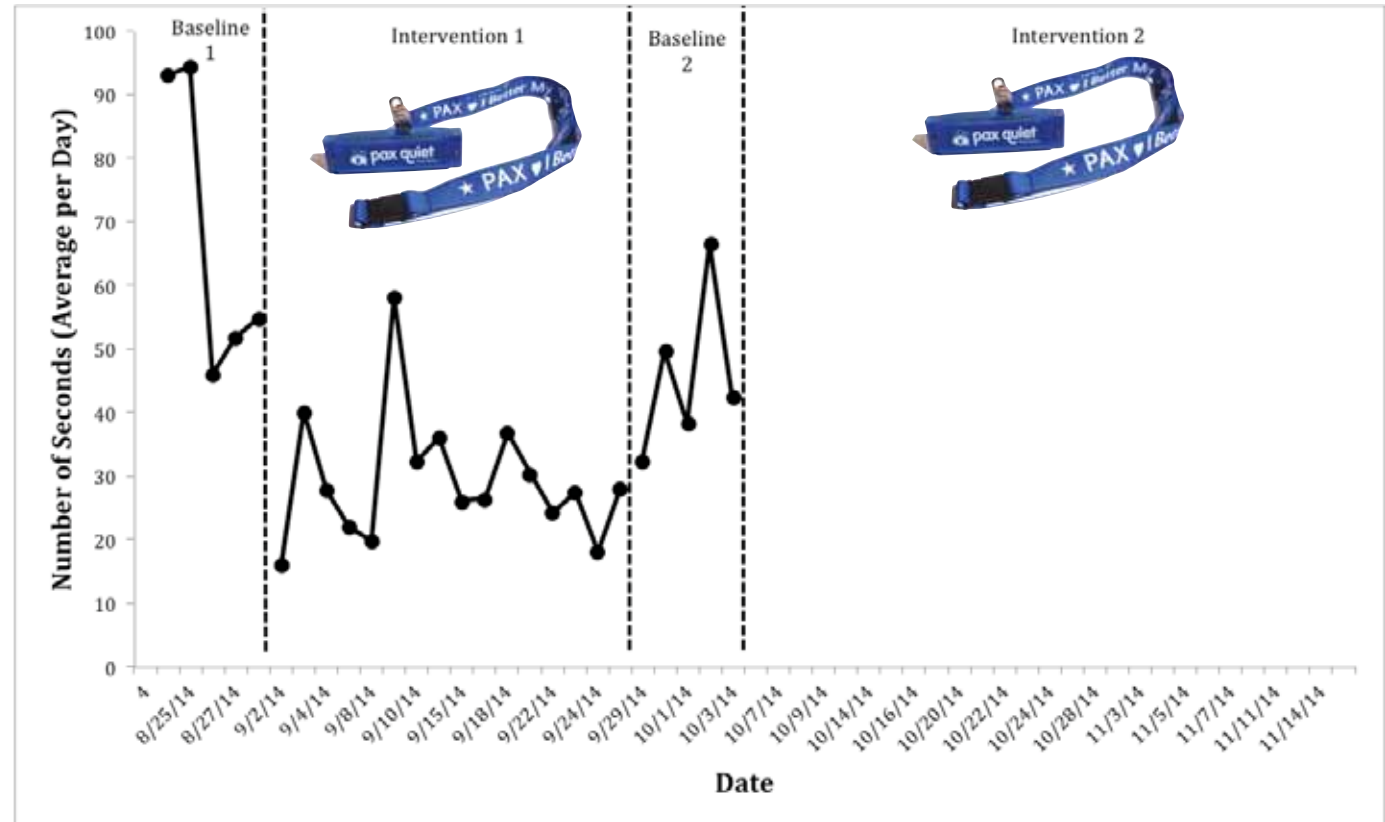


An evidence-based kernel creates early wins

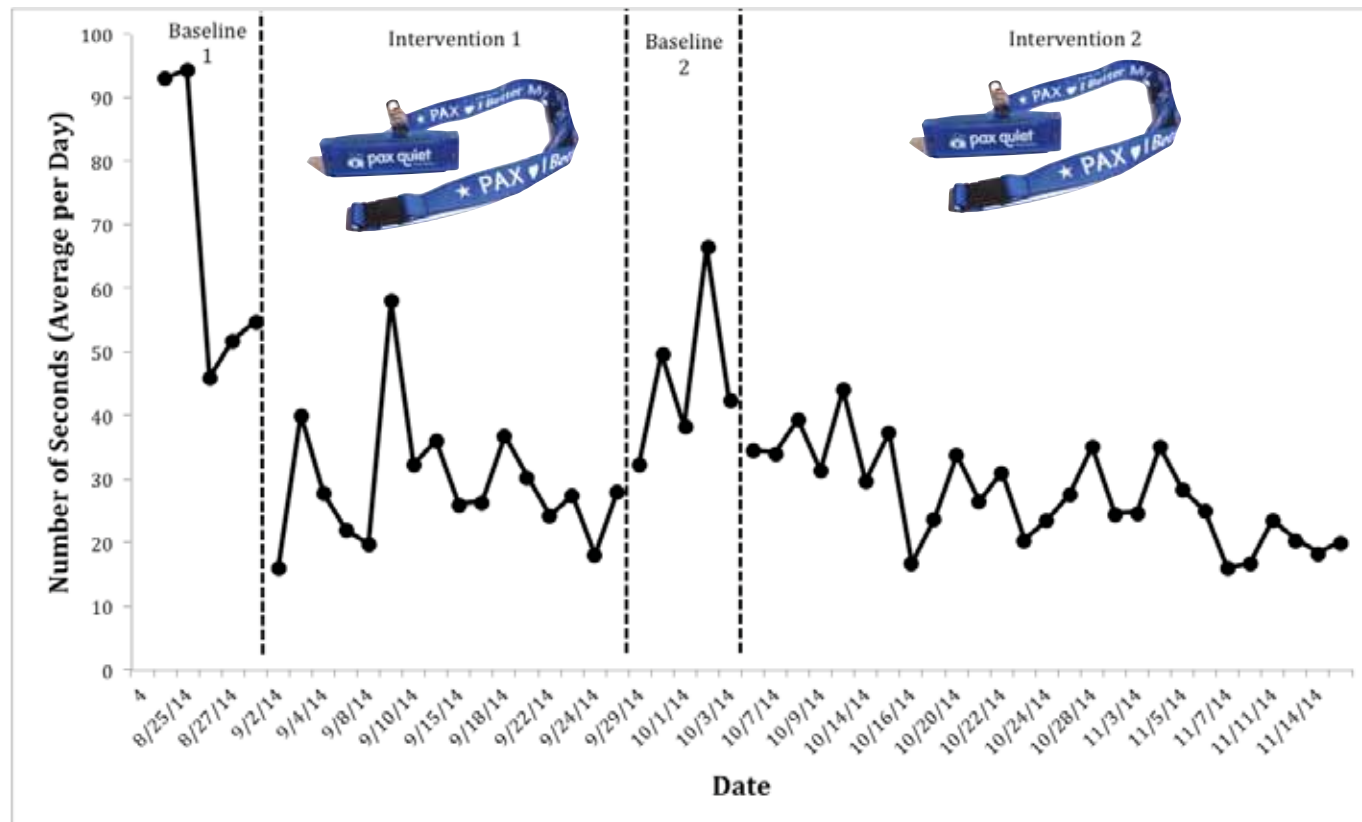


An evidence-based kernel creates early wins





An evidence-based kernel creates early wins



An evidence-based kernel creates early wins

## BEFORE

Draw or Write What Adults Do to Get Students to Be Quiet BEFORE PAX QUIET

Teacher use to shush kids when  
they to niosy or they would shout  
to the kids and tell the to be  
quiet.



## AFTER

Draw or Write What Adults Do to Get Students to Be Quiet AFTER PAX QUIET

Teacher do the peace sine now  
and blow harmonicas now.













A behavioral vaccine is...

A repeated behavior that nurtures wellbeing and reduces sickness and /or death

## Behavioral Vaccines and Evidence-Based Kernels: Nonpharmaceutical Approaches for the Prevention of Mental, Emotional, and Behavioral Disorders

Dennis D. Embry, PhD

### KEYWORDS


• Evidence-based kernels • Behavioral vaccines • Prevention  
• Public health

The Institute of Medicine Report on the Prevention of Mental, Emotional and Behavioral Disorders Among Young People<sup>1</sup> (IOM Report) provides a powerful map for how the United States might significantly prevent mental illnesses and behavioral disorders like alcohol, tobacco, and other drug use among America's youth. This document is already shaping United States policies, and will almost certainly affect Canada and other countries' policies. Mental, emotional, and behavioral disorders (MEBs) among America's youth and young adults present a serious threat to the country's national security<sup>2-7</sup> and to our economic competitiveness compared with 22 other rich countries.<sup>3-7</sup> Such MEBs are also the leading preventable cost center for local, state, and the federal governments.<sup>1,4</sup> Further, safe schools, healthy working environments, and public events or places are seriously compromised by MEBs as well.

## The Good Behavior Game: A Best Practice Candidate as a Universal Behavioral Vaccine

Dennis D. Embry<sup>1</sup>

A “behavioral vaccine” provides an inoculation against morbidity or mortality, impacting physical, mental, or behavior disorders. A historical example of a behavioral vaccine is antiseptic hand washing to reduce childhood fever. In current society, issues with high levels of morbidity, such as substance abuse, delinquency, youth violence, and other behavioral disorders (multi-problems), cry out for a low-cost, widespread strategy as simple as antiseptic hand washing. Congruent research findings from longitudinal studies, twin studies, and other investigations suggest that a possibility might exist for a behavioral vaccine for multiproblem behavior. A simple behavioral strategy called the Good Behavior Game (GBG), which reinforces inhibition in a group context of elementary school, has substantial previous research to consider its use as a behavioral vaccine. The GBG is not a curriculum but rather a simple behavioral procedure from applied behavior analysis. Approximately 20 independent replications of the GBG across different grade levels, different types of students, different settings, and some with long-term follow-up show strong, consistent impact on impulsive, disruptive behaviors of children and teens as well as reductions in substance use or serious antisocial behaviors. The GBG, named as a “best practice” for the prevention of substance abuse or violent behavior by a number of federal agencies, is unique because it is the only practice implemented by individual teachers that is documented to have long-term effects. Presently, the GBG is only used in a small number of settings. However, near universal use of the GBG, in major political jurisdictions during the elementary years, could substantially reduce the incidence of substance use, antisocial behavior, and other adverse developmental or social consequences at a very modest cost, with very positive cost-effectiveness ratios.



Used 3+ times per day  
during any school activity

To teach, practice, self-monitor, and celebrate self-regulation  
with peers for a purpose of bettering self and others



# *Why is self-regulation to our futures?*

## Watch Prime Time Media Headlines and Data



Use Hashtag: **#SaveAllKids**





# *Why is self-regulation to our futures?*

## Watch Prime Time Media Headlines and Data



Use Hashtag: **#SaveAllKids**



What might be the ROI if all Estonian 18,000 first graders were protected by the PAX Good Behavior Game?



1,548	Fewer young people will need any form of special education services
1,002	More boys will likely graduate from high school.
1,202	More boys will likely enter university
1,598	More girls will likely graduate from high school
1,248	More girls will likely enter university
175	Fewer young people will commit and be convicted of serious violent crimes
1,731	Fewer young people will likely develop serious drug addictions
1,184	Fewer young people will likely become regular smokers
638	Fewer young people will likely develop serious alcohol addictions
873	Fewer young women will likely contemplate suicide
1,184	Fewer young men will likely attempt suicide

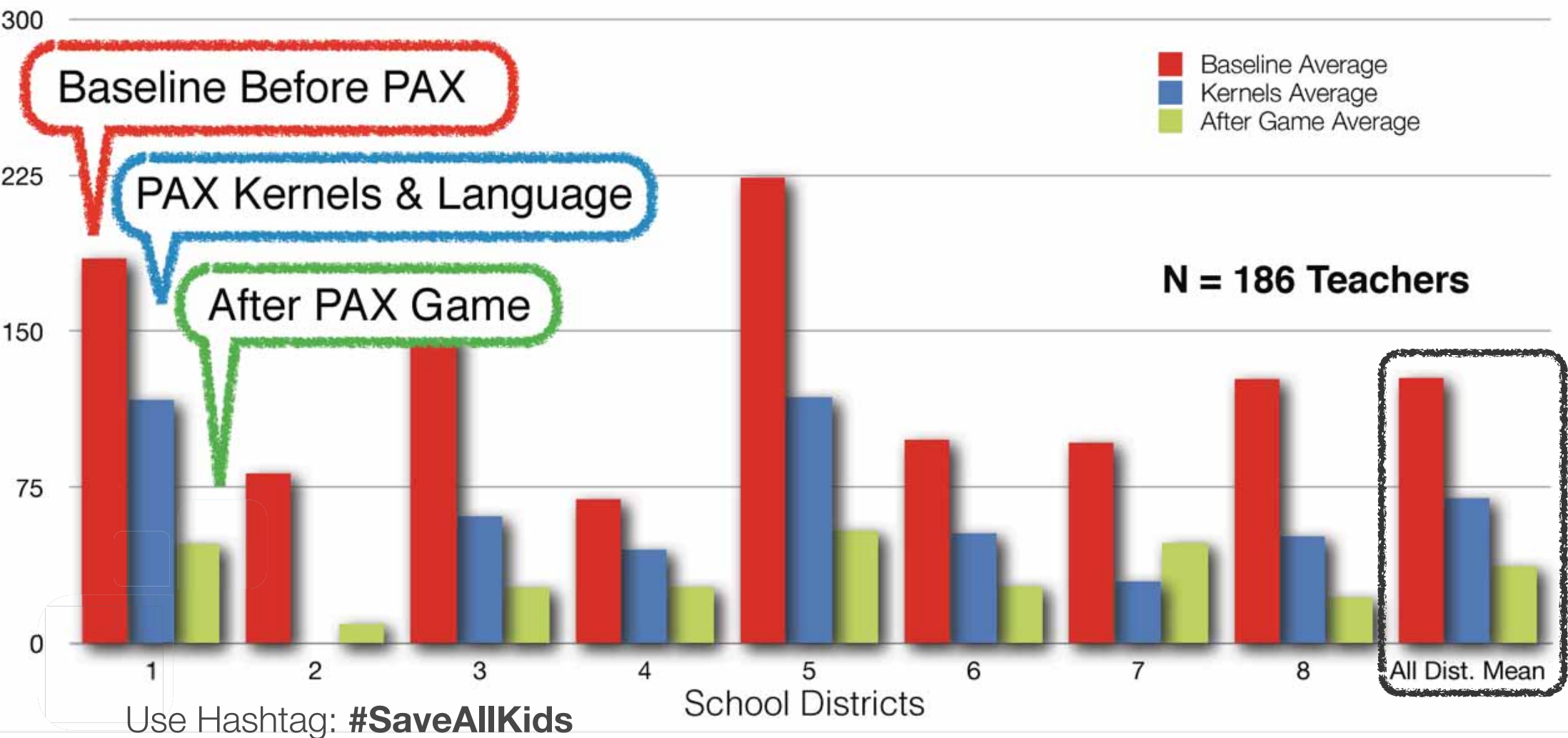


Saving Estonia between €120m to €170m  
Per Cohort by Age 19-21 (for €2.4m)

Use Hashtag: **#SaveAllKids**

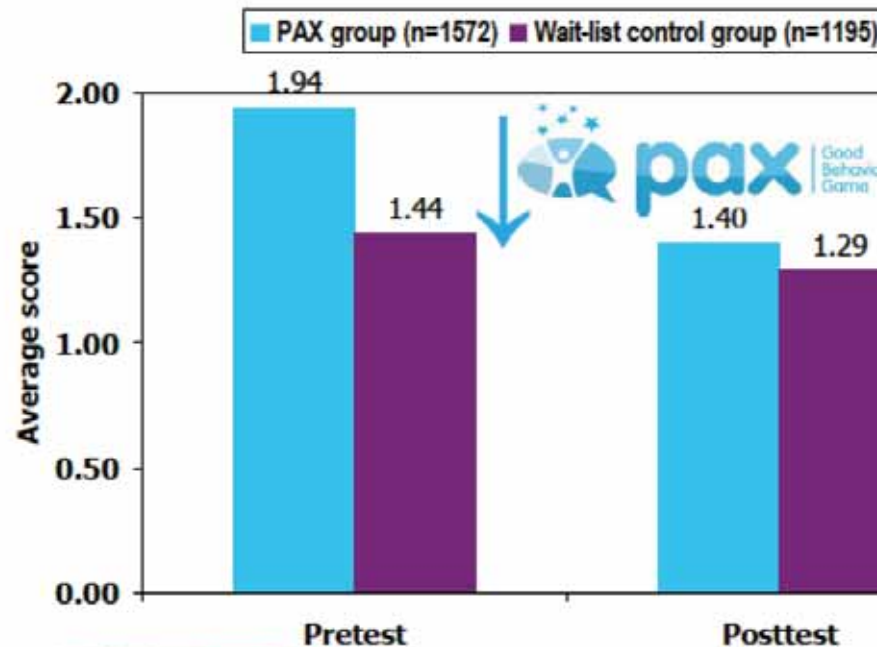


# 3-Month Impact of PAX in Eight US School Districts on Disturbing, Disruptive and Inattentive Behaviors Per 15 minutes



## PRELIMINARY

### Immediate Effect of PAX on Children's Emotional Symptoms, 2011-2012 (SDQ - Strengths and Difficulties Questionnaire)



PAX had a statistically significant effect ( $-.59, p=.02$ ) in reducing children's emotional symptoms: (often complains of headaches, stomach-aches or sickness; many worries, often seems worried; often unhappy, down-hearted or tearful; nervous or clingy in new situations, easily loses confidence; many fears, easily scared)

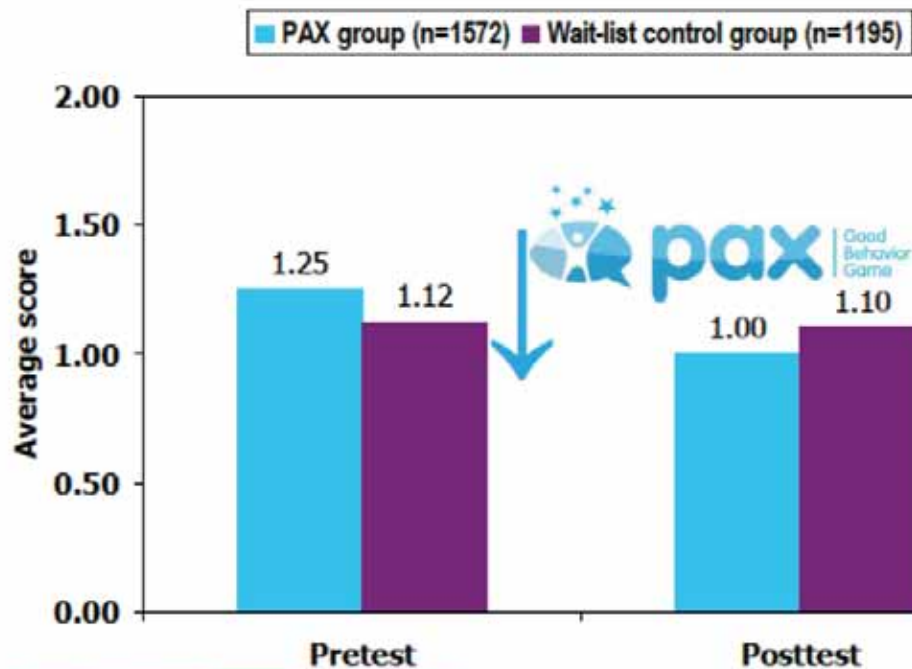
**Standardized effect size: .29**  
compared to .18 for prevention programs for child anxiety and .25-.30 for the FRIENDS program (Fisak et al., 2011), and .16-.22 for prevention programs for child depression (Fingeret et al., 2006; Horowitz & Garber, 2006; Jane-Llopis et al., 2003)

NOTE: Shorter bars are better

Presentation for Healthy Child Committee of Cabinet – May 13, 2013

## PRELIMINARY

### Immediate Effect of PAX on Children's Conduct Problems, 2011-2012 (SDQ - Strengths and Difficulties Questionnaire)

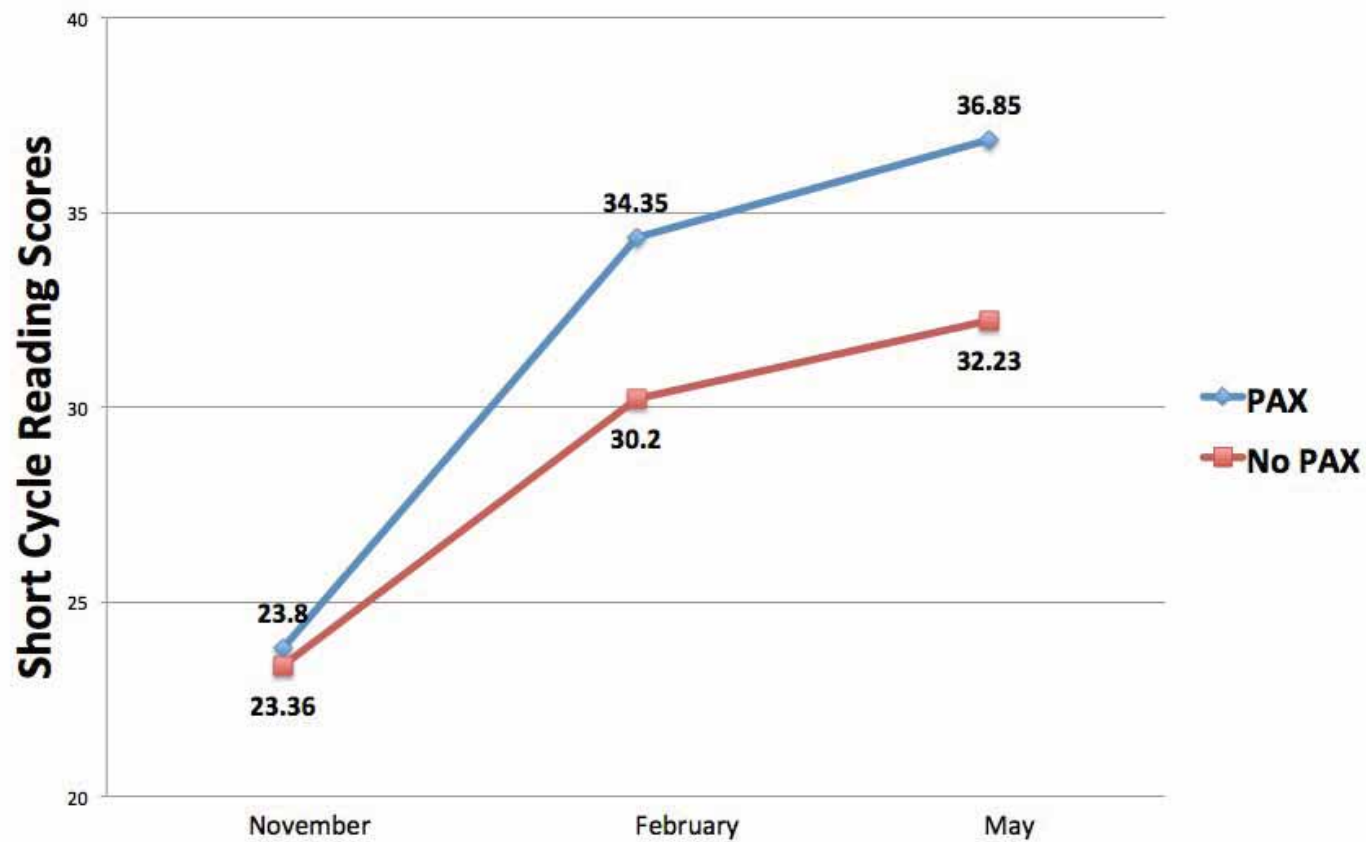


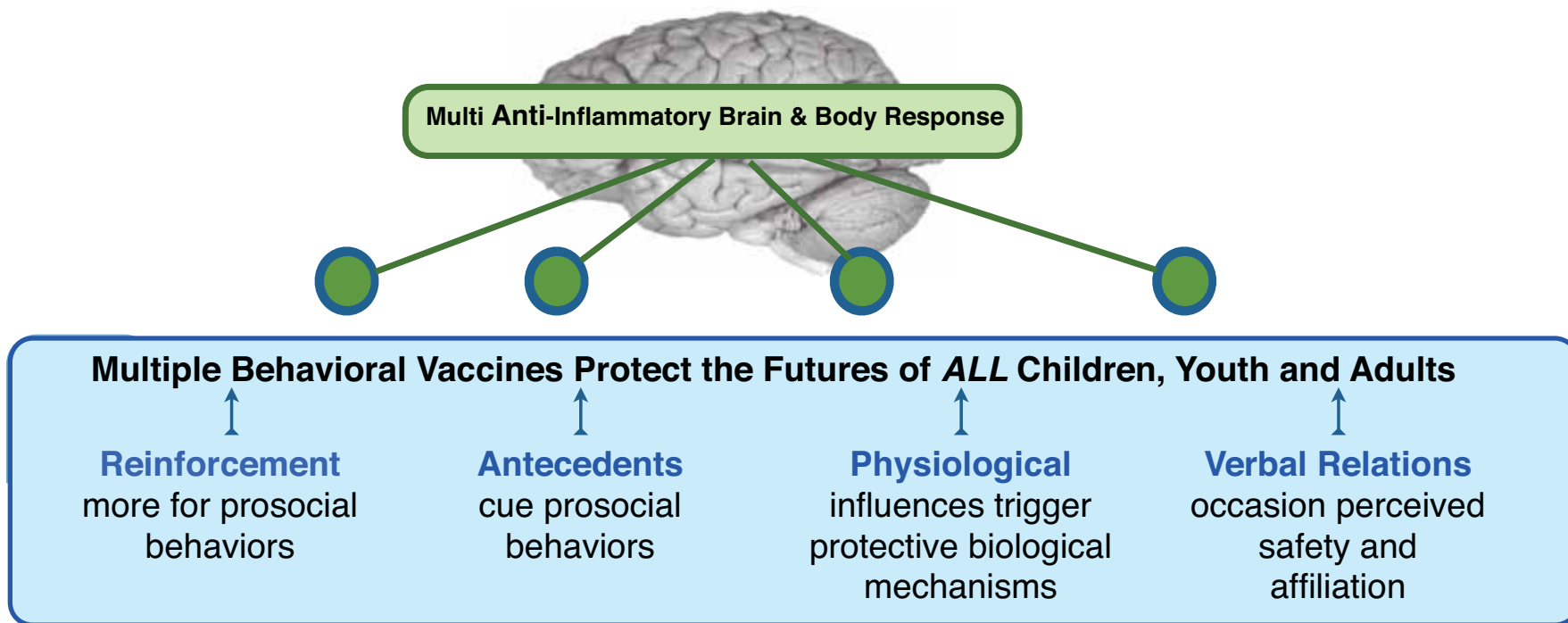
PAX had a statistically significant effect ( $-.82, p=.002$ ) in reducing children's conduct problems: (often has temper tantrums or hot tempers; generally obedient, usually does what adults request [*reverse scored*], often fights with other children or bullies them; often lies or cheats; steals from home, school or elsewhere)

**Standardized effect size: .47**  
compared to .25 for ROE (Santos et al., 2011), .21 for model/demonstration programs, and .10 for routine practice (Wilson et al., 2003; Wilson & Lipsey, 2007)



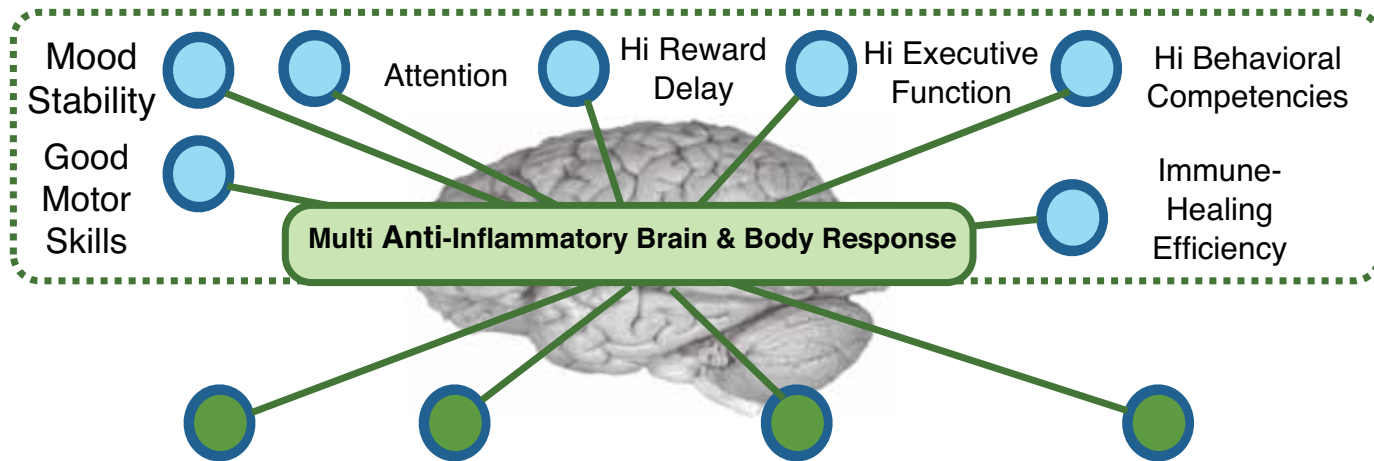
### Saville Elementary 4th Grade 2012-2013





Changing Conditions to Protect and Prevent





### Multiple Behavioral Vaccines Protect the Futures of **ALL** Children, Youth and Adults

**Reinforcement**  
more for prosocial  
behaviors

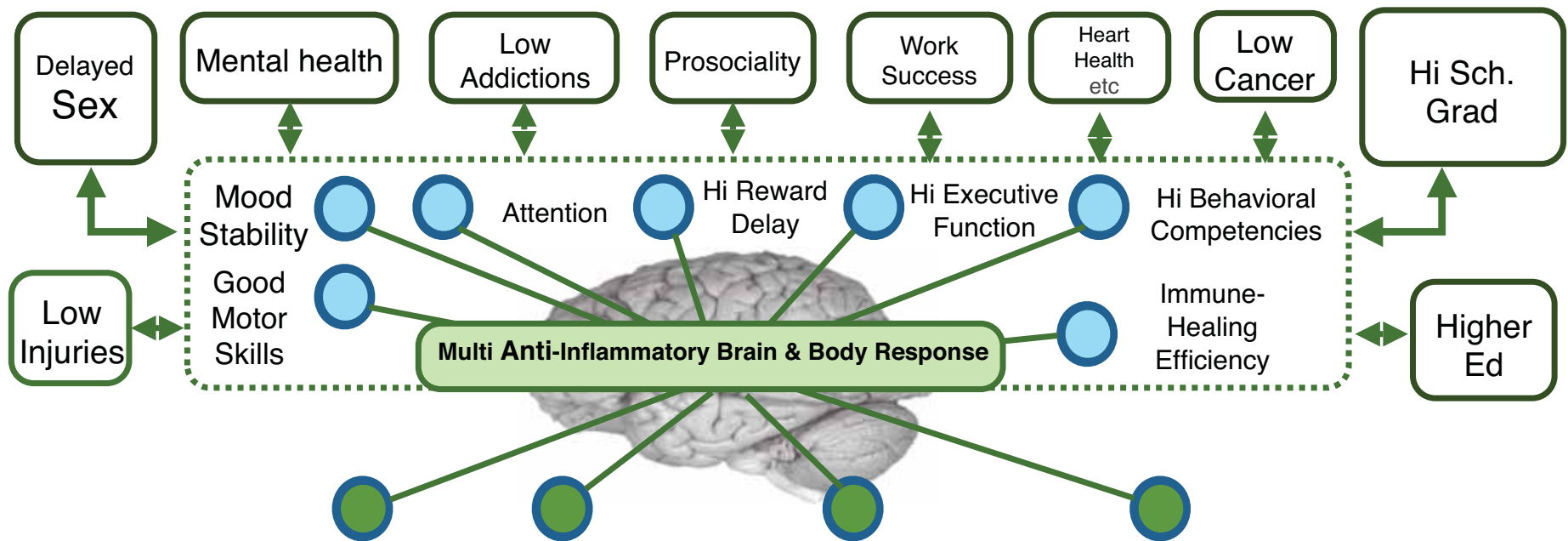
**Antecedents**  
cue prosocial  
behaviors

**Physiological**  
influences trigger  
protective biological  
mechanisms

**Verbal Relations**  
occasion perceived  
safety and  
affiliation

## Changing Conditions to Protect and Prevent





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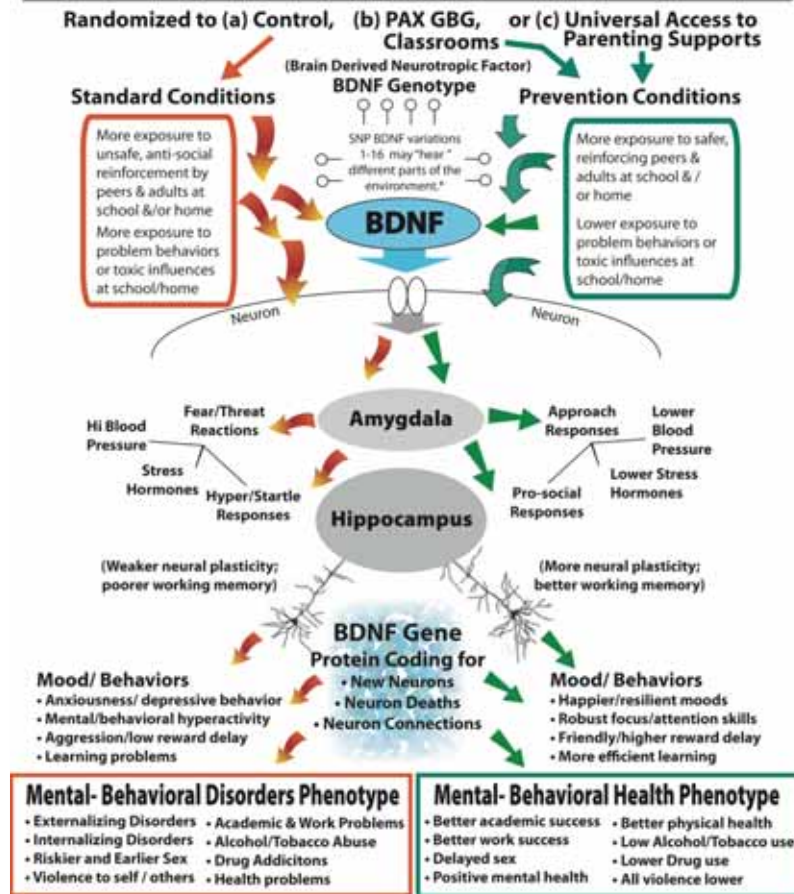
**Physiological**  
influences trigger  
protective biological  
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**Verbal Relations**  
occasion perceived  
safety and  
affiliation

Changing Conditions to Protect and Prevent



# How the Social Environment Affects Expression of Genes Associated with Mental and Behavioral Disorders from Recent Experimental Results Following Children for Two Decades\*



Prev Sci  
 DOI 10.1007/s11121-013-0441-3

## Reducing Aggression and Impulsivity Through School-Based Prevention Programs: A Gene by Intervention Interaction

Rashelle J. Musci · Catherine P. Bradshaw · Brion Maher · George R. Uhl · Sheppard G. Kellam · Nicholas S. Ialongo

© Society for Prevention Research 2013

**Abstract** A variety of school-based, universal preventive interventions have been developed to address behavioral and mental health problems. Unfortunately, few have been evaluated within the context of randomized controlled trials with long-term follow-up. Even fewer still have examined the potential genetic factors that may drive differential impact of the intervention. In the present analysis, we examine the extent to which the longitudinal effects of two elementary school-based interventions were moderated by the brain-derived neurotrophic factor (BDNF) gene, which has been linked with aggression and impulsive behaviors. The sample included 678 urban, primarily African American children who were randomly assigned along with their teachers to one of three first grade classroom conditions: classroom-centered (CC) intervention, Family School Partnership (FSP), or a control condition. The teacher ratings of the youth's aggressive and impulsive behavior were obtained at baseline and in grades 6–12. Single-nucleotide polymorphisms (SNPs) from the BDNF gene were extracted from the genome-wide data. Longitudinal latent trait state error models indicated a significant interaction between a particular profile of the BDNF SNP cluster (46 % of sample) and CC intervention on impulsivity ( $\beta = -.27, p < .05$ ). A similar interaction was observed for the BDNF SNP cluster and the CC intervention

on aggression ( $\beta = -.14, p < .05$ ). The results suggest that the impacts of preventive interventions in early elementary school on late adolescent outcomes of impulsivity and aggression can be potentially modified by genetic factors, such as BDNF. However, replication of these results is necessary before firm conclusions can be drawn.

**Keywords** Aggression · Impulsivity · Genes · Brain-derived neurotrophic factor · Intervention · Schools

An early onset of aggressive and impulsive behavior problems in childhood is associated with increased risk for mental health and problems in adolescence and adulthood (Bradshaw et al. 2010; Ialongo et al. 2006; Moffitt 2006; Petras et al. 2004). The need for efficacious prevention programs is particularly great in urban communities, where the risk for behavioral, mental health, and academic concerns is considerably increased (Institute of Education Sciences 2011; Institute of Education Sciences 2012; Perie et al. 2006). Only a select number of school-based prevention programs have been effective at reducing rates of behavioral and mental health problems through late adolescence (Wilson and Lipsey 2007). One such program is the Good Behavior Game (GBG). Another program of interest is the Family School Partnership (FSP), which was designed to reduce early risk behaviors by enhancing family-school communication and parent behavior management and academic instruction skills. These interventions are designed to target the early antecedents of problem behaviors such as substance abuse, depression, and antisocial behavior. This work is supported by previous work showing that learning problems in childhood can predict psychiatric distress and that early aggressive behavior can predict later antisocial behavior and substance use (Kellam et al. 2008).

The preventive effects of the GBG and FSP interventions were evaluated within the context of a randomized controlled trial by the Johns Hopkins Prevention Intervention Research

**Electronic supplementary material** The online version of this article (doi:10.1007/s11121-013-0441-3) contains supplementary material, which is available to authorized users.

R. J. Musci (✉) · C. P. Bradshaw · B. Maher · S. G. Kellam · N. S. Ialongo  
 Department of Mental Health, Johns Hopkins Bloomberg School of Public Health, Rm. 806, 624 N. Broadway, Hampton House 850, Baltimore, MD, 21205, USA  
 e-mail: rmusci@jhsph.edu

G. R. Uhl  
 Molecular Neurobiology Division, NIDA Intramural Research Program, Baltimore, MD, USA

Published online: 01 November 2013

Springer

Earliest version of PAX GBG

Causes protective phenotypic BDNF gene expression

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March 2015, Vol. 4, No. 1, pp. 245-254  
ISSN: 2334-296X (Print), 2334-2978 (Online)  
Copyright © The Author(s). 2015. All Rights Reserved.  
Published by American Research Institute for Policy Development  
DOI: 10.15640/jehd.v4n1a22  
URL: <http://dx.doi.org/10.15640/jehd.v4n1a22>

## Teaching Prevention: The Impact of a Universal Preventive Intervention on Teacher Candidates

Jason D. Fruth<sup>1</sup> & Mary J. Huber<sup>2</sup>

### Abstract

This study examines the impact of delivering a universal preventive intervention to pre-service early childhood teacher educator candidates. Multiple studies list classroom impacts of the PAX Good Behavior Game on students' proximal and distal outcomes including decreased disruptive behaviors, decreased substance abuse, alcohol dependence, and tobacco use. However, little is known about the impact of PAX GBG on teachers. This randomized control study included a group of teacher candidates who received PAX GBG as part of their teacher education instruction and a control group that received traditional teacher education instruction. The results showed that the PAX group reported significantly higher levels of self-efficacy in all areas after the intervention and also when compared to the control group.





8,000 teachers trained in the US last year





To protect Estonia's Future,  
must make sure 800  
teachers this behavior  
vaccine well each year.



8,000 teachers trained in the US last year

# *Recall The Thomas Francis Polio Public Health Study:* Bigger Picture Design of Public Health Brain Protection Studies Across Multiple Nations

## 1. Three Conditions

1.1. Proven Scalable  
Behavioral Vaccine  
(e.g. PAX GBG)

1.3. Site Chosen Behavior  
Vaccine Innovation

1.4. Programs as Usual

## 2. Sample Sizes

2.1. 30-90 first grade  
classrooms (750 to 2,500  
children )

2.2. Randomly assigned to  
condition

## 3. Analyses

3.1. Within Country/Community

3.2. Pooled Across Sites

3.3. Mediators/Moderators

3.4. ??

Mobilization &  
Investigator  
Teams  
for Each Site

Implementation  
Teams for Each  
Site

Common &  
Special  
Measures for  
Each Site

National  
supports

National  
media

See Resource Table for Children's Network By PAXIS Institute...for some relevant details and steps

Use Hashtag: **#SaveAllKids**



1 Year Old



64 Years Old



## Further Reading

- Search [www.pubmed.gov](http://www.pubmed.gov) (National Library of Medicine) for the following:
  - “Behavioral Vaccines
  - “Evidence-based kernels”
  - “Nurturing Environments

Image of the **Koru**,  
the Maori infinite  
symbol of spiral of life

*Thank you*

Visit <http://bit.ly/DennisPublications>

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- Video clip from CBC National for Good Behavior Game
- Nobel Prize Committee photo of Elinor Ostrum



Dennis D. Embry  
[dde@paxis.org](mailto:dde@paxis.org)