From Small Beginnings Come Greater Goods

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Applying Evidence-Based Science Beyond Publications

American Speech-Language Hearing Association’s • Carlsbad, CA • 03/20/2014
Foretelling my talk today

- Identifying fundamental units of change for speech, language, and hearing
- Developing a testable approach for improving speech, language, and hearing outcomes at a population level
We don’t need another Silicon Valley. We need a Carbon Valley…
Our iPhones, iPads and computers run on silicon
Our iPhones, iPads and computers run on silicon

Our lives and futures run on carbon lifeforms
What is the equivalent of the periodic table of basic, non-reductible elements for creating speech, language and hearing?
This work establishes a scientifically substantiated link between children's early family experience and their later intellectual growth—a link that exists regardless of a child's race.

This story describes the authors' years of research as they search for the roots of intellectual disparity. Hart and Risley examined the daily lives of 1- and 2-yr-old children in typical American families. They found staggering contrasts at the extremes of advantage—and within the middle class—in the amount of interaction between parents and children.

These differences in the amount of early family experience translate into striking disparities in the children's later vocabulary growth rate, vocabulary use, and IQ test scores.

Citation Index: 1,485 as of March 19, 2014
Reflecting on your knowledge of Speech, Language and Hearing

Simple, proven, practical tools to help
Action…

1. Write the name of the strategy
2. Write what it increases
3. Write what it decreases
4. Write how many people could benefit by using the strategy in North America
5. What’s a good reference for the strategy
6. How difficult is it to learn (time, skill, other)
7. Can this be evaluated in a single-subject design (Yes, no, unclear)
8. Write your name and email
9. Give your note to the organizers before the end of the day
What is an evidence-based kernel?

- Is the smallest unit of scientifically proven behavioral influence.
- Is indivisible; that is, removing any part makes it inactive.
- Produces quick easily measured change that can grow much bigger change over time.
- Can be be used alone OR combined with other kernels to create new programs, strategies or policies.
- Are the active ingredients of evidence-based programs.
- Can be effective at a public-health or population level, even spread by media or word of mouth.
- Can heal or reduce past disparities.
Kernels are building blocks of behavior change

- Humans survive individually and collectively by influencing the behavior or other humans.
- The 2008 paper by Embry and Biglan identifies 52 evidence based kernels that can be used to design or improve programs.
- We in this room can find new kernels.

For advancing Speech-Language Hearing Nurturing Environments widely
From the 19th century, the “Ivory Tower” has been used to designate a world or atmosphere where intellectuals engage in pursuits that are disconnected from the practical concerns of everyday life…

Illustration credit: Tim Ketzer.com
Planting and growing your evidence-based kernels

- The kernel can fit into naturally occurring human ecologies and routines
- Develop with subject-designs before randomized trials
- Has easily perceived/measured proximal gains. Has robust reliability when implemented versus depending on tight dose and fidelity
- Consilient with multiple theoretical perspectives
- Can grow symbiotically with other kernels
- Can it fit into selection by consequences
- And…
If some kernels, or combination of kernels, are used often…

• May improve indicators of wellbeing, reduce morbidity and possibly mortality (a behavioral vaccine) to affect lifetime language, hearing and speech plus other related outcomes beneficial to the individual, his or her family, and the larger society…
Example of evidence-based kernel recipe as behavioral vaccine
Building and testing logic model for population-level influence or change

Update Research Databases for Proven Prevention Solutions

Document User Experiences & Lessons Learned at Local, State, & National Levels

Report on monitoring & evaluation of quick, medium, longer term outcomes

Recognize & Reward successes In/by
- Media
- Political arena
- Other leaders
- Imitable models from all ages and backgrounds

Nurturing Environments Logic Model for population-level benefits

Multi-problem analyses
- Identify Behaviors to Increase
  - Linked causes & mechanisms
- Identify Behaviors to Decrease

Predict Benefits:
- Estimate local, state, & national prevalence & costs saved by proposed prevention recipes.
- Cite powerful studies & links to cultural practices
- Cite relevant endorsements or standards

Create policy, organizational, & advocacy supports to nurture efforts
- Develop Business Model

Cultivate some current or early adopters for local impact data and local testimonials.
- Create system for monitoring, evaluation & research

Plan Population-Level Change: Reach, Efficacy, Adoption, Implementation, & Maintenance

Create Community Prevention Score/Dashboard

Launch Social Marketing: Advocacy & Media
- Products have catchy, positive name (a meme)
- Place for getting product is easy & non-stigmatizing
- Price is low for use in money or time.
- Promotion focuses on popularity, joining, aligned values & benefits for all.
  Creative epidemiology aligns people & organizations for common action.

Create workforce & training systems
- Monitor & Coach implementation & proximal outcomes

Developmental stages
- Birth
- Childhood
- Adolescence
- Adulthood
- Old age

Population-Level Targeting
- Low intensity
  - High reach
  - Birth Childhood
  - Adolescence
  - Adulthood
  - Old age

- High intensity
  - Low reach
  - Birth Childhood
  - Adolescence
  - Adulthood
  - Old age

Note Workforce development: efficiency achieved by broad use of similar/same evidence-based strategies or evidence-based kernels.
The first whole classroom study of behavioral psychology in the world…

Longitudinal Johns Hopkins Studies of GBG

Kindergarten

Every child rated by teachers

NREPP
National Registry of Evidence-Based Programs and Practices
Please visit http://bit.ly/NREPP
Longitudinal Johns Hopkins Studies of GBG

Kindergarten

Every child rated by teachers

First Grade

GBG

NO GBG

Tested in 41 first- and second-grade classrooms within 19 elementary schools with two consecutive groups of first graders.
Longitudinal Johns Hopkins Studies of GBG

Kindergarten: Every child rated by teachers.

First Grade:
- GBG
- NO GBG

Tested in 41 first- and second-grade classrooms within 19 elementary schools with two consecutive groups of first graders.

Grades 2 thru 12 Follow Up:
- No More GBG
- No GBG

Purpose: To find out if GBG affected their adolescent lives.

Note: Some kids got GBG in 1st Grade only, and some in both 1st & 2nd grade.

National Registry of Evidence-Based Programs and Practices
Please visit http://bit.ly/NREPP
Longitudinal Johns Hopkins Studies of GBG

Kindergarten: Every child rated by teachers

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Grades 2 thru 12 Follow Up: Purpose: To find out if GBG affected their adolescent lives.
Note: Some kids got GBG in 1st Grade only, and some in both 1st & 2nd grade,

Young Adulthood Follow Up: Purpose: To find out if GBG affected their adult lives.

NREPP: National Registry of Evidence-Based Programs and Practices
Please visit http://bit.ly/NREPP
4,000,000 First graders exposed to PAX GBG for one year had these benefits at age 21.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Long Term Outcome Indicator at Age 21</th>
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<tbody>
<tr>
<td>350,306</td>
<td>More boys predicted to graduate from high school</td>
</tr>
<tr>
<td>226,668</td>
<td>More boys predicted to enter university</td>
</tr>
<tr>
<td>272,002</td>
<td>More girls predicted to graduate from high school</td>
</tr>
<tr>
<td>361,444</td>
<td>More girls predicted to enter university</td>
</tr>
<tr>
<td>282,440</td>
<td>More boys’ lives protected from violent crime &amp; criminal records</td>
</tr>
<tr>
<td>39,564</td>
<td>More boys’ lives protected from serious drug addictions</td>
</tr>
<tr>
<td>391,518</td>
<td>More boys’ lives protected from regular smoking</td>
</tr>
<tr>
<td>267,881</td>
<td>More boys’ lives protected from alcohol addictions or abuse</td>
</tr>
<tr>
<td>144,244</td>
<td>More boys’ lives protected from needing any service use</td>
</tr>
<tr>
<td>197,510</td>
<td>More girls’ lives protected from suicidal thoughts</td>
</tr>
<tr>
<td>267,881</td>
<td>More boys’ lives protected from suicidal thoughts</td>
</tr>
</tbody>
</table>

$54 Billion

Total Predicted Savings to Child, Family, Community, State, and Federal Agencies when the cohort of first-graders reach age 21

SOURCE: Aos, S., et al. (2013) Good Behavior Game, Return on Investment: Evidence-Based Options to Improve Statewide Outcomes. 8

Read this and other studies about the Good Behavior Game at [www.pubmed.gov](http://www.pubmed.gov)
Refining active ingredients for population-level scale up for ROBUST implementation rather than “dose & fidelity”

<table>
<thead>
<tr>
<th>Kernel or Critical Component</th>
<th>Kernel Rationale</th>
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<tbody>
<tr>
<td>Response cost for negative behavior (e.g., Conyers et al., 2004)</td>
<td>Easier to use and effective for ADHD like behaviors</td>
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<tr>
<td>Team competition (e.g., Beersma et al., 2003)</td>
<td>Creates positive peer pressure, and reduces negative peer attention</td>
</tr>
<tr>
<td>Public posting of results (e.g., Parsons, 1982)</td>
<td>Increases performance and peer pressure</td>
</tr>
<tr>
<td>Team Rotations (deemed critical but no study)</td>
<td>Reduces bullying and peer rejection</td>
</tr>
<tr>
<td>Low emotional response to negative behaviors (e.g., Abromowitz et al., 1987)</td>
<td>Reduces accidental attention to negative behavior by adult</td>
</tr>
<tr>
<td>Three games per day (deemed critical but no study)</td>
<td>Improves maintenance of skill</td>
</tr>
<tr>
<td>Use of timer (e.g., Adams &amp; Drabman, 1995)</td>
<td>Creates pressure to succeed and excitement</td>
</tr>
<tr>
<td>Secret Game (unannounced) – indescribable contingency – (Freeland &amp; Noel, 2002)</td>
<td>Increases generalization to non-game times</td>
</tr>
<tr>
<td>Lower points to win (e.g., Harris &amp; Sherman, 1973)</td>
<td>Causes more rapid improvement</td>
</tr>
<tr>
<td>Student help design game rules (e.g., Fishbein &amp; Wasik, 1981)</td>
<td>Improves acceptance by students and occasions correspondence</td>
</tr>
<tr>
<td>Relational frame language correspondence training (e.g., “I’m a PAX Leader”) (Embry et al., 1996)</td>
<td>Improves generalization of rule governed behavior</td>
</tr>
<tr>
<td>Use of Premack Principle for prizes (e.g., Browder et al., 1984)</td>
<td>Improves acceptability of game by students and adults</td>
</tr>
<tr>
<td>Non-verbal cues (e.g., Rosenkoetter &amp; Fowler, 1986; Cox, Cox, &amp; Cox, 2000)</td>
<td>Accelerates generalization and adoption of the game</td>
</tr>
<tr>
<td>Meaningful roles as DRO (e.g., Rutter, 1981)</td>
<td>Increases attention to positive behavior; reduces problem actions</td>
</tr>
<tr>
<td>Setting generalization — recipe for carrying over the Game to hallways, restrooms, cafeteria, etc. (e.g., Fishbein &amp; Wasik, 1981)</td>
<td>Improves generalization by students and acceptability of game by adults</td>
</tr>
<tr>
<td>Symbolic self-modeling (e.g., Embry et al., 1996)</td>
<td>Improves imitation of behavior</td>
</tr>
<tr>
<td>School-home note (e.g., Kelley et al., 1988)</td>
<td>Prompts family reinforcement and generalization of behavior to home</td>
</tr>
<tr>
<td>Peer-to-peer praise notes (e.g., Embry et al., 1996; Skinner et al., 2000)</td>
<td>Improves social competence and reduces negative peer attention</td>
</tr>
<tr>
<td>Self-monitoring by teacher (e.g., Agran et al., 2005)</td>
<td>Improves mastery of skill and results by teacher</td>
</tr>
<tr>
<td>Good behavior lottery (e.g., Putman et all, 2003)</td>
<td>Improves generalization when not playing the game</td>
</tr>
</tbody>
</table>
CTV Winnipeg: Game helps kids improve behaviour

Jon Hendricks reports on a development strategy designed to help kids learn social and emotional skills.

Pax game helps kids improve behaviour
How and where we might go to create the first carbon valley?

We create and test evidence-based kernels for Speech, Language and Hearing that can be scaled to better the world. Lodge that database with the Foundation.
From small beginnings come greater goods…

…Attributed to St. Francis of Assisi

Benjamin Franklin started the Leather Apron Club in 1727, when he was 21 years old. Franklin required each member “should produce one or more queries on any point of Morals, Politics, or Natural Philosophy, to be discuss'd by the company” at each meeting, followed by writing essays for practical improvements.

American science moved inquiry for ornamentation or aesthetics to practical invention, from the earliest roots of science in America.
Bridging the ivory archipelago and the perils of cladistics…
Epigenetics are heritable changes in gene expression caused by mechanisms other than changes in the underlying DNA sequence. These changes can pass through multiple generations.

These polygenes can be “added”, “subtracted”, “divided”, or “multiplied.”
Move from minor theory to BIG theory
Consider the sheer joy… Of making meaningful differences…
Thank you

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