autism © 2011
SAGE Publications
and The National
Autistic Society
Vol 15(1) 114–133; 348070
1362-3613(2011)

Evidence-Based Practices and Autism

GARY B. MESIBOV *Division TEACCH, Carolina Institute for Developmental Disabilities, University of North Carolina at Chapel Hill, United States*

VICTORIA SHEA *Division TEACCH, Carolina Institute for Developmental Disabilities, University of North Carolina at Chapel Hill, United States*

ABSTRACT Interventions for autism are increasing being held to standards such as 'evidence-based practice' in psychology and 'scientifically-based research' in education. When these concepts emerged in the context of adult psychotherapy and regular education, they caused considerable controversy. Application of the concepts to autism treatments and special education has raised additional concerns. An analysis of the benefits and limitations of current approaches to empiricism in autism interventions is presented, and suggestions for future research are made.

KEYWORDS *Evidence-Based Practice, Scientifically-Based Research*

ADDRESS *Correspondence should be addressed to:* GARY B. MESIBOV, *Ph.D., Director, Division TEACCH, CB # 7180, Chapel Hill, North Carolina 27599–7180, USA. e-mail: Gary_Mesibov@med.unc.edu*

Over the past decade, the concept described by combinations of the terms '*research-*' '*empirically-*' or '*scientifically-*' with '*based*', '*supported*' or '*validated*' applied to '*treatments*', '*practices*', '*instruction*' or '*interventions*' has become widespread in psychology, education, medicine, and other human service professions (Dunst et al., 2002). A review of the relationship of this concept to the field of autism intervention is the focus of this article. (Autism is used in this article to refer to all autism spectrum disorders.) From our perspective, the goal of clinical research in autism is to make interventions as effective as possible for our clients and students and their families. Identifying and discussing issues in clinical research in autism is an important step toward this ultimate goal.

History of Evidence-Based Concepts in Psychology and Education

The evolution of the concept of evidence-based intervention in both psychology and education is an important foundation for understanding its

DOI: 10.1177/1362361309348070

current status with respect to autism treatments, as the professional literature in autism reflects the overlap between education and psychology. That is, although most modern interventions for autism are educational in nature, most research on interventions has either been carried out by psychologists, published in psychological journals, or both.

Evidence-Based Practice in Psychology

Within American psychology, the current movement to identify treatments with empirical support had roots in professional and economic issues affecting adult psychotherapy in the early 1990s. At that time, various subgroups of the American Psychological Association (APA) were concerned with defending adult psychotherapy against the encroachment of medication, especially for depression, and also with favorably positioning psychology and especially adult psychotherapy with respect to managed-care and other cost-conscious third party insurance plans (APA, 2006; Elliott, 1998; Society of Clinical Psychology, 1995). Strengthening psychology through defining empirically-based elements of psychological 'best practices' was widely considered to be important for these purposes.

One such approach to 'best practices' was developed by APA's Clinical Psychology division (Division 12), which set up the Task Force on Promotion and Dissemination of Psychological Procedures. This Division 12 task force developed specific criteria for identifying psychotherapeutic treatments as 'well-established' and 'probably efficacious' (Society of Clinical Psychology, 1995, p. 10). For designation as a well-established treatment, the Division 12 criteria (sometimes referred to as the Chambless criteria after the chair of the task force) included the following elements:

1. A manual describing the treatment protocol
2. Clearly specified client characteristics
3. Either 2 'good' group-design experiments (Society of Clinical Psychology, 1995, p. 10) or a large series of single-case design studies (later defined as 9 such studies; Chambless et al., 1996)
4. Demonstration that the treatment was at least equivalent to another treatment (not to 'no treatment' or 'waiting list control group')
5. Demonstration of the treatment effect by at least two independent investigators

The 'probably efficacious' criteria reflected slightly less stringent standards (e.g., comparison of treatment to a waiting list control; two studies by the same investigator).

Various psychotherapeutic treatments were then evaluated against these criteria by the Division 12 Task Force, resulting in a list of 'Empirically

Validated Treatments' (EVTs) published in 1995 (Society of Clinical Psychology, 1995) and updated in 1998 (Chambless et al., 1998).

Almost immediately, strong criticisms of the Division 12 guidelines began to appear in the psychotherapy literature (e.g., Elliott, 1998; Lampropoulos, 2000). Also, a number of groups developed different approaches to identifying empirically-supported interventions (e.g., APA Divisions 16 [School Psychology], 17 [Counseling], 29 [Psychotherapy], and 32 [Humanistic Psychology], the Society for Behavioral Medicine, and professional groups in Canada, the United Kingdom and Germany.

Over time the Division 12 Task Force changed the name of treatments meeting its criteria from Empirically *Validated* Treatments to Empirically *Supported* Treatments (EST). Describing later stages of the EVT/EST movement, Chambless and Ollendick (2001, p. 687) wrote that 'it became clear that APA would not itself pick up the work of the EST list' and so in 1999 Division 12 made its Task Force a standing committee (the Committee on Science and Practice) that would continue evaluating treatments. However, Chambless and Ollendick (2001) also reported that this committee decided to postpone further reviews until a manual for evaluating treatments was prepared and adopted, and that the manual was in its 12th draft at the time their 2001 article was prepared. No further lists have been published by the committee.

In 2005, after a 'decade of both enthusiasm and controversy' (APA, 2006, p. 272) since the publication of the first EVT list, the President of APA appointed a task force to devise a definition for APA of 'Evidence-Based Practice in Psychology' (EBPP). In 2006, APA adopted that task force's proposed definition of EBPP as the 'integration of the best available research *and clinical expertise within the context of patient characteristics, culture, values, and preferences*' (emphasis added; APA, 2006, p. 273). This definition is intentionally broader and more flexible than the earlier Division 12 EVT/EST criteria. In fact, the definition is so flexible that it does not contain any specific criteria against which to evaluate research, clinical expertise, or patient characteristics, culture, etc. As a result, there is no official procedure for designating an intervention as an 'Evidence-Based Practice in Psychology'.

Scientifically Based Research in Education

Unlike the EVT/EST movement in psychology, which was developed and promoted by scientist-practitioners within universities, the 'Scientifically Based Research' (SBR) concept in education was mandated by the United States government (Eisenhart & Towne, 2003). The US Federal Law *Elementary and Secondary Education Act (No Child Left Behind Act of 2001)* (NCLB) included the requirement that schools receiving certain federal funds select and implement programs based on 'Scientifically Based Research'. This curious term (what other kind of research is there?) appeared 111 times within NCLB (Simpson, 2005a, p. 7), was also used in the *Education Sciences Reform Act* of 2002 that reorganized the United States government's educational research bureaucracy and standards, and was incorporated by reference into the 2006 regulations for the *Individuals with Disabilities Education Improvement Act* of 2004 (http://www.ed.gov/legislation/FedRegister/finrule/200–/081406a.html, section 300.35; http://www.wrightslaw.com/idea/law.htm). As a result, the designation of interventions as being based on SBR now has significant legal and financial consequences in terms of both regular and special education, including the education of all students with autism, although this was not the intended focus of the law.

The term 'scientifically based research'

> (A) means research that involves the application of rigorous, systematic, and objective procedures to obtain reliable and valid knowledge relevant to education activities and programs; and
>
> (B) includes research that –
>
> (i) employs systematic, empirical methods that draw on observation or experiment;
>
> (ii) involves rigorous data analyses that are adequate to test the stated hypotheses and justify the general conclusions drawn;
>
> (iii) relies on measurements or observational methods that provide reliable and valid data across evaluators and observers, across multiple measurements and observations, and across studies by the same or different investigators;
>
> (iv) is evaluated using experimental or quasi-experimental designs in which individuals, entities, programs, or activities are assigned to different conditions and with appropriate controls to evaluate the effects of the condition of interest, *with a preference for random-assignment experiments* [emphasis added], or other designs to the extent that those designs contain within-condition or across-condition controls;
>
> (v) ensures that experimental studies are presented in sufficient detail and clarity to allow for replication or, at a minimum, offer the opportunity to build systematically on their findings; and
>
> (vi) *has been accepted by a peer-reviewed journal or approved by a panel of independent experts* [emphasis added] through a comparably rigorous, objective, and scientific review.' (http://www.ed.gov/policy/elsec/leg/esea02/pg107.html#sec9101)

Thus, not only does this definition provide a general requirement for objective evaluation of educational methodologies, it also includes both a *preferred* *research design* and a requirement for the *specific form of publication or peer review*, criteria that are significantly more prescriptive than the APA definition of EBPP.

The US Department of Education in 2002 established the 'What Works Clearinghouse' to provide educators with evaluations of educational practices according to evidentiary standards. The 'What Works Clearinghouse' set up a website (http://ies.ed.gov/ncee/wwc/) for this purpose. As of February 2009 interventions for autism are not included on this website or in other NCLB-related publications, suggesting either that autism in not a major focus of NCLB or SBR, or that the experimental literature on autism is insufficient to conform to the SBR criteria.

The SBR criteria generated at least as much controversy within education as EVT/EST criteria did within psychology. For example, Berliner (2002, p. 18), describing 'evidence-based practices' and 'scientific research' in NCLB as 'code words for randomized experiments', wrote that 'to think that this form of research is the only 'scientific' approach to gaining knowledge – the only one that yields trustworthy evidence – reveals a myopic view of science in general and a misunderstanding of educational research in particular'.

History of Evidence-Based Concepts and Autism

In neither education nor psychology were interventions for autism mentioned in the early stages of the SBR/EVT/EST movement. In education, the focus of SBR was on issues in regular education (not special education), such as reading, math, and science curricula, dropout prevention, etc. In psychology, the initial work on EVTs/ESTs dealt primarily with adult psychotherapy. After the broad concept of evidence-based treatment began to be applied within child psychology, few reviews included autism, focusing instead on mental health or behavioral issues such as anxiety, depression, oppositional-defiant behavior, enuresis and encopresis, etc.

There have been several exceptions to this general trend, however. In 1998, a special issue of the *Journal of Clinical Child Psychology* included analyses of slightly modified Division 12 criteria to treatments for a variety of child and adolescent disorders, including autism in young children. The autism review was prepared by Sally Rogers, a distinguished researcher and clinician. Her review indicated that no early childhood autism treatments, *including her own*, met the modified Division 12 criteria as either well-established or probably efficacious (Rogers, 1998). (A recent update of this review [Rogers & Vismara, 2008] indicated that the efficacy of the Lovaas approach for improving the intelligence test scores of young children with autism can be considered 'well-established' although these skills may remain impaired.

Evidence for the efficacy of this approach in terms of behavior, language, and adaptive skills was found to be less consistent). In 1999, the US Surgeon General's report on mental health included a short section (three paragraphs) on psychoeducational treatments for autism (US Department of Health and Human Services, 1999). In 2002, Chorpita and colleagues provided an objective review for the State of Hawaii of treatments of various childhood disorders including autism, but relied primarily on the Rogers (1998a) review article for their conclusions (Chorpita et al., 2002).

Additional reviewers have focused specifically on identifying evidence-based interventions for autism (Bodfish, 2004; Canadian Autism Intervention Research Network [http://www.cairn-site.com/en/research4.html; the Cochrane Library [http://www.cochrane.org/reviews/en/subtopics/58.html]; Interactive Autism Network Community [http://www.iancommunity.org/cs/what_do_we_know/overview]; Iovonnone et al., 2003; Maine Administrators of Services for Children with Disabilities, 2000; National Autism Center's National Standards Project [http://www.nationalautismcenter.org/about/development.php]; New York State Department of Health, 1999; Odom et al., 2003; Scottish Intercollegiate Guidelines Network [http://www.sign.ac.uk/guidelines/published/index.html] Simpson, 2005a). However, these various groups reviewed different literature, used different definitions of 'evidence-based', lumped or split interventions at different levels of specificity (e.g., treatment protocols vs. broad principles), and, not surprisingly, came to different conclusions. As a result, although there is *some* (although not universal) consensus about *some* aspects of interventions for *some* sub-groups of individuals with autism, particularly young children (e.g., National Research Council, 2001), there really is no agreement within the field about what constitutes effective, evidence-based treatment for the entire range of people with autism, as desirable as such a determination would be (Simpson et al., 2007).

Perspectives on Evidence-Based Concepts and Autism

There are several clear benefits of an evidence-based (i.e. empirical) approach to autism treatment. First, many years ago empiricism put an end to psychodynamic speculations about parental pathology as the cause of autism. Second, empiricism continues to enable the field to move beyond testimonials and anecdotes from family members, which in autism have resulted in some particularly egregious fads (e.g., facilitated communication; the administration of secretin; chemical chelation of the blood). Third, empiricism in educational settings can potentially counterbalance factors such as historical traditions, philosophical trends, and political pressures that influence how services for students with autism are organized and delivered.

Although the benefits of empiricism are clear and widely accepted, however, some elements of the narrow SBR and EST/EVT criteria can be problematic in the context of autism interventions, as described in the following section.

Problematic Element: Goals

The laudable emphasis on empiricism in autism treatments may have the unintended consequence of limiting interventions to those whose goals are easy to measure. Long-term, meaningful improvements in functioning may be *based on* short-term goals and objectives that can and should be measured. However, variables that lend themselves well to measurement and statistical analysis may not be good indicators of some of the most important long-term goals for people with autism, such as life satisfaction, community adaptation, and personal relationships (Kazdin, 2008). Limiting the focus of education and psychological treatment to what can most easily be measured would be seriously detrimental to the long-term well-being of our students and clients.

Problematic Element: Manualized Treatment

Written intervention protocols for *specific* problems, sub-populations, skill areas, or techniques are potentially as useful and important for working with people with autism as they are in psychotherapy, and indeed a number of such treatment protocols have been developed and subjected to empirical study (e.g., Aldred, Green, & Adams [2004] for language in preschoolers; Laugeson et al. [2009] for social skills training for teenagers; Wood et al. [2009] for anxiety in elementary school children).

However, the population of people with autism is too heterogeneous and comprehensive autism intervention programs are too complex for an *overall program* manual to be either practical or informative. For example, toilet training for preschool students with severe retardation and autism has little bearing on supporting appropriate social behavior on job sites for young adults with average intelligence and autism, or on decreasing anxiety in a school-age child with borderline intelligence and autism.

In our view, for autism treatment manuals to be useful, the concept of a manual should be flexible enough to take into account individuals' patterns of cognitive and language skills, atypical interests, social relationship patterns, degree of rigidity and stereotyped behavior, co-morbid conditions, and variety of treatment settings and agents (e.g., parents, teachers). Examples of such modifications of manualized treatment include the report of Chalfant, Rapee, and Carroll, (2007) about the use of a cognitive behavior therapy program with children with Asperger syndrome, the study of Lehmkuhl et al. (2008) of the uses of exposure and response provision for obsessive compulsive disorder in a young adolescent with autism, and the parent behavioral training manual developed by Johnson et al. (2007).

Problematic Element: Randomized Controlled Trials

As described earlier, an explicit element of the SBR and EVT/EST criteria has been the strong preference for Randomized Controlled Trials (RCTs) to evaluate the efficacy of treatments. [This is not true of the APA policy on EBPP, which explicitly states that 'multiple research designs contribute to evidence-based practice, and different research designs are better suited to address different types of questions' (APA, 2006, p. 274).]

The RCT methodology (in which one variable is manipulated while all other factors are effectively neutralized through random assignment of subjects to treatment or control groups) is generally recognized as the most appropriate method for answering questions about causality in the physical sciences, agriculture, and some aspects of medicine (Maxwell, 2004). In the specific area of autism, RCTs have been used to investigate the effect of a *single independent variable* (such as parent training vs. services provided by staff, or a specific intervention vs. unspecified community services) on *discrete dependent variables* in a relatively *homogeneous sub-population* of individuals with autism (e.g., Sofronoff et al., 2004; Solomon et al., 2004; Yoder & Stone, 2006). However, the RCT methodology may not be appropriate or practical for determining which aspects of the *multiple components* of comprehensive treatment programs are clinically meaningful for which of the *numerous, inter-related, pervasive deficits* of individuals diagnosed with autism who are extraordinarily *heterogeneous* in multiple dimensions (Burack, 2004; Charman & Howlin, 2003; Harrington et al., 2002; Kasari, 2002; Lord et al., 2005; Odom et al., 2005, Reichow & Wolery, 2009; Smith et al., 2007).

Along these lines, Strain and Hoyson (2000, p. 121), writing about social skills interventions for children with autism, took issue with the concept of simple experiments. They wrote, 'Is it logistically possible and ethically tolerable to disassemble comprehensive interventions? . . . Any linear, univariate way of examining social competence is a convenient myth and will not generate useful answers to these questions'.

An interesting perspective on the current enthusiasm for randomized experiments in education was provided by Berliner (2002, p. 18):

> The distinctions between hard and soft sciences are part of our culture. Physics, chemistry, geology, and so on are often contrasted with the social sciences in general and education in particular. Educational research is considered too soft, squishy, unreliable, and imprecise to rely on as a basis for practice in the same way that other sciences are involved in the design of bridges and electronic circuits, sending rockets to the moon, or developing new drugs. But the important distinction is really not between the hard and soft sciences.

> Rather, it is between the hard and easy sciences. Easy-to-do science is what those in physics, chemistry, geology, and some other fields do. Hard-to-do science is what social scientists, do and, in particular it is what we educational researchers do.

An example of the difficulties of carrying out an RCT in autism treatment is found in the account of Drew et al. (2002) of a parent training program to support the development of social communication skills in children with autism. The children were randomly assigned either to treatment or to a control condition of local community services only. Among the problems: three of twelve children assigned to the control group began another intensive treatment in the middle of the study. Further, in spite of random assignment, the experimental and control groups were not equivalent in nonverbal IQ. Both of these factors obviously confounded interpretation of results.

A similar RCT problem is seen in the study by Sallows and Graupner (2005), who originally designed a study to replicate the studies by Lovaas and colleagues (Lovaas, 1987; McEachin et al., 1993) comparing early intensive behavioral intervention with less intensive treatment (http://www.wiautism.com/weapresearch.php). However, after random assignment of subjects, differences on several significant pretreatment variables remained. In addition, most parents, who were expected to provide the less intensive control condition, actually chose to provide almost as many hours of treatment as were received by the experimental group, thus limiting the conclusions that could be drawn.

This is not to say that RCTs are inappropriate for autism intervention studies – simply that they are not necessarily the only or best research methodology (Smith et al., 2007). Horner et al. (2005) have provided an excellent review of the elements and contributions of single-subject research in special education, including making the case that since special education is philosophically and legally focused on individual needs, 'single subject methods allow targeted analysis at the unit of the 'individual,' the same unit at which the intervention will be delivered' (p. 173). Kazdin (2008) has also argued in general for the value of qualitative research, particularly for studying the 'real life' experiences and outcomes of various psychological interventions.

Problematic Element: Research Reviews

Not all research reviews on the same topic will yield the same conclusions, for a variety of reasons. For example, at a fundamental level are philosophical differences about how we know what we know (Wendt & Slife, 2007). There are also practical variations in how the construct of evidence-based practice is operationalized (Westen & Bradley, 2005), and standards of 'evidence' may be affected by underlying political or economic factors (e.g., Gordon, 2006. Webster et al., 2002). Reviews may be based on other reviews, so the limitations and shortcomings of the original studies are blurred (Chorpita et al., 2002; Shea, 2004; US Department of Health and Human Services, 1999). Some reviewers of the research evidence for autism interventions are so independent of the research they are evaluating that they may have little direct experience with autism, while others who synthesize autism research (including the authors of this paper) are affiliated with a specific approach or program and therefore bring preconceptions to the task of evaluating others' research (Green, 1996; Smith, 1996). In summary, there are multiple factors that make evaluating autism treatment research results more subjective than might be apparent.

Reichow et al. (2008) have recently developed a method specific to autism for evaluating the degree to which interventions are evidence-based. This is essentially a multi-step rating scale involving a large number of quality indicators for either group or single-subject research, a synthesis of these indicators into a rating of research report strength, and then a variety of criteria that combine strength and the number of studies or subjects to yield an overall designation of 'established' or 'promising' practice. This approach is thus more flexible than the Division 12 criteria and more practical than the APA criteria, and appears to have promise for the field of autism intervention research.

Empirical Foundations of Contemporary Interventions for Autism

Jones and Jordan (2008) have noted that there have been two predominant foundations for autism interventions: theory (sometimes empirically supported, sometimes not) and empirical demonstrations of effectiveness. The best-known and most popular autism intervention programs in the United States have historically prioritized these elements differently. Specifically, the TEACCH program is based on a theoretical (and empirically supported) conceptualization of autism (called the 'Culture of Autism') and clinical expertise in the strategies, called 'Structured Teaching' that flow from this conceptualization (Mesibov et al., 2005). There has been limited emphasis on experimental demonstrations of empirical support, although various studies have supported the overall program (Marcus et al., 1978; Ozonoff & Cathcart, 1998; Panerai, 2009; Short, 1984) and several recent studies have clearly demonstrated the efficacy of specific components of the approach on specific sub-populations (Hume, 2009; Hume & Odom, 2007; Welterlin, 2009). The Young Autism Program (Lovaas, 1987) and its variants (e.g., Smith, Groen, & Wynn, 2000, 2001; Howard et al., 2005) have published a number of empirical studies that suggest efficacy, although not as strongly as some proponents claim (Reichow & Wolery, 2009; Rogers & Vismara, 2008; Shea, 2004). This approach employs applied behavior analysis methods, particularly discrete trial training, that are not based on a theory specific to autism. Pivotal Response Training (Schreibman & Koegel, 2005) a variant of applied behavior analysis that is specific to autism, is based on the finding that when certain behaviors (i.e. pivotal responses) are learned, additional, non-targeted behaviors also begin to emerge. There have been a number of empirical studies of the efficacy of this approach with children with autism (Koegel & Koegel, 2006). The 'Floortime' (or Developmental, Individual-Difference, Relationship-Based) approach of Greenspan and associates (Greenspan & Wieder, 2006) has a theoretical foundation related to the connection between affective development and the development of skills in other areas; this approach is not specific to autism. Like TEACCH, Floortime emphasizes individualization rather than a standardized, tightly manualized approach; no rigorous empirical studies have been published.

Conclusions and Recommendations

To sum up our view of the current status of empiricism and autism interventions:

There are benefits to basing decisions about interventions on empirical evidence and professional experience rather than on beliefs and testimonials.

There is a wide and frequently-changing array of terms and definitions for such an empirical approach.

The autism intervention research literature is relatively sparse compared, for example, to the research literature on interventions for depression in adults, oppositional behavior in children, reading and math curricula for typical students, etc. This paucity of research is particularly notable in the area of treatment and education for adolescents and adults: research on interventions for young children dominates the field, in spite of the fact that autism affects individuals of all ages.

Broad, flexible definitions for determining whether an intervention is 'evidence-based' (e.g., APA's) do not have specific criteria against which to measure assertions of empirical support. However, the inclusion, in the APA definition, of clinical expertise and the concept of individualizing treatment based on various client factors makes this a valuable guide for establishing the evidence base of a wide range of interventions.

Definitions of evidence-based practice that include specific criteria developed for mental health treatment or regular education (e.g., EVT/EST, SBR) are problematic when applied to the autism intervention research literature. The autism-specific method of evaluating research recently developed by Reichow et al. (2008) is more appropriate, although not surprisingly it does not capture the 'soft' clinical factors that enrich actual practice and the lives of our students and clients.

Various well-known autism programs have focused on different elements of interventions in different settings: clinical service, research, professional training, for-profit, not-for-profit, university-based, community- and school-based, etc.

The concepts of EBP and SBR have significant financial and legal implications. An unfortunate recent trend is for approaches to claim that they are the 'only' evidence-based or scientifically-proven approach and to encourage parents to demand that public funds be used to support the approach in question.

It is not surprising that the current state of empiricism in clinical work and education does not match the aspirational standards promoted by various constituencies of researchers and policy-makers, given the heterogeneity of the population of people with autism, the extraordinary costs of conducting rigorous research, and professionals' impassioned attachment to different treatment approaches. Nevertheless, it is our impression that most clinicians and educators working with individuals with autism are guided by the fundamental empirical questions: What works? Why does it work? For whom does it work? What might make it work even better? What else works?

Our recommendations for future directions for research into the evidence-based basis of autism interventions are presented below. These include both methodological issues and suggestions about populations and topics that need additional study.

1. Instead of implying or stating that RCTs are the ultimate standard, recognize the importance for autism interventions of contributions from a variety of research designs, including single-case designs and qualitative research. These kinds of studies are significantly more practical and less expensive to conduct than the many, large RCTs that would be needed to demonstrate intervention effects given the heterogeneity of populations of people with autism. Others have made this recommendation as well (e.g., Smith et al., 2007) but it appears to us that the educational establishment in particular continues to put too much emphasis on the RCT methodology.
2. Related to this, use small studies to identify specific strategies that are effective, rather than focusing on studies of 'brand name' programs. This tactic is likely to be much more useful for teachers than the large 'horse race' studies. An example of this approach is the work of the

National Professional Development Center on Autism Spectrum Disorders at the University of North Carolina at Chapel Hill (http://www.fpg.unc.edu/~autismPDC/assets/pdf/ebp_flyer_1–23–09.pdf).

3. To address the problems of rigid manualization, define 'manuals' in autism research as written explanations of theory, principles, possible strategies, and possible forms of individualized modifications. This would enable the measurement of treatment fidelity while also enabling appropriate individualization of clinical services. For example, manuals and fidelity measures could focus on the use of discrete trials (Lovaas, 2003), visual schedules (Mesibov, Shea, & Schopler, 2005), closing circles of communication (Greenspan & Wieder, 2006), or teaching behaviors in the class of pivotal responses (Schreibman & Koegel, 2005).
4. Recognize that optimal educational outcomes for individuals with autism are generally different from the academic proficiency goals reflected in NCLB. Students with autism and at least average intelligence (i.e. Asperger syndrome/High Functioning Autism) may be quite proficient on tests of academic achievement, yet have profound functional impairments in life skills such as time management, organization of their work materials, pragmatic language, interpersonal relationships, and initiation and self-direction in the community. For these students, an educational focus on academics is inappropriately limited: *additional* goals must be addressed to support meaningful adult outcomes (Klin et al., 2007). On the other hand, for students with autism that coexists with mental retardation, the development of grade-level skills in reading comprehension, expository writing, math, science, etc. may be beyond their cognitive ability level, no matter how much special instruction they receive (Simpson, 2005b). For these students, an educational focus on traditional academics is also inappropriate: *different* goals must be addressed to support functional and meaningful adult outcomes. In summary, educational research should focus on 'real life' goals including, but not limited to academic achievement.
5. Diversify research efforts (and funding) to include more studies of the effects of interventions for adults. Despite the current fervor for early intervention, there is little question that there will continue to be a need for evidence-based services for adults with autism.
6. Both with children and adults, conduct investigations into the effects of various interventions on 'soft' variables including individuals' quality of life, obtainment of self-identified goals, attainment of adult social roles (e.g., employment, independent living, and social relationships). Just as standardized treatment techniques can be modified for people with autism, it should be possible to modify standardized measures of

concepts such as 'happiness' and 'satisfaction' (Frederickson, 2009; Lyubomirsky, 2008).

7. Find ways to measure concepts such as professional recognition and clinical expertise in autism interventions. Although these elements might be somewhat difficult to quantify, there appears to be general agreement among objective professionals about substantial and highly-regarded programs and strategies (e.g., Schreibman, 2000; Harris & Handleman, 2001, 2006). Similarly, 'fringe' and 'fad' movements in autism interventions are somewhat like Supreme Court Justice Potter Stewart's comment about obscenity: it may be difficult to define, but we know it when we see it. 'Treatments' such as swimming with dolphins, chemical chelation, or the Options Method, for example, are rarely or never included in reputable journals, reviews, and handbooks – such inclusion might be one measure of the professional reputation of an approach. In addition, sociometric techniques could presumably be used among professionals to identify professionals and approaches that have clinical value, expertise, reputation, etc.

Assessing the evidence base of an intervention or program is particularly complex when there are multiple forms of evidence to consider. What to do when a study's results are statistically significant but clinically questionable? What to do when an intervention is highly regarded clinically but has a relatively small research base? What to do when a dubious commercial program documents tremendous parental support? Perhaps clinicians and educators in the area of autism would do well to consider the legal concept of the 'preponderance of the evidence.' That is, rather than trying to identify the 'truth', we should recognize that there are several legitimate but potentially conflicting or incomplete sources of information. Our charge is to consider the various forms of evidence and make judgments about what approaches seem most reasonable, recognizing that our knowledge is imperfect, that generally effective approaches sometimes fail and unlikely approaches sometimes succeed, and that all intervention principles and techniques must ultimately be individualized to each client or student and then assessed for effectiveness in that unique situation. This broad prescription may be unsatisfactory to some readers – we recognize that critical issues regarding research designs have been left unresolved. It is our hope that this paper will at least serve to advance discussion about how to blend the importance of 'proof' with the richness of clinical practice and the complexities of the lives of people with autism.

Acknowledgements

The authors are grateful to the following individuals for their thoughtful comments on earlier drafts of this paper: Vera Bernard-Opitz, Cathy Lord, Lee Marcus, John Thomas, Andrea Walker, Linda Watson, and several anonymous reviewers.

References

Aldred, C., Green, J., & Adams, C. (2004) ‘A New Social Communication Intervention for Children with Autism: Pilot Randomized Controlled Treatment Study Suggesting Effectiveness’, *Journal of Child Psychology and Psychiatry* 45(8): 1420–1430.

American Psychological Association. (2006) ‘Evidence-Based Practice in Psychology’, *American Psychologist* 61 (4): 271–285.

Berliner, D.C. (2002) ‘Educational Research: The Hardest Science of All’, *Educational Researcher* 31(8): 18–20.

Bodfish, J.W. (2004) ‘Treating the Core Features of Autism: Are We There Yet?’ *Mental Retardation and Developmental Disabilities Research Reviews* 10(4): 318–326.

Burack, J.A. (ed.). (2004) ‘Research Methodology – Matching’ [Special issue]. *Journal of Autism and Developmental Disorders* 34 (1).

Chalfant, A.M., Rapee, R., Carroll, L. (2007) ‘Treating Anxiety Disorders in Children with High Functioning Autism Spectrum Disorders: A Controlled Trial’, *Journal of Autism and Developmental Disorders* 37 (10): 1842–1857.

Chambless, D.L., Sanderson, W.C., Shoham, V., Bennett Johnson, S., Pope, K.S., Crits-Christoph, P., et al. (1996) ‘An Update on Empirically Validated Therapies’, *The Clinical Psychologist* 49(2): 5–18.

Chambless, D.L., Baker, M.J., Baucom, D.H., Beutler, L.E., Calhoun, K.S., Crits-Christoph, P., et al. (1998) ‘Update on Empirically Validated Therapies II’, *The Clinical Psychologist* 51(1): 3–16.

Chambless, D.L. & Ollendick, T.H. (2001) ‘Empirically Supported Psychological Interventions: Controversies and Evidence’, *Annual Review of Psychology* 52: 685–716.

Charman, T. & Howlin, P. (2003) ‘Research into Early Intervention for Children with Autism and Related Disorders: Methodological and Design Issues. Report on a Workshop Funded by the Wellcome Trust, Institute of Child Health, London, UK, November, 2001’, *Autism* 7(2): 217–225.

Chorpita, B.F., Yim, L.M., Donkervoet, J.C., Arensdorf, A., Amundsen, M.J., McGee, C., et al. (2002) ‘Toward Large Scale Implementation of Empirically Supported Treatments for Children: A Review and Observations by the Hawaii Empirical Basis to Services Task Force’, *Clinical Psychology: Science and Practice* 9(2): 165–190.

Drew, A., Baird, G., Baron-Cohen, S., Cox, A., Slonims, V., Wheelwright, S., et al. (2002) ‘A Pilot Randomized Control Trial of a Parent Training Intervention for Pre-School Children with Autism: Preliminary Findings and Methodological Challenges’, *European Child and Adolescent Psychiatry* 11(6): 266–272.

Dunst, C.J., Trivette, C.M., & Cutspec, P.A. (2002) ‘Toward an Operational Definition of Evidence-Based Practices’, *Centerscope*, 1(1): 1–10. [http://www. evidencebasedpractices.org/centerscope/]

Eisenhart, M. & Towne, L. (2003) ‘Contestation and Change in National Policy on ‘Scientifically based’ Education Research’, *Educational Researcher* 32(7): 31–38.

Elliot, R. (1998) 'Editor's Introduction: A Guide to the Empirically Supported Treatments Controversy', *Psychotherapy Research* 8(2): 115–125.

Frederickson, B. (2009) *Positivity: Groundbreaking Research Reveals How to Embrace the Hidden Strength of Positive Emotions, Overcome Negativity, and Thrive*. New York: Crown Publishers.

Frost, L.A. & Bondy, A.S. (2002) *The Picture Exchange Communication System Training Manual* (2nd ed.). Newark, DE: Pyramid Educational Products, Inc.

Gordon, E.J. (2006) 'The Political Contexts of Evidence-Based Medicine: Policymaking for Daily Homodialysis' *Social Science & Medicine* 62 (11): 2707–2719.

Green, G. (1996) 'Early Behavioral Intervention for Autism: What Does the Research Tell Us?' In C. Maurice, G. Green, & S.C. Luce (eds). *Behavioral Intervention for Young Children with Autism: A Manual for Parents and Professionals*, pp. 29–44. Austin, TX: Pro-ed.

Greenspan, S.I. & Wieder, S. (2006) *Engaging Autism: Using the Floortime Approach to Help Children Relate, Communicate, and Think*. New York: Da Capo.

Harrington, R.C., Cartwright-Hatton, S., & Stein, A. (2002) 'Annotation: Randomized Trials', *Journal of Child Psychology and Psychiatry* 43(6): 695–704.

Handleman, J.S. & Harris, S.L. (2001) *Preschool Education Programs for Children with Autism* (2nd ed.). Austin, TX: Pro-ed.

Handleman, J.S. & Harris, S.L. (2006) *School- age education programs for children with autism*. Austin, TX: Pro-ed.

Horner, R.H., Carr, E.G., Halle, J., McGee, G., Odom, S. & Wolery, M. (2005) 'The Use of Single-subject Research to Identify Evidence-based Practice in Special Education', *Exceptional Children* 71(2): 165–179.

Howard, J.S., Sparkman, C.R., Cohen, H.G., Green, G., & Stanislaw, H. (2005) 'A Comparison of Intensive Behavior Analytic and Eclectic Treatments for Young Children with Autism', *Research in Developmental Disabilities*, 26 (4): 359–383.

Hume, K. (2009) 'Effects of an Individual Work System on Independence, Task Acquisition and Duration, and Generalization in Students with Autism', Manuscript submitted for publication.

Hume, K. & Odom, S. (2007) 'Effects of an Individual Work System on the Independent Functioning of Students with Autism', *Journal of Autism and Developmental Disorders* 37(6): 1166–1180.

Iovannone, R., Dunlap, G., Huber, H. & Kincaid, D. (2003) 'Effective Educational Practices for Students with Autism Spectrum Disorders', *Focus on Autism and Other Developmental Disabilities* 18(3): 150–165.

Johnson, C.R., Handen, B.L., Butter, E., Wagner, A., Mulick, J., Sukhodolsky, D.G., Williams, S., Swiezy, N.A., Arnold, L.E., Aman, M.G., Scahill, L., Stigler, K.A., McDougle, C.J., Vitiello, B., & Smith, T. (2007) 'Development of a Parent Training Program for Children with Pervasive Developmental Disorders', *Behavioral Interventions* 22: 201–221.

Jones, G. & Jordan, R. (2008) 'Research Base for Intervention in Autism Spectrum Disorders' in E. McGregor, M. Nunez, K. Cebula, & J.C. Gomez (eds.) *Autism: An Integrated View from Neurocognitive, Clinical, and Intervention Research*, pp 281–302. Malden, MA: Blackwell.

Kasari, C. (2002) 'Assessing Change in Early Intervention Programs for Children with Autism', *Journal of Autism and Developmental Disorders* 32(5): 447–461.

Kazdin, A.E. (2008). 'Evidence-based Treatment and Practice: New Opportunities to Bridge Clinical Research and Practice, Enhance the Knowledge Base, and Improve Patient Care', *American Psychologist*, 63 (3): 146–159.

Klin, A., Saulnier, C.A., Sparrow, S.S., Cicchetti, D.V., Volkmar, F.R., & Lord, C. (2007) 'Social and Communication Abilities and Disabilities in Higher Functioning Individuals with Autism Spectrum Disorders: The Vineland and the ADOS', *Journal of Autism and Developmental Disorders* 37(4): 748–759.

Koegel, R.L. & Koegel, L.K. (2006) *Pivotal Response Treatments: Communication, Social, and Academic Development*. Baltimore: Paul H. Brookes.

Lampropoulos, G.K. (2000) 'A Reexamination of the Empirically Supported Treatments Critiques', *Psychotherapy Research* 10 (4): 474–487.

Laugeson, E.A., Frankel, F., Mogil, C., & Dillon, A.R. (2009) 'Parent-assisted Social Skills Training to Improve Friendships in Teens with Autism Spectrum Disorders' *Journal of Autism and Developmental Disorders* 39 (4): 596–606.

Lehmkuhl, H. D., Storch, E.A., Bodfish, J.W., Geffken, G. R. (2008) 'Brief report: Exposure and Response Prevention for Obsessive Compulsive Disorder in a 12-year-old with Autism' *Journal of Autism and Developmental Disorders* 38 (5): 977–981.

Lord, C., Wagner, A., Rogers, S., Szatmari, P., Aman, M., Charman, T., et al. (2005) 'Challenges in Evaluating Psychosocial Interventions for Autism Spectrum Disorders', *Journal of Autism and Developmental Disorders* 35(6); 695–708.

Lovaas, O.I. (1987) 'Behavioral Treatment and Normal Educational and Intellectual Functioning in Young Autistic Children', *Journal of Consulting and Clinical Psychology* 55(1): 3–9.

Lovaas, O.I. (with Bondy, A., Buch, G., Cohen, H.G., Dobel, K., Eikeseth, S., Frost, L., et al.). (2003) *Teaching Individuals with Developmental Delays: Basic Intervention Techniques*. Austin, TX: Pro-ed.

Lyubomirsky, S. (2007) *The How of Happiness: A Scientific Approach to Getting the Life You Want*. New York: Penguin Press.

Maine Administrators of Services for Children with Disabilities (MADSEC). (2000) '*Report of the MADSEC Autism Task Force (revised ed.)*' [http://www.madsec.org/docs/atf.htm]

Marcus, L.M., Lansing, M., Andrews, C.E., & Schopler, E., (1978) 'Improvement of Teaching Effectiveness in Parents of Autistic Children', *Journal of the American Academy of Child Psychiatry* 17(4): 625–639.

Maxwell, J.A. (2004) 'Casual Explanation, Qualitative Research, and Scientific Inquiry in Education', *Educational Researcher* 33(2): 3–11.

McEachin, J. J., Smith, T., & Lovaas, O. I. (1993) 'Long-Term Outcome for Children with Autism who Received Early Intensive Behavioral Treatment', *American Journal on Mental Retardation* 97(4): 359–372.

Mesibov, G.B., Shea, V., & Schopler, E. (with Adams, L., Burgess, S., Chapman, S.M., Merkler, E., Mosconi, M., Tanner, C. & Van Bourgondien, M.E.). (2005) *The TEACCH Approach to Autism Spectrum Disorders*. New York: Springer.

National Research Council (2001) *Educating Children with Autism*. Committee on Educational Interventions for Children with Autism. Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.

New York State Department of Health Early Intervention Program (1999) '*Clinical Practice Guideline: Report of the Guideline Recommendations: Autism/Pervasive Developmental Disorders: Assessment and Intervention for Young Children (age 0–3 Years)* [http://www.health.state.ny.us/community/infants_children/early_intervention/autism/index.htm #acknowledgment/]

Odom, S.L., Brantlinger, E., Gersten, R., Horner, R.H., Thompson, B., & Harris, K.R. (2005) 'Research in Special Education: Scientific Methods and Evidence-Based Practices', *Exceptional Children* 71(2): 137–148.

Odom, S.L., Brown, W.H., Frey, T., Karasu, N., Smith-Canter, L.L., & Strain, P.S. (2003) 'Evidence-Based Practices for Young Children with Autism: Contributions for Single-Subject Design Research', *Focus on Autism and Other Developmental Disabilities* 18(3): 166–175.

Ozonoff, S. & Cathcart, K. (1998) 'Effectiveness of a Home Program Intervention for Young Children with Autism', *Journal of Autism and Developmental Disorders* 28(1): 25–32.

Panerai, S., Zingale, M., Trubia, G., Finocchiaro, M., Zuccarello, R., Ferri, R., & Elia, M. (2009) 'Special Education Versus Inclusive Education: The Role of the TEACCH Program' *Journal of Autism and Developmental Disorders*.

Reichow. B., Volkmar, F.R. & Cicchetti, D.V. (2008) 'Development of the Evaluative Method for Evaluating and Determining Evidence-Based Practices in Autism', *Journal of Autism and Developmental Disorders* 38 (7): 1311–1319.

Reichow, B. & Wolery, M. (2009) 'Comprehensive Synthesis of Early Intensive Behavioral Intervention for Young Children with Autism Based on the UCLA Young Autism Project', *Journal of Autism and Developmental Disorders*.

Rogers, S.J. (1998) 'Empirically Supported Comprehensive Treatments for Young Children with Autism', *Journal of Clinical Child Psychology* 27(2): 168–179.

Rogers, S.J. & Vismara, L.A. (2008) 'Evidence-Based Comprehensive Treatments for Early Autism', *Journal of Clinical Child & Adolescent Psychology* 37 (1): 8–38.

Sallows, G.O. & Graupner, T.D. (2005) 'Intensive Behavioral Treatment for Children with Autism: Four-Year Outcome and Predictors', *American Journal on Mental Retardation* 110(6): 417–438.

Schreibman, L. (2000) 'Intensive Behavioral/Psychoeducational Treatments for Autism: Research Needs and Future Directions', *Journal of Autism and Developmental Disorders* 30(5): 373–378.

Schreibman, L. & Koegel, R.L. (2005) 'Training for Parents of Children with Autism: Pivotal Responses, Generalization, and Individualization of Interventions', In E.D. Hibbs & P.S. Jensen (eds.) *Psychosocial Treatments for Child and Adolescent Disorders: Empirically Based Strategies for Clinical Practice* (2nd ed.), pp 605–631. Washington, DC: American Psychological Association.

Shea, V. (2004) 'A Perspective on the Research Literature Related to Early Intensive Behavioral Intervention (Lovaas) for Young Children with Autism', *Autism* 8(4): 349– 367.

Short, A.B. (1984) 'Short-term Treatment Outcome Using Parents as Co-therapists for Their Own Autistic Children', *Journal of Child Psychology and Psychiatry* 25(3): 443–458.

Simpson, R.L. (2005a) *Autism Spectrum Disorders: Interventions and Treatments for Children and Youth*. Thousand Oaks, CA: Corwin Press.

Simpson, R.L. (2005b) 'Evidence-based Practices and Students with Autism Spectrum Disorders', *Focus on Autism and Other Developmental Disabilities* 20(3): 140–149.

Simpson, R.L., McKee, M., Teeter, D., & Beytien, A. (2007) 'Evidence-Based Methods for Children and Youth with Autism Spectrum Disorders: Stakeholder Issues and Perspectives', *Exceptionality* 15(4): 203–217.

Smith, T. (1996) 'Are Other Treatments Effective? In C. Maurice, G. Green, & S.C. Luce (eds.). *Behavioral Intervention for Young Children with Autism: A Manual for Parents and Professionals*, pp. 45–59. Austin, TX: Pro-ed.

Smith, T., Groen, A.D. & Wynn, J.W. (2000) 'Randomized Trial of Intensive Early Intervention for Children with Pervasive Developmental Disorder', *American Journal on Mental Retardation* 105(6): 269–85.

Smith, T., Groen, A.D. & Wynn, J.W. (2001) 'Randomized Trail of Intensive Early Intervention for Children with Pervasive Developmental Disorder: Errata', *American Journal on Mental Retardation* 106 (3): 208.

Smith, T., Scahill, L., Dawson, G., Guthrie, D., Lord, C., Odom, S., Rogers, S., & Wagner, A. (2007) 'Designing Research Studies on Psychosocial Intervention in Autism', *Journal of Autism and Developmental Disorders* 32 (2): 354–366.

Society of Clinical Psychology (1995) 'Task Force on Promotion and Dissemination of Psychological Procedures', *The Clinical Psychologist* 48(1): 1–17.

Sofronoff, K., Leslie, A., & Brown, W. (2004) 'Parent Management Training and Asperger Syndrome: A Randomized Controlled Trial to Evaluate a Parent Based Intervention', *Autism* 8(3): 301–317.

Solomon, M., Goodlin-Jones, B.L., & Anders, T.F. (2004) 'A Social Adjustment Enhancement Intervention for High Functioning Autism, Asperger's Syndrome, and Pervasive Developmental Disorder-NOS', *Journal of Autism and Developmental Disorders* 34(6): 649–668.

Strain, P.S. & Hoyson, M. (2000) 'The Need for Longitudinal, Intensive Social Skill Intervention: LEAP Follow-Up Outcomes for Children with Autism', *Topics in Early Childhood Special Education* 20(2): 116–122.

U.S. Department of Health and Human Services. (1999) '*Mental Health: A Report of the Surgeon General–Executive Summary*', Rockville, MD: U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services, National Institutes of Health, National Institute of Mental Health. [http://www.surgeongeneral.gov/library/mentalhealth/summary.html]

Webster, A., Webster, V., & Feiler, A. (2002) 'Research Evidence, Polemic and Evangelism: How Decisions are Made on Early Intervention in Autistic Spectrum Disorder', *Educational and Child Psychology* 19(3): 54–67.

Welterlin, A. (2009). The Home TEACCHing Program: A Study of the Efficacy of a Parent Training Early Intervention Model. Unpublished doctoral dissertation, Rutgers University.

Wendt, D.C. & Slife, B.D. (2007) 'Is Evidence-Based Practice Diverse Enough? Philosophy of Science Considerations', *American Psychologist* 62(6): 613–614.

Westen, D. & Bradley, R. (2005) 'Empirically Supported Complexity: Rethinking Evidence-Based Practice in Psychotherapy', *Current Directions in Psychological Science* 14(5): 266–271.

Wood, J.J., Drahota, A., Sze, K., Har, K., Chiu, A., & Langer, D.A. (2009) 'Cognitive Behavioral Therapy for Anxiety in Children with Autism Spectrum Disorders: A Randomized, Controlled Trial', *Journal of Child Psychology and Psychiatry* 50(3): 224–234.

Yoder, P. & Stone, W.L. (2006) 'Randomized Comparison of Two Communication Interventions for Preschoolers with Autism Spectrum Disorders', *Journal of Consulting and Clinical Psychology* 74(3): 426–435.

APPENDIX

Abbreviations

APA	American Psychological Association
EBPP	Evidence-Based Practice in Psychology
EST	Empirically Supported Treatments
EVT	Empirically Validated Treatments
NCLB	Elementary and Secondary Education Act (No Child Left Behind Act of 2001)
RCT	Randomized Controlled Trials
SBR	Scientifically Based Research