

Avoiding Loss in Translation: From
Evidence-Based Practice to
Implementation Science for Individuals
with ASD

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Goals of the Presentation

- Describe the origins of evidence-based practice
- Examine process and criteria for identifying evidence-based practice in behavioral intervention research
- Discuss issues related to implementation of EBPs
- Describe strategies for supporting implementation

Autism and ASD: Agreeing on Terminology and Characteristics

- Definition and Diagnosis (Autistic Disorder)
 - DSM-IV Criteria often the standard for diagnosis criteria
 - Core features
 - Social competence
 - Communication
 - Repetitive behavior/need for sameness
- Autism Spectrum Disorder
 - Autistic Disorder
 - Pervasive Developmental Disorder Not Otherwise Specified
 - Asperger's Disorder

Practice of Science in Autism Intervention Research

- Goals have been:
 - Cure autism
 - Remediate or ameliorate condition for children and families
- Social science intervention research has focused on two classes of interventions in its research literature
 - Comprehensive treatment models
 - Focused intervention models

What Do We Mean By Practice?

Comprehensive Models vs. Focused Interventions

- Comprehensive models are multi-component programs designed to positively and systematically affect the lives of children with ASD and their families
- Focused interventions are procedures that promote individual skills or learning within a specific skill area.

Origins of Evidence Based Practices

- Current emphasis may be traced to Cochrane's (1972) concern about the lack of use of research in health care practice
- Formation of Cochrane Collaborative to conduct systematic reviews of effects of health care interventions
- Evidence-based medicine coined as a term at McMaster University in 1980's
- Sackett and colleagues were primary early advocates for evidence-based medicine

Sackett (1996) qualifications of EBM

- Neither old hat nor impossible to practice
- Not at “cook-book” medicine
- Not a cost cutting medicine
- Not restricted to randomized trials and meta-analyses

According to Sackett et al. (1996), “if no randomised trial has been carried out for our patient’s predicament, we must follow the trail to the next best external evidence and work from there” (p. 72).

Movement of “evidence-based” into Education

- Campbell Collaboration formed (in the US) in 1990 to conduct systematic reviews of educational and social policy practices
 - What Works Clearinghouse funded by Institute of Education Sciences operates through CC
- Evidence for Policy and Practice Information Center (EPPIC) at the University of London Institute of Education was created in 1993
- Center for Evidence-Based Practice at Orelena Puckett Institute in North Carolina

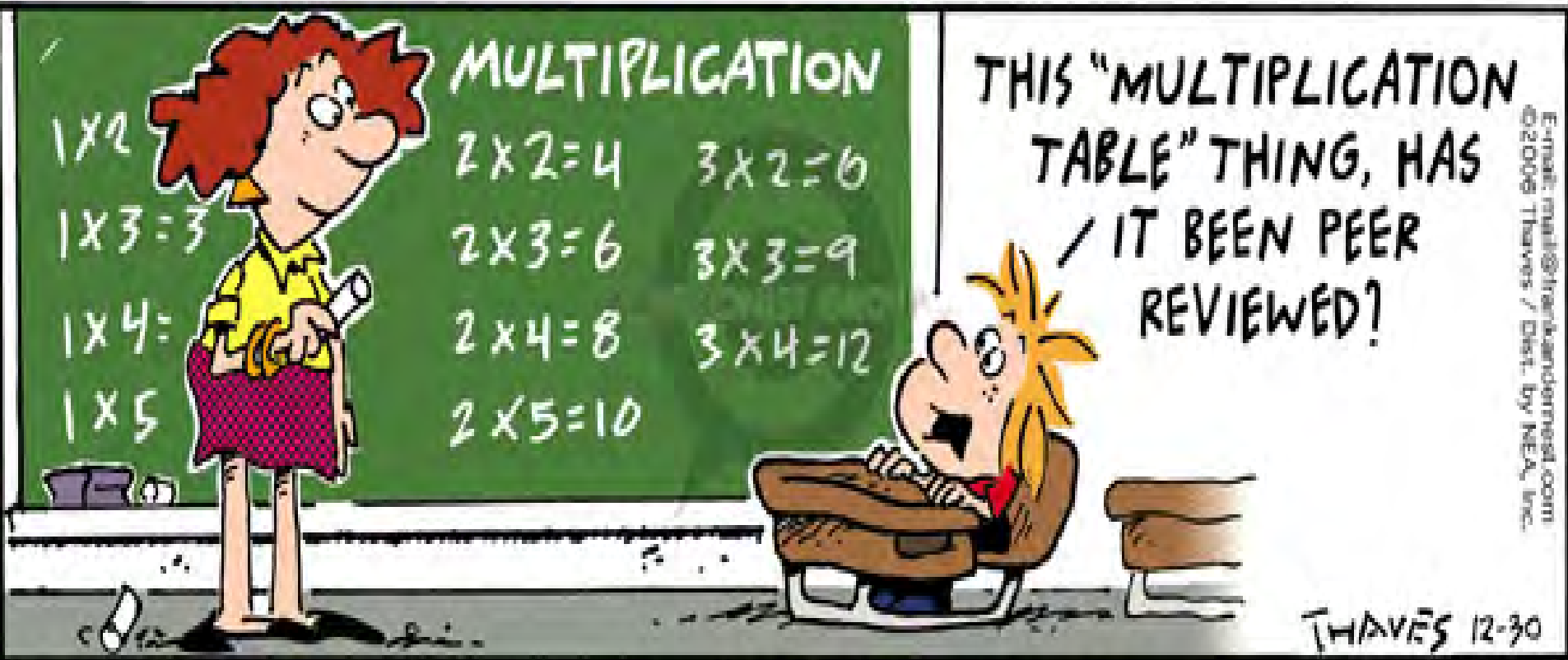
Efforts to Identify Evidence-Based Practices/Professional Associations

- Child-Clinical Section of Division 12 of the American Psychological Association
- CEC-Division for Research
- National Association for School Psychology (empirically supported interventions)
- ASHA
- DEC Recommended Practices

Attempts to Examine Evidence-Based Practices for Children with Autism Spectrum Disorder

- **States**
 - New York Department of Health
 - California Department of Human Resources
- **Research Organizations**
 - National Academy of Sciences
 - National Autism Center—National Standards Project
 - IMPAQ International
- **Professional Organizations**
 - National Academy of Pediatrics
- **Scholars**
 - Rogers
 - Odom, Brown, et al. (2003)

What Counts As Evidence?



What Counts As Evidence?

- Peer-reviewed, refereed journal articles
 - Report research
 - Clearly identified children with ASD and/or families were participants
- Methodologies
 - Experimental Group Designs
 - Quasi experimental designs
 - Single subject designs

Quality Indicators for Experimental and Quasi-Experimental Research

Gersten, Compton, Fuchs,
Greenwood, Innocenti, & Coyne
(2005)

What do we mean by Experimental Group Research?

- Randomized Clinical Trials (Randomized Experimental Group Designs)
- Quasi-Experimental Designs

Quality Indicators for Single Subject Design

Horner, Carr, Halle, McGee, Odom, & Wolery
(2005)

Major Quality Indicator Categories

- Experimental Control
- Description of participants and setting
- Dependent variable
- Independent variable
- Baseline
- External Validity
- Social Validity

National Professional Development Center on Autism Spectrum Disorders



**A multi-university
center to promote
use of evidence-
based practice for
children and
adolescents with
autism spectrum
disorders**

FPG Child Development Institute, University of North Carolina at Chapel Hill; M.I.N.D. Institute, University of California at Davis Medical Center; Waisman Center, University of Wisconsin at Madison

Criteria for Evidence-Based Practices for Focused Interventions (NPDC-ASD)

- Two high quality randomized experimental group design or quasi-experimental group designs that rule out selectivity and other threats to internal validity
- Five high quality single subject design
 - At least three different researchers in different locations
 - Each study has at least three demonstrations of experimental control

Criteria for Evidence-Based Practices for Focused Interventions (NPDC-ASD)

■ Combined evidence

- One RCT or high quality quasi-experimental design

- At least three high quality single subject designs

Review of Literature

- Began by looking at outcomes that related to the core features of autism
 - Social
 - Communication
 - Repetitive and problem behavior
 - Adaptive behavior
 - Academic skills
- Identified and grouped interventions that addressed these skills
- Looked for similar interventions across skill domains and age levels

Frank and Ernest

HEY, WAIT.. NUMBER 17 IS THE SAME AS NUMBER 3, AND NUMBER 12 IS THE SAME AS NUMBER 6... AND NUMBER 14 IS PRACTICALLY THE SAME AS NUMBER 2, AND...



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Focused-Interventions Identified

- Behavioral intervention practices
 - Prompting
 - Time delay
 - Reinforcement
 - Task Analysis and Chaining

Behavioral Interventions to Decrease Interfering Behaviors

- Positive behavior support
 - Functional Behavior Assessment
 - Differential reinforcement of alternative behavior
 - Extinction
 - Response interruption/redirection
 - Stimulus Control
 - Functional Communication Training

Focused Interventions

- Discrete trial training
- Naturalistic intervention
- Pivotal response training
- Self-management

Focused Interventions

- Visual supports
- Individualized work systems
- Video modeling
- Computer-assisted instruction
- VOCA

Focused Interventions

- Social skills training
- Peer mediated intervention
- Social Stories
- Picture exchange communication system (PECS)

Evidence-Based Practices	Academics & Cognition			Behavior			Communication			Play			Social			Transition		
	E C	E L	M H	E C	E L	M H	E C	E L	M H	E C	E L	M H	E C	E L	M H	E C	E L	M H
Computer Assisted Instruction																		
Differential Reinforcement																		
Discrete Trial Training																		
Extinction																		
Functional Behavioral Assessment																		
Functional Communication Training																		
Naturalistic Interventions																		
Parent Implemented Interventions																		
Peer Mediated Instruction/Intervention																		
Picture Exchange Com. System																		
Pivotal Response Training																		
Prompting																		
Reinforcement																		
Response Interruption & Redirection																		
Self-Management																		
Social Narratives																		
Social Skills Groups																		
Speech Generating Devices (VOCA)																		
Stimulus Control																		
Structured Work Systems																		
Task analysis																		
Time delay																		
Video Modeling																		
Visual Supports																		

Key: Blue shading indicates that the studies making up the evidence base for that practice included dependent variables in the domain indicated by that column.

EBPs National Standards Project

Established Practice	Descriptor
Antecedent package	Modification of situational events that precede challenging behavior
Behavioral package	Interventions to reduce challenging behavior and teach functional alternatives
Comprehensive behavioral treatment for young children	Comprehensive treatment programs that use a combination of behavioral analytic approach
Joint attention intervention	Interventions focused on teaching referencing others/regulating others' behavior
Modeling	Interventions using peers or adults to model appropriate target skill
Naturalistic teaching strategies	Child directed interactions occurring in natural settings
Peer training package	Teaching children without disabilities how to elicit target behavior in children with ASD
Naturalistic interventions	A variety of strategies that closely resemble typical interactions and occur in natural settings, routines and activities
Pivotal response treatment (PRT)	Teaching pivotal behaviors in natural environment producing naturalized behavioral improvements
Schedules	Task list that communicates a series of activities
Self-management	Teaching individuals to regulate their own behaviors
Story-based intervention package	Written descriptions of a situation that assist in eliciting target behavior

National Professional Development Center on ASD	Antecedent package	Behavioral package	CBTY C ³	Joint Attention ³	Modeling	Naturalistic	Peer training	PRT	Schedules	Self-Management	Story-based
Prompting	X										
Reinforcement	X										
Task analysis		X									
Time delay	X										
Computer aided instruction ¹											
DTT		X									
Naturalistic interventions						X					
Parent implemented ²											
PMI							X				
PECS ¹											
PRT								X			
FBA		X									
FCT		X									
Stimulus control	X										
Response interruption		X									
Extinction		X									
Differential reinforcement		X									
Self-management										X	
Social narratives											X
Social skills training groups ¹											
Structured work systems									X		
Video modeling					X						
Visual supports									X		

Evaluation of Comprehensive Treatment Models for Individuals with ASD

Odom, Boyd, Hall, & Hume (2010)

Evaluation Purpose

- Provide information upon which to make decisions
 - School districts to make decisions about adoption
 - Families choose a model for their children
- Systematic review of “model features”
- Critical evaluation

Comprehensive Treatment Strategies

- Multiple components (e.g., child-focused instruction, family-focused support)
- Broad scope (i.e., they address development domains representing the core features of ASD)
- Intensity (i.e., they often occur over an entire instructional day or in multiple settings such as a school/clinic and home)
- Longevity (i.e., they may occur over months or even years).
- Replication in the US

Evaluation of all CTMs

- Located all articles in publicly available locations (e.g., journals, book chapters, computer searches, public presentations, etc.)
- Searched websites for information
- Interviewed every CTM developer
- CTM developers send additional materials for our review
 - Some not publicly available

Applied Behavior Analysis-Clinical or Home Based

- * Autism Partnerships**
- * CARD**
- * Lovaas Institute (formerly UCLA Young Autism Project)**
- * Pivotal Response Treatment**

Applied Behavior Analysis-Classroom Based

- * Alpine Learning Group**
- * Eden**
- * Douglass Developmental Disabilities Center**
- * Institute for Child Development-SUNY Binghamton**
- * Lancaster-Lebanon IU 13**
- * May Institute**
- * Princeton Child Development Institute**
- * Pyramid Model**
- * River Street**
- * STAR (OR)**
- * Summit Academy**
- * Therapeutic Pathways**
- * Valley**

Applied Behavioral Analysis/ Inclusive Settings

- **Children's Toddler Project**
- **LEAP**
- **Project DATA**
- **Walden Model**

Developmental and Relationship-Based Models

- **Denver Model**
- **Developmental, Individualized, Relationship (DIR-also know as Floortime)**
- **Hanen Method**
- **Relationship Development Intervention (RDI)**
- **Responsive Teaching**
- **SCERTS**
- **Son Rise**

Other Idiosyncratic Models

- **Higashi-Daily Living Therapy Model**
- **Miller Method**
- **TEACCH Model**

Evaluation of six features of the programs

- Operationalization
- Fidelity of Implementation
- Replication
- Outcomes reported
- Quality of the research methodology
- Supplemental research on focused intervention features of the CTM

Rating	Operationalization	Fidelity of Treatment Measurement	Replication at Remote Sites	Outcome Data Presented	Average Quality Rating From Outcome Data*	Additional Studies on Related Focused Interventions***
5	Written document(s) that describe procedures for the treatment and content in enough detail to replicate the model.	Robust psychometric data have been collected on treatment fidelity measures. This would include evaluating reliability (e.g., internal consistency, test-retest), inter-rater agreement and validity (e.g. construct/content, convergent) of the instrument.	Model replicated at two or more remote locations (i.e., not the original model development site) by two or more investigators who were not part of the original model development team**.	Two or more <i>experimental</i> referred journal articles analyzing efficacy of the project	4.49–5.0	21+ studies conducted on focused interventions that are components of the comprehensive treatment model
4	Written document(s) in which procedures are well specified and content is described but content is poorly specified.	Preliminary psychometric data have been collected on treatment fidelity measure. This would include the basic elements of reliability (i.e., inter-rater)	Model replicated at one remote location by one or more investigators who were not part of the model development team	One <i>experimental</i> referred journal article analyzing efficacy of the project	3.50–4.49	16-20 studies conducted on focused interventions that are components of the comprehensive treatment model

3	Written document(s) in which content is clearly specified <u>and</u> procedures are described but poorly specified.	Formal or standardized treatment fidelity measure exists (e.g., checklists outlining model components) in a form that would allow the model implementer or other outside observer to evaluate implementation of essential model components, but no psychometric data have been collected on instrument	Model replicated by original model developers at two or more remote locations	A book chapter in a book edited by someone other than the model developer describing outcome data or a journal article providing descriptive data about child outcome for the project	2.50–3.49	11-13 studies conducted on focused interventions that are components of the comprehensive treatment model
2	Some written documentation provided that describes procedures <u>and</u> content but neither procedures nor content sufficiently specified.	Formal measure only exists for some but not all essential model components	Model replicated by original model developers at one remote location	A book written by model developer(s) with section or chapter on outcome study	1.50–2.49	7-10 studies conducted on focused interventions that are components of the comprehensive treatment model

1	Some written documentation provided that describes EITHER procedures OR content but is not sufficiently specified.	No formal or codified measure of treatment fidelity exists or only informal measures are used		A chapter in a book edited by model developer describing outcome data	0.50-1.49	3-6 studies conducted on focused interventions that are components of the comprehensive treatment model
0	Only general description of the model is available.	No formal or informal measure of treatment fidelity exists	No information about model replication at other remote locations provided	No outcome data published or outcome data published only in report form by model developer	0.00*0.49	Less than three studies conducted on focused interventions that are components of the comprehensive treatment model

Review by Two Evaluators

- All trained on two CTMs, up to an 80% criteria
- Primary evaluator constructed the portfolio and completed evaluation
- Secondary evaluator completed second review of each portfolio
- When disagreements occurred, resolved through discussion
- Inter-rater agreement was 83% (exact agreement)

Program	Operationalization	Fidelity	Replication	Outcome Data	Quality	Additional Studies
Alpine	3	3	5	3	N/A	2
Autism Partnerships	5	3	5	0	N/A	1
CARD	5	4	4	3	N/A	2
Children's Toddler	2	3	1	5	3	2
DATA	3	1	5	3	N/A	2
Deneer	5	4	5	5	2	0
DIR	5	3	5	4	2	0
Douglass	5	2	0	5	3	5
Eden	3	2	0	0	N/A	0
Hansen	2	3	1	3	N/A	2
Higashi	2	0	2	3	N/A	0
Institute for Child Dev.	3	2	0	3	N/A	0
Lancaster	2	0	0	0	N/A	0
LEAP	4	5	5	4	2	5
Lovasz Institute	5	4	5	5	3	5
Map Institute	5	4	5	4	2	5
Miller	3	1	5	4	0	1
PCDI	5	4	5	4	2	5
PRT	4	3	5	2	N/A	5
Pyramid	2	3	4	3	N/A	5
Responsive Teaching	3	3	0	5	3	0
RDI	5	3	0	4	2	0
SCERTS	5	0	0	0	N/A	4
Son Rise	3	0	0	2	N/A	0
STAR	5	3	5	4	2	0
Sennett	3	4	0	0	N/A	0
TEACCH	3	3	5	5	2	2
Therapeutic Pathways	5	4	3	4	3	0
Valley	3	3	5	0	N/A	0
Walden	4	3	4	3	N/A	2

Errors in Table

- PRT
 - 4 for Outcome Data
 - 2 for Quality of Research
- Alpine
 - 5 for Operationalization

The Green CTMs

- Denver Model
- LEAP
- Lovaas Institute
- May Institute
- Princeton Child Development Institute
- PRT

Emerging Evidence

- Autism Partnerships
- Alpine
- CARD
- Children's Toddler Program
- Douglass Developmental Center
- Responsive Teaching
- SCERTS
- STAR
- TEACCH

Conclusions

- Strongest feature of CTM literature is operationalization
- Fidelity documented but not in rigorous manner
- Efficacy and effectiveness studies are limited but growing
 - Difficulty for classroom-based models
 - Generational issues
- Models are evolving

Moving Research to Practice: Operating Assumptions

- Science has/will inform us about efficacious practices
- Yet, the distance between scientific knowledge and practice has not diminished.
- Implementation is the linkage between science and outcomes

15th Anniversary: Our Greatest Hits & Misses

WIRED

**Attention
Environmentalists:
Keep your SUV.
Forget organics.
Go nuclear.
Screw the spotted owl.**

If you're serious about global warming,
only one thing matters:
Cutting carbon. That means facing
some inconvenient truths.

Plus:
What We'll Miss About Bill Gates Spies and Sabotage at Ferrari Farewell, Battlestar Galactica

GIVE A HOOT | JUN. 2008

Promoting Practices that are Beneficial for Children and Families

Expired

Tired

Wired

Promoting Practices that are Beneficial for Children and Families

<i>Expired</i>	<i>Tired</i>	<i>Wired</i>
<ul style="list-style-type: none">■ Narrative reviews of the literature■ Practices based on professional opinion (Odom & McLean, 1995)		

History of Recommended Practices in Early Intervention

- Narrative review by individual investigators that specified practices
- Original DEC Recommended Practices
 - Spurred on by NAEYC publication of Developmentally Appropriate Practices
 - DEC convened a summit
 - Involved multiple constituents (Researchers, practitioners, families)
 - Published set of recommended practices that came from that activity

Promoting Practices that are Beneficial for Children and Families

<i>Expired</i>	<i>Tired</i>	<i>Wired</i>
<ul style="list-style-type: none">■ Practices based on professional opinion (Odom & McLean, 1995)■ Narrative reviews of the literature	<ul style="list-style-type: none">■ Meta-analyses■ WWC■ Quantitative review of studies and aggregation of results	

Identification of Practices Based on Science

- Quantitative analysis of the literature
 - Systematic evaluation of individual research articles
 - Aggregation of articles around practice
- Criteria established for level of evidence
 - APA Division 12
 - NASP
 - CEC Division for Research

Promoting Practices that are Beneficial for Children and Families

<i>Expired</i>	<i>Tired</i>	<i>Wired</i>
<ul style="list-style-type: none">■ Practices based on professional opinion (Odom & McLean, 1995)■ Narrative reviews of the literature	<ul style="list-style-type: none">■ Meta-analyses■ WWC■ Quantitative review of studies and aggregation of results	<ul style="list-style-type: none">■ Practice-based review of evidence■ Implementation Science■ Enlightened professional development and technical assistance

Wired

Practice-based Analyses of the Literature (Dunst and Trivette)

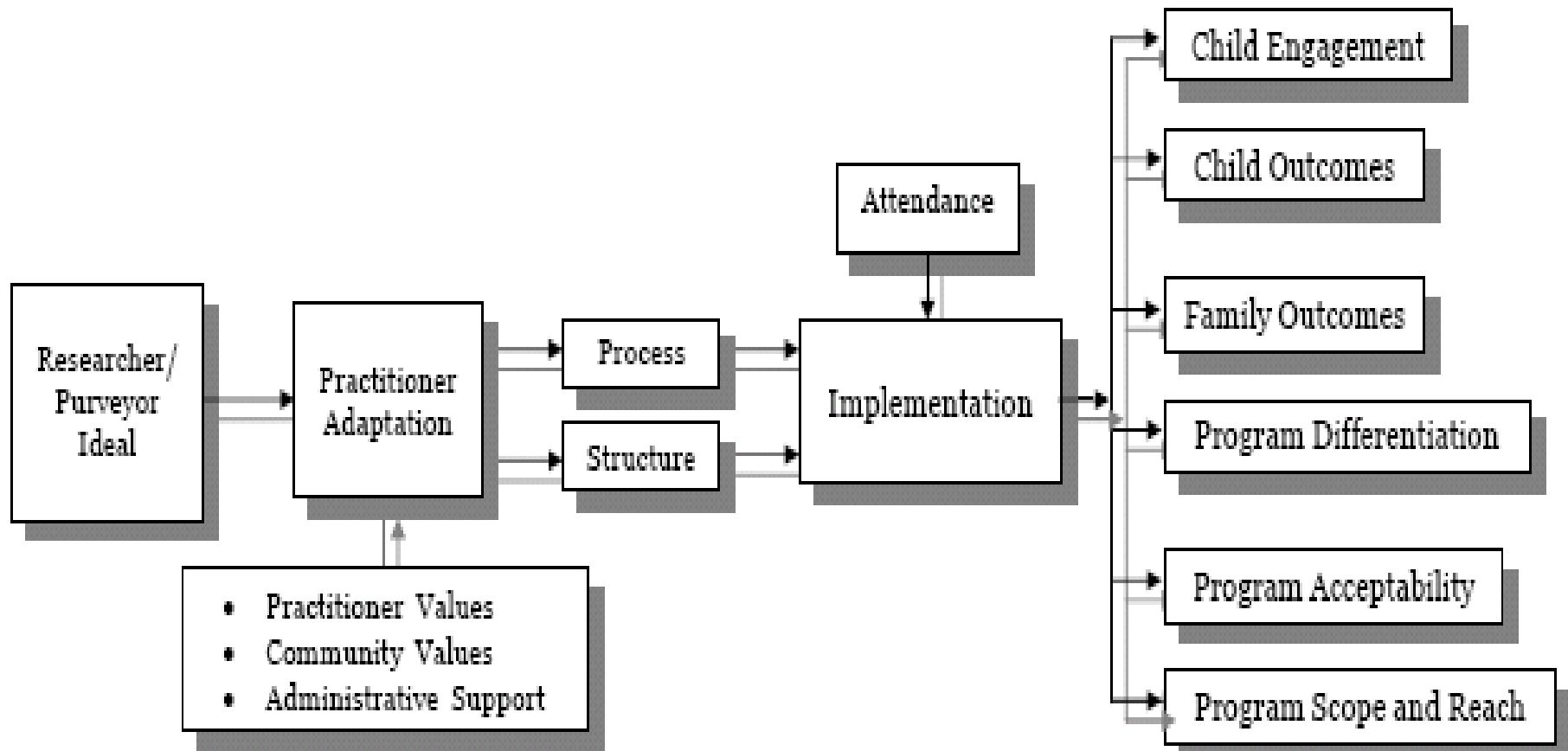
- Analyze at the practice level
- Incorporate different designs
- Communicate information in different formats
- Translate literature to information that professionals and parents may use

Wired

Implementation: The Tie that Binds

- “...of what a program consists when it is delivered in a particular setting” (Durlak & DuPre, 2008, p.)
- “...a specified set of activities designed to put into practice a ... program of known dimensions, (Fixsen, et al., 2005, p. 5)
- “...program delivered to and experienced by participants... and their families (Odom, Hanson, Lieber, Butera, et al., 2008)

Implementation As a Process



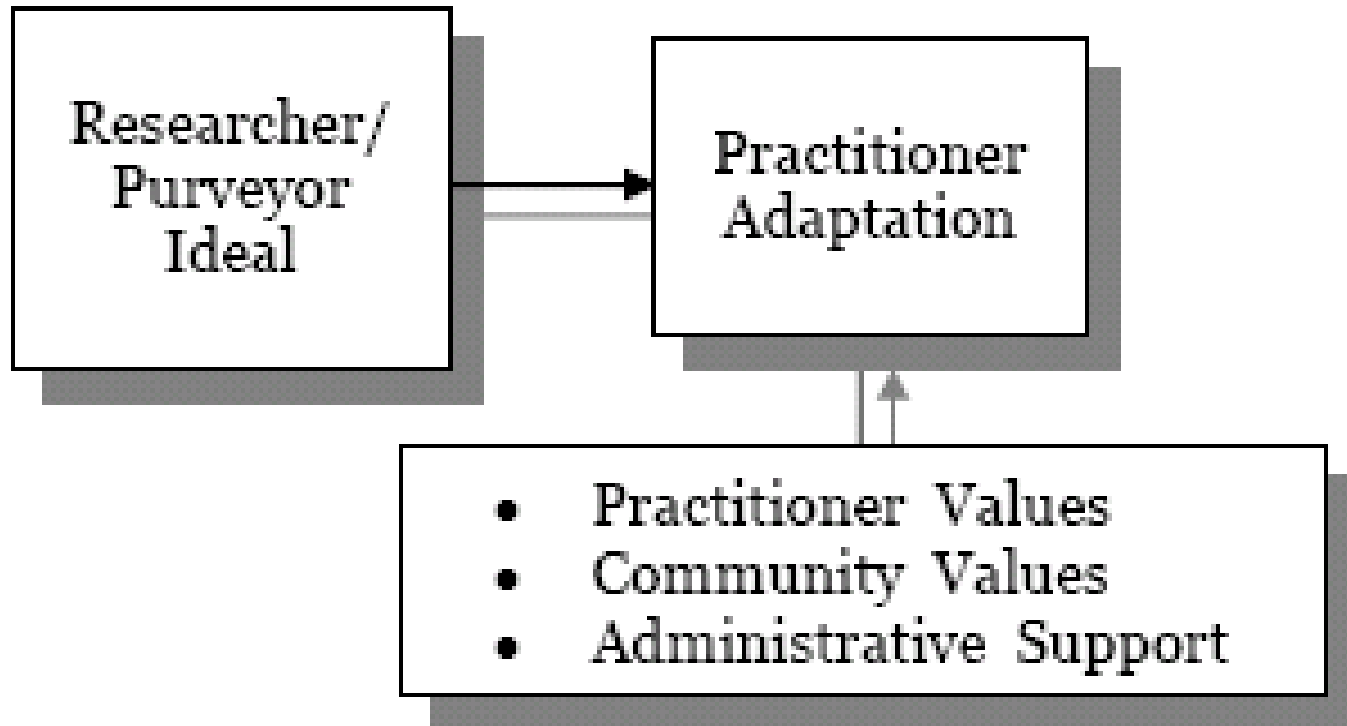
Purveyor

Researcher/
Purveyor
Ideal

Researchers/Purveyors Ideal

- Theoretical or conceptual framework
- Manualized intervention or model
 - Curricula
 - Procedural Manual
- Procedural or implementation checklist
- Researchers/Purveyors provide professional development, training, support

Adaptation



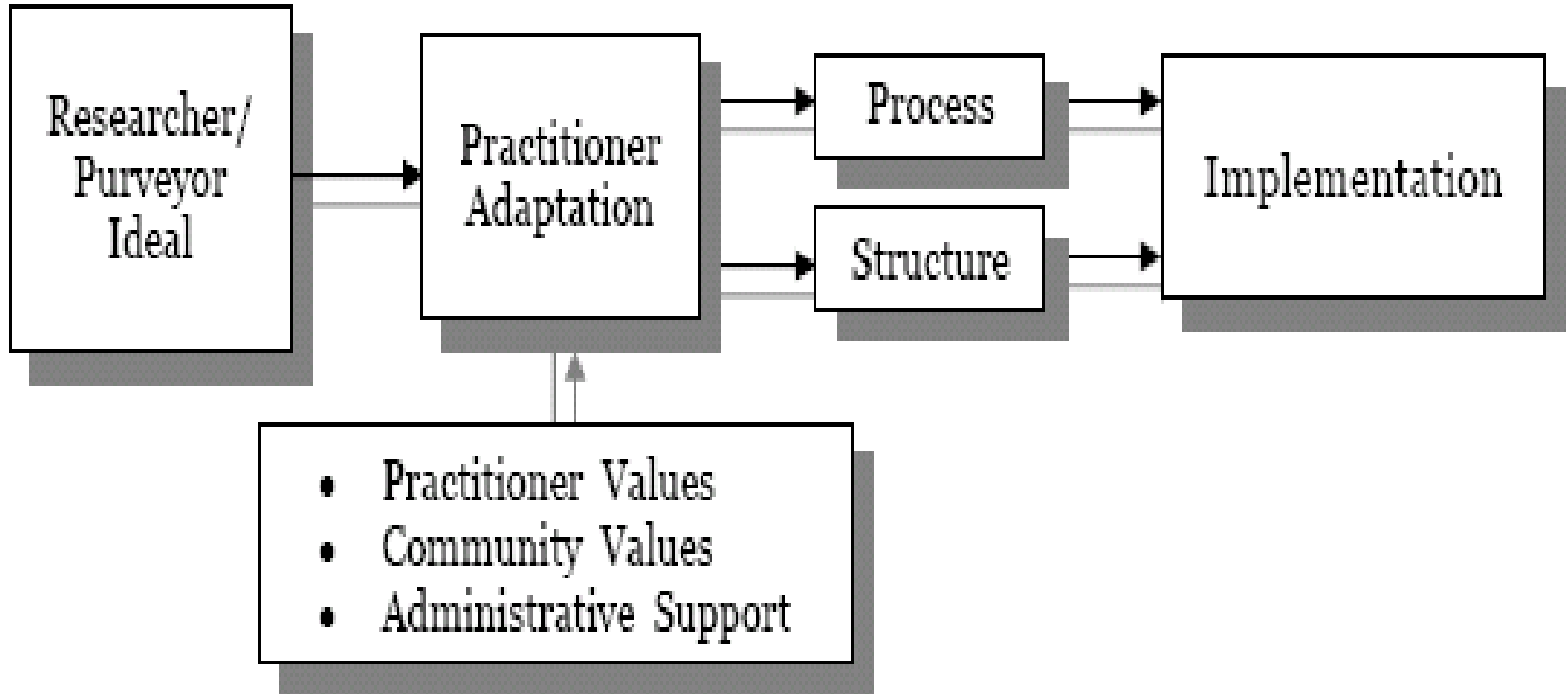
Adaptation: The Blacksnake of the Implementation Process

- Adaptation is essential for sustainability across range of context
- Professionals take the ideal and fit it to their local context
- Influenced by
 - Philosophy and teacher beliefs
 - Cultural and community match
 - Feasibility

Adaptation: Challenges

- Tension between scientists who look for high procedural reliability and practitioners who mold the intervention to fit the context
- Concern about how much and which features are adapted
- Distinguishing between adapters and low implementers

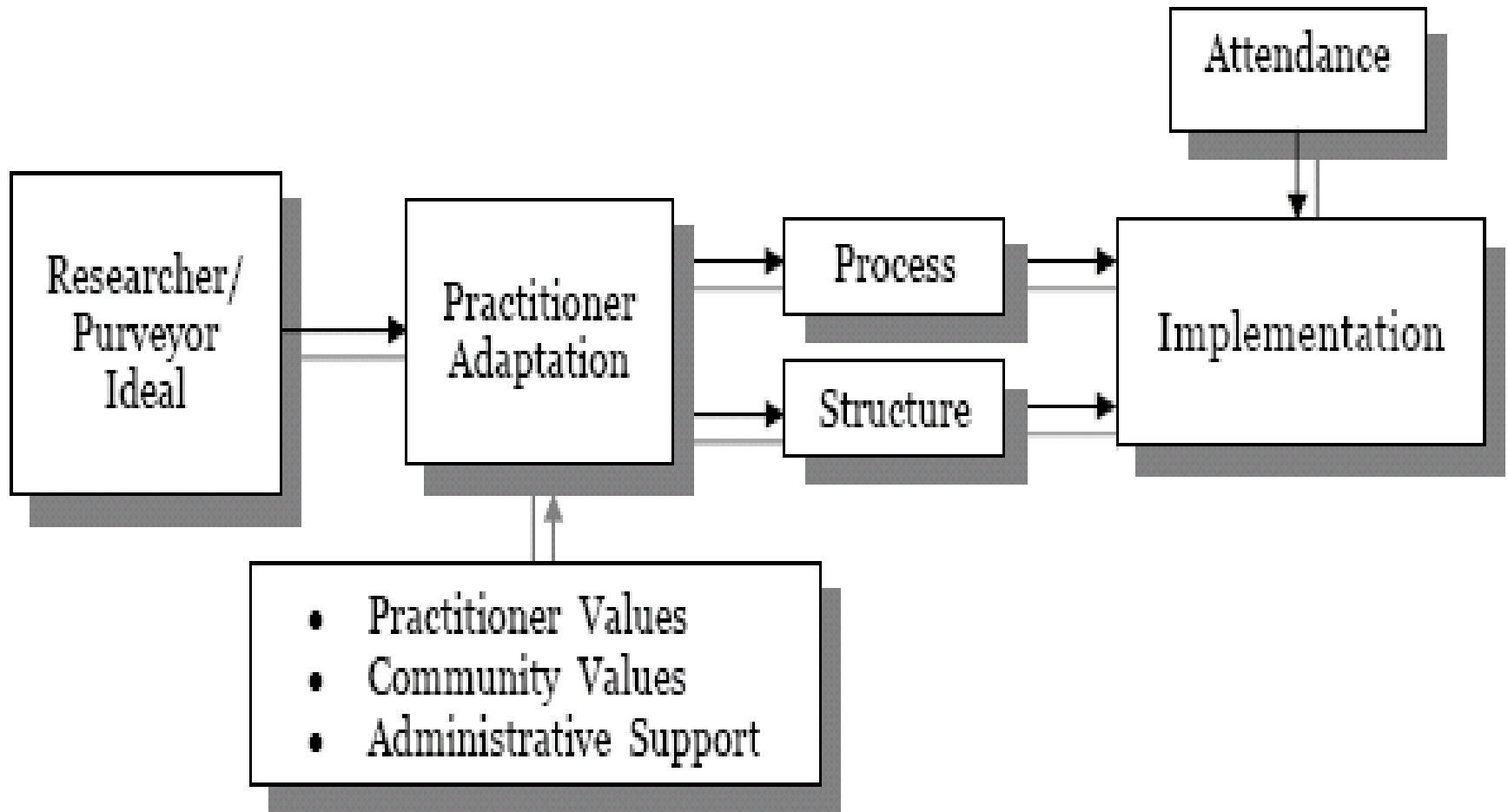
Structure and Process



Features of Implementation

- Structural dimensions of implementation
 - Dosage or amount of curriculum delivered
 - Number of trials per day
 - Number of hours of intervention
- Process dimensions of implementation
 - Fidelity: intervention delivered in ways intended
 - Quality of delivery of intervention
 - Fidelity ratings completed by site supervisors seven times during the year

Attendance: Special Structure Feature



What Affects Implementation?

- Design of materials
- Match between intervention and teacher philosophy
- Professional development and technical assistance
- Administrative support
- Peer support

(Odom, 2009)

Wired: Enlightened Professional Development

- Beyond the one shot workshop
- Development of models of coaching and support (Wesley & Buysse)
- Using technology to our advantage
 - Web-based instruction and posting of modules
 - Video transfer and feedback
 - Interactive communication
 - Virtual community of learners (involving information exchange and peer support)

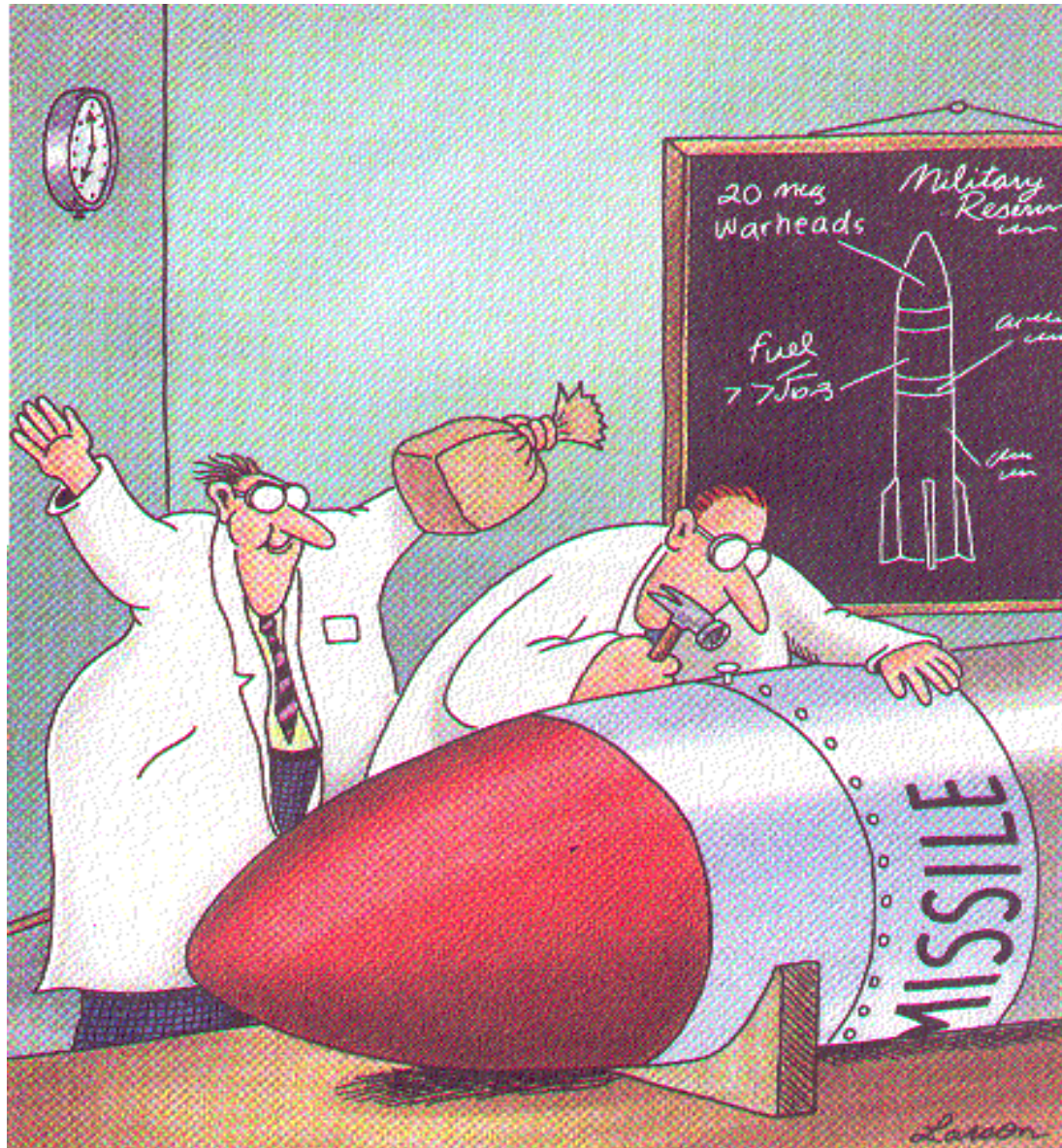
Wired: Enlightened Professional Development

- Ecological perspective on supports for professional development, adoption of innovation, and systems change
- Awareness of adaptation that occurs in local contexts
 - Identification of key ingredients

Conclusions

- Identification of evidence-based practices necessary but not sufficient to move research to practice
- Implementation science will be the tie that binds research to practice in early intervention
- The support for implementation come through professional development and technical assistance.

Rocket Science



References

- Hume, K. A., & Odom, S. L. (in press). Best practices, policy, and future directions: Behavioral and psychosocial interventions. In D. Amaral, G. Dawson, & D. Geschwind (Eds.), *Autism spectrum disorders*. New York: Oxford University Press.
- Lord, C., & Bishop, S. L. (2010). Autism Spectrum Disorders: Diagnosis, prevalence, and services to children and families. *SRCD Social Policy Report, 24* (2).
- National Autism Center (2009). *National Standards Project*. (<http://www.nationalautismcenter.org/about/national.php>)
- Odom, S. L. (2009). The tie that binds: Evidence-based practice, implementation science, and outcomes for children. *Topics in Early Childhood Special Education, 29*, 53-61.
- Odom, S. L., Boyd, B., Hall, L., & Hume, K. (2010). Evaluation of comprehensive treatment models for individuals with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders, 40*, 425-436.
- Odom, S. L., Collet-Klingenberg, L., Rogers, S., & Hatton, D. (in press). Evidence-based practices for children and youth with Autism Spectrum Disorders. *Preventing School Failure*.