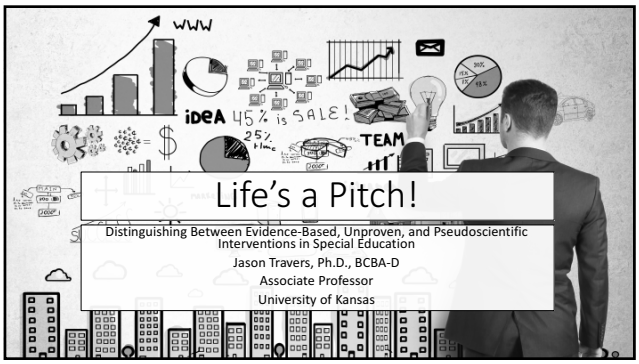

Life's a Pitch!

Distinguishing Between Evidence-Based, Unproven, and Pseudoscientific Interventions in Special Education

Jason Travers, Ph.D., BCBA-D
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Pseudoscience Abounds

- Most dietary supplements
- Brain training/exercise
- Chiropractic
- Psychoanalysis
- Racism
- Acupuncture
- Astrology
- Aromatherapy
- ESP
- Dowsing
- Anti-flouridated water
- Naturopathy
- Beauty products
- Homeopathy
- Anti-vaccination
- Intelligent design
- Polygraph (lie detector)
- Electronic voice phenomenon (ghost hunting)
- Flat Earth
- Feng Shui
- Handwriting analysis
- Cupping (Michael Phelps)

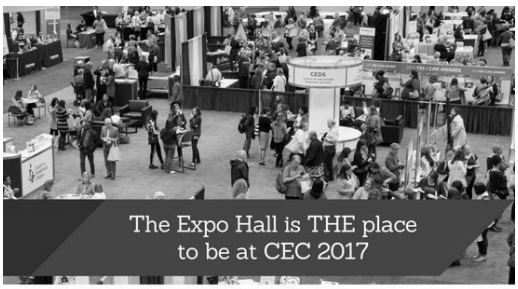
Someone is Always Trying to Persuade Us

Persuasion & Product Placement

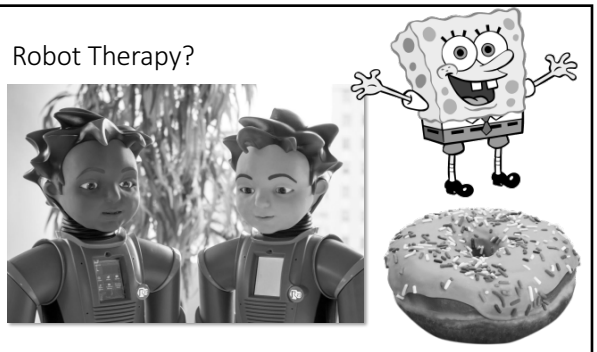
Savvy Marketing

007/Bond Films
Cast Away
E.T.
Risky Business
Sex in the City

Example



Robot Therapy?



Global K-12 Education Market Size in 2015: $2.47 Trillion

U.S. K-12 Education Market Size in 2015: $789 billion

U.S. PK-12 Special Education Spending in 2015: $34.1 Billion

An "Evidence-Based" (Special) Education

- Evidence-based: Multiple studies of very high quality indicate the intervention is very likely to be effective
- Response to unproven, disproven, and pseudoscientific interventions
  - Persistent problem in general and special education

- Whole language reading instruction
- Learning Styles
- Facilitated communication (AKA, rapid prompting method; supported typing)
- Fast Forword
- Irlen lenses
- Brain gym
- Psychomotor patterning
- Self-esteem curriculum
- Floortime/DIR
- Diets (red dye; sugar; gluten)
- Scared straight

"Bandwagons also go to funerals" ~Burton Blatt

- Learning Styles
- Multiple intelligences
- Emotional Intelligence
- Brain-based teaching
- Full inclusion/Mainstreaming
- New Math
- Keyword instruction
- Discovery learning
- Irlen lenses/colored overlays
- Differentiated instruction
- Core knowledge
- Self-esteem
- Cultural Literacy
- Flipped classroom
- Gentle Teaching
- Multi-sensory education
- Reading across the curriculum
- Special Diets (red dye; gluten free)
- Thematic curriculum
- GRIT
- **Sensory integration interventions**

So… What's The Harm?

The Ultimate Fad?

- Sensory interventions
  - Scooters, swings, ball pits, brushing, etc.
  - Very popular
  - Cost : $30-$165/hour per student*
    - 1 hr/week x 36 weeks = $2,160 – $11,880 per student/yr*
- Approximately 13% of students have disabilities
  - If 2.5% of all students receive sensory interventions
  - If treatment is 2 hours/week per AY

*Zane, Davis, & Rosswurm (2014)

Estimated Investment in Sensory Interventions

- Wichita: $2.8 – $15.1 million
- Olathe: $1.6 – $8.7 million
- SMSD: $1.5 – $8.1 million
- Blue Valley: $1.2 – $6.7 million
- KCK: $1.2 – $6.6 million
- OKCPS: $2.2 – $12.2million
- Tulsa PS: $2.2 – $12.2 million
- Lincoln PS: $2.1 – $11.6
- St Louis City: $1.7 – $9.2 million
- North KC (MO): 41.0 – $5.9
- Des Moines: $1.9 – $10.2 million
- Cedar Rapids: $0.9 – $5.1 million

Other Harms Associated with Questionable Practices

- Intervention is discovered ineffective only after investment is made
  - Already limited resources are lost
- Limited access to effective education
  - Ethical and legal obligation to be effective educators
- Accumulated time lost to be educated
  - 15 min/day = 7.5 days lost per AY
  - 7.5 days/AY for 10 years = 75 days lost
  - @18 academic years = 135 days lost
  - 60 min/day @ 10 years = 300 days lost
    - 540 days lost @18 years

Why do educators try unproven methods?

- Curiosity:
  - "Maybe this will work for Marco."
  - "What if this new reading intervention works better than what I'm using?"
- Compassion:
  - "He deserves the best interventions that are available."
  - "I'll do anything to help this kid.
- Desperation:
  - "I've tried everything I know of and nothing seems to be working."
- Fear:
  - "What if I'm refusing to try something that will produce a breakthrough?"

So what's an educator to do?

- BE A SKEPTIC!
  - Consider the source of the claim
  - Consider what your biases are and if they are influencing your belief
    - And what biases the proponent might have
  - Check for red flags of pseudoscience
  - Check for errors in reasoning
  - Consider the TYPE and AMOUNT of scientific evidence
  - Ascertain whether belief is compelled or not
    - Proportion confidence of belief with available evidence
    - Decide whether to invest resources

Skepticism

- Using reliable information to compel belief
  - Embracing doubt

Ubi dubium, ibi libertas

"With doubt, there is freedom"

- Doubt = asking questions
  - Should we use this reading curriculum? This program? Consultant?
- Choosing your beliefs about teaching, learning?
  - Or coming to a state of belief based on evidence

Skepticism

- A tool for informing beliefs
  - Not a belief system
- Credulous: believe almost anything for bad reasons
- Cynicism: doubtful of the motivations of all people; pessimistic
- Denialist: rejects claims despite overwhelming evidence
  - not a skeptic
- Skepticism: having good reasons for believing claims
  - Open-minded, but not so opened that your brain falls out.
  - Embraces good news, if warranted

Credulity

Cynicism
Denialism

Skepticism

Consider bias

- Acknowledge bias
  - sources of bias (e.g. MSNBC or FOX News?)
  - Direct instruction or project-based
  - Are you seeking confirmation, or refutation?
- Recognize errors in reasoning
  - Fallacious arguments (more in a bit)
- Be careful about all claims
  - Is there enough cause to compel belief?
- Know precisely what you need to be convinced or change your mind
  - Full inclusion?

Considering the Source of the Claim

Qualities of Credible Claims of Intervention Effectiveness (Desirable)	Red Flags for Concern About Claims of Intervention Effectiveness(Undesirable)
☐ Is the intervention identified as an EBP by one or more government agencies, university centers, technical assistance centers, and/or reputable non-profit organizations (e.g., What Works Clearinghouse, National Professional Development Center on ASD)?	☐ Are explanations about how the intervention works convoluted, confusing, and/or full of jargon in ways that seem scientific but remain unclear?
☐ Is the intervention included and/or described in a practice guide published by a professional organization, association, or governmental agency (e.g., federal or state department of education; university institute or center)?	☐ Is anecdotal evidence (i.e., written or spoken testimonials; word of mouth endorsements) the primary/exclusive support for the intervention?
☐ Do multiple textbooks (not popular books) recommend the intervention in question along with supporting citations to reputable peer-reviewed research journals?	☐ Does the intervention appear to be a direct contradiction of generally established facts?
☐ Has the intervention been the subject of a meta-analysis (i.e., a data-based analysis of multiple studies of the intervention) and been published in a reputable, peer-reviewed journal?	☐ Is the intervention without rigorous experimental investigations by independent researchers and have proponents relied on popular media (books, Internet, television) to promote it?
☐ Has a literature review (i.e., a narrative-based examination) of the research on the intervention in question been published in a reputable, peer-reviewed journal?	☐ Have proponents of the intervention failed to respond to criticism or reacted with hostility to criticism of their claim(s)?
	☐ When questioned, do intervention proponents shift the burden of proof by requiring disproof of their claim(s) of instead of presenting evidence in support of their claim?
	☐ Do proponents select/emphasize a small amount of evidence that fits with their claim while ignoring/discounting evidence against it?
	☐ Is the intervention promoted primarily via private/personal/unreliable websites popular literature/books, or self-published materia?
	☐ Do proponents claim the intervention is effective for a broad array of student academic, behavioral, social, communication, motoric, or mental health needs?
	☐ Does the intervention promise swift and dramatic improvements with little effort and/or financial investment?

Considering the Source of the Claim

Credible Sources (Desirable)

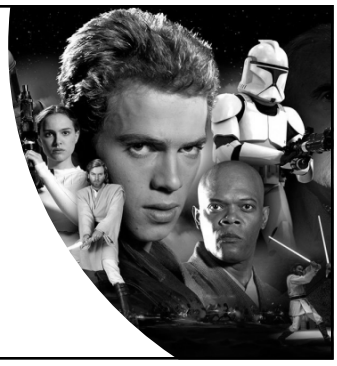
- Intervention identified as an EBP by one or more government agencies, university centers, or technical assistance centers?
  - WWC, NPDCASD, NTACT
- Intervention included and/or described in a practice guide published by a professional organization, association, or governmental agency?
- Is a meta-analysis showing positive effects available from reputable journal?

Questionable Sources (Undesirable)

- ☐ Are explanations about how the intervention works convoluted, confusing, and/or full of jargon in ways that seem scientific but remain unclear?
- ☐ Is anecdotal evidence (i.e., written or spoken testimonials; word of mouth endorsements) the primary/exclusive support for the intervention?
- ☐ Does the intervention appear to be a direct contradiction of generally established facts?

When you **WANT** something to be true

Bias Challenge



✓ SCIENCE	▶ PSEUDOSCIENCE
✓ Evidence obtained via experimentation informs belief ✓ Belief withheld if evidence is not available ✓ Relies on entire body of evidence	▶ Beliefs formed first then evidence sought in support ▶ Relies on credulity ▶ Disconfirming evidence is rejected
✓ Conservative, tentative claims are based on evidence ✓ Beliefs change in conjunction with new evidence ✓ Open-minded	▶ Sensational claims uncoupled from evidence ▶ Beliefs dogmatic & unchanging despite new evidence; ▶ Close-minded
✓ Precise and measurable terminology conducive to understanding and verification/replication (i.e., procedures) ✓ Rejects unverifiable claims	▶ Convoluted explanations with jargon to elude criticism and inhibit replication (i.e., no procedures) ▶ Defends unverifiable claims.
✓ Knows, understands, and applies logic and evidence to justify belief/position	▶ Relies on logical fallacy and cherry-picked evidence
✓ Treats critics as colleagues ✓ Seeks criticism & refutation from scientific community; ✓ engages in reasoned debate	▶ Views critics as adversaries; ▶ Avoids criticism and condemns dissent; ▶ Works alone; ▶ Engages in fallacious reasoning

Common Errors in Reasoning

- **Anecdotes and Testimonials:** "It worked for me."
  - Anecdotes may or may not be true, but are never representative.
  - Anecdotes are the lowest form of evidence and are extremely unreliable.
- **Confirmation Bias:** noticing confirmatory info., ignoring or discounting disconfirming info
  - Without malice
  - Discounts influence of personal investment on perceived outcomes
  - Ignores placebo effect
- **Appeals to Faith:** "It works if you believe it works"
  - Requires acceptance of a claim in the absence of evidence

Common Errors in Reasoning

- **Arguing from Ignorance:** "There's no proof the GRIT curriculum won't work for our LD students, so it's worth a try."
  - Absence of data for or against an intervention is not a valid reason to believe it may or will be effective.
- **Shifting the Burden of Proof:** "Can you prove sensory interventions are not effective?!"
  - Claimants require doubter to refute their unsupported claim/position.
  - Requires skeptic to prove a negative (not possible).
- **Appeal to Authority:** Dr. Jones says this curriculum is great, so we are using it."
  - Belief has nothing to do with evidence for claim.

Common Errors in Reasoning

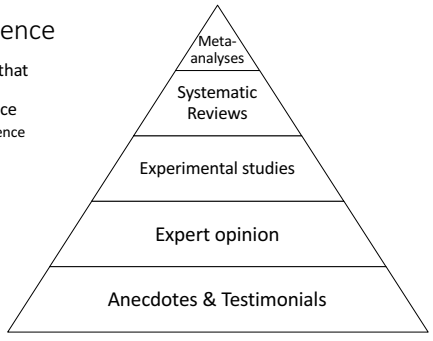
- **False Authority:** "Experts in Responsive Classroom agree it is a highly-effective program!"
  - Dubious credentials are used to promote the intervention
  - Fake experts discount critics without the dubious credential
- **Appeal to Emotion:** "These (smiling beautiful) children are better off now that they've received this reading intervention."
  - Manipulates emotions rather than providing evidence to convince you.
- **Argument to Moderation:** "People say phonics is best, but others say whole language is best. We should use a little of both."
  - Position with less or no evidence and position with most/all evidence are treated as extremes
  - Concludes middle position is most likely true (politically correct?)
- **Ad hominem:** "Dr. Travers is only interested in self-promotion, therefore his opinions can't be trusted."
  - Ignores argument and evidence to instead attack the critic's character

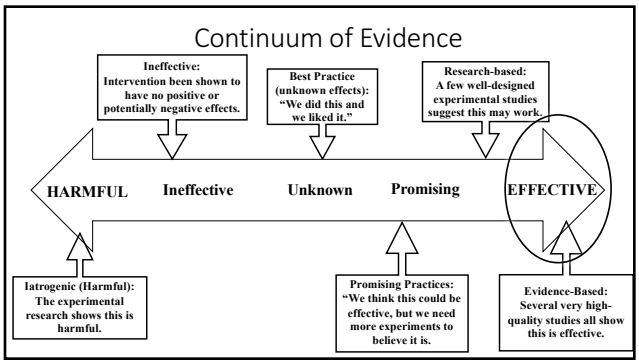
Error	Brief Explanation	Example	Problem
Anecdotal Evidence	Testimonial from people who claim to have benefited	"It worked for my student with ADHD."	Anecdotes may or may not be true, but are never representative. Anecdotes are the lowest form of evidence and are extremely unreliable.
Confirmation Bias	Selecting and conforming evidence to maintain cherished beliefs	Investing time and money into Irlen lenses makes it more likely to perceive a positive effect when one doesn't exist.	Purposely or implicitly ignores contradictory data and elevates positive data; discounts the influence of personal investment in outcome on perceptions; ignores placebo effect
Appeal to Faith	Intervention effectiveness depends on belief that it works	"Facilitated communication cannot be empirically tested because skeptical examination compromise its effects."	Requires acceptance of a claim in the absence of evidence; intervention is only effective when the person believes it will be.
Argument from Ignorance	Absence of evidence for competing claims is treated as evidence in favor of a claim	"There's no proof Brain Gym won't work, so it's worth trying."	Absence of data for or against an intervention is not a valid reason to believe it may or will be effective.
Shifting the Burden of Proof	Requiring the skeptic to refute unfounded claim.	"Prove to me that this student won't benefit from sensory-integration treatments."	Claimants require skeptics to refute an unsupported claim/position. Requires skeptic to prove a negative (not possible).

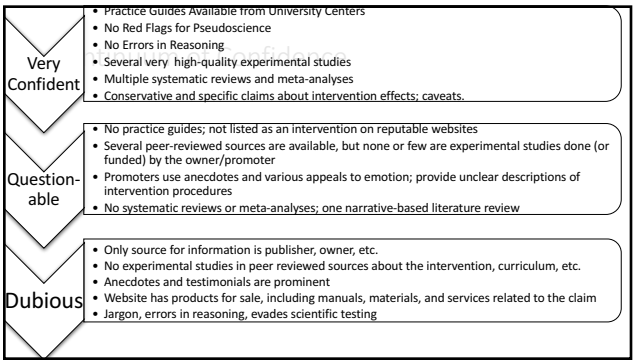
Error	Brief Explanation	Example	Problem
Appeal to Authority	Relying on status of the claimant to support the claim	"Professor Smith says discovery learning is effective, so we should use it."	Belief in the claim is derived from the authority of the person making it; belief has nothing to do with evidence for claim.
False Authority	Relying on purported expertise to refute argument	"Only the founder and certified trainers can comment on RPM's efficacy."	Gives credence to unsubstantiated claims by discounting arguments from those without the (often dubious) credential.
Argument to Moderation	Asserting the truth lies between two claims despite the amount or quality of evidence	"Many people say phonics is the best way to teach reading, but others argue for whole language. We should use a little bit of both in our curriculum."	Position with or less/no evidence is perceived equally plausible as position supported by more/most evidence; Concludes truth lies between both positions when one is likely true.
Ad Hominem	Attacking the claimant rather than the argument or evidence presented.	"The researcher is only out to protect his beliefs. Nothing s/he says can be trusted."	Ignores the argument and evidence for the effectiveness of the intervention and instead focuses on attacking the person (or their character).

Types of Evidence

- Belief is something that happens to you via contact with evidence
  - Continuum of evidence







Process for Evaluating Intervention Claims

- Consider the source of the claim
- Consider what your biases are and if they are influencing your belief
  - And what biases the proponent might have
- Check for red flags of pseudoscience
- Check for errors in reasoning
- Consider the TYPE and AMOUNT of scientific evidence
- Ascertain whether belief is compelled or not
  - Proportion confidence of belief with available evidence
  - Decide whether to invest resources

Some Suggested Resources

Books

- Foxx, R. M. & Mulick, J. A. (2016). Controversial Therapies for Autism and Intellectual Disabilities (2nd edition). New York, NY: Routledge.
- Sagan, C. (1995). The Demon Haunted World: Science as a Candle in the Dark. New York, NY: Random House.
- Shermer, M. (1997). Why People Believe Weird Things. New York, NY: Holt & Company.
- Willingham, D. T. (2012). *When Can You Trust the Experts?: How to Tell Good Science from Bad in Education.*

Videos

- What is Skepticism: https://www.youtube.com/watch?v=DsTWlKgXniw
- Critical Thinking: https://www.youtube.com/watch?v=6OLPL5p0fMg
- The Baloney Detection Kit: https://www.youtube.com/watch?v=hJmRbSX8Rqo

Websites

- The Skeptic's Guide to the Universe: http://www.theskepticsguide.org/
- The Skeptic's Society: http://www.skeptic.com/
- Rational Wiki: http://rationalwiki.org/wiki/Main_Page

Figure 1. Qualities associated with credible claims of interventions effects and pseudoscientific interventions.

Qualities of Credible Claims of Intervention Effectiveness (Desirable)	Qualities of Claims that are Red Flags (Undesirable)
☐ Is the intervention identified as an EBP by one or more government agencies, university centers, technical assistance centers, and/or reputable non-profit organizations (e.g., What Works Clearinghouse, National Professional Development Center on ASD)? ☐ Is the intervention included and/or described in a practice guide published by a professional organization, association, or governmental agency (e.g., federal or state department of education; university institute or center)? ☐ Do multiple textbooks (not popular books) recommend the intervention in question along with supporting citations to reputable peer-reviewed research journals? ☐ Has the intervention been the subject of a meta-analysis (i.e., a data-based analysis of multiple studies of the intervention) and been published in a reputable, peer-reviewed journal? ☐ Has a literature review (i.e., a narrative-based examination) of the research on the intervention in question been published in a reputable, peer-reviewed journal?	☐ Are explanations about how the intervention works convoluted, confusing, and/or full of jargon in ways that seem scientific but remain unclear? ☐ Is anecdotal evidence (i.e., written or spoken testimonials; word of mouth endorsements) the primary or exclusive support for the intervention? ☐ Does the intervention appear to be a direct contradiction of generally established facts? ☐ Is the intervention without rigorous experimental investigations by independent researchers and have proponents relied on popular media (books, Internet, television) to promote it? ☐ Have proponents of the intervention failed to respond to criticism or reacted with hostility to criticism of their claim(s)? ☐ When questioned, do intervention proponents shift the burden of proof by requiring disproof of their claim(s) of instead of presenting evidence in support of their claim? ☐ Do intervention proponents select and emphasize a small amount of evidence that fits with their claim(s) while ignoring or discounting the preponderance of the evidence against their claims? ☐ Is the intervention promoted primarily via private/personal/unreliable websites popular literature/books, or is self-published? ☐ Do proponents claim the intervention is effective for a broad array of student academic, behavioral, social, communication, motoric, or mental health needs? ☐ Does the intervention promise swift and dramatic improvements with little effort and/or financial investment?

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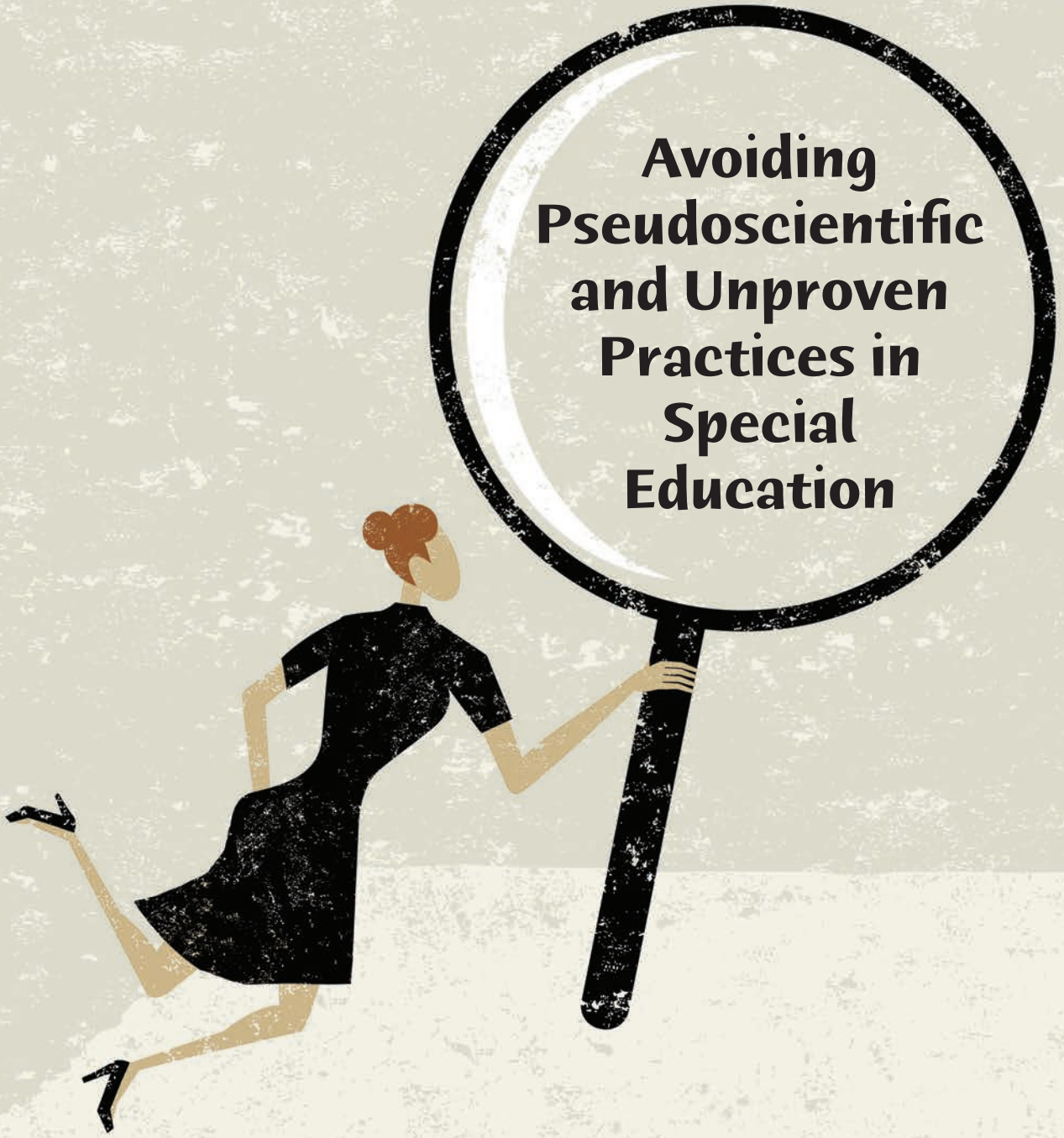
INTERVENTION
IN SCHOOL AND CLINIC

VOLUME 52, NUMBER 4

Avoiding Pseudoscientific and Unproven Practices in Special Education



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Evaluating Claims to Avoid Pseudoscientific and Unproven Practices in Special Education

Jason C. Travers, PhD, BCBA-D[1]

Abstract

Special education professionals are charged with using evidence-based practices, but various unproven, disproven, and pseudoscientific interventions continue to proliferate. Unproven and ineffective interventions emerge and are adopted for various reasons. Ineffective interventions are inevitably harmful and require professionals to adopt a conservative approach that both minimizes potential for harm and maximizes potential for educational benefit. This is fundamental to the evidence-based movement, but special education professionals may not recognize and avoid ineffective interventions. This article aims to improve recognition of potentially ineffective interventions by shedding light on aspects of science, pseudoscience, and some mistakes frequently made in evaluating claims of intervention effectiveness. By becoming familiar with the distinctions between science and pseudoscience, and by developing an understanding of how errors in thinking are used to promote and defend interventions unsupported by empirical evidence, special education professionals can better protect their students with disabilities from potential harms associated with ineffective practices.

Keywords

comprehension, reading, language-learning, disabilities, processing, language, reading, intervention(s), strategies, instruction

The shift toward an evidence-based special education was partly a response to the intrusion of fad, pseudoscientific, and unproven interventions that have plagued the field for decades (Kozloff, 2005). Accordingly, special education professionals are charged with deploying and monitoring the effectiveness of evidence-based practices (EBPs) for their students with disabilities. However, special educators regularly encounter novel challenges educating students with disabilities and may turn to social media, the Internet, and word of mouth for solutions. Such sources may occasionally deliver helpful information about EBPs for students with disabilities, but bogus interventions also thrive in these ways.

Despite advances in the evidence-based special education movement, unproven, disproven, and pseudoscientific interventions have continued to proliferate throughout the field. A stroll through the exposition at many special education conferences reveals vast numbers of booths promoting questionable and downright ridiculous "solutions" to a host of teaching and learning challenges. Sensory integration interventions (e.g., scooter boards, brushing, swings, ball pits) are perhaps a perfect example of a widely popular intervention that is not supported by credible evidence (Barton, Reichow, Schnitz, Smith, & Sherlock, 2015). Nevertheless, sensory integration interventions are among the most commonly used interventions for students with disabilities, costing districts as much as $16,500 per student per year (Zane, Davis, & Rosswurm, 2014). But sensory integration isn't the only or best example. Past and current popular education interventions that are unsupported by evidence include (a) whole-language reading instruction (i.e., "balanced literacy"; Moats, 2000), (b) learning styles (Pashler, McDaniel, Rohrer, & Bjork, 2008), (c) facilitated communication (i.e., "supported typing" and "rapid prompting method"; Mostert, 2001, 2010; Travers, Tincani, & Lang, 2014), (d) Drug Abuse Resistance Education (i.e.,

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DARE; Ennett, Tobler, Ringwalt, & Flewelling, 1994), (e) auditory integration training (Simpson, 2005), (f) Fast Forword (Gillam et al., 2008), (g) Irlen lenses (Hyatt, Stephenson, & Carter, 2009), (h) Brain Gym (Hyatt et al., 2009), (i) psychomotor patterning (Travers, Ayers, Simpson, & Crutchfield, 2016), (j) DIR/Floortime (National Autism Center, 2015; Zane, Weiss, Dunlop, & Southwick, 2015), and many others. Special educators should abstain from unproven, disproven, and pseudoscientific interventions. However, schools remain places where unproven practices often are relied on heavily (Miller & Sawka-Miller, 2010).

Knowledge of EBPs is a fundamental aspect of special education preparation and professional development. But merely listing EBPs will not ensure that professionals adhere to them (Lilienfeld, Ammirati, & David, 2012; Vyse, 2015). A variety of tactics are used by both well-intentioned and deceptive promoters and publishers to entice special educators to buy materials, equipment, supplies, manuals, and services that are not supported by scientific evidence. If special educators are to adhere to an evidence-based model, they must be prepared with the knowledge and skills to detect and avoid using unproven and pseudoscientific interventions. This requires developing a basic understanding of why this problem persists, the harm associated with using questionable interventions, and knowing how to distinguish between EBPs and those promoted despite adequate empirical evidence.

Why Do Unproven and Pseudoscientific Interventions Persist?

Various reasons explain the appeal of unproven and pseudoscientific interventions in special education (Vyse, 2015). It is common for promoters to claim their products are evidence-based, and countless questionable practices find their way onto lists of interventions that are showcased in conference programs, web pages, books, and popular media. Moreover, savvy marketers craft advertisements to lure special education professionals into trial runs of interventions to "see for themselves." Education publishers and vendors may use convincing albeit empty appeals to emotion (e.g., excitement, convenience, concern, compassion, desperation) to convince educators to try their wares. With the best of intentions, special education professionals might further rationalize this exploration by convincing themselves there is little or no harm in trying them on their students (Smith, 2015). Teachers might initiate an intervention out of curiosity (e.g., "Maybe this intervention will work for Marco"). They also might think, "What if this new reading intervention works better? There's no harm in trying it for a few weeks." Such a disposition might be further influenced by a sense of compassion (e.g., "I will do anything to help this kid"), desperation (e.g., "I'm at my wits end and am unsure what to do next"), and/or fear (e.g., "What if I'm refusing to try something that might produce a breakthrough?").

Unfounded stereotypes about students with disabilities as well as beliefs about teaching and learning also may explain why questionable interventions are frequently used (Smith, 2015). For example, special educators might perceive students with autism as being *locked in their mind* and in need of a solution to liberate them, though no evidence supports this belief (Sarrett, 2011). Some may incorrectly believe students with learning disabilities simply suffer from a lack of adequate motivation and simply need to try harder (Gwernan-Jones & Burden, 2010), but also wrongly believe that positive reinforcement will negatively affect student motivation (Hattie & Timperley, 2007). Other misguided beliefs about teaching and learning often emanate from education leaders who, despite decades of accumulated evidence, continue to erroneously claim that systematic and explicit instruction is harmful to learning, an eclectic approach is best, and teachers should be creative (Heward, 2003). Such claims create confusion and may lead teachers to adopt ineffective interventions. But what's the harm in trying a questionable intervention for a short period of time? Should teachers avoid exploring questionable practices? Could teachers who adhere exclusively to EBPs be failing to provide interventions that may produce a breakthrough?

What's the Harm in Trying?

No EBP is guaranteed to confer benefit and the effects of an intervention will likely vary among students. For example, an intervention found to be generally effective for students with autism (e.g., social narratives) might not produce similar effects for a particular student with autism due to differences in their disability severity, previous learning experiences, or cultural and economic differences. However, many professionals may presume an intervention will (or should) work if it has been deemed an EBP by a trustworthy source (e.g., National Professional Development Center on Autism Spectrum Disorder). Although it is common to portray interventions as being evidence based or not evidence based, this dichotomous portrayal may not illustrate accurately the practical motivation of the evidence-based movement. The identification of EBPs is motivated by the discovery and application of interventions that are *most likely* to be effective, not guaranteed to be effective. An EBP is an intervention that is more likely to confer benefit than an unproven intervention because it has been subjected to the most stringent scientific tests currently available. In this way, it is clear that adherence to EBPs is just as much about maximizing the probability of educational benefit as it is about preventing potential harm associated with ineffective interventions.

Although many unproven or pseudoscientific interventions might appear relatively benign at first glance, it could be argued that every ineffective intervention is associated with some degree of harm. A main problem is that a tried intervention is only revealed to be a failure after the

investment is made; instructional time is permanently lost and educational benefit is not conferred. Implementation of an intervention that failed to confer benefit means resources were wasted and a student's opportunity to learn (i.e., time) has been permanently lost. Every student with a disability has a finite amount of time to receive special education services; and professionals are ethically obligated to maximize the impact of these limited services. It may seem that a few weeks of time exploring whether an intervention works has only minimal harm, but a small amount of time lost to ineffective instruction can accumulate over time to a significant loss of potential educational benefit.

To illustrate this point, suppose a student loses the equivalent of 4 weeks time due to teacher use of ineffective interventions every school year. This means from age 3 to 22 years (i.e., 19 years), a student could lose as much as 76 weeks (i.e., more than 2 entire academic years) of time due to teacher use of ineffective interventions. This amount of lost instructional time could easily be multiplied if ineffective interventions are used for prolonged periods of time (e.g., whole-language reading interventions) or combined with other ineffective interventions. Given the persistence of poor outcomes of students with disabilities (Newman, Wagner, Cameto, & Knokey, 2009), the harm done to students with disabilities by way of failing to provide effective instruction may be more common than many professionals are willing to acknowledge.

The use of unproven and pseudoscientific interventions also wastes valuable resources. Education systems throughout the nation are confronted with increasingly limited financial and human resources accompanied by incessant public demand to improve student academic performance. These conditions mean materials, equipment, teacher time, and support personnel come at a premium. Teachers are known to regularly work overtime (i.e., before and after hours, during holidays, and/or throughout the summer) without compensation. They regularly open their pocketbooks to purchase supplies, materials, and equipment. When pseudoscientific or unproven interventions are used, even for a short period and with the best intentions, precious resources are misdirected from interventions that are more likely to be effective and toward those that are unlikely to confer student benefit. Such imprudence has broad impacts on students with disabilities who receive them, and also may negatively affect other students who have to wait for more resources to become available to receive educational benefit. Related, failed attempts to improve student skills sap teacher optimism and can lead to frustration, burnout, and abandonment of the profession (Billingsley, 2004).

Ethical Obligation to Avoid Unproven and Pseudoscientific Practices

Although lost access to effective instruction and wasted resources serve as adequate justification for abstaining from unproven and pseudoscientific interventions, other legal and ethical reasons are available and worth considering. Van Houten et al. (1988) explained how learners with disabilities are entitled to an education comprising (a) a therapeutic environment, (b) services that prioritize personal welfare, (c) competent professionals, (d) meaningful (i.e., functional) instruction, (e) ongoing assessment and evaluation, and (f) the most effective interventions and procedures available. From an ethical perspective, these entitlements serve as guiding principles in the design and delivery of special education programming.

Because there is no guarantee that a student will benefit from a given intervention, regardless of its status as an EBP, special educators must take steps to ensure they maximize their potential for delivering effective interventions. Special educators are also obligated by federal law to use EBPs (Individuals with Disabilities Education Improvement Act, 2006). The special education professional ethical code set by the Council for Exceptional Children (CEC) listed 12 principles that address issues related to use of interventions proven to be effective, including these 5:

- Maintaining a high level of professional competence and integrity and exercising professional judgment to benefit individuals with exceptionalities and their families
- Using evidence, instructional data, research, and professional knowledge to inform practice
- Protecting and supporting the physical and psychological safety of individuals with exceptionalities
- Neither engaging in nor tolerating any practice that harms individuals with exceptionalities
- Advocating for professional conditions and resources that will improve learning outcomes of individuals with exceptionalities (CEC, 2010)

In addition to EBP lists and practice guides (e.g., What Works Clearinghouse, National Professional Development Center on Autism Spectrum Disorders), special educators must be able to evaluate claims made about intervention efficacy to adhere to ethical precepts.

Distinguishing Among Effective, Unproven, and Pseudoscientific Interventions

Simply listing interventions to avoid will not ensure that special education professionals adhere to EBPs. Providing special educators with the knowledge and tools for evaluating claims may help prevent adoption of unproven and pseudoscientific interventions in special education (Travers et al., in press). This can be achieved by understanding the qualitative differences between an EBP and unproven or pseudoscientific interventions. Common mistakes in thinking and