APSEA

Autism in Education Information Paper

Research to Inform Practice

Evidence-Based Practice for Learners with Autism Spectrum Disorder

Educators are expected to identify and use interventions and approaches that are supported by scientific evidence. Knowledge and understanding of which interventions have been demonstrated to be successful is integral to effective educational planning. This approach, sometimes referred to as "evidence-based practice," is founded in the belief that interventions that have been proven to be effective in well-controlled research studies are more likely to result in successful outcomes than those that have not been scientifically evaluated. For learners with Autism Spectrum Disorder (ASD) this can be particularly important.

The prevalence of ASD is increasing, with a recently quoted rate of 1 in every 66 children (Public Health Agency of Canada, 2018). This marks a significant increase from the previous rates of 1 in 110 children reported in 2006, and 1 in 150 reported in 2000, as indicated by the US Centers for Disease Control and Prevention. The increasing number of children with ASD in schools underscores the importance of using the knowledge gained from research to develop effective programs and services for these learners.

Why is evidence-based practice important?

Autism Spectrum Disorder poses significant and often serious challenges to individuals diagnosed with ASD and to their families and caregivers. Over the past several decades, a considerable amount of research has been done to identify the interventions and treatments that are most effective in helping individuals with ASD build essential skills and reduce challenging behaviours that may interfere

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Information Papers provide topical research summaries and recommendations based on empirical evidence in the field of Autism Spectrum Disorder. It is our aim that the information will guide thoughtful educational planning within the context of informed evidence-based practice and build awareness of potential benefits and risks for any intervention implemented.

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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 & Early Childhood Development / Lifelong Learning to the activities described. This document originates with the Interprovincial Autism in Education Partnership.

with learning. This body of research has shown that some approaches and strategies are more effective than others for learners with ASD. An online search for "autism intervention" or "autism treatment" will turn up millions of results, and figuring out what works and what does not can be overwhelming. It is essential to be mindful when evaluating potential interventions and to select the approaches that have the highest likelihood of success. At best, ineffective interventions result in the loss of valuable time for learning and skill development and poor use of limited resources. At worst, some of these interventions can be harmful and put learners at risk.

When trying to sort through the research and figure out which interventions are likely to be most effective for each individual learner with ASD, it is important to remember that not all research is equal and of the same quality (Luiselli et al., 2008). Some studies are carefully designed and well-controlled, while others contain biases and significant limitations. Although educators can, and should, use the research to guide the selection process and help them implement effective practices in their work with learners with ASD, it is often not easy to know where to look for good research or what to look for when trying to evaluate the evidence. Fortunately, experts in the field of ASD have taken on the task of combing through years of research and have provided comprehensive and detailed summaries of the evidence to help guide decisions and inform professional practice.

Sorting out the terminology

Perhaps one of the most challenging aspects of figuring out which strategies and interventions are most effective is understanding the confusing terminology. Phrases such as "best practice," "preferred practices," "better practices," "research-based interventions," and "evidence-based treatment" have become quite common in educational vocabulary in recent years. The problem is that, although these terms are frequently used, those who use them are not

> *When working with learners with ASD, starting with the research is essential to increasing the likelihood of the most successful outcomes.*

necessarily on the same page about what they mean. Many of these terms are commonly used at professional learning events, in program planning meetings, and even in general conversation in school staffrooms. The origin of the terms comes from the field of medicine, beginning in the early 1990's, and their use has spread to many other areas of professional practice, including nursing, psychology, and education (Cook & Cothren Cook, 2011). Although these terms are frequently used interchangeably, it is important to make a distinction between them. Since the quality of research can be extremely variable, calling an intervention "research-based" does not necessarily mean that it was proven effective in carefully-designed and well-controlled scientific studies. Although "research-based" sounds good on the surface, the term can be deceiving.

Another term that has appeared recently is "evidence-informed practice." Like many of the other phrases, evidence-informed practice has been interpreted in different ways by different people. Some definitions describe evidence-informed practice as a specific intervention which

is guided by the wisdom of the professional and an understanding of child development, supported by some research and having a history of demonstrating positive outcomes (Howse et al., 2013). A more general definition of evidence-informed practice as an overall approach suggests professional practice in which research evidence is one factor that informs the decision-making process, along with the experience of the professional, the preferences of the individual client/family, the available resources, and the context of the intervention. No single one of these factors is considered to be more important than any of the others. The evidence may serve to inform the practitioner, but it is not necessarily the starting point for selecting interventions (Nevo & Slonim-Nevo, 2011; Sawatzky-Dickson, 2010). When working with learners with ASD, however, starting with the research is essential to increasing the likelihood of the most successful outcomes.

What is evidence-based practice (EBP)?

In order to avoid confusing terminology, and to underscore the importance of starting with the best scientific evidence, in this paper we have chosen to use two specific terms. **"Evidence-based practice"** describes an approach to professional practice which starts with the best available research evidence, then also considers the well-informed professional judgment and expertise of the practitioner based on the learning context, characteristics of the individual learner, and input from the family and school team (APA Presidential Task Force on Evidence-Based Practice, 2005; Wong et al., 2013). Although evidence-based practice starts with the research as its foundation, it does not neglect other important factors, as its purpose is to integrate the research into the real world of practice.

> *"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."*
>
> *(Beaulieu, 2009)*

"Evidence-based intervention" refers to the interventions and strategies that have consistently demonstrated successful outcomes for specific target behaviours in learners who share particular characteristics in several well-controlled, high-quality scientific studies. This means that the changes in behaviour observed and measured in each study were clearly the result of the intervention, and not something else (Levant, 2005; Luiselli et al, 2009; Myers & Plauché Johnson, 2007).

Evidence-based practice involves several key components. It requires the professionals to know and understand which interventions have been demonstrated to be successful for learners who share particular characteristics and for specific learning objectives. It then considers important factors such as individual and family values, staff training, available resources, and learning context, that may affect the implementation of interventions. Finally, it evaluates the impact of the intervention for the learner (Detrich, 2008). For example, research has shown that video modeling is an evidence-based intervention to teach communication skills to learners with ASD. However, if you are working with a learner who has not yet learned to imitate a model, or who does not attend to a video, professional judgment would probably lead

you to choose a different evidence-based intervention, at least until the learner develops these essential prerequisite skills. You might choose to use a particular prompting strategy, which is also supported by research, instead of video modeling, for this learner. Evidence-based practice then requires that the impact of the intervention on the learner's communication skills be measured and monitored on an ongoing basis and that decisions are made based on the data.

Teaching and supporting learners with ASD is a dynamic process. Although educational program planning starts with an understanding of evidence-based interventions, it is informed by the team's knowledge of the individual learner, related circumstances such as the setting, resources, and staff training, and by the ongoing collection and analysis of data as an intervention is implemented. Using the best available research as a starting point means that we have the best chance of helping learners experience successful outcomes.

How clear is the research?

Hundreds of research studies related to the field of ASD have been published in a variety of resources over the past several decades. Sifting through all of that information to figure out which interventions are likely to be most effective for a particular learner would be overwhelming, if not impossible for each individual educator. Fortunately, over the last few years, several comprehensive research reviews have been conducted to analyze this research and identify the interventions and strategies that have scientific evidence of effectiveness for learners with ASD. The earliest reviews focused primarily on interventions for young children (birth to age 8), (New York State Department of Health, 1999; Perry & Condillac, 2008) or on specific aspects such as screening, diagnosis and assessment (Dua, 2003; Nachshen et al, 2008). Recent reviews provide a more thorough evaluation of interventions for individuals with ASD up to the age of 22 (National Autism Center, 2015; Steinbrenner et al., 2020; Wong et al., 2013) as well as an initial examination of evidence-based interventions for adults with ASD (National Autism Center, 2015). The expanded focus of these reviews allows us to be more confident the interventions will be applicable to school-aged children, youth, and young adults.

For the purpose of this paper and school-aged learners with ASD, the most relevant reviews are:
  - The National Clearinghouse on Autism Evidence and Practice (2020). *Evidence-Based Practices for Children, Youth, and Young Adults with Autism*. It should be noted that this review serves as an update to the 2014 review, *Evidence-Based Practices for Children, Youth, and Young Adults with Autism Spectrum Disorder* from the National Professional Development Center on Autism Spectrum Disorder.
  - The National Autism Center (2009/2015). *Findings and Conclusions: The National Standards Project Report* (Phases 1 and 2)
  - National Professional Development Center on Autism Spectrum Disorder (2014): *Evidence-Based Practices for Children, Youth, and Young Adults with Autism Spectrum Disorder*

- 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*

Please refer to **Appendix A: Resources** for more information about these reviews and additional supporting documentation/resources.

These reviews provide clarity to help educators and practitioners make decisions regarding interventions for learners with ASD. However, as there is not yet complete 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 report slightly different conclusions in a few areas. 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 research participants, timeframe, and so on.

Criteria used to evaluate the scientific rigor/merit of studies
Although there is not a universally-accepted definition, it has been suggested that two independent, randomized clinical trials conducted by separate research teams meets the criteria of evidence-based (Reichow, Volkmar, & Cicchetti, 2008). Some researchers argue that this definition is too rigid and ignores the findings of a large body of group design and single-case research 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 variables (target behaviours) and independent variables (interventions), participant involvement, inter-rater reliability (consistency in the data across independent observers), and generalization. This allows reviewers to objectively evaluate 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, the National Autism Center and the Maine Departments of Health & Education both classify interventions deemed effective (confident that favorable outcomes were the result of the intervention) as "established interventions" whereas the National Professional Development Center on ASD and the National Clearinghouse on Autism Evidence and Practice refer to this category as "evidence-based." Reviewers also use different terminology and categories to rate interventions of lesser evidentiary standards, including "emerging," "unestablished" (National Autism Center, 2015), "promising," "preliminary," and "no evidence of effect" (Beaulieu, 2009).

Terminology used to identify the outcome(s) targeted by interventions

Across the hundreds of studies reviewed, a large number of different skills, behaviours, or groups of behaviours were targeted for change using a variety of interventions. Reviews grouped targets/outcomes into larger content areas in order to identify which interventions were beneficial in terms of a specific skill or developmental area. These content areas differ somewhat between the various reviews, making it challenging to directly compare some elements of the reviews. For example, the National Professional Development Center on ASD review categorized target behaviours according to behavioural, developmental, and academic outcomes, whereas the National Autism Center organized target outcomes around specific skills to increase and behaviours to decrease.

Terminology used to identify specific interventions or intervention categories

Interventions in the literature are not always referred to by the same name, which makes it difficult to compare and contrast particular interventions directly. The reviews in many cases use different terms to label specific practices or combinations of interventions. For example, the National Autism Center collapses groups of interventions under categories such as "behavioural interventions" and "comprehensive behavioural treatment for young children" whereas the National Professional Development Center on ASD and National Clearinghouse on Autism Evidence and Practice reports consider a number of these practices, such as reinforcement, prompting, task analysis, and discrete trial teaching as individual interventions. This requires readers to take the time to figure out which terms refer to the same interventions across the reviews.

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

What does the research tell us?

In spite of the differences in methods used by the individual reviews, there is little disagreement among reviewers that interventions based on behavioural strategies have the strongest empirical evidence of effectiveness. Authors of the reviews make reference to one another's findings and note the many similarities between the reviews as they build consensus among experts across different fields. They suggest that, in many cases, the differences in the conclusions between their reviews relate more to organization and categorization rather than to any disagreement about the evidence (Wong et al., 2013).

The following table provides a list of interventions which have been deemed to have sufficient empirical evidence to be classified as "evidence-based" or "established" by at least two of the above-mentioned comprehensive reviews of the research. The table only provides a cursory summary of the interventions. It is important to keep in mind that not all of the interventions listed are effective for learners of all ages, with all combinations of strengths and needs, and/or for all targeted outcomes. More detailed information is available in each review. It is also

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 (2015)	NCPD on ASD (2014) / NCAEP (2020)	Maine (2009)
Behavioural Interventions; Comprehensive/Intensive Behavioural Treatment for Young Children	*The NCPD on ASD and the Maine Departments of Health & Human Services/Education did not report on specific "comprehensive programs for young children" or "behavioural packages;" however, many of the components in the intervention packages identified as effective by the National Standards Project overlap with individual interventions identified as effective by NCPD on ASD and the Maine Departments of Health & Human Services/Education.*		
Antecedent Based Interventions	X	X	X
Augmentative and Alternative Communication	emerging[1]	X	X
Cognitive Behaviour Intervention	X	X	promising evidence[2]
Differential Reinforcement	X	X	X
Discrete Trial Training	X	X	X
Exercise	emerging[1]	X	X
Extinction	X	X	X
Functional Behaviour Assessment	X	X	X
Functional Communication Training	emerging[1]	X	X
Modeling	X	X	X
Naturalistic Intervention / Incidental Teaching	X	X	X
Parent-Implemented Intervention	X	X	X
Peer-Mediated Instruction and Intervention	X	X	X
Picture Exchange Communication System (PECS)	emerging[1]	X	X
Pivotal Response Training (PRT)	X	X	X
Prompting	X	X	X

Reinforcement	X	X	X
Response Interruption/Redirection	X	X	X
Scripting	X	X	not reviewed
Self-Management	X	X	X
Social Narratives / Story-Based Interventions	X	X	insufficient evidence
Social Skills Training	X	X	insufficient evidence
Task Analysis	X	X	X
Technology Aided Instruction and Intervention	emerging[1]	X	promising evidence[2]
Time Delay	X	X	X
Video Modeling	X	X	X
Visual Supports/Schedules	X	X	X

[1] *The National Standards Project review identified interventions as "emerging" when at least one well-controlled study indicated that the intervention may show beneficial results, but "additional high-quality studies are needed that consistently show these interventions to be effective for individuals with ASD."*

[2] *The Maine Departments of Health & Human Services/Education identified an intervention as having "promising evidence" when it had shown positive effects in two or more well-controlled research studies, but the reviewers judged that additional research by independent teams was necessary to further support the effectiveness of the intervention.*

It is worth noting that the most recent review of the research, the 2020 report from the National Clearinghouse on Autism Evidence and Practice (NCAEP), identified five new categories of interventions that now have sufficient research support to be classified as evidence-based. These include: Augmentative and Alternative Communication, Behavioural Momentum Intervention, Direct Instruction, Music-Mediated Intervention, and Sensory Integration (as originated by A. Jean Ayres, 2005). This review also identified a number of manualized intervention packages, already included within various categories of evidence-based practices in previous reviews, that now have sufficient research support to stand on their own as evidence-based practices. These include Picture Exchange Communication System (PECS); Pivotal Response Treatment (PRT); Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER); Milieu Training; Project impact; Stepping Stones/Triple P; Social Stories (as originated by Carol Gray, 1990); Program for the Education and Enrichment of Relational Skills (PEERS); Mindreading; and FaceSay. It is also important to note that, with the exception of PRT, the NCAEP review is the only comprehensive review of the research that has, to date, classified these interventions as evidence-based. Future reviews and/or updates to existing reviews may

provide additional valuable information on the state of the evidence associated with these interventions.

Summary and Implications for Practice

There is an ever-increasing body of evidence that supports the effectiveness of specific interventions and educational practices for the development of essential skills and reduction of interfering behaviours in learners with ASD. Using procedures with no empirical evidence of effectiveness places children at risk by slowing their progress and wasting time that is critical to their development and learning. In the most severe cases, it can even place them at risk of physical harm. A commitment to evidence-based practice requires educators to start with the best available research to determine which interventions demonstrate the highest likelihood of success, to consider factors that are critical to effective implementation of the intervention, and to evaluate the effectiveness of the intervention on an ongoing basis. Please refer to **Appendix C: Guiding Questions** for considerations that may guide decision-making concerning the need for, and type of, intervention to address specific behaviours.

While educational program planning should focus on the interventions that are currently supported by research, it is important to note treatments designated as emerging, promising, or preliminary may be effective for some learners and some targeted outcomes, but there is not yet enough high-quality research to allow confidence in their effectiveness. As research continues, the rating for emerging or promising interventions may change. Ongoing research may result in changes to the categorization of some interventions over time, so staying current about emerging research is essential for professionals who work with learners with ASD.

The unique combination of strengths and needs of each learner with 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 use of unsupported interventions and practices. Providing interventions that are supported by scientific evidence allows educators and other professionals to have increased confidence that the learner will experience the most successful results.

In order for education to implement a system of evidence-based practice, it is critical that all levels of the system support the identification, dissemination, and implementation of evidence-based interventions. This requires:

1) departments and districts/boards/regions to work collaboratively to support the large-scale adoption of evidence-based practice by providing professional learning and ongoing coaching/mentoring for staff.

2) district/board/region and school-level specialists to remain informed about evidence-based interventions and to share this information with those responsible for the care and education of learners with ASD.

3) school teams to include the following practices in their work with individual learners:
- prioritize target behaviours and skills based on assessment and consultation with appropriate team members and family.
- select target behaviours that have high social value in the areas of communication, relationships, academic performance, health and employment.
- select interventions that are supported by scientific evidence of effectiveness, as appropriate to each learner. The team and family should discuss the evidence available to support the selected intervention along with consideration for the individual learner and family, the setting, staff training, and available resources.
- ensure that the educational program plan/intervention plan is well-documented and that all team members understand how to carry out the plan, according to their respective roles.
- start with baseline measurement of the targeted skill or behaviour and identify a system of ongoing measurement that will be used to evaluate the learner's progress (data collection).
- provide appropriate levels of supervision to ensure the intervention is being carried out as intended.
- monitor progress for effectiveness and make adjustments accordingly (data-based decision making).

Ongoing quality research is needed in many areas to continue to inform educators and partner professionals in their decisions concerning the most effective interventions for learners with ASD. Practitioners are encouraged to integrate their knowledge of strategies based upon the best existing evidence into their day-to-day practice. This requires educational/intervention plans that are grounded in the research and guided by professional judgment, with consideration for the individual learner and family and the context in which the plan will be carried out. Building educational program plans and intervention plans on a foundation of the best available evidence ensures the highest likelihood of successful outcomes for learners with ASD.

This paper is produced by the Autism in Education (AIE) Partnership. 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: Shelley_McLean@apsea.ca

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Appendix A: Resources

- **Evidence-Based Practices for Children, Youth, and Young Adults with Autism (2020)** Steinbrenner, J. R., Hume, K., Odom, S. L., Morin, K. L., Nowell, S. W., Tomaszewski, B., Szendrey, S., McIntyre, N. S., Yucesoy-Ozkan, S., & Savage, M. N. (2020). *Evidence-Based Practices for Children, Youth, and Young Adults with Autism*. The University of North Carolina at Chapel Hill, Frank Porter Graham Child Development Institute, National Clearinghouse on Autism Evidence and Practice Review Team.
  https://ncaep.fpg.unc.edu/

- **Findings and Conclusions: National Standards Project, Phase 2**
  National Autism Center (2015). Findings and Conclusions: National Standards Project, Phase 2. Randolph, MA: Author.

  The National Autism Center has also published two supplementary reports which provide guidelines for evidence-based practice. The first, the **Parent Manual** is intended to help parents of children with ASD sort through information regarding effective treatment options. The second document, **Evidence-Based Practice and Autism in the Schools, 2nd Edition,** provides educational personnel with information and tools to assist them in program planning for individual learners with ASD. All of the National Autism Center's reports are available for free download on their website.
  http://www.nationalautismcenter.org/national-standards-project/

- **Evidence-Based Practices for Children, Youth, and Young Adults with Autism Spectrum Disorder (2014)**
  Wong, C., Odom, S. L., Hume, K., Cox, A. W., Fettig, A., Kucharczyk, S., Brock, M. E., Plavnic, J. B., Fleury, V. B., & Schultz, T. R. (2014)*. Evidence-Based Practices for Children, Youth, and Young Adults with Autism Spectrum Disorder*, Chapel Hill: The University of North Carolina, Frank Porter Graham Child Development Institute, Autism Evidence-Based Practice Review Group.
  http://autismpdc.fpg.unc.edu/national-professional-development-center-autism-spectrum-disorder

  The National Professional Development Center on ASD also provides a detailed overview of each of the 27 interventions it identifies as evidence-based.
  http://autismpdc.fpg.unc.edu/evidence-based-practices

  The "Evidence-Based Practice Briefs" have also been incorporated into web-based modules through collaboration with the Ohio Center for Autism and Low Incidence Disabilities, and are available free of charge on the Autism Internet Modules (AIM) website.
  http://www.autisminternetmodules.org/

- **Interventions for Autism Spectrum Disorders, State of The Evidence**
  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*. University of Southern Maine, Muskie School of Public Service. Portland, ME: Author.
  http://digitalcommons.usm.maine.edu/cgi/viewcontent.cgi?article=1015&context=cyf

Appendix B: Methodology Processes

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions reviewed
National Autism Center's National Standards Project 2 (2015)	**Age range:** up to the age of 22 **Study inclusion criteria:** 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) (all studies were prior to DSM-V) c) published in peer-reviewed treatment literature 1957-2012 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. **Study exclusion criteria:** a) Rett's Disorder and Childhood Disintegrative Disorder, b) individuals at risk or suspected of an ASD diagnosis c) uncommon co-morbid	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). Dimensions include: a) research design b) measurement of dependent variable c) measurement of independent variable or procedural fidelity d) participant ascertainment e) generalization and maintenance of effects **Note:** Reviewers maintained an acceptable level of inter-observer agreement of 80%	Three classifications: **Established** - Sufficient evidence is available to confidently determine that an intervention produces favorable outcomes for individuals on the autism spectrum. That is, these interventions are established as effective. **Emerging -** Although one or more studies suggest an intervention produces favorable outcomes for individuals with ASD, additional high quality studies must consistently show this outcome before we can draw firm conclusions about intervention effectiveness. **Unestablished** - There is little or no evidence to allow us to draw firm conclusions about intervention effectiveness with individuals with ASD. Additional research may show the treatment to be effective, ineffective, or harmful.	Targeted behaviours/ categories included: **Skills increased:** ▪ academic ▪ communication ▪ higher cognitive functions ▪ interpersonal ▪ learning readiness ▪ motor skills ▪ personal responsibility ▪ placement ▪ play ▪ self-regulation **Behaviours decreased:** ▪ general symptoms ▪ problem behaviours ▪ restricted, repetitive, nonfunctional patterns of behaviours, interests, or activities ▪ sensory or emotional regulation	Combined treatment approaches that were similar and held common core characteristics into 45 interventions / intervention categories. **Established Interventions:** ▪ behavioural interventions ▪ cognitive behavioural intervention package ▪ comprehensive behavioural treatment for young children ▪ language training (production) ▪ modeling ▪ natural teaching strategies ▪ parent training ▪ peer training package ▪ pivotal response training ▪ schedules ▪ scripting ▪ self-management ▪ social skills package ▪ story-based intervention **Emerging Interventions:** ▪ augmentative and alternative communication devices ▪ developmental relationship-based treatment ▪ exercise ▪ exposure package ▪ functional communication training ▪ imitation-based intervention ▪ initiation training ▪ language training (production & understanding) ▪ massage/touch therapy ▪ multi-component package ▪ music therapy ▪ picture exchange communication system ▪ reductive package

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions reviewed
	conditions to ASD d) no empirical data				▪ sign instruction ▪ social communication intervention ▪ structured teaching ▪ technology-based treatment ▪ theory of mind training **Unestablished Interventions:** ▪ animal-assisted therapy ▪ auditory integration training ▪ concept mapping ▪ DIR/Floor Time ▪ facilitated communication ▪ gluten- and casein-free diet ▪ movement-based intervention ▪ SENSE Theatre Intervention ▪ sensory integrative package ▪ shock therapy ▪ social behavioural learning strategy ▪ social cognition intervention ▪ social thinking intervention
	Age range: adults beyond the age of 22				**Established Interventions:** ▪ behavioural interventions **Emerging Interventions:** ▪ vocational training package **Unestablished Interventions:** ▪ cognitive behavioural intervention package ▪ modeling ▪ music therapy ▪ sensory integration package
National Clearinghouse on Autism Evidence and Practice (2020) **AND**	**Age range:** up to the age of 22 **Study inclusion criteria:** a) diagnosis of ASD (autism, Asperger	a) study had to address interventions that were behavioural, developmental, academic and/or vocational in nature b) had to compare an	Criteria for qualification as an "evidence-based" practice a) at least 2 high quality experimental or quasi-experimental group design articles, conducted by at least 2 different researchers or research	Targeted behaviours/ categories include: ▪ academic/pre-academic ▪ adaptive / self-help ▪ challenging /	Lists 28 categories of evidenced-based practices. **Evidence-Based Practices:** ▪ antecedent-based interventions ▪ augmentative and alternative communication ▪ behavioural momentum

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions reviewed
National Professional Development Center on ASD (2014)	syndrome, PDD-NOS); also included those with ASD and co-occurring conditions b) studies published between 1990 and 2017 c) met methodological criteria as defined under scientific rigor section **Study exclusion criteria:** a) diagnosis of Rett's Disorder and Childhood Disintegrative Disorder b) participants identified as "at risk for autism"	experimental condition to at least one other condition c) studies employed an experimental group design, quasi-experimental design, or single case design .	groups OR b) at least 5 high quality single case design articles, conducted by at least 3 different researchers or research groups, and having a total of at least 20 participants across studies OR c) a combination of at least one quality experimental or quasi-experimental group design article and least 3 high quality single case design articles, conducted by at least 2 different research groups	interfering behaviour ▪ cognitive ▪ communication ▪ joint attention ▪ mental health ▪ motor ▪ play ▪ school readiness ▪ social ▪ vocational	intervention ▪ cognitive behavioural / instructional strategies ▪ differential reinforcement ▪ direct instruction ▪ discrete trial teaching ▪ exercise and movement ▪ extinction ▪ functional behaviour assessment ▪ functional communication training ▪ modeling ▪ music-mediated intervention ▪ naturalistic intervention ▪ parent implemented intervention ▪ peer mediated instruction and intervention ▪ prompting ▪ reinforcement ▪ response interruption / redirection ▪ self-management ▪ sensory integration (as originated by A. Jean Ayres, 2005) ▪ social narratives ▪ social skills training ▪ task analysis ▪ technology-aided instruction and intervention ▪ time delay ▪ video modeling ▪ visual supports Classifies 10 **manualized intervention packages** as evidence-based: ▪ Picture Exchange Communication System (PECS) ▪ Pivotal Response Treatment (PRT) ▪ Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER)

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions reviewed
					▪ Milieu Training ▪ Project impact ▪ Stepping Stones/Triple P ▪ Social Stories (as originated by Carol Gray, 1990) ▪ Program for the Education and Enrichment of Relational Skills (PEERS) ▪ Mindreading ▪ FaceSay
Maine Departments of Health and Human Services & Education (2009)	**Age range:** children and youth **Study inclusion criteria:** a) published in a peer-reviewed, scholarly journal to and including 2008 b) children with Autism, PDD/PDD-NOS, and/or Asperger Syndrome c) children with ASD and additional diagnoses d) intervention addressed the core symptoms of ASD and/or associated issues, such as aggression or self-injurious behaviour **Study exclusion criteria:** a) diagnosis of Rett's Disorder and Childhood Disintegrative Disorder	Utilized the *Evaluative Method for Determining Evidence-Based Practices* for both group and single-subject research. Rates scientific rigor based on: a) primary quality indicators of participant characteristic, independent variables, comparison condition (control group) dependent variable and link between research question and data analysis b) secondary quality such as inter-observer agreement, blind raters, attrition, effect size, etc. **Note**: Each study was reviewed by two research staff, however, did not utilize inter-rater reliability measurement.	**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. **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. **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. **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	Targeted behaviours included: ▪ communication ▪ academics ▪ adaptive living skills ▪ challenging behaviours ▪ social skills ▪ vocational skills ▪ diet and nutritional approaches and psychotropic medications specific to such areas as disruptive behaviours, agitation, inattention and hyperactivity in children with ASD[1]	Grouped interventions under 11 interventions / intervention categories: **Established Evidence:** **Applied Behaviour Analysis (ABA)** ▪ ABA for challenging behaviour ▪ ABA for communication ▪ ABA for social skills **Augmentative and Alternative Communication (AAC)** ▪ Picture Exchange Communication System (PECS) **Pharmacological Approaches** ▪ Risperidone (respiridol) ▪ Ritalin ▪ Haldol **Promising Evidence:** **Applied Behaviour Analysis (ABA)** ▪ ABA for adaptive living skills **Augmentative and Alternative Communication (AAC)** ▪ voice output (VOCA) **Psychotherapy** ▪ cognitive behaviour therapy for anxiety **Preliminary Evidence:** **Applied Behaviour Analysis (ABA)** ▪ ABA for academics

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions reviewed
			desired outcomes. **Insufficient Evidence -** Conclusions cannot be drawn on the efficacy of the intervention due to a lack of quality research and/or mixed outcomes across several studies. **Evidence of Harm -** Studies or published case reports indicate the intervention involves significant harm or risk of harm, including injury and death.		▪ ABA for vocational skills **Augmentative and Alternative Communication (AAC)** ▪ sign language **Developmental, Social-Pragmatic (DSP) Models** ▪ eclectic models **Diet & Nutritional Approaches** ▪ modest effect on sensory motor with symptoms with Vitamin C **Pharmacological Approaches** ▪ 3 medications **Psychotherapy** ▪ cognitive behaviour therapy for anger management **Sensory Integration Therapy** ▪ touch therapy/massage **Other** ▪ hyperbaric oxygen treatment **Studied and No Evidence of Effect:** **Pharmacological Approaches** ▪ 2 including secretin **Insufficient Evidence:** **Applied Behaviour Analysis (ABA)** ▪ ABA for academics-cooperative learning groups **Augmentative and Alternative Communication (AAC)** ▪ facilitated communication **Diet & Nutritional Approaches** ▪ casein-gluten free, Omega-3 fatty supplements , vitamin B6/magnesium **Developmental, Social-Pragmatic (DSP) Models** ▪ DIR/Floortime ▪ RDI ▪ SCERTS **Pharmacological Approaches** ▪ 7 medications

Review	Inclusion/exclusion criteria	Scientific rigor	Strength of evidence	Outcome targets	Interventions reviewed
					Sensory Integration Therapy ▪ auditory integration training ▪ sensory integration training (includes deep pressure, weighted vests, etc.) **Social Skills Training** ▪ social skills training groups ▪ social stories **Other** ▪ TEACCH **Evidence of Harm:** ▪ intravenous chelation

[1] There 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.**

Appendix C: Guiding Questions

The following **GUIDING QUESTIONS** may assist educators in making decisions concerning the need for, and type of, intervention to address specific behaviours.

1) **What is the specific behaviour of interest (BOI)? (What can be observed?)**

2) **How does the behaviour impact the learner in school? At home? In community?**

3) **Is an intervention required?**

   - Does the behaviour interfere with learning?
   - Does the behaviour interfere with health or safety?
   - How often does the behaviour occur?
   - Is the behaviour itself stigmatizing for the learner?
   - Does the behaviour interfere with peer relationships?
   - Is it a priority for the learner? family? school? community?
   - Will successful intervention have a direct positive effect for the learner and/or family?

4) **What is the possible communicative function of the behaviour?**

   - What factors or situations are associated with occurrence or non-occurrence of the behaviour?
   - What happens prior to the behaviour and following the behaviour?
   - How do people react when the behaviour occurs?
   - Does it occur without social input (e.g., when other people are not interacting with the learner)?

5) **What are possible intervention options?**

   - What is the evidence to support the intervention?
   - Is the intervention considered evidence-based with this population and in this setting (e.g., accepted as evidence-based for individuals with ASD in systematic reviews such as the National Standards Project, National Clearinghouse on Autism Evidence and Practice, and comparable reviews)?
   - Is the intervention itself exclusionary? Stigmatizing?
   - Is the intervention a good fit for use in the school environment (appropriate personnel resources and adheres to school or board policies)?
   - Do staff members who will carry out the intervention have adequate training and supervision?
   - Is there adequate time allotted and are procedures in place to monitor the intervention?

Evidence-Based Practice

- Are there risks associated with implementing the intervention? Are there risks in not implementing the intervention?

6) How is the intervention to be applied?

- What do we want to teach the learner to do instead of the targeted behaviour?
- How will we teach and reinforce the new skill?
- Can effectiveness of the intervention be measured?
- How will we monitor progress in an objective way?
- Is there a plan to help the learner generalize the skills outside the teaching situation or learning environment?
- When will the intervention be reviewed?

(**Note:** It should be recognized that problem behaviours, especially those representing a significant change from the individual's typical behaviour, may indicate an underlying medical condition. The learner's educational plan or behaviour support plan may require input from appropriate medical professionals).