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Evidence-Based Practices in Interventions for Children and Youth with Autism Spectrum Disorders

Samuel L. Odom, Lana Collet-Klingenberg, Sally J. Rogers, and Deborah D. Hatton

ABSTRACT: Evidence-based practices (EBPs) are the basis on which teachers and other service providers are required to design educational programs for learners with autism spectrum disorders (ASD). As part of their work with the National Professional Development Center (NPDC) on ASD, researchers developed a process for reviewing the research literature and established criteria for identifying EBPs. In their review, they identified 24 focused intervention practices having sufficient evidence. In this article, the authors describe procedures for selecting specific EBPs appropriate for addressing specific IEP goals for learners with ASD. The authors emphasize the importance of systematic implementation of practices.

KEYWORDS: *autism spectrum disorders, evidence-based practices*

BASING EDUCATIONAL PRACTICE on scientific evidence of its effectiveness has become a necessary feature of programs for infants, children, and youth with autism spectrum disorders (ASD). This policy is based in part on the precedents set in the fields of medicine and health care (Sackett, Rosenberg, Gray, Haynes, & Richardson, 2002), and educational policy in the United States that requires teachers and school systems to implement scientifically proven practices (U.S. Department of Education, 2008). Yet, a perusal of the professional literature may lead a reader to conclude that most practices are evidence-based because their developers or purveyors describe them as such. It is the brand put on many programs and practices. To date, however, there is not a universally agreed-on standard or set of standards by which to identify a practice as evidence-based, although the field is moving in that direction.

Teachers and other practitioners working with children and youth with ASD and their families are required by agencies and insurance companies to implement evidence-based practices, but there may be little guidance regarding where to locate those practices and what criteria to use to verify that a practice is evidence based. The aims of the present article were (a) to provide a definition of evidence-based practices (EBP) used with infants, children, and youth with ASD and their families; (b) to describe a process for identifying EBPs; (c) to identify the practices that meet the offered definition and thus have sufficient empirical support to qualify as evidence-based; and (d) to describe how teachers and practitioners might use such information to select practices to address specific goals and objectives for individual children.

A Short History of EBP in ASD

In the 1970s, members of the health care community in England began a concerted effort to employ the findings from medical and health care sciences in their practices with patients (Cutspec, 2003). The movement was based on the realization that medical doctors and health care providers were not using the most current and strongly evaluated procedures or treatments with their patients. This resulted in the formation an organization called the Cochrane Collaboration, which summarizes scientific evidence for specific health care treatments or practices. This systematic approach to gathering evidence of effectiveness was subsequently created for social intervention through formation of the Campbell Collaboration, whose mission is to summarize evidence that will support policy and practice decision making. In the United States, the Institute for Education Science funded the What Works Clearinghouse (WWC) to summarize evidence about educational practices or interventions that have evidence of efficacy. The WWC has made progress on identifying practices in general education but little information

has been provided about practices for children and youth with ASD. One reason for this omission is that WWC has, to date, chosen not to include single-case research studies as an acceptable form of empirical evidence.

Within the field of practice for individuals with ASD, national professional organizations, such as the American Academy of Pediatrics (Johnson, Myers, & Council on Children with Disabilities, 2007), have established guidelines for practices around early screening and diagnosis for ASD. In 2000, the National Academy of Sciences convened a committee to review research on educational practices for children with ASD and their families, which subsequently generated general recommendations for practice (Committee on Educational Interventions for Children with Autism, 2001). Some states such as New York have followed systematic processes for identifying intervention and educational practices for children with ASD. Also, there have been national initiatives to review the research literature and identify the quality of research that has examined individual practices (National Autism Center, 2008). In 2007, the Office of Special Education Programs in the U.S. Department of Education funded the National Professional Development Center on Autism Spectrum Disorders (NPDC) to promote the use of evidence-based practices in programs for infants, children, and youth with ASD and their families, and an initial activity of this center has been to identify EBPs. In the present article, we describe the process established and followed by the NPDC and use this process as the basis for our discussion of EBPs.

Evidence-Based Practice: The Devil in the Details

An initial devilish, but critically important detail is in the definition of practice. We propose an important distinction, existing in the ASD literature, between comprehensive treatment models (CTMs) and focused intervention practices (Odom, Boyd, Hall, & Hume, 2010). CTMs are conceptually organized packages of practices and components designed to address a broad array of skills and abilities for children with ASD and their families. The models should be described well enough to be replicated by others and have a process for assessing implementation to verify replication. CTMs from the Denver Model (Rogers et al., 2006), LEAP (Hoyson, Jamieson, & Strain, 1984), Lovaas Institute , the May Institute, and the Princeton Child Development Institute are examples of well-documented CTMs. We refer the reader to Odom et al. (2010) for more information about these models. However, in our work with the NPDC, we concentrated only on focused intervention practices.

Focused interventions, in contrast with CTMs, are individual instructional practices or strategies that teachers and other practitioners use to teach specific educational targets—skills and concepts—to children with ASD. The practices may take place in classrooms, clinics, homes, or communities and, ideally, are based on explicit teacher behaviors that can be described and measured. Most also involve multiple steps. Prompting, reinforcement, Picture Exchange Communication System, and visual supports are examples of focused intervention practices. Intervention practices that have been tested in high quality research designs and found efficacious are considered EBPs. This is the important devilish detail that is often overlooked in service programs. Many practices are considered to be EBPs only because the practice is based on theory, research on typical child development, or research findings that do not come from intervention studies (e.g., neuroscience, attachment, Erickson, Skinner, Bronfenbrenner). However, a focused intervention practice is empirically based and supported when the practice has been specifically tested in an experimental n research study, with learners who resemble the target students in critical ways (e.g., age, diagnosis, intellectual level, language level).

A Process for Identifying Evidence-Based Practices for Children with ASD

Providing a definition for EBP and establishing criteria for the amount of evidence needed to qualify as an EPB are two necessary initial steps for identifying practices from the research literature.

Evidentiary Criteria

Several professional organizations have established criteria for determining a social intervention as being efficacious or evidence-based (Chambless & Hollon, 1998; Kratochwill & Stoiber, 2002; Odom et al., 2004). The criteria converge around several common indicators for the level of evidence provided by experimental or quasiexperimental group designs or single case designs. For our work in the NPDC, we drew from the criteria discussed by Nathan and Gorman (2007), Rogers and Vismara (2007), Odom et al. (2004), and Horner et al. (2005).

For us to accept evidence about a practice from a particular study, the study had to (a) have been conducted with participants having ASD who were between birth and 22 years, (b) have outcomes for those participants as dependent measures, (c) clearly demonstrate that the use of the practice was followed by gains in the targeted teaching skills, and (d) have adequate experimental control so that one could rule out most threats to internal validity (Gersten, Fuchs, Compton, Coyne, Greenwood, & Innocenti, 2005; Horner et al., 2005). When a research study met these criteria, it could qualify as evidence for a specific practice. For a specific practice to meet our criteria for an EPB, the practice had to have evidence from (a) at least two experimental or quasiexperimental group design studies carried out by independent researchers, (b) at least five single case design studies from at least three independent

investigators, or (c) a combination of at least one experimental and one quasi-experimental study and three single case design studies from independent investigators (see Table 1).

Searching the Research Literature

Initially, researchers from the NPDC conducted broad literature searches using search engines in the following databases: Academic Search, ERIC, LEXIS/NEXIS Academic, PsycINFO, PubMed/Medline, and SocIndex. Search terms included keywords such as *autism, ASD, autism spectrum*, and PDD-NOS; as well as terms related to specific domains including *academics/cognition, behavior, communication, play, social skills*, and *transition*. In each domain, the NPDC researchers identified additional keywords. For example, in the domain of behavior, search terms also included words such as *adaptive, functional, idiosyncratic, perseverative, repetitive*, and *stereotypical*.

When potential research articles were identified, NPDC staff first screened potential studies by reading the abstracts and then obtained original articles for those studies that appeared to meet inclusion criteria. They scrutinized the *Methods* sections of articles to assess whether the article met the methodological criteria and, if so, it would be grouped with other articles about the same intervention practice. For all groups of intervention studies, a second senior researcher with training in research methodology conducted a second review of the articles to make sure they met criteria.

To categorize practices, researchers used the terminology for a well-known practice as it appears in the literature (e.g., discrete trial training, Picture Exchange Communication System). In other instances, practices with various names were found to have similar, if not identical, procedural features. In this instance, a generic name, or summary descriptor, was developed and the evidence for these closely related practices was pooled. For example, naturalistic intervention is a summary descriptor we created to label interventions

identified by researchers as applying behavioral principles inside an interaction style that involved following rather than directing. These interventions were known in the field by a variety of different names: milieu teaching (e.g., enhanced milieu, prelinguistic milieu), activity-based interventions, and incidental teaching, but they were similar in delivery style, and thus the development of the summary descriptor. The studies supporting one of these was considered to support the class of practices named by the summary descriptor.

Evidence-Based Practices for Infants, Children, and Youth with ASD

From the review of the literature, researchers with the NPDC have thus far identified 24 EBPs (see Table 2). The practices are generally organized in alphabetical order. Two sets of practices are grouped within a larger descriptor. The first subgroup is *behavioral teaching strategies*, which are fundamental intervention techniques (e.g., prompting, reinforcement) based on the principles of applied behavior analysis. These strategies appear as parts of other focused interventions (e.g., prompting and reinforcement is a part of Discrete Trial Training), but they also have sufficient evidence to be listed independently. Second, we grouped a set of strategies used primarily to reduce or eliminate interfering behaviors (e.g., tantrums, disruptive behavior, aggression, self-injury, repetitive behavior) under a general classification of positive behavior support (PBS). The general PBS approach comprises individual focused interventions, organized around the results of functional behavioral assessment and ordered in level of intensity (Horner, Carr, Strain, Todd, & Reed, 2002). In this grouping, we included Differential Reinforcement of Other Behavior as a special application of the use of reinforcement to the reduction of interfering behavior.

Table 3 shows the EBP by domain matrix, which indicates what EBP practices have evidence of efficacy for teaching

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TABLE 1. Criteria for Evidence-Based Practice

Practice	Criteria
Experimental or quasiexperimental group design evidence	At least two peer-reviewed studies that meet acceptable methodological criteria and are conducted by different research groups
Single-case design evidence	At least five peer-reviewed studies that meet acceptable methodological criteria and are conducted by at least three different research groups.
Complementary evidence	At least one experimental or quasi-experimental design and at least three single case design peer-viewed studies meeting acceptable methodological criteria and conducted by three different research groups.

TABLE 2. Identified Evidence-Based Practices with Descriptors

Evidence-based practice	Descriptor
Behavioral strategies	
Prompting	Behaviorally based antecedent teaching strategy
Reinforcement	Behaviorally based consequence teaching strategy
Task analysis and chaining	Behaviorally based antecedent teaching strategy that breaks down steps and links them for prompting
Time delay	Behaviorally based antecedent teaching strategy that promotes errorless learning
Computer-aided instruction	The use of computers for varied instruction
Discrete trial training (DTT)	One-to-one instructional strategy that teaches skills in a planned, controlled, and systematic manner
Naturalistic interventions	A variety of strategies that closely resemble typical interactions and occur in natural settings, routines and activities
Parent-implemented interventions	Strategies that recognize and use parents as the most effective teachers of their children
Peer-mediated instruction/ intervention (PMII)	Strategies designed to increase social engagement by teaching peers to initiate and maintain interactions
Picture exchange communication system (PECS)™	A system for communicating that uses the physical handing over of pictures or symbols to initiate communicative functions
Pivotal response training (PRT)	An approach that teaches the learner to seek out and respond to naturally occurring learning opportunities
Positive behavioral support strategies	
Functional behavior assessment (FBA)	A systematic approach for determining the underlying function or purpose of behavior
Stimulus control/Environmental modification	The modification or manipulation of environmental aspects known to impact a learner's behavior
Response interruption/ redirection	The physical prevention or blocking of interfering behavior with redirection to more appropriate behavior
Functional communication training (FCT)	A systematic practice of replacing inappropriate or ineffective behavior with more appropriate or effective behaviors that serve the same function
Extinction	Behaviorally based strategy that withdraws or terminates the reinforcer of an interfering behavior to reduce or eliminate the behavior
Differential reinforcement (DRA/I/O/L)	Behaviorally based strategies that focus reinforcement on alternative, incompatible, other, or lower rates of the interfering behavior in order to replace it with more appropriate behavior
Self-management	A method in which learners are taught to monitor, record data, report on, and reinforce their own behavior
Social narratives	Written narratives that describe specific social situations in some detail and are aimed at helping the individual to adjust to the situation or adapt their behavior
Social skills training groups	Small group instruction with a shared goal or outcome of learned social skills in which participants can learn, practice, and receive feedback

(Continued on next page)

TABLE 2. Identified Evidence-Based Practices with Descriptors (*Continued*)

Evidence-based practice	Descriptor
Structured work systems	Visually and physically structured sequences that provide opportunities for learners to practice previously taught skills, concepts, or activities
Video modeling	Utilizes assistive technology as the core component of instruction and allows for pre-rehearsal of the target behavior or skill via observation
Visual supports	Tools that enable a learner to independently track events and activities
VOCA/ Speech Generating Devices (SGD)	Electronic, portable devices used to teach learners communication skills and as a means of communication

skills in specific educational domains. For example, for naturalistic intervention, Table 3 indicates that this practice has shown efficacy for teaching communication and social skills. We did not find studies documenting efficacy for teaching play. This does not mean that naturalistic interventions may not be a useful practice for teaching play skills. In fact, we suspect that this would be an effective approach for promoting play (e.g. see Kasari, Freeman, & Paparella, 2006). It means that we did not find sufficient published studies in which this practice was used to teach play skills that fit the aforementioned criteria stated. Specific advice on how to interpret and apply information on identified EBPs in practice follows.

How to Use EBPs

Definitions of EBP often include the qualifier that the selection and use of practices established by the best available evidence must be blended with professional expertise (Buysse & Wesley, 2006; Sackett, Rosenberg, Gray, Haynes, & Richardson, 2002). One feature of professional expertise is the knowledge that EBPs must be used strategically if they are to be valuable. Their strategic use includes basing the selection of practices for individual children on carefully identified learning objectives for learners with ASD and careful implementation of the practice as it was designed.

Basing Selection of EPB on Learning Objectives

The first necessary step in building a program for learners with ASD is through assessment of learners' skills, assessment of the requirements of their school, home, or community environment, and use of the information to establish learning objectives (i.e., as in a learner's IEP goals). We anticipated that practitioners, family members, and perhaps the learner with ASD would be involved in this process. Once a learning objective is established, practitioners can consult the practice (outcome matrix in Table 3 to identify EBPs that are applicable to the general skill area of the objective and select a practice to use to teach the objective.

However, in some cases, there may not be an EBP that has been used successfully in teaching a particular content to a learner with ASD. The teacher may be aware of a promising practice that could be applicable, but researchers have not yet conducted or published studies that document the efficacy of that specific practice. When this occurs, the practitioner may draw on his or her teaching or clinical experience to select a practice having some evidence of efficacy for other outcomes and in the practitioners' judgment has a high likelihood of teaching the learner the identified objective. In this situation, the data that the educator collects while teaching determines efficacy of that practice for teaching the target objective to the target child and helps the educator make further instructional decisions.

Implementation

The efficacy of an EBP assumes implementation in the manner and level of intensity used in the efficacy studies. However, the research literature seldom describes the implementation of the practice in enough detail for a practitioner to immediately use the practice (although some EBP researchers have translated their research into practitioner friendly resources; e.g., Lovaas, 2002). The NPDC staff has examined thoroughly the publications of each of the EBPs listed in Table 2 to construct step-by-step guidelines and corresponding implementation checklists to guide teachers and other practitioners in their use of practices. When possible, the original developers of the identified EBPs reviewed these materials to make sure they accurately reflected the practice. As a final step, educators in the field reviewed these guidelines and implementation checklists to ensure that they were clear, understandable, and applicable in a school setting. These

TABLE 3. Evidence-Based Practices × Learner Outcome Matrix Key

	Academic	Behavior	Communi-cation	Play	Social	Transitions
Evidence-based practice						
Behavioral intervention strategies						
Prompting	X					
Reinforcement	X	X	X	X		
Task analysis and chaining	X		X	X	X	X
Time delay	X		X	X	X	
Computer-aided instruction	X		X		X	
Discrete trial training (DTT)		X	X			
Naturalistic interventions			X		X	
Parent-implemented interventions		X	X		X	X
Peer-mediated instruction/intervention (PMII)		X	X		X	X
Picture exchange communication system (PECS)		X	X		X	
Pivotal response training (PRT)		X	X	X	X	
Positive behavioral support strategies						
Functional behavior assessment (FBA)		X	X			
Stimulus control/Environmental modification	X	X		X		
Response interruption/redirection	X	X	X			
Functional communication training (FCT)		X	X			
Extinction		X	X			
Differential reinforcement (DRA/I/O/L)		X	X			
Self-management	X	X	X		X	X
Social narratives		X	X		X	
Social skills training groups			X		X	
Structured work systems	X					X
Video modeling		X	X	X	X	
Visual supports	X		X	X	X	X
VOCA/ Speech Generating Devices (SGD)			X		X	

Note. X indicates that the studies making up the evidence base for specific practice.

step-by-step guidelines and implementation checklists are being assembled into Web-based modules, developed by the NPDC in collaboration with the staff at the Ohio Center for Autism and Low Incidence Disabilities and the Autism Intervention Module Web site. In addition to the implementation guidelines, the modules also contain information on the evidence base for each practice, procedural details of the EBP, descriptions of how to collect data for this practice, case examples, picture examples, video examples, and additional resources (e.g., data sheets, where to find materials).

Administrative Support for Implementation

When federal law, state policy, or litigation dictates that practitioners need to use EBP for learners with ASD, administrators may expect practitioners to implement EBPs and change their educational practices immediately. However, sometimes practitioners are already using EBPs, and all that is needed is documentation of their use. In this situation, the NPDC products that may be helpful in documenting the use of EBPs include data collection procedures, evidence-based summaries, steps for implementation, and implementation checklists. In other situations, practitioners may be using an

identified EBP in part but not completely. The NPDC products involving procedural guidelines and implementation checklists can aide the professional in assuring that the EBP is being implemented in the correct way, as demonstrated in the studies making up the evidence-base. For example, when asked if they use PECS, many practitioners reply, "yes." However, when queried further they admit that they use the acronym PECS for the use of pictures with learners; not that they use the complete picture exchange system for communication instruction. The NPDC products support and promote the EBP practices in their entirety, helping practitioners to be confident of the ways in which they are implementing the EBPs that they use.

For many practitioners, however, the adoption of EBPs may require learning to implement new practices in their programs. Rarely can a supervisor hand a procedural manual to a practitioner, say "Do this," and see an immediate and accurate implementation of a practice. Even single-training workshops may produce limited sustainable change in practices (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005). The educational literature has long documented the variables that affect practitioner adoption of "innovation" (i.e., EBPs). These variables include training, administrative support (e.g., from the principal or supervisor), time for planning, and clear delineation of roles (Fullan, 1991; Leiber et al., 2009). The emerging science around implementation documents the need for an ecological systems perspective for moving EBPs into daily educational practice for learners with ASD (Fixsen et al., 2005).

Conclusion

To translate research about focused interventions for learners with ASD from the research lab into the classroom begins with a systematic process for identifying and describing evidence based practices. In the present article, we described one approach to this task. We established criteria and identified 24 practices that met the criteria established for EPB. We also used the research methods from the studies to develop step-by-step guidelines, implementation checklists and web-based modules for educators and other practitioners. These 24 are not a final set of EPBs. The research literature in ASD is active, with new research studies about focused interventions being published monthly. One should expect this set of practices to grow along with the literature. Additional lines of research are providing empirical evidence for methods for implementing EBPs into daily practice in educational settings for learners with ASD. The work of the NPDC is one source of information that is supporting this effort.

AUTHOR NOTES

Samuel L. Odom is the director of the Frank Porter Graham Child Development Institute at the University of North Carolina.

Lana Collet-Klingenberg is a professional development specialist in autism at the Waisman Center, University of Wisconsin-Madison. **Sally J. Rogers** is a professor at the MIND Institute at the University of California at Davis Medical School. **Deborah D. Hatton** is an associate professor in the Department of Special Education, Peabody, College, Vanderbilt University.

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