



INFORMATION PAPER

Research to Inform Practice



Evidence-Based Practice

As professionals, educators are expected to identify and disseminate practices that have empirical evidence of effectiveness. An understanding and knowledge of evidence-based interventions is integral to evidence-based practice and is founded in the belief that interventions with an empirical base are more likely to be effective than those that have not been scientifically supported.

More children than ever are being diagnosed with Autism Spectrum Disorder (ASD) with a commonly quoted prevalence rate of 1 in every 110 children ([Centers for Disease Control and Prevention, 2011](#)). The increasing number of children with ASD in our public school system underscores the importance of using the knowledge gained from research to develop effective programs and services for children with ASD.

Why is this important?

Across the four Atlantic Provinces it is estimated that approximately 3,900 school-age children are diagnosed with ASD. The disorder imposes significant and often serious challenges to the individual and to the families and service providers who are responsible for their care and education.

Over the past several decades, ASD has been the subject of considerable research and much has been written about the disorder and the range of interventions/treatments claiming to ameliorate, if not ‘cure,’ the disorder. However, all research is not equal and of the same quality; therefore making sense of this considerable body of research is a complex and multifaceted process ([Luiselli et al. 2008](#)). In spite of this challenge, much has been learned from the research that can be used to guide the selection and implementation of effective practices in our work with children with ASD.

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Information Papers provide a review and summary of research on requested topics. The papers aim to promote informed decision making about issues and practices that affect the education and well-being of children with autism within our public education systems.

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Disclaimer

This document synthesizes current knowledge and offers recommendations for consideration.

It does not constitute provincial education policy or commit Departments of Education to the activities described. This document originates with the Interprovincial Autism Advisory Group.



What is evidence-based practice (EBP)?

The American Psychological Association defines **evidence-based practice as the integration of the best available research evidence with clinical expertise in the context of patient characteristics, culture, and preference** (APA Presidential Task Force on Evidence-Based Practice 2005).

Although the two terms “evidence-based treatment/intervention” and “evidence-based practice” are frequently used interchangeably, it is important to make a distinction between the two. **Evidence-based treatment refers to specific treatments or intervention models that have been proven through sufficient experimental evidence to be effective for specific problems**, i.e. measurable differences in behaviors or class of behaviors can be attributed to the intervention (Levant, 2005, Luiselli et al, 2009, Myers et al., 2007). It is recognized, however, that evidence-based practice is determined by more than just research. Evidence-based practice is founded on an understanding of the research, and this knowledge is then integrated into the real world of practice. This requires professional judgment that takes into consideration factors such as; individual and family preferences (i.e., responsive to and inclusive of family and youth perspectives), clinical expertise, capacity (i.e., available skills and resources) and the environment in which an intervention is implemented. EBP assumes a coherent body of scientific knowledge which allows the practitioner to anticipate the potential impact of an intervention upon a particular student/child (Myers et al., 2007).

Beaulieu (2009) postulates that “*evidence-based practice* bridges the science-to-practice gap by using research evidence to inform clinical practice in the context of the client’s needs and environment”.

In conclusion, EBP requires a scientifically minded orientation, in which the practitioner builds on evidence through engaging in an ongoing process of observation, inquiry and evaluation of outcomes. It includes the consideration of factors that affect the implementation of interventions and the evaluation of their impact. Detrich (2008) describes the **process of evidence-based practice as including the three steps of identifying, implementing, and evaluating evidence-based interventions**. These definitions recognize that intervention/education is a dynamic process and although treatment selection may start with an understanding of evidence-based interventions, it is then informed by the educator’s knowledge of the child, related circumstances and additionally by the ongoing collection and analysis of data as an intervention is implemented.

How clear is the research?

There are hundreds of research studies related to the field of ASD that have been published in a variety of resources. Fortunately, over the past decade there have been several comprehensive research reviews conducted to analyze this research with the goal of identifying practices that have scientific evidence of effectiveness for children with autism. Earlier reviews focused primarily on interventions for young children (birth to age 8), (NYSDOH, 1999; National Research Council, 2001, Perry & Condillac, 2008) or on specific aspects such as screening, diagnosis and assessment (Naschen et al, 2008; Dua, 2003). More recent reviews provide a thorough evaluation of interventions for individuals with ASD up to the age of 22. This shift in focus allows us to be more confident the interventions will be applicable to school-aged children and youth.

For the purpose of this paper, the most pertinent of these reviews are:

- The National Autism Center (2009): *The National Standards Project Report*
- National Center for Professional Development for ASD (2009): *Evidence-Based Practices in Interventions for Children and Youth with Autism Spectrum Disorders*
- Maine Department of Health and Human Services & Department of Education (2009): *Interventions for Autism Spectrum Disorders, State of The Evidence: Report of the Children's Services Evidence-Based Practice Advisory Committee*
- New Zealand Ministry of Education and Ministry of Health (2009): *Technical Review of Published Research on Applied Behavioral Analysis Interventions for People with Autism Spectrum Disorder*
- New Zealand Ministries of Health and Education (2008): *New Zealand Autism Spectrum Disorder Guideline*

Essentially these reviews provide clarity to assist educators and practitioners in making decisions regarding interventions with children with ASD. However, as there is not yet consensus among researchers and reviewers as to what criteria and/or processes should be used to select and review studies to determine treatment efficacy, the reviews do not always report the same conclusions. The methodologies used by reviewers differ in a number of key areas which in turn impacts the interpretation of findings. Following is a brief review of the most significant differences.

Inclusionary and exclusionary criteria for selecting studies

Each project established different criteria for determining the studies selected for review in their evaluation of evidence based practices for ASD, e.g., diagnostic criteria, co-morbid conditions, age of subjects, timeframe, etc. In some cases, this difference in criteria is significant and has a considerable impact on the findings.

Criteria used to evaluate the scientific rigor/merit of studies (i.e., evaluating if the methods used provide convincing support that a treatment was effective)

Although there is not a universally accepted definition, it is generally agreed that two independent, randomized clinical trials conducted by separate research teams meets the criteria of evidence-based (Reichow 2007). Researchers argue this definition is too rigid and ignores the findings of a large body of group design and single-subject design studies. More recent reviews developed rubrics or rating scales to assess scientific rigor based upon a number of research dimensions such as experimental design, measurement of the dependent and independent variables, participant involvement, inter-rater reliability, and generalization. This provides a means to objectively measure a broader range of studies.

The classification system used to rate the strength of the evidence

Reviewers used different rating systems to indicate their level of confidence in the effectiveness of a treatment based upon the quality, quantity, and consistency of research findings. These ratings carry different labels and varied levels of evidence to then define the category. For example, NSP and Maine classify treatments deemed effective (confident that favorable outcomes were the result of the treatment) as “established” whereas NCPD-ASD referred to this category as “evidence-based”.

Reviewers also use different terminology and categories to rate interventions of lesser evidentiary standards.

Terminology used to identify the outcome/s targeted by interventions

Across the hundreds of studies reviewed, a large number of different skills, behavior or groups of behaviors were targeted for change using a variety of interventions. Reviews grouped targets/ outcomes into larger content areas in order to identify which treatment/s were beneficial in terms of a specific skill or developmental area. These content areas differ somewhat between the various reviews and again challenge the practitioner to find consensus across the reviews. For example the Maine and NCPD-ASD reviews consider the impact of interventions on academics (teaching literacy and numeracy skills) whereas the NSP uses learning readiness as a targeted outcome.

Terminology used to identify specific or categories of interventions

Interventions in the literature are not always referred to by the same name which makes it difficult to communicate about the different interventions. The reviews in many cases utilize different terms to label specific practices or combinations of interventions. For example, the NSP collapses a group of interventions under the category of “behavior package” whereas the NCPD-ASD report considers a number of these practices as specific interventions such as reinforcement, task analysis, and discrete trial training. This requires practitioners to ascertain which terms refer to the same intervention across the reviews.

Please refer to *Appendix 1: Methodology Processes* for a summary of the key criteria and processes utilized by each of the aforementioned reviews in their analysis of evidence-based practices.

What does the research tell us?

In spite of the differences in the methods used for review, there is little disagreement among reviewers that interventions based on behavioural strategies have the strongest empirical evidence of effectiveness. Authors of the aforementioned reviews make note of a “spirit of collaboration” as they build consensus among experts of different fields and orientations and suggest that in many cases the noted differences relate more to organization and categorization rather than disagreement about the evidence (NCPD-ACD website).

The following table provides a list of interventions which have been deemed to have sufficient empirical evidence to be classified as evidence-based by at least two of the above-mentioned reviews, i.e., proven effectiveness. The table only provides a cursory summary of the interventions. It should be noted all of the interventions listed are not effective for children of all ages, all diagnoses under the spectrum and/or for all targeted outcomes. It is important for professionals to understand the research from a comprehensive perspective in order to make informed decisions concerning intervention options for any given individual.

Table 1 – Evidence-Based Interventions for Children and Youth with ASD

Intervention	NSP	NCPD-ASD	Maine	New Zealand
Comprehensive Behavioral Treatment for Young Children	x	N/A ¹	x	x
Antecedent Based Interventions ²	x	x	x	x
Time Delay	x	x	x	x
Task Analysis	x	x	x	x
Reinforcement	x	x	x	x
Response Interruption/Redirection	x	x	x	x
Differential Reinforcement	x	x	x	x
Discrete Trial Training	x	x	x	x
Video Modeling	x	x	x	x
Extinction (Reductive Procedures)		x		x
Pivotal Response Training PRT	x	x		
Functional Behavior Assessment	x	x	x	x
Functional Communication Training		x	x	x
Naturalistic Intervention (incidental teaching and social conditioning, natural language paradigm)	x	x	x	x
Stimulus Control/Environmental Modification	x	x	x	x
Peer-Mediated Instruction and Intervention		x	x	x
Picture Exchange Communication System (PECS)		x	x	x
Visual Supports (schedules, scripts)	x	x	x	x
Structured Work Systems	x	x		x

Computer-Aided Instruction		X		X
Self-Management (monitor, record, report on and reinforce own behavior)	X	X		X
Social Narratives (Story-Based interventions, e.g., Social Stories™)	X	X		X
Speech Generating Devices/VOCA		X	X	X
Imitation Training using Modeling, Prompting, Differential Reinforcement using Tokens and Error Correction		X	X	X

¹ The NCPD-ASD did not review comprehensive programs for young children, but contend many of the intervention components overlap with many NCPD identified interventions.

² It should be noted in some cases a specific intervention category designated by a review group includes a variety of strategies that can be used as a single strategy, but most often are used in combination with strategies in the same category or an alternate category. For example NSP uses “Antecedent Package” to categorize those interventions involved in the modification of situational events that precede the occurrence of a behavior. This category includes, “but is not restricted to” behavior chain interruption; behavioral momentum, choice, contriving motivational operations, cueing and prompting/prompt fading procedures, environmental enrichment (environmental modification of task demands, social comments, adult presence, inter-trial interval, seating, familiarity with stimuli), errorless learning, errorless compliance, habit reversal (incorporating echolalia, special interests, thematic activities, or ritualistic/obsessional activities into tasks), maintenance interspersal, non-contingent access, non-contingent reinforcement, priming, stimulus variation, and time delay. Many of these strategies (principles) are listed as individual interventions or subsumed under a larger intervention category by other reviews.

Summary

Education has been defined as the fostering of acquisition of skills and knowledge to assist a child in developing independence and personal responsibility. This takes into account not only academic learning, but also socialization, adaptive skills, communication, amelioration of interfering behaviors, and generalization of abilities across multiple environments (Lord et al, cross ref Myers, 2007). With such an all-encompassing mandate, using procedures with no empirical evidence of effectiveness within an educational setting places children at risk by slowing their progress and wasting time that is valuable to their development and learning.

There is an ever increasing body of evidence that supports the efficacy of specific interventions and educational practices in ameliorating symptoms and enhancing functioning for children with ASD across their school years. Interventions coming from the applied behaviour analysis, behavioural psychology and positive behavioural support literature have the strongest research support at this time.

At the same time it is important to note those treatments designated as emerging, promising, or preliminary may be effective, but the strength of current research does not yet meet higher evidentiary standards. As research continues, the rating for these interventions may change. In fact, both the National Standards Project and the NCPD-ASD reports are currently being updated through a review of studies beyond 2007. These reports are expected to be released in 2012.

The heterogeneity of ASD makes the selection of effective treatments for any one individual challenging. Reviews serve to highlight evidence-based interventions that can be used to inform educators and to mitigate the usage of unsubstantiated interventions and practices. While every parent has the right to seek treatment they believe may work for them and their child, professionals have a responsibility to objectively interpret research evidence and provide effective and empirically validated interventions.

Implications for practice

Research conveys that in order for education to implement a system of evidence-based practice it is critical the organization at all levels supports the identification, dissemination and implementation of science-based interventions. This requires:

- 1) departments and district/boards to work collaboratively to support the large scale adoption of evidence-based practice through providing access to training and ongoing coaching/mentoring systems for staff.
- 2) district and school level specialists to be abreast of best practices and science-based interventions and to make that knowledge accessible to those responsible for the care and education of students with ASD.
- 3) school teams to include the following practices in their work with individual children;
 - identify functional target behaviors or skills based on assessment and consultation with appropriate team members and family.
 - select target behaviors that have high social value in the areas of relationships, academic performance, health and employment.
 - select intervention options giving priority to those with the strongest evidence of effectiveness. The team and family discuss the evidence available to support the selected intervention as they consider the child, setting, training and resources available.

- ensure all team members understand and agree to a well-documented intervention plan.
- start with a baseline of the targeted behavior and identify a system of measurement that will be used to evaluate the student’s progress (data collection).
- provide appropriate level of supervision to ensure the intervention protocol is being applied as designed.
- monitor progress for effectiveness and make adjustments accordingly (data driven decision making).

Further quality research is needed in many areas to inform educators and other practitioners in their decisions concerning interventions for children with ASD. In the meantime, practitioners are encouraged to integrate their knowledge of strategies based upon evidence into their day-to-day practice. This requires educational/intervention plans that are also based upon professional judgment, understanding of the child, the context, and developed through an active partnership between the child’s parents and program planning team.

Note: This paper is produced by the Interprovincial Autism Advisory Committee. It will be amended as new information comes to light through relevant research and literature. If you would like to make a comment or provide additional information related to this topic area, please forward to: Sheila_Bulmer@apsea.ca

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Resources

- The National Autism Center published the *National Standards Project Report* and two supplementary reports which provide guidelines for evidence-based practice for pre- and school-aged children (2009) <http://www.nationalautismcenter.org/nsp/reports.php>
Parent Manual http://www.nationalautismcenter.org/learning/parent_manual.php
Evidence-Based Practice and Autism in the Schools Educator Manual
<http://www.nationalautismcenter.org/learning/practitioner.php>

- Evidence-Based Practices in Interventions for Children and Youth with Autism Spectrum Disorders - National Center for Professional Development for ASD, 2009. Odom, S., Collet-Klingenberg, L., Rogers, S., Hatten, D. (2010) Evidence-Based Practices in Interventions for Children and Youth with Autism Spectrum Disorders, *Preventing School Failure*, 54(4), 275-282.

The NCPD-ASD provides a briefing on each of the 24 interventions it identifies as evidence-based (<http://autismpdc.fpg.unc.edu/content/briefs>). **Note:** These briefings have been incorporated into web-based modules through collaboration with the Ohio Center for Autism and Low Incidence Disabilities and the Autism Intervention Module (AIM) website <http://www.ocali.org/aim/>. The modules provide implementation guidelines, the evidence base for the practice, procedural details of the EBP, descriptions of how to collect data for this practice, case examples, picture and/or video examples, and additional resources (e.g., data sheets, where to find materials, etc).

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Appendix 1 – Methodology Processes

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions Reviewed
<p>NSP (National Standards Project)</p>	<p>Age range: up to the age of 22</p> <p>Study inclusion criteria:</p> <ul style="list-style-type: none"> a) targeted core characteristics and associated symptoms of ASD, b) diagnoses of Autistic Disorder, Asperger’s Syndrome, and Pervasive Developmental Disorder–Not Otherwise Specified (PDD-NOS), c) published in peer-reviewed treatment literature 1957-2007, d) individual with ASD was the target of the treatment study, i.e., study not included if the parent, teacher, caregiver was the sole target. <p>Study exclusion criteria:</p> <ul style="list-style-type: none"> a) Rett’s Disorder and Childhood Disintegrative Disorder, b) children at risk or suspected of an ASD diagnosis, c) uncommon co-morbid conditions to ASD, d) no empirical data. <p>(criteria reviewed in pp 10-15)</p>	<p>Developed the Scientific Merit Rating Scale (SMRS) which rates studies across five dimensions - 5 representing a strong score (sufficient scientific rigor has been applied) to 0 representing a poor score (insufficient rigor).</p> <p>Dimensions include:</p> <ul style="list-style-type: none"> a) research design, b) measurement of dependent variable, c) measurement of independent variable or procedural fidelity, d) participant ascertainment, e) generalization. <p>(description of scale, pp 16-26)</p> <p>Note: Reviewers maintained an acceptable level of inter-observer agreement of >.80</p>	<p>Four classifications:</p> <p>Established - Sufficient evidence is available to confidently determine that a treatment produces beneficial treatment effects for individuals on the autism spectrum. That is, these treatments are established as effective.</p> <p>Emerging - Although one or more studies suggest a treatment produces beneficial treatment effects for individuals with ASD, additional high quality studies must consistently show this outcome before we can draw firm conclusions about treatment effectiveness.</p> <p>Unestablished - There is little or no evidence to allow us to draw firm conclusions about treatment effectiveness with individuals with ASD. Additional research may show the treatment to be effective, ineffective, or harmful.</p> <p>Ineffective/Harmful - Sufficient evidence is available to determine that a treatment is ineffective or harmful for individuals on the autism spectrum. (pp 31 – 33)</p>	<p>Targeted behaviors/ categories included:</p> <ul style="list-style-type: none"> ▪ communication ▪ higher cognitive functions ▪ interpersonal ▪ learning readiness ▪ motor skills ▪ personal ▪ responsibility ▪ placement ▪ play ▪ self-regulation <p>(description provided, pgs 35-40)</p>	<p>Combined treatment approaches that were similar and held common core characteristics into 38 treatment categories.</p> <p>Established Treatments:</p> <ul style="list-style-type: none"> ▪ antecedent package ▪ behavioral package ▪ comprehensive behavioral treatment for young children ▪ joint attention intervention ▪ modeling ▪ naturalistic teaching strategies ▪ peer training package ▪ pivotal response treatment ▪ schedules ▪ self-management ▪ story-based intervention package <p>Emerging Treatments:</p> <ul style="list-style-type: none"> ▪ augmentative and alternative communication device ▪ cognitive behavioral intervention package ▪ developmental relationship-based treatment ▪ exercise ▪ exposure package ▪ imitation-based interaction ▪ initiation training ▪ language training (production) ▪ language training (production & understanding) ▪ massage/touch therapy ▪ multi-component package ▪ music therapy ▪ peer-mediated instructional arrangement ▪ picture exchange communication system ▪ reductive package ▪ scripting ▪ sign instruction ▪ social communication intervention ▪ social skills package ▪ structured teaching ▪ technology-based treatment

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions Reviewed
					<ul style="list-style-type: none"> ▪ theory of mind training <p><u>Unestablished Treatments:</u></p> <ul style="list-style-type: none"> ▪ academic interventions ▪ auditory integration training ▪ facilitated communication ▪ gluten- and casein-free diet ▪ sensory integrative package <p>(treatments described in pp 43-75)</p>
NCPD-ASD	<p>Age range: up to the age of 22</p> <p>Study inclusion criteria:</p> <ul style="list-style-type: none"> a) diagnosis of ASD, b) up to and including 2007, c) met methodological criteria as defined under scientific rigor section. <p>Study exclusion criteria:</p> <ul style="list-style-type: none"> a) diagnosis of Rett’s Disorder and Childhood Disintegrative Disorder 	<ul style="list-style-type: none"> a) have outcomes for those participants as dependent measures, b) clearly demonstrate that the use of the practice was followed by gains in the targeted teaching skills, and c) have adequate experimental control so one could rule out most threats to internal validity. <p>Note: All research articles were initially screened by NCPD staff to determine if they met inclusion criteria and methodological criteria. A second senior researcher reviewed all screened in studies to ensure they met criteria.</p>	<p>Only list practices that are “evidence-based”:</p> <ul style="list-style-type: none"> a) at least 2 experimental or quasi-experimental group design studies carried out by independent researchers, b) at least 5 single case design studies from at least 3 independent investigators, c) a combination of at least one experimental and one quasi-experimental study and 3 single case design studies from independent investigators. 	<p>Targeted behaviors/categories include:</p> <ul style="list-style-type: none"> ▪ academic ▪ behavior ▪ communication ▪ play ▪ social ▪ transitions 	<p>Lists 24 evidenced-based practices. Labels practice by using terminology for a well-known practice (e.g. discrete trial training, PECS) or grouped practices with similar/identical procedural features under a generic name, e.g., naturalistic interventions include milieu teaching, activity-based interventions and incidental teaching. Grouped practices under two larger categories:</p> <p><u>Behavioral Strategies</u></p> <ul style="list-style-type: none"> ▪ prompting ▪ reinforcement ▪ task analysis ▪ time delay ▪ computer-aided instruction ▪ discrete trial training ▪ naturalistic interventions ▪ parent implemented interventions ▪ peer mediated instruction intervention ▪ picture exchange communication system ▪ pivotal response training <p><u>Positive Behavioral Support Strategies</u></p> <ul style="list-style-type: none"> ▪ functional behavior assessment ▪ stimulus control/environmental modification ▪ response interruption/redirection ▪ functional communication training ▪ extinction ▪ differential reinforcement ▪ self-management ▪ social narratives ▪ social skills training groups ▪ structured work systems ▪ video modeling ▪ visual supports

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions Reviewed
					<ul style="list-style-type: none"> VOCA/speech-generating devices (Table 2 - Identified Evidence-Based Practices with Descriptors – pp 278) <p>Note: A comparison of the NCPD-ASD and NSP intervention categories is provided at the following site: http://autismpdc.fpg.unc.edu/content/national-standards-project</p>
Maine	<p>Age range: children and youth</p> <p>Study inclusion criteria:</p> <ul style="list-style-type: none"> a) published in a peer-reviewed, scholarly journal to and including 2008, b) children with Autism, PDD/PDD-NOS, and/or Asperger’s Syndrome, c) if children had a dual diagnosis, d) if the intervention addressed the core symptoms of ASD and/or associated issues, such as aggression or self-injurious behavior. <p>Study exclusion criteria:</p> <ul style="list-style-type: none"> a) diagnosis of Rett’s Disorder and Childhood Disintegrative Disorder. 	<p>Utilized the <i>Evaluative Method for Determining Evidence-Based Practices</i> for both group and single-subject research. Rates scientific rigor based on;</p> <ul style="list-style-type: none"> a) primary quality indicators of participant characteristic, independent variables, comparison condition (control group) dependent variable and link between research question and data analysis, and b) secondary quality such as inter-observer agreement, blind raters, attrition, effect size, etc. <p>(description of rating scales in appendices, pp 42-44 and 59-65)</p> <p>Note: Each study was reviewed by two research staff, however, did not utilize inter-rater reliability measurement.</p>	<p>Established Evidence - The treatment has been proven effective in multiple strong or adequately rated group experimental design studies, single-subject studies, or a combination. Results must be replicated in studies conducted by different research teams.</p> <p>Promising Evidence - The intervention has been shown effective in more than two strong or adequately rated group experimental design studies or at least three single-subject studies. Additional research is needed by separate teams to confirm the intervention is effective across settings and researchers.</p> <p>Preliminary Evidence - The intervention has been shown effective in at least one strong or adequately rated group or single-subject design study. More research is needed to confirm results.</p> <p>Studied and No Evidence of Effect - Numerous (three or more) strong or adequately rated studies have determined the intervention has no positive effect on the desired outcomes.</p>	<p>Targeted behaviors included:</p> <ul style="list-style-type: none"> communication academics adaptive living skills challenging behaviors social Skills vocational Skills diet and nutritional approaches and psychotropic medications specific to such areas as disruptive behaviors, agitation, inattention and hyperactivity in children with ASD¹ <p>(pp 32-36)</p>	<p>Grouped interventions under 11 categories:</p> <p>Established Evidence:</p> <p>Applied Behavior Analysis (ABA)</p> <ul style="list-style-type: none"> ABA for challenging behavior ABA for communication ABA for social skills <p>Augmentative and Alternative Communication (AAC)</p> <ul style="list-style-type: none"> picture exchange communication system <p>Pharmacological Approaches</p> <ul style="list-style-type: none"> Risperidone (respiridol) Ritalin Haldol <p>Promising Evidence:</p> <p>Applied Behavior Analysis (ABA)</p> <ul style="list-style-type: none"> ABA for adaptive living skills <p>Augmentative and Alternative Communication (AAC)</p> <ul style="list-style-type: none"> voice output (VOCA) <p>Psychotherapy</p> <ul style="list-style-type: none"> cognitive behavior therapy for anxiety <p>Preliminary Evidence:</p> <p>Applied Behavior Analysis (ABA)</p> <ul style="list-style-type: none"> ABA for academics ABA for vocational skills <p>Augmentative and Alternative Communication (AAC)</p> <ul style="list-style-type: none"> sign language <p>Developmental, Social-Pragmatic (DSP) Models</p> <ul style="list-style-type: none"> eclectic models

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions Reviewed
			<p><u>Insufficient Evidence</u> - Conclusions cannot be drawn on the efficacy of the intervention due to a lack of quality research and/or mixed outcomes across several studies.</p> <p><u>Evidence of Harm</u> - Studies or published case reports indicate the intervention involves significant harm or risk of harm, including injury and death.</p>		<p>Diet & Nutritional Approaches</p> <ul style="list-style-type: none"> ▪ modest effect on sensory motor with symptoms with Vitamin C <p>Pharmacological Approaches</p> <ul style="list-style-type: none"> ▪ 3 medications <p>Psychotherapy</p> <ul style="list-style-type: none"> ▪ cognitive behavior therapy for anger management <p>Sensory Integration Therapy</p> <ul style="list-style-type: none"> ▪ touch therapy/massage <p>Other</p> <ul style="list-style-type: none"> ▪ hyperbaric oxygen treatment <p><u>Studied and No Evidence of Effect:</u></p> <p>Pharmacological Approaches</p> <ul style="list-style-type: none"> ▪ 2 including secretin <p><u>Insufficient Evidence:</u></p> <p>Applied Behavior Analysis (ABA)</p> <ul style="list-style-type: none"> ▪ ABA for academics-cooperative learning groups <p>Augmentative and Alternative Communication (AAC)</p> <ul style="list-style-type: none"> ▪ facilitated communication <p>Diet & Nutritional Approaches</p> <ul style="list-style-type: none"> ▪ casein-gluten free, Omega-3 fatty supplements , vitamin B6/magnesium <p>Developmental, Social-Pragmatic (DSP) Models</p> <ul style="list-style-type: none"> ▪ DIR/Floortime ▪ RDI ▪ SCERTS <p>Pharmacological Approaches</p> <ul style="list-style-type: none"> ▪ 7 medications <p>Sensory Integration Therapy</p> <ul style="list-style-type: none"> ▪ auditory integration training ▪ sensory integration training (includes deep pressure, weighted vests, etc.) <p>Social Skills Training</p> <ul style="list-style-type: none"> ▪ social skills training groups ▪ social stories <p>Other</p> <ul style="list-style-type: none"> ▪ TEACCH

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions Reviewed
					Evidence of Harm: <ul style="list-style-type: none"> ▪ intravenous chelation (Table 1 – p 24)
<p>Two documents; #1) The New Zealand Autism Spectrum Disorder Guidelines (and related evidence tables) and; #2) Review of applied behavior analytic interventions</p>	<p>Age Range: individuals of all ages</p> <p>#1. The guideline is an evidence-based summary that covers the identification and diagnosis of ASD, and ongoing assessment and access to interventions and services. It is divided in eight parts. Inclusion criteria were broad including autism-specific studies; double-blind randomized controlled trials; systematic reviews; case reports; papers of general interest on the topic; published guidelines; published reviews of relevant literature; writing from experts in the field; first person accounts from people with ASD; practice experience and expert opinion; the experiences of people with ASD and their parents; and policy and position papers. (pg 13 for the sections most related to education)</p> <p>Study Inclusion Criteria:</p> <ol style="list-style-type: none"> a) published in a peer reviewed journal between 1998 to 2004 (although did include some studies occurring up to 2007), b) a focus on education and ASD, c) diagnosis of Autism, PDD/PDD-NOS, and/or Asperger’s Syndrome, d) participants with a dual diagnosis. 	<p>#1. guideline review</p> <p>The grading system was developed by the new Zealand Guideline Group (NZGG) and is a two-tier system:</p> <ol style="list-style-type: none"> a) each relevant study was appraised using a checklist (method, participation, measures, and outcomes/results) and was assigned an overall level of evidence, indicating whether the study met most or all of the criteria in the checklist, some of the criteria or very few of the criteria (+, ~ or x), b) the body of evidence was then evaluated to develop graded recommendations. <p>(Studies and ratings pertinent to educational practices, pp112-203: Evidence Tables for The New Zealand Autism Spectrum Disorder Guidelines)</p>	<p>#1. guideline review</p> <p>Strength of evidence was based on 3 domains;</p> <ol style="list-style-type: none"> 1) quality (predicated on the extent to which bias was minimized), 2) quantity (number of studies, sample size or power), and 3) consistency (extent to which similar results are reported using similar ad different study designs). <p>Recommendations are supported by GOOD evidence (where there is a number of studies that are valid, applicable and clinically relevant), by FAIR evidence (based on studies that are mostly valid, but there are some concerns about the volume, consistency, applicability and/or clinical relevance of the evidence that may cause some uncertainty, but are not likely to be overturned by other evidence), by EXPERT OPINION only (from external opinion, published or unpublished, e.g., consensus guidelines), or where no evidence is available, best practice recommendations are made based on the experience of the Guideline Development teams or feedback from consultation within New Zealand.</p> <p>(description of process, pp 3-6; Evidence Tables for The New Zealand Autism Spectrum Disorder Guidelines)</p>	<p>#1. guideline review</p> <p>Targeted behaviors/outcomes :</p> <ul style="list-style-type: none"> ▪ social development and relating to others, ▪ development of cognitive skills, ▪ functional and spontaneous communication used in natural environments, ▪ engagement and flexibility, ▪ fine and gross motor skills, ▪ challenging behaviors, ▪ generalization of skills, ▪ maintenance of effects, ▪ comprehensive behavioral programs. 	<p>#1. guideline review</p> <p>The guidelines characterize interventions as being on a continuum of three primary models,</p> <ol style="list-style-type: none"> 1) discrete trial training (DTT)/traditional behavioural approaches, for example, Lovaas Young Autism Project 193 194; 2) approaches which draw on recent behavioural and developmental research, for example, Pivotal Response Training¹⁹⁵ and SCERTS^{TM196}; 3) developmental (social pragmatic) approaches, for example “Floortime” . <p>(description of models, pp 88-90)</p>

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions Reviewed
	<p>#2. ABA review</p> <p>Ministries of Health and Education in 2007 conducted an independent review of the research on the effectiveness of ABA interventions.</p> <p>Study inclusion criteria:</p> <p>a) studies between 1998-2007</p> <p>b) data from the analysis of peer-reviewed publications collected by the NSP review</p> <p>c) additional studies that met criteria established by the ministries of health and education</p> <p>Study exclusion criteria:</p> <p>a) did not meet or exceed a score of 2 on the Scientific merit rating scale (SMRS)</p> <p>b) Single case/subject experimental study design, unless included in a systematic reviews, or</p> <p>c) reported on samples fewer than 5</p>	<p>#2. ABA review</p> <p>Reviewers were trained in the SMRS coding system (national and international inter-rater reliability were reported as “generally high”.</p>	<p>#2. ABA review</p> <p>Level of support for intervention was derived by only using studies receiving a SMRS score of 2 or higher</p> <p>Strong support – for beneficial results</p> <p>Limited Support – emerging, but insufficient evidence to provide string support</p> <p>Unknown</p> <p>Does not support (no specific tool provided)</p>	<p>#2. ABA review</p> <p>Same as guidelines except did not include fine and gross motor outcomes (Technical Report, pp 27-44).</p> <p>Note: A comparison of targets with those of the NSP. (Technical Report, pp 24-25)</p>	<p>#2. ABA review</p> <p>List 26 sets of interventions (can include a group or a combination of interventions) as evidence-based (Technical Report, pp 45-46)</p> <ul style="list-style-type: none"> ▪ communication training ▪ differential reinforcement ▪ differential observing responses to increase accuracy on matching to sample task with words ▪ direct instruction ▪ extinction ▪ function-based intervention package ▪ functional communication training ▪ imitation ▪ learn units plus multiple example instruction ▪ naturalistic teaching strategies ▪ non-contingent reinforcement ▪ prompts ▪ reductive procedures ▪ reinforcement plus non-contingent access to preferred stimuli ▪ schedules ▪ scripts ▪ self-management ▪ social stories ▪ stimulus control ▪ task analysis ▪ teaching communication ▪ teaching social behavior to replace problem behavior ▪ using peers to establish motivating operation ▪ video modeling ▪ video rehearsal ▪ work systems

¹There have been several approaches proposed to guide the psychopharmacologic management (including Complementary and Alternative Medicine (CAM) of ASDs. For a review of one such approach, the reader is directed to Myers et al., **Management of Children with Autism Spectrum Disorders, 2007, from the American Academy of Pediatrics** <file:///C:/Users/WinXp/Desktop/APA%20Treatment%20Guidelines.htm>