# Evidence-Based Practices for **Children, Youth, and Young Adults with Autism**

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## Advancing knowledge to transform children's lives

An earlier version of this report referred to Ayres Sensory Integration® (ASI®) as Sensory Integration® (SI). To clarify the practice for which our review found evidence, we have updated the terminology in this report to ASI®.

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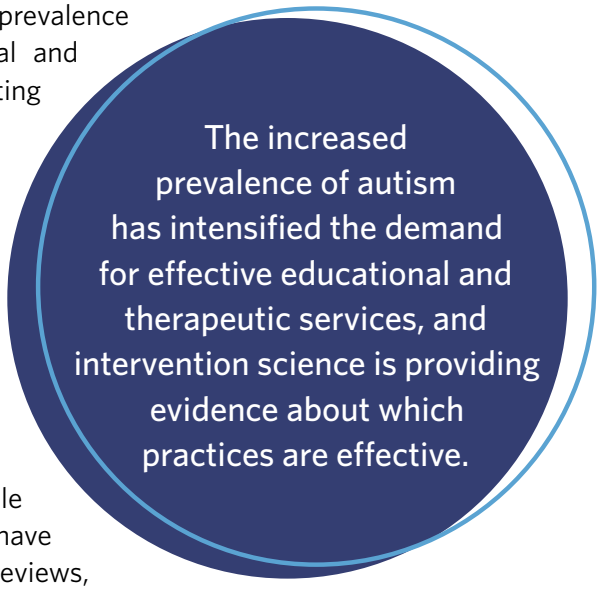
# CHAPTER 1
# INTRODUCTION

Autism is currently one of the most prominent and widely discussed human conditions. Its increased prevalence has brought it to the attention of society in the United States, with world wide recognition. Much discussion surrounds the conceptualization of autism as a disability or as a set of unique skills that can be seen as strengths (Urbanowicz et al., 2019). Although there is truth in both, there is also much verification that the life course for many individuals with autism, from infancy and into adulthood, is challenging for them and their families (Shattuck et al., 2018). In efforts to have a positive impact on this life trajectory, personnel in early intervention, schools, clinics, and other human service programs search for practices that could be most effective when working with children and youth with autism. The increased prevalence of autism has intensified the demand for effective educational and therapeutic services, and intervention science is providing mounting evidence about practices that positively impact outcomes.




The purpose of this report is to describe a set of practices that have clear evidence of positive effects with autistic children and youth. The report is the third iteration of a systematic review that has examined the intervention literature (Odom, Collet-Klingenberg, et al., 2010; Wong et al., 2014; 2015), extending the coverage to articles published between 1990 and 2017. In this first chapter, we will briefly discuss the current conceptualization of autism, explain the differences between focused intervention practices and comprehensive treatment models, provide a rationale for narrowing our review to the former, describe other reports that have identified evidenced-based practices, briefly describe our previous reviews, and lastly provide the rationale for conducting an updated systematic review.

In Chapter 2, we describe in detail the methodology followed in searching the literature, evaluating research studies, and identifying practices. In Chapter 3, the results of the systematic review are reported. We describe the practices along with the type of outcomes they generate and the age of children and youth for whom the outcomes were found. For the first time, race and ethnicity data of study participants will be highlighted, and features of the intervention setting and group size, along with the intervention implementer will also be described. In Chapter 4, we summarize the findings, discuss their relationship to other reviews, compare the current review process to the previous process, identify limitations of this review, and propose implications of study results for practice and future research. In the Appendix, each practice is described and specific studies that provide empirical support for the practice are listed.

## A Word About Terminology

In this document, we will use a mixture of terminology when referring to autism and persons identified as autistic. A common form of description has been called "person-first", in which the person (e.g., child) appears before the condition (e.g., autism), such as "child with autism". Many professional journals require this form of identification. Many autistic self-advocates and advocacy groups now prefer an identify-first form, such as "autistic child" (Brown, 2011; Kenny et al., 2016). In addition, autistic advocates have spoken about the desirability of using the term "autism" rather than "autism spectrum disorder" (Brown, 2011). At the time of this writing, terminological issues have not been settled. To honor the advocates and professionals in the field, as well as other groups of individuals with disabilities who prefer the person-first term, we will be mixing terminology throughout the manuscript, using person-first and identity-first terminology with the primary descriptor being autism or autistic.

# What is Autism?

The diagnostic characteristics of autism are impairments in social communication and the presence of restricted and repetitive behavior (American Psychiatric Association [APA], 2013; World Health Organization, 2015). Social communication includes social initiations (e.g., starting play or conversations with others), social reciprocity (e.g., taking turns in communications), synchrony (e.g., meaningfully linking conversation to the topic), and understanding and expressing appropriate nonverbal behavior such as gestures or facial expressions. Impairments in social communication can result in limited engagement in social interactions with peers and establishment of social relationships.

The purpose of this report is to identify approaches that support autistic children and youth in being more independent and realizing outcomes that support their success. Programs can select practices that focus on specific learning goals, while building on identified strengths.

Restrictive and repetitive behavior (RRB) may include stereotypic behavior or speech, fixation on or interests in specific topics (e.g., trains, dinosaurs), and strict adherence to routines, schedules, or settings with discomfort when they change or are altered. These RRBs can impact individuals' participation and engagement at home, at school, and in the community. In its most severe form, RRB is expressed in self-injurious behavior.

Not all children and youth with autism have all of these behaviors. A popular saying is that if you have seen "one autistic child you have seen one autistic child," meaning that autism manifests in many different ways. Autism is a "spectrum" condition. In fact, in the official psychiatric diagnostic classification system in the United States, the Diagnostic and Statistical Manual of Mental Disorders , Fifth Edition (DSM-5; APA, 2013), uses the term Autism Spectrum Disorder (ASD). Spectrum means that there is a range of abilities and impairments that occur for people with autism. Some children and youth with autism may have average or above average intelligence and need little support to function independently, while other children or youth may have severe intellectual disability, limited or no verbal communication, and very limited adaptive behavior. Because it is a spectrum condition with a range of abilities, the DSM-5 has also included the classification of the range of support an autistic individual would need to be successful in learning or living activities (i.e., "requiring support", "requiring substantial support", "requiring very substantial support").

In discussing abilities and disabilities, we are sensitive to the concerns about employing a "deficit" model perspective in characterizing autism, because individuals with autism have unique sets of skills upon which programs may be built (Donaldson et al., 2017). As noted, the purpose of this report is to identify approaches that support autistic children and youth in being more independent and realizing outcomes that support their success. Programs can select practices that focus on specific learning goals, while also building on identified strengths.

As noted, the official diagnostic classification system in the United States is the DSM-5, which the APA published in 2013. In the fourth and earlier editions of the DSM, a variety of conditions that the DSM-5 would now classify as ASD were identified as separate classifications. These include Asperger syndrome, autistic disorder, and pervasive developmental disorders not otherwise specified. Because our review of the literature extends to the years when previous diagnostic systems were in use, we include these and other similar descriptors in our selection criteria for articles in the review, as will be seen in the next chapter.

### What We Know About the Demographics of Autism

The prevalence of autism, as noted, has increased markedly over the past two decades, rising from 2 in 10,000 in 1990 to between 1 in 50 and 1 in 88 children in 2012 (Blumberg et al., 2013; Centers for Disease Control and Prevention, 2018). In the most recent report from the U.S. Center on Disease Control and Prevention (CDC; Maenner et al., 2020; see Figure 1.1), the prevalence rate for children was 1 in 54, based on a sample of 8-year-old children. While the gender ratio has decreased slightly from four years ago when the CDC issued a previous report, boys are still four times more likely to be diagnosed than girls. For the first time, CDC data found no overall difference in the number of Black children identified with autism compared to White children. However, the number of Hispanic children identified with autism is still lower compared to White or Black children. Also, Maenner et al. reported that among children identified with autism who had intelligence quotient (IQ) scores available, approximately one-third also had intellectual disability.

## The Importance of the Evidence-Based Practice Movement in Education and Human Services

Educational and human service programs for children and youth with autism should be based on scientific evidence of their effectiveness. The requirement is particularly important for children and youth with autism and their families. Many "treatment" program purveyors have made claims that their programs or practice can improve the lives of children with autism or even suggest that they have a cure (Siri & Lyons, 2014). A

Figure 1.1 Demographics of autism



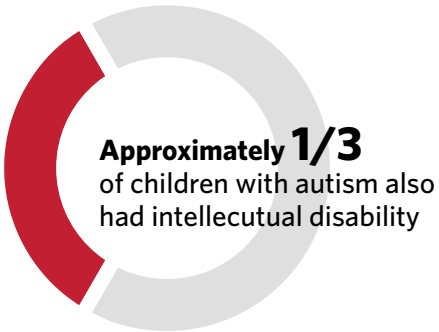
**1 in 54**

8-year-old children were identified with autism in 2016

For every girl identified with autism,
**4 boys were identified**

**White & Black children were 1.2x more likely**
to be identified with autism than Hispanic children


Values indicate prevalence per 1,000 children




Adapted from Centers for Disease Control; Maenner et al., 2020

recent example of such a practice is the Rapid Prompting Method, a variation on the previously debunked Facilitated Communication that has gained popularity in the past two decades, and which in a recent systematic review yielded no evidence of effectiveness (Schlosser et al., 2019).

One can trace the contemporary focus on evidence-based practice to the early 1970s, when Archie Cochrane (1972) voiced the concern that health care workers in England were not basing their practice on scientific evidence. His efforts led to an initiative to conduct systematic reviews of the scientific literature in order to communicate practices that are based on science. This work led to the emergence of the evidence-based medicine movement, which gained further traction through the work of Sackett and colleagues in Canada (1996). An important contribution of this movement, which Cochrane also suggested, was that such identification and verification of evidence-based practice is just the first step. The application of such practices depends on the skills and wisdom of the health care worker in selecting appropriate practices for the individual and applying them with fidelity. Sackett et al. noted "Evidence based medicine is not "cookbook" medicine…it's about integrating individual clinical expertise and the best external evidence." (p. 71, Sackett et al., 1996).

Like the evidence-based medicine movement, in the application of science to interventions for autistic children and youth, the identification of evidence-based practice is also just the first step. Although there is much discussion about terminology and application (McGrew et al., 2016), there is little disagreement on the importance of selecting and using interventions that have empirical evidence of efficacy. As Sackett et al. noted, the decision-making process of the practitioner (e.g., health care worker, therapist, teacher) is crucial. Despite misinterpretations of our earlier reviews (Kasari & Smith, 2016), we have proposed a companion decision-making process consistent with Sackett et al. for considering child characteristics, intervention context, and practitioner variables (e.g., skills, preference) in the application of evidence-based practices to meet individual learning needs of autistic children and youth (National Professional Development Center on Autism Spectrum Disorder, 2017; Odom et al., 2013). We will describe our efforts to translate the science into information that practitioners can more readily apply in their work with autistic children and youth in Chapter 4, but at this point, pinning down the definition of intervention practice is important.

We have proposed a companion decision-making process for considering child characteristics, intervention context, and practitioner variables in the application of evidence-based practices to meet individual learning needs of autistic children and youth.

## Evidence-Based Intervention Approaches

Two broad classes of interventions appear in the research literature (Smith, 2013), and we have identified them as comprehensive treatment models and focused intervention practices. Although the current review concentrated on the latter class of interventions, it is important to describe both in order to distinguish the two.

## Comprehensive Treatment Models

Comprehensive treatment models (CTMs) consist of a set of practices designed to achieve a broad learning or developmental impact on the core features of autism (Odom, Boyd, et al., 2010). In their review of education programs for children with autism, the National Academy of Science Committee on Educational Interventions for Children with Autism (National Research Council, 2001) identified 10 CTMs. Examples included the UCLA Young Autism Program by Lovaas and colleagues (Smith et al., 2000), the TEACCH program developed by Schopler and colleagues (Marcus et al., 2000), the LEAP model (Strain & Hoyson, 2000), and the Denver model (Rogers et al., 2000). In a follow-up to the National Academy review, Odom, Boyd, et al. (2010) identified 30 CTM programs operating within the U.S. These programs were characterized by organization (i.e., around a conceptual framework), operationalization (i.e., manualized procedures), intensity (i.e., substantial number of hours per week), longevity (i.e., occur across one or more years), and breadth of outcome focus (i.e., multiple outcomes such as communication, behavior, social competence targeted; Odom et al., 2014).

## Focused Intervention Practices

In contrast, focused intervention practices are designed to address a single skill or goal of a learner with autism (Odom, Collet-Klingenberg, et al., 2010). These practices are operationally defined, address specific learner outcomes, and tend to occur over a shorter time period than CTMs (i.e., until the individual goal is achieved). Examples include discrete trial teaching, visual supports, prompting, and video modeling. Focused intervention practices could be considered the building blocks of educational programs for children and youth with autism, and they are highly salient features of the CTMs just described. For example, peer-based intervention (Odom, 2019), is a key feature of the LEAP CTM (Strain & Bovey, 2011).

The purpose of the current review is to identify focused intervention practices that have evidence of efficacy in promoting positive outcomes for learners with autism. Focused intervention practices that meet the evidence criteria specified in the next chapter are designated as evidence-based practices (EBPs). Teachers and other service providers may select these practices when designing an individualized education or intervention program because of the evidence that they produce outcomes similar to the goals established for children and youth with autism. Odom and colleagues (2012) described this as a technical eclectic approach and the National Professional Development Center on ASD (NPDC) has designed a process through which these practices could be systematically employed in early intervention and school-based programs (Cox et al., 2013).

# Previous Literature Reviews of EBPs for Children and Youth with Autism

The historical roots of evidence-based practice for learners with autism are within the evidence-based medicine movement and the formation of the Cochrane Collaboration to host reviews of the literature about scientifically supported practices in medicine, both described previously. The work of the Campbell Collaboration (http://www.campbellcollaboration.org/) and the What Works Clearinghouse (http://ies.ed.gov/ncee/wwc/) exemplify the subsequent adoption of the evidence-based conceptual approach in the social sciences. In the 1990s, the American Psychological Association Division 12 established criteria for classifying an intervention practice as efficacious or "probably efficacious," which provided a precedent for quantifying the amount and type of evidence needed for establishing practices as evidence-based (Chambless & Hollon, 1998; Chambless et al., 1996).

Before the mid-2000s, the identification of EBPs for children and youth with autism was accomplished through narrative reviews by an individual or set of authors or organizations (e.g., Simpson, 2005). Although these reviews were systematic and useful, they did not follow a stringent review process that incorporated clear criteria for including or excluding studies for the reviews or organizing the information into sets of practices. In addition, many traditional systematic review processes, such as the Cochrane Collaborative (https://www.cochrane.org/) or Project AIM (Sandbank et al., 2020), have only included studies that employed a randomized experimental group design (also called randomized control trial or RCT) and have excluded single case design (SCD) studies. By excluding SCD studies, such reviews (a) omit a vital experimental research methodology recognized as a valid scientific approach (What Works Clearinghouse, 2020) and (b) eliminate the major body of research literature on interventions for children and youth with autism.

To date, only the National Professional Development Center on ASD (NPDC) at the Frank Porter Graham Child Development Institute at the University of North Carolina at Chapel Hill and National Standards Project at the National Autism Center have conducted comprehensive reviews of focused intervention practices for children and youth with autism. Both reviews followed a systematic process for accessing the literature, included group and SCD studies, evaluated the methodological quality before including (or excluding) articles in their review, and identified a specific set of interventions that have evidence of efficacy. In addition, each review has been through two iterations, with this report describing the third iteration of the NPDC review (i.e., now conducted by the National Clearinghouse on Autism Evidence and Practice). We describe each review in the subsequent sections.

## National Standards Projects (NSP)

In 2015, the National Standards Project (NSP; National Autism Center, 2015) published Phase 2 of their comprehensive systematic review. In Phase 1, their search process accessed articles from the early years of experimental intervention research for autistic children and youth (1957) through September 2007 (National Autism Center, 2009). Peer-reviewed journal articles were included if the interventions were implemented in school, home, community, vocational or clinic settings, included children with autism who did not have significant co-occurring conditions, and included statistical analyses (for group design) or graphic displays (for single case designs) of their data. The NSP staff recruited and trained a national set of reviewers, using a standard evaluation process. This evaluation process generated a "strength of evidence" score, which the NSP staff used to determine which practices were evidence-based. The Phase 1 search, after excluding articles that did not meet their criteria, yielded 775 studies. They identified 11 practices

as established treatments. In addition, they identified 22 practices as emerging treatments, meaning that there was some evidence but it was not strong enough to meet the established criteria. They also found five practices for which researchers demonstrated, experimentally, that there were no effects, and no practices they would characterize as ineffective/harmful.

In Phase 2, the NSP investigators followed the same process in searching and evaluating articles as occurred in Phase 1 (National Autism Center, 2015). They incorporated articles published from September 2007 to February 2012. Their systematic review identified 351 new, acceptable articles. In addition, the center expanded their review to include adults with autism, finding 27 articles for that age group. Their analyses of the scientific merit scores and sorting of interventions generated 14 practices for children and youth with autism that met their criteria for evidence-based. In addition, they found 18 practices categorized as emerging (i.e., some positive evidence but not enough to qualify as evidence-based) and 13 interventions with unestablished effects. For adults, they found one intervention (i.e., behavioral intervention) with sufficient scores to be categorized as evidence-based, one intervention identified as emerging (i.e., vocation package), and four interventions that were unestablished (i.e., cognitive behavioral, music therapy, sensory intervention package, and modeling).

## NPDC and the National Clearinghouse on Autism Evidence and Practice

In their initial review, NPDC investigators also conducted a review of the intervention literature, although it only included articles published over the 10-year period from 1997 to 2007 (Odom, Collet-Klingenberg, et al., 2010). They began with a computer search of the literature, first using autism and related terms for the search and specifying outcomes. They then used the research design quality indicator criteria established by the Council for Exceptional Children (CEC)-Division for Research (Gersten et al., 2005; Horner et al., 2005) to evaluate articles for inclusion or exclusion from the review. This review yielded 175 articles. They content-analyzed the intervention methodologies, created intervention categories, and sorted articles into those categories. Adapting criteria from the Chambless et al. (1996) group, they found 24 focused intervention practices that met criteria for being evidence-based. For some practices that were developed in the 1980s, foundational articles from the earlier time period were included if they were routinely cited in the articles from the 10-year time-period. To translate this scientific review into practice, NPDC investigators and staff collaborated with staff at the Ohio Center for Autism and Low Incidence Disorders (OCALI) to develop online training modules.

Frank Porter Graham Child Development Institute established the National Clearinghouse on Autism Evidence and Practice to continue the work of reviewing the autism intervention research and translating the information into evidence-based practices.

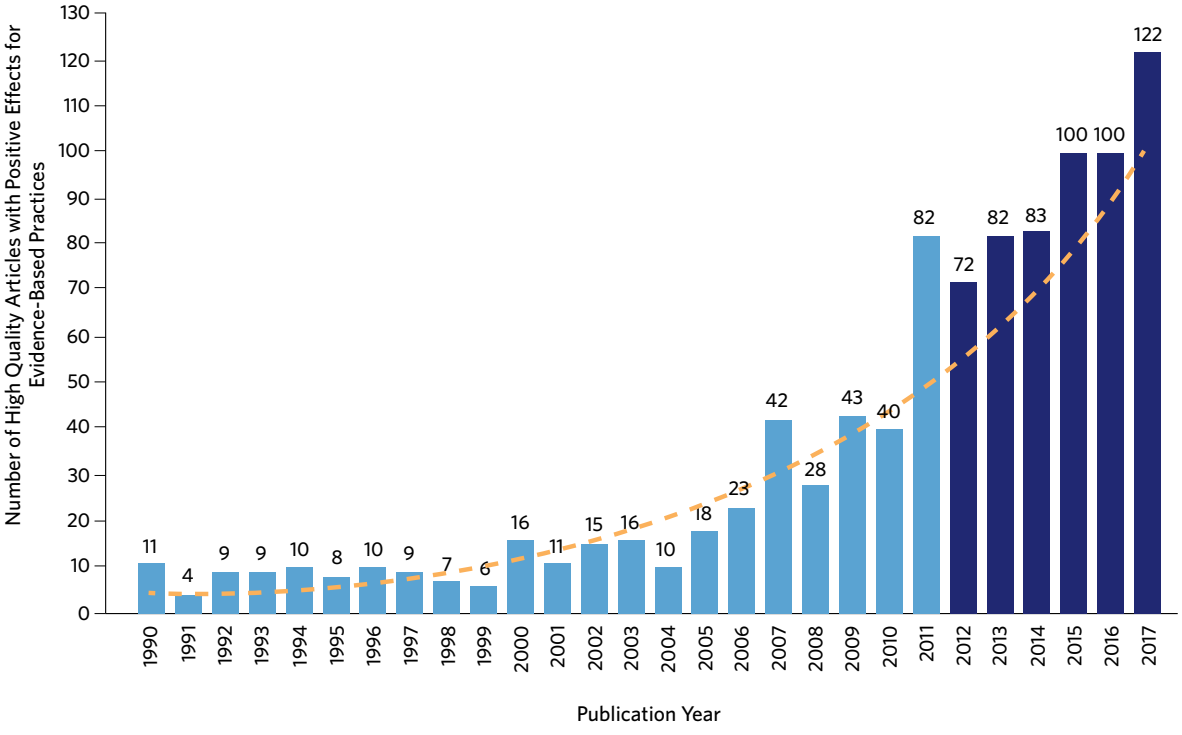
NPDC investigators conducted an update of their initial review, which they published in a report (Wong et al., 2014) and a journal article (Wong et al., 2015). This review differed from the first review in several ways. First, the authors used a more comprehensive search strategy to access the data in collaboration with research librarians at the UNC Health Science Library. Second, they extended the coverage of the literature, including peer-reviewed journal articles published between 1990 and the end of 2011. Third, they revised their methodological review criteria to include current criteria established by What Works Clearinghouse and developed standardized methodological review protocols. Fourth, they recruited and trained a national panel of 159 reviewers to evaluate journal articles. From an initial set of 29,105 articles, NPDC investigators identified 456 articles judged methodological acceptable, which they then sorted into practices following a constant

comparative research methodology. From this process, they identified 27 focused interventions that meet the criteria for evidence-based. To translate this information into practical procedures, our research team developed the Autism Focused Intervention Resources and Modules (AFIRM, https://afirm.fpg.unc.edu), which will be described further in the discussion (Sam et al., 2019). The funding for NPDC and AFIRM, from the Office of Special Education Programs, ended in 2016. At that time, the Frank Porter Graham Child Development Institute established National Clearinghouse on Autism Evidence & Practice (NCAEP, pronounced en-CAPE) to continue the NPDC work of reviewing the autism intervention research and translating the information into EBPs.

## Rationale for Current NCAEP Review

The autism intervention literature does not stand still; in fact, it is accelerating rapidly. As noted at the outset of this chapter, autism has captured the attention of the world, and particularly the community of intervention scientists. In the last six years, new journals have been initiated and the volume of articles published has expanded substantially. In the previous review (Wong et al., 2014), the initial cyber search generated over 29,000 articles published between 1990 and 2011. As will be seen in the third chapter, the current cyber search initially identified more articles published over the subsequent six years covered in the current search. Figure 1.2 contains a graph of the number of articles meeting methodological criteria by year from 1990 through 2017. A positive and accelerating trend across time exists. Such an active literature requires ongoing surveillance and evaluation to keep up with the research documenting possible new EBPs and continuing to validate existing EBPs. This review has been designed to address just such an objective.

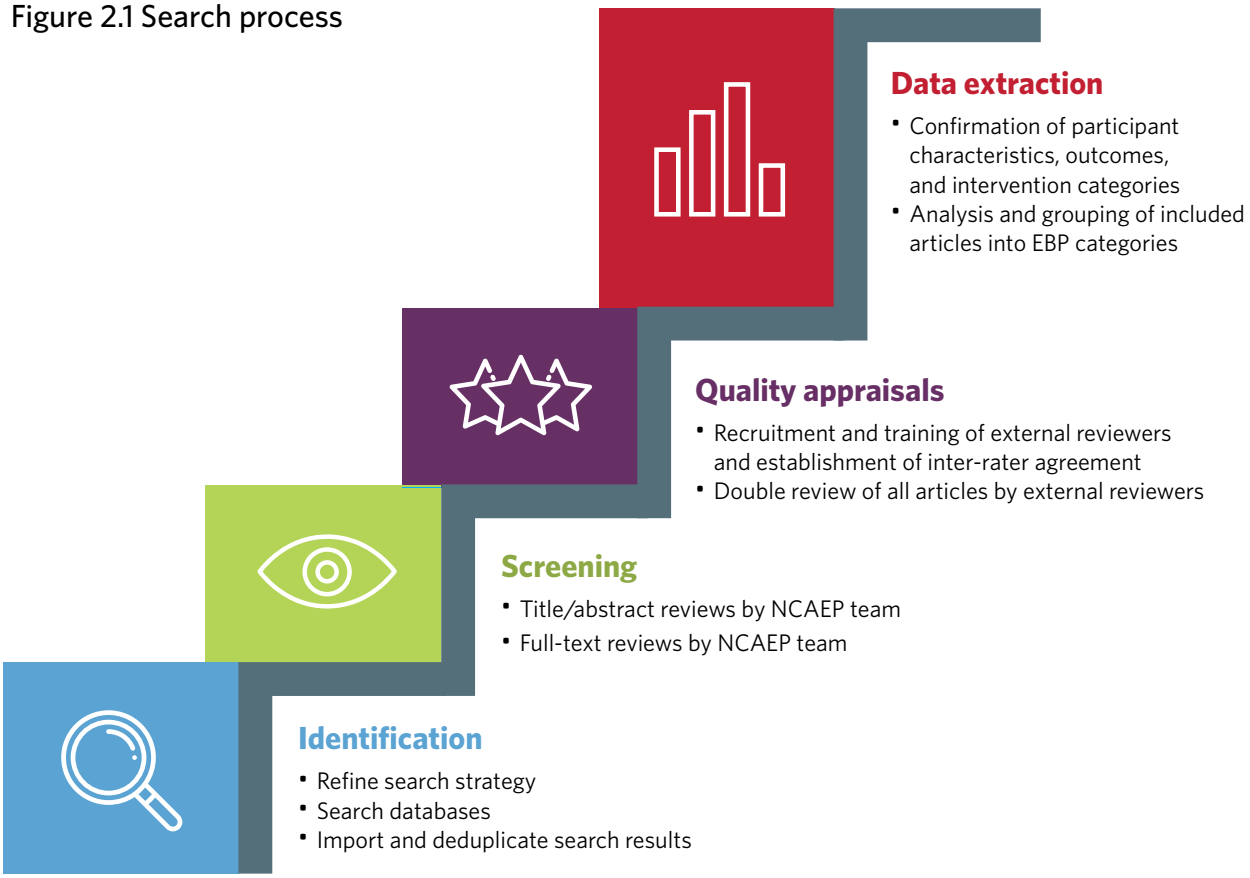
Figure 1.2 Trends in autism intervention research



# CHAPTER 2
# METHODS

In this chapter, we describe the methodology utilized in this systematic review of EBPs. An overall summary of the search process is followed by a description of inclusion/exclusion criteria for studies. Reviewer training, the review process, and the process for identifying EBPs conclude the chapter. Our team carried out the systematic review in four phases: identification, screening, quality appraisal, and data extraction (see Figure 2.1). Since this search was an update to the previous systematic review (Wong et al., 2014), the team used methodology consistent with the previous review (e.g., quality appraisal tools) but also updated the methodology to reflect changes in the field (e.g., search terminology) and current review standards (e.g., double review for quality appraisals).

Figure 2.1 Search process



# Identification

The identification phase included refining search terms, searching the databases, and importing and deduplicating the results. The NCAEP team initially met with a research librarian from the University of North Carolina at Chapel Hill to review the databases and search terms from the previous systematic review and update as needed based on changes to the databases, library science practices and the field of autism research. The previous review included two primary categories of search terms: terms to capture the diagnostic category of autism and terms to capture studies that were about interventions. The search strategy was intentionally broad to be as comprehensive as possible. The basic search terms are in Table 2.1. One example of a term that was changed for the updated review is the addition of the abbreviation "ASC" to capture the recently emerging terminology of "autism spectrum condition".

Table 2.1 Search terms

| ASD related | Intervention related |
|---|---|
| Autism OR Asperger OR autistic OR pervasive developmental disorder OR ASD OR ASC OR PDD OR PDD-NOS | Intervention OR practice OR therapy OR therapeutic OR treatment OR strategy OR program OR procedure OR method OR education OR curriculum |

Our team searched nine databases that represented a wide range of disciplines (see Table 2.2). The databases were the same as the previous review with two exceptions: we used PubMed instead of MEDLINE, as it includes MEDLINE but is also broader in searches. Also, we used Academic Search Premier instead of Academic Search Complete because of a change in the UNC Library System subscription. Additionally, the Web of Knowledge database changed names to Web of Science since the previous review. An NCAEP team member with a degree in library science searched each of the nine databases with the terminology just noted for articles published from January 1, 2012 to December 31, 2017. We imported all search results into EndNote for deduplication. Following deduplication, all search results were imported into Covidence, an online software program designed specifically to support systematic reviews.

Table 2.2 List of databases

- Academic Search Premier
- Cumulative Index to Nursing and Allied Health Literature (CINAHL)
- Excerpta Medica Database (EMBASE)
- Educational Resource Information Center (ERIC)
- PsycInfo
- PubMed
- Social Work Abstract
- Sociology Abstracts
- Web of Science

# Screening and Inclusion/Exclusion Criteria

Inclusion and exclusion criteria were developed at the outset of this project (see Table 2.3). In the current review, only peer-reviewed articles published in journals or available in a prepublication format online were included (i.e., dissertations or other grey literature were excluded). Articles had to have been published between 1990 and 2017, which includes both the previous review period (1990-2011) and the current review period (2012-2017). Only articles published in English language journals were included and the articles had to provide an original test of the efficacy of an intervention. During the screening phase, articles that included secondary data analyses or follow-up analyses were included, though secondary data and follow-up analyses were linked to original studies in later phases to avoid inflating the evidence base. Related to the content of the articles, we employed a conceptual framework followed by the Cochrane Collaboration and others, which focuses on Participants, Interventions, Comparison, and Outcomes, (PICO, https://linkeddata.cochrane.org/pico-ontology).

## Population/Participants

To qualify for the review, the participants in a study had to be between birth and 22 years of age and identified as having autism spectrum disorder (ASD), autism, Asperger syndrome, pervasive developmental disorder (PDD), pervasive developmental disorder-not otherwise specified (PDD-NOS), or high-functioning autism (HFA). Studies with participants identified as "at risk for autism" were not included in the review. Studies with autistic participants who had co-occurring conditions were included in this review. These conditions could be intellectual disability, genetic syndrome (e.g., Fragile X, Down syndrome), seizure disorder, mental health conditions (e.g., anxiety, depression, obsessive compulsive disorder), attention deficit/hyperactivity disorder (i.e. ADHD), physical disability (e.g., cerebral palsy, orthopedic impairment), hearing and/or visual impairment, or learning disability.

To be included in this review, the focused intervention practices examined in a study had to be behavioral, clinical, developmental, and/or educational in nature. Only interventions that could be practically implemented in typical educational, home, clinic, or community settings were included.

## Interventions

To be included in this review, the focused intervention practices examined in a study had to be behavioral, clinical, developmental, and/or educational in nature (i.e., these were the independent variables of the studies). Studies in which the interventions were only medications or nutritional supplements/special diets (e.g., melatonin, gluten-casein free, vitamins) were excluded from the review. In addition, only interventions that could be practically implemented in typical educational, home, clinic, or community settings were included. As such, intervention practices requiring highly specialized materials, equipment, or locations unlikely to be available in most educational, clinic, community, or home settings were also excluded (e.g., dolphin therapy, hippotherapy, hyperbaric chambers). The intervention should be able to be implemented by teachers, clinicians, related service providers, families, community providers, or others that would typically provide behavioral, clinical, developmental, or educational intervention, though interventions that were implemented by research staff in studies were still included in the review. Interventions requiring the supervision of trained medical personnel were excluded (e.g., chelation, neurofeedback, or acupuncture/acupressure).

## Comparison

For inclusion in the review, the design of the study had to compare an experimental condition in which a focused intervention practice was implemented with a control (i.e., focused intervention practice not implemented) or comparison (i.e., services as usual, alternative intervention practice) condition. All relevant features of the comparison condition had to be described to allow for a clear understanding of the differences between the conditions. If the control was "services as usual" instruction, the instructional or classroom environment had to be described.

## Outcomes

Additionally, focused intervention practices had to generate behavioral, developmental, academic, vocational, or mental health outcomes (i.e., these were dependent variables in the studies). These outcome data could be discrete behaviors (e.g., social initiations, stereotypies) assessed observationally, or by ratings of behavior or learner performance (e.g., parent or teacher questionnaires), standardized assessments (e.g., nonverbal IQ tests, developmental assessments), and/or informal assessment of student academic performances (e.g., percentage of correct answers on an instructional task, time). Studies reporting both behavioral and health/medical outcomes of participants were included, but studies only reporting physical health outcomes (e.g. BMI) were excluded from the review. Studies that targeted only caregiver and/or staff outcomes were excluded, as were studies that only looked at how caregiver/staff outcomes mediated student outcomes.

## Study Design

Finally, studies included in the review had to employ a group design, or single case design (SCD) to test the efficacy of focused intervention practices. Adequate group designs included randomized control trials (RCT), sequential multiple assignment randomized trials (SMART design), quasi-experimental designs (QED), or regression discontinuity designs (RDD) that compared an experimental/intervention group receiving the intervention to at least one other control or comparison group that did not receive the intervention or received another intervention (Shadish et al., 2002). SCDs had to demonstrate the functional relationships between the intervention (or independent variable) and the autistic child/youth outcomes (Kazdin, 2011). Acceptable SCDs for this review were withdrawal of treatment (ABAB), concurrent multiple baseline, multiple probe, alternating treatment, and changing criterion designs (Horner & Odom, 2014), as well as SCDs that included hybrid designs. Studies that were solely descriptive, examined only predictors, reviewed existing literature, or were meta-analyses were excluded. In addition, non-concurrent multiple baseline studies and parametric analyses without a baseline condition were also excluded.

## Initial Screening

Our team followed standard systematic review procedures in screening articles to locate those that met our inclusion/exclusion criteria. We screened the articles in two steps: a title/abstract screening and a full-text screening. Prior to each step of the screening process, team members participated in two separate 1-hour trainings to review the inclusion and exclusion criteria and procedures for each step of screening.

For the title/abstract screening, team members reviewed the title and abstract of the article and indicated if the article should be excluded or further reviewed in a full-text screening. We completed the title/abstract screening using single reviewers. Following the title/abstract screening, the team gathered the full-text version of all articles that were not excluded. During the full-text screening, team members indicated if an article should be included or excluded. If an article was excluded, the reviewing team member indicated a reason for exclusion. We completed the full-text screening using single reviewers.

Table 2.3 Inclusion and exclusion criteria

| Category | Inclusion | Exclusion |
|---|---|---|
| Literature | • Article published (or online prepublication) in peer-reviewed journal | • Grey literature such as dissertations, conference presentations or proceedings |
| Language | • Article published in English | • Article published in non-English journal |
| Intervention | • Intervention was focused intervention practice<br>• Intervention was behavioral, developmental, academic and/or vocational | • Intervention was comprehensive treatment program<br>• Intervention was medical or psychopharmacological |
| Outcomes | • Outcomes were behavioral, developmental, academic, mental health, or vocational for autistic children and youth | • Outcomes were physical health, neuroimaging, or EEG<br>• Only outcomes for family or caregivers reported |
| Study Design | • Article examined efficacy of intervention with group or single case design | • Article primarily descriptive or correlational<br>• Article tested moderation of effects on previously published or nonsignificant main effects |
| Population/ Participants | • Some participants identified as autistic<br>• Some participants between birth and 22 years of age | • Outcomes for participants with autism/in specified age range were not presented separately |

## Quality Appraisal

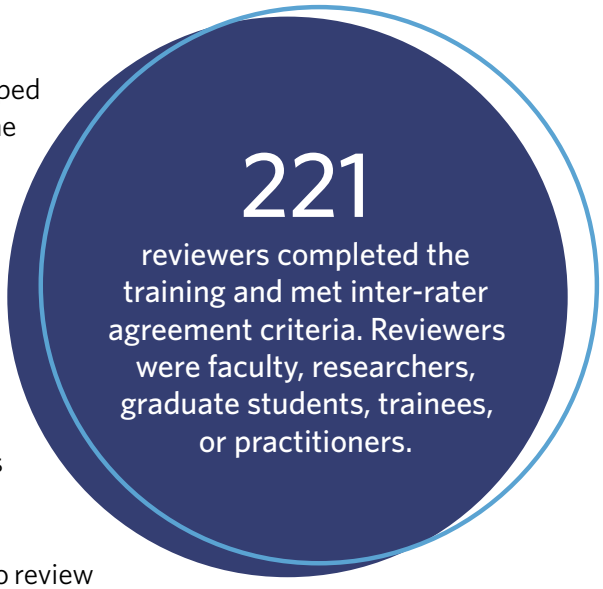
Once articles were screened for inclusion based on their format (e.g., peer-reviewed journal) and content (e.g., autistic participants, age range), they were then evaluated for the acceptability of their experimental methodology. At this phase of the review, we recruited a national cadre of external reviewers who were trained to criterion and then evaluated the methodology of each article.

## Recruitment

The NCAEP team contacted reviewers from the previous review to let them know about the opportunity to review articles for the current review. Leaders of doctoral training programs in autism research were contacted via email to ask that they distribute information about reviewing for the current review to their doctoral students and their faculty colleagues. Prominent researchers in behavioral, developmental, and educational research, who were not part of doctoral training programs were also contacted. In addition, professional organizations (e.g., Association for Behavior Analysis International, CEC's Division on Autism and Developmental Disabilities) assisted in disseminating the solicitation for reviewers. Our team also used project social media outlets to post announcements about recruitment. Last, an open solicitation was posted on the NCAEP website. The criteria for qualifying for the subsequent training was that the individual had to have a graduate degree, had to have finished coursework in experimental group design and/or single case design research, and had to have had coursework related to and/or experience working with individuals with autism. The incentives provided were that their name would be listed as a reviewer in this report. Also, any reviewers who were Board Certified Behavior Analysts could count the hours allocated to the training and review toward continuing education credit as certified by the Behavior Analysis Certification Board.

## Reviewer Training

For both design types (group and SCD), the NCAEP team developed training procedures for external reviewers that included an online training module describing the project and explaining each item on the review protocols. Additionally, examples and non-examples of each protocol item were presented in the training. The training modules also included instructions for coding descriptive features of articles that were determined to have acceptable experimental methodology. Reviewers coded participant information (diagnosis, co-occurring conditions, and age), intervention information (name, description, and intervention category), and outcomes (variable name, description, and outcome category). Reviewers could also identified any concerns or issues encountered during the article review process.




Reviewers who met the qualifications indicated whether they wanted to review SCD studies, group design studies, or both. Based on that decision, they completed the respective (i.e., group or single case) design training module. Following training, they coded a "master-file" article (i.e., an article in which correct review answers had been established by our team) that employed the respective design. For the review of the master-file study, reviewers had to meet an 80% inter-rater agreement criterion for study elements. If potential reviewers did not meet the criteria for posttest or sample study review, they were allowed to complete the task a second time (i.e., with a different master-file article for the article review). Reviewers who expressed an interest in reviewing both group and SCD articles had to complete training and reach inclusion criteria for both types of studies.

Two hundred and twenty-one reviewers completed the training and met inter-rater agreement criteria with the master code files. Most reviewers received their degrees in the area of special education or applied behavior analysis and were faculty, graduate students, or practitioners. The majority of reviewers had professional experience in a classroom, clinic, or home setting and conducted research related to individuals with ASD. Details about the reviewers can be found in Table 2.4.

Table 2.4 Reviewer information

| Types of articles reviewed | |
|---|---|
| Single case design | 122 |
| Group design | 21 |
| Single case and group design | 78 |
| | **221** |

| Degree level | |
|---|---|
| Master's degree and/or current graduate student | 120 |
| Doctorate degree | 101 |
| | **221** |

| Degree area | |
|---|---|
| Applied behavior analysis | 33 |
| Education | 6 |
| Psychology (e.g., school, clinical, developmental) | 27 |
| Special education | 119 |
| Other (e.g., SLP, OT, Psychiatry) | 36 |
| | **221** |

| Current Position | |
|---|---|
| Faculty | 81 |
| Researcher | 8 |
| Graduate student | 73 |
| Practitioner/administrator | 55 |
| Postdoctoral fellow | 4 |
| | **221** |

| Experience with autism* | |
|---|---|
| Providing intervention in classroom setting | 89 |
| Providing intervention in clinical setting | 73 |
| Providing intervention in home setting | 87 |
| Conducting autism research | 79 |
| Teaching college level course on autism | 33 |
| | **361** |

*Reviewers could report more than one type of experience with autism

### Review Protocols and Process

Protocols for reviewing group design and SCD studies used to determine methodological acceptability were developed in our previous review (see Appendices 1 and 2). The protocols in the 1990-2011 review drew from the methodological quality indicators developed by Gersten and colleagues (2005) for group design and Horner et al. (2005) for SCD, as well as the review guidelines established by the WWC. Protocols went through two iterations of pilot testing within the research group and then were reviewed by two national leaders in research methodology and intervention research, with expertise in SCD and group design, respectively. From this process the protocols were finalized and formatted for online use. Only minor updates were made in the current review (i.e. include SMART design as a design option).

After finalization, the review protocol and ten articles were sent to each reviewer. They first completed a set of screening questions about the articles (e.g., type of study design) followed by the quality review items for SCD or group design. If an article met all individual quality items on the review protocol, reviewers next noted whether the study had positive effects for autistic participants on at least one outcome variable and listed the variables with positive effects. Last, reviewers described the key features of the study (e.g., participant characteristics) and the intervention procedures. Each article was independently reviewed by two external reviewers. Once both reviews for a given article were complete in the online system, the NCAEP team identified any disagreements between the reviewers related to study quality and effects. If needed, an NCAEP team member was assigned to complete a third review and make a final determination about quality and/or effects.

### Inter-Rater Agreement

The NCAEP team collected inter-rater agreement for 1,085 articles. The formula for inter-rater agreement was total agreements divided by agreements plus disagreements multiplied by 100%. Agreement was calculated for (a) individual quality review items on the review protocol, (b) summative evaluation of whether a study met or did not meet quality criteria, and (c) evaluation of whether or not studies that met quality criteria had positive effects for autistic participants on at least one outcome variable. Mean inter-rater agreement on the individual study quality evaluation criteria was 85% (range = 55-97%) for group design articles and 93% (range = 87-97%) for SCD articles, generating a total mean item agreement of 90%. Mean inter-rater agreement for summary decisions about article inclusion was 65% for group design articles and 80% for SCD articles, generating a total agreement of 73%. Of the articles that met inclusion criteria and were evaluated to have positive effects on at least one outcome variable, there was 86% agreement for group design articles and 74% agreement for SCD articles, yielding a total agreement of 80%.

## Data Extraction

During the quality appraisal, the external reviewers also coded information about participants (age, diagnosis, comorbidities), outcomes (identifying domain areas of individual outcomes with positive effects), and intervention. All participant and outcome data were confirmed by the NCAEP team. During this process, the NCAEP team also coded data about the gender and the race, ethnicity, and nationality of participants, as well as information about setting and implementers involved in the intervention. Due to the complexity and importance of the data extraction for interventions, the data extraction was reviewed internally in a two-step process, First, team members thoroughly reviewed each article to identify primary interventions. In this identification

step, the reviewer could: assign an article to one or more of the 27 practice categories identified in the previous review (Wong et al., 2014); assign the article to a practice category that had been identified as having some evidence in the previous review; and/or identify a new possible category of practices represented in the article.

Once the NCAEP team had sorted articles within practices, the second step was for different team members to review each article assigned to a given category in the previous step to confirm that it fit within the category. At times, authors published a single study in multiple research articles, such as when they report effects on different dependent variables, follow-up to the original study, or secondary analysis (e.g., a separate analysis of moderators or implementation). These were "counted" as one study when making decisions about level of evidence necessary for classification as an EBP. During this step of data extraction, team members also identified manualized interventions that fit within a conceptual category. Manualized interventions shared procedural features that were similar to other interventions in the category but had unique features that distinguished them as a salient model and had an identifiable title. For example, Social Stories™ is a trademarked intervention by Carol Gray (1993), that fits within the Social Narratives category but is also distinct as a particular type of Social Narrative. Also, during the data extraction phase of the review, our team identified additional articles that were removed for not meeting eligibility requirements and/or quality standards, which may have been missed in the original quality review. These decisions were confirmed by a second team member. Following the final steps of data extraction, we compiled the data for analysis and synthesis.

## Identification of EBPs

When all articles were assembled into categories, the team made a final determination about whether a practice met the level of evidence necessary to be classified as an EBP using criteria for evidence established by the previous NPDC team. The NPDC's criteria were originally drawn from the work of Nathan and Gorman (2007), Rogers and Vismara (2008), Horner and colleagues (2005), and Gersten and colleagues (2005), as well as the earlier work by the APA Division 12 (Chambless & Hollon, 1998). Its rationale is based on the necessity of having a sufficient number of empirical demonstrations of efficacy through high quality, peer-reviewed journal articles **and** replications of those demonstrations by independent research groups.

Figure 2.2 Criteria for qualification as an evidence-based practice

Different criteria were established for group and single case design evidence (see Figure 2.2). To be identified as evidence-based, a category of practice had to contain (a) two high quality group design studies conducted by two different research groups, or (b) five high quality single case design studies conducted by three different research groups and involving a total of 20 participants across studies, or (c) a combination of one high quality group design study and three high quality single case design studies with the combination being conducted by two independent research groups.

The emphasis on independent replication in this systematic review is aligned with the core features of the scientific method (Fiddler, & Wilcox, 2018), and in most cases the concept of Sidman's (1960) definition of systematic replication. Independence of research groups was defined as the research being located in different settings and the key constituent members of the authorship of published articles being different from other research groups.

## Conclusion

In this chapter, we described the procedures followed in conducting this systematic review. The methods drew from standard and accepted systematic review processes and accepted methodological standards in the field for individual studies. The NCAEP team used a multiphase approach moved from searching the literature, to screening for inclusion, to evaluating the study methodology, and finally to deriving the categories of practice and determining the practices that had sufficient scientific support to be classified as evidence-based. We report the results of this process in the next chapter.

# CHAPTER 3
# RESULTS

In this report, we conducted a systematic review of intervention research studies published between 1990 and 2017. The review combines a previous search and analysis of the literature from 1990-2011, as reported in Wong et al. (2014), and an updated review of articles published between 2012 and 2017. We will present the results of the updated search, and then identify the EBPs for the current review. We will also provide information about the study designs, participant characteristics, associated outcomes and implementation characteristics of the interventions.

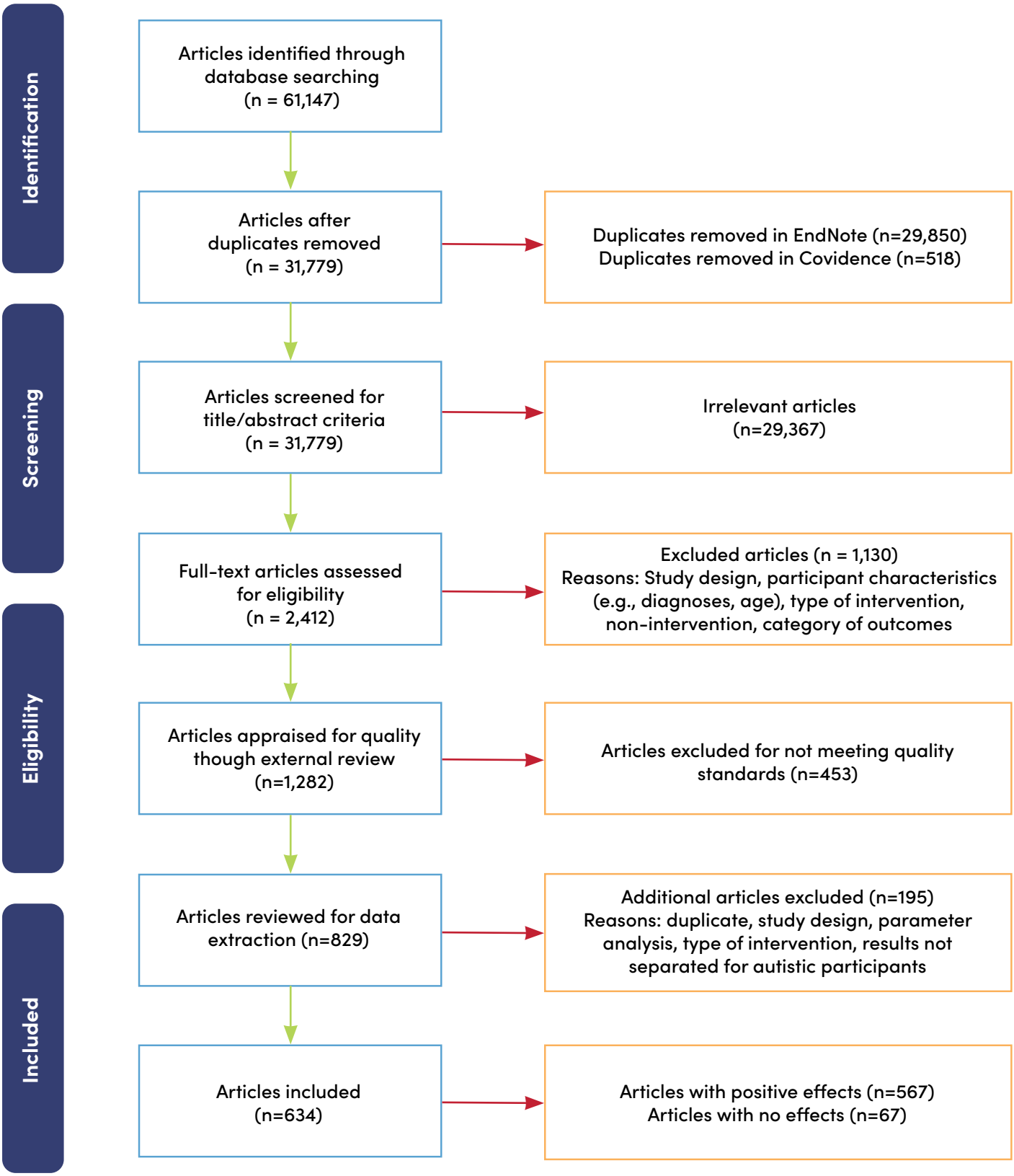
## Previous Review Period (1990-2011)

The previous review identified 29,105 articles in an initial search of the literature, and through a screening process described by Wong et al. (2014) included 427 articles that met methodological criteria for inclusion. *(Note: This number differs from the number of articles reported in the previous report because several of the articles in the previous review were excluded based on our re-review for this report.)*

## Updated Search Results (2012-2017)

The search update incorporated results from the nine databases identified in the previous chapter, which generated an initial total of 61,147 articles (see Figure 3.1) and 31,779 after duplicates were removed. After reviewers screened articles by title/abstract and then full-text, 1,282 articles remained for quality appraisal. During quality appraisal, an additional 453 articles were eliminated, resulting in the inclusion of 829 articles. The NCAEP team discovered 11 duplicate articles during data extraction, and excluded 184 additional articles for not meeting inclusion criteria and/or quality standards. Common reasons for exclusion in this phase included (a) component analyses that studied variations of delivery of an intervention rather than providing evidence for an intervention's efficacy, (b) single case design studies with sufficient experimental control but only a subset of participants having autism (e.g., 3 demonstrations of effects, but only 2 of 3 participants had autism), and (c) alternating treatment design studies with no difference between the two interventions. This left 634 articles that met our established criteria for evidence. Of the remaining 634 articles, 567 of the articles showed positive effects for at least one outcome of interest for the current review.

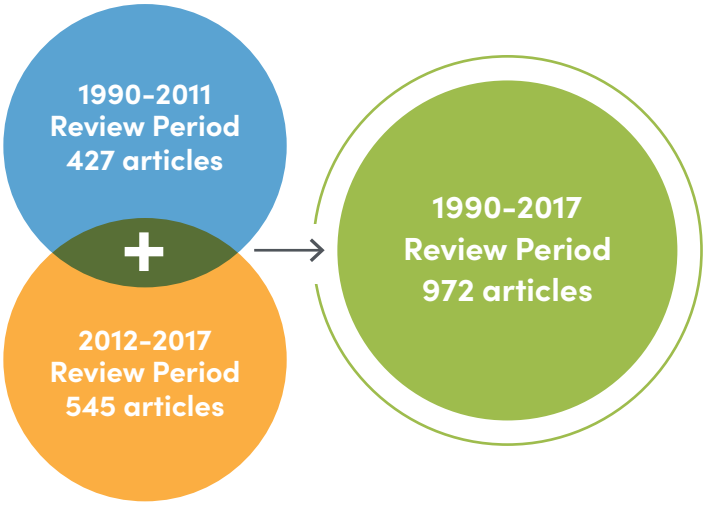
Figure 3.1. PRISMA flow diagram for 2012-2017 review period



# Identification of Evidence-Based Practices

The NCAEP team reviewed the remaining 567 articles with positive effects and determined that 545 of the articles were primary studies (i.e., not secondary data analysis or follow-up analysis of a primary study in the review). These 545 studies were combined with the 427 studies from the previous review, yielding a total of 972 acceptable articles (see Figure 3.2). The classification of articles, as described in Chapter 2, resulted in 28 EBPs.

Figure 3.2. Number of articles included in each review period




The 28 EBPs, their abbreviated definitions, and the number of articles from each review period that contributed to the evidence base are included in Table 3.1. Additionally, Appendix 3 contains a fact sheet for each of the EBPs with a longer description, information about participant ages and positive outcomes, and a full reference list.

Table 3.1 Evidence-based practices, definitions, and number of articles across review periods

| | | Empirical Support | | |
|---|---|---|---|---|
| **Evidence-Based Practice** | **Definition** | **1990-2011 (n)** | **2012-2017 (n)** | **1990-2017 (n)** |
| Antecedent-Based Interventions (ABI) | Arrangement of events or circumstances that precede an activity or demand in order to increase the occurrence of a behavior or lead to the reduction of the challenging/interfering behaviors. | 29 | 20 | **49** |
| Ayres Sensory Integrationn® (ASI®) | Interventions that target a person's ability to integrate sensory information (visual, auditory, tactile, proprioceptive, and vestibular) from their body and environment in order to respond using organized and adaptive behavior. | 1 | 2 | **3** |
| Augmentative and Alternative Communication (AAC) | Interventions using and/or teaching the use of a system of communication that is not verbal/vocal which can be aided (e.g., device, communication book) or unaided (e.g., sign language) | 9 | 35 | **44** |
| Behavioral Momentum Intervention (BMI) | The organization of behavior expectations in a sequence in which low probability, or more difficult, responses are embedded in a series of high probability, or less effortful, responses to increase persistence and the occurrence of the low probability responses. | 8 | 4 | **12** |
| Cognitive Behavioral/ Instructional Strategies (CBIS) | Instruction on management or control of cognitive processes that lead to changes in behavioral, social, or academic behavior. | 7 | 43 | **50** |
| Differential Reinforcement of Alternative, Incompatible, or Other Behavior (DR) | A systematic process that increases desirable behavior or the absence of an undesirable behavior by providing positive consequences for demonstration/non-demonstration of such behavior. These consequences may be provided when the learner is: a) engaging in a specific desired behavior other than the undesirable behavior (DRA), b) engaging in a behavior that is physically impossible to do while exhibiting the undesirable behavior (DRI), or c) not engaging in the undesirable behavior (DRO). | 27 | 31 | **58** |
| Direct Instruction (DI) | A systematic approach to teaching using a sequenced instructional package with scripted protocols or lessons. It emphasizes teacher and student dialogue through choral and independent student responses and employs systematic and explicit error corrections to promote mastery and generalization. | 2 | 6 | **8** |
| Discrete Trial Training (DTT) | Instructional approach with massed or repeated trials with each trial consisting of the teacher's instruction/presentation, the child's response, a carefully planned consequence, and a pause prior to presenting the next instruction. | 16 | 22 | **38** |
| Exercise and Movement (EXM) | Interventions that use physical exertion, specific motor skills/ techniques, or mindful movement to target a variety of skills and behaviors. | 6 | 11 | **17** |
| Extinction (EXT) | The removal of reinforcing consequences of a challenging behavior in order to reduce the future occurrence of that behavior. | 13 | 12 | **25** |
| Functional Behavioral Assessment (FBA) | A systematic way of determining the underlying function or purpose of a behavior so that an effective intervention plan can be developed. | 11 | 10 | **21** |
| Functional Communication Training (FCT) | A set of practices that replace a challenging behavior that has a communication function with more appropriate and effective communication behaviors or skills. | 12 | 19 | **31** |
| Modeling (MD) | Demonstration of a desired target behavior that results in use of the behavior by the learner and that leads to the acquisition of the target behavior. | 10 | 18 | **28** |
| Music-Mediated Intervention (MMI) | Intervention that incorporates songs, melodic intonation, and/or rhythm to support learning or performance of skills/behaviors. It includes music therapy, as well as other interventions that incorporate music to address target skills. | 3 | 4 | **7** |



*continued on next page*

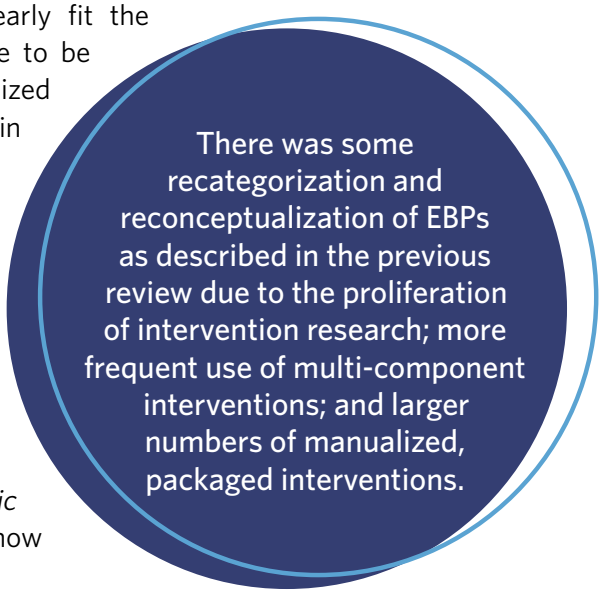
Table 3.1 Evidence-based practices, definitions, and number of articles across review periods

| | | Empirical Support | | |
|---|---|---|---|---|
| **Evidence-Based Practice** | **Definition** | **1990-2011 (n)** | **2012-2017 (n)** | **1990-2017 (n)** |
| Naturalistic Intervention (NI) | A collection of techniques and strategies that are embedded in typical activities and/or routines in which the learner participates to naturally promote, support, and encourage target skills/behaviors. | 26 | 49 | **75** |
| Parent-Implemented Intervention (PII) | Parent delivery of an intervention to their child that promotes their social communication or other skills or decreases their challenging behavior. | 13 | 42 | **55** |
| Peer-Based Instruction and Intervention (PBII) | Intervention in which peers directly promote autistic children's social interactions and/or other individual learning goals, or the teacher/other adult organizes the social context (e.g. play groups, social network groups, recess) and when necessary provides support (e.g., prompts, reinforcement) to the autistic children and their peer to engage in social interactions. | 19 | 25 | **44** |
| Prompting (PP) | Verbal, gestural, or physical assistance given to learners to support them in acquiring or engaging in a targeted behavior or skill. | 55 | 85 | **140** |
| Reinforcement (R) | The application of a consequence following a learner's use of a response or skills that increases the likelihood that the learner will use the response/skills in the future. | 53 | 53 | **106** |
| Response Interruption/Redirection (RIR) | The introduction of a prompt, comment, or other distractors when an interfering behavior is occurring that is designed to divert the learner's attention away from the interfering behavior and results in its reduction. | 13 | 16 | **29** |
| Self-Management (SM) | Instruction focusing on learners discriminating between appropriate and inappropriate behaviors, accurately monitoring and recording their own behaviors, and rewarding themselves for behaving appropriately. | 14 | 12 | **26** |
| Social Narratives (SN) | Interventions that describe social situations in order to highlight relevant features of a target behavior or skill and offer examples of appropriate responding. | 15 | 6 | **21** |
| Social Skills Training (SST) | Group or individual instruction designed to teach learners ways to appropriately and successfully participate in their interactions with others. | 18 | 56 | **74** |
| Task Analysis (TA) | A process in which an activity or behavior is divided into small, manageable steps in order to assess and teach the skill. Other practices, such as reinforcement, video modeling, or time delay, are often used to facilitate acquisition of the smaller steps. | 9 | 4 | **13** |
| Technology-Aided Instruction and Intervention (TAII) | Instruction or intervention in which technology is the central feature and the technology is specifically designed or employed to support the learning or performance of a behavior or skill for the learner. | 10 | 30 | **40** |
| Time Delay (TD) | A practice used to systematically fade the use of prompts during instructional activities by using a brief delay between the initial instruction and any additional instructions or prompts. | 16 | 15 | **31** |
| Video Modeling (VM) | A video-recorded demonstration of the targeted behavior or skill shown to the learner to assist learning in or engaging in a desired behavior or skill. | 35 | 62 | **97** |
| Visual Supports (VS) | A visual display that supports the learner engaging in a desired behavior or skills independent of additional prompts. | 34 | 31 | **65** |

It is important to note that there was some recategorization and reconceptualization of EBPs as described in the previous review. In cases of reconceptualization and recategorization, the articles from the previous review (Wong et al., 2014) were reviewed and recategorized if needed. There were several major trends that impacted the categorization of the EBPs including: the proliferation of intervention research; more frequent use of hybrid, multi-component interventions; and larger numbers of manualized, packaged interventions. With the proliferation of intervention research and the more frequent use of multi-component interventions, two decisions were made about categorization: (1) efforts were made to combine and/or expand EBP categories that shared similar features (e.g., Scripting moved into *Visual Supports*, Structured Play Groups moved into *Peer-Based Instruction and Intervention*; see Chapter 4 for discussion), (2) articles were more frequently coded into multiple intervention categories when multiple EBPs were present (n=193). In the previous review, 13 studies with multiple components had been classified as idiosyncratic behavior packages and in the current review they were reclassified into each of the individual EBPs.

## Manualized Interventions Meeting Criteria for EBPs

Emerging from the current review were interventions that clearly fit the EBP categorical definitions but had themselves enough evidence to be classified as an EBP. We have identified these practices as Manualized Interventions Meeting Criteria (MIMCs) and grouped them within established EBP categories. The rationale for this classification was to provide conceptual clarity of the EBP organization but also to highlight the particular approach. In addition to having sufficient evidence, MIMCs had to have clearly established manualized procedures or software. In total, there were 10 MIMCs classified within six of the EBP categories (see Chapter 4 for full list and additional discussion). As part of the reclassification process and to be conceptually consistent, two of the previous EBPs were reclassified as MIMCs and included under other EBP categories (i.e., Pivotal Response Training is now classified within *Naturalistic Intervention* and Picture Exchange Communication Systems© is now classified within *Augmentative and Alternative Communication*).




## Practices with Some Evidence

There are 11 practices that have at least some evidence but have not met criteria for an evidence-based practice (e.g., too few studies or participants, only one research group), including five new interventions and six interventions maintained from the previous review. Table 3.2 includes a list of these 11 practices with a short definition and the articles supporting the intervention. With the increase in multi-component interventions, some of the interventions include studies that were also categorized within EBPs.

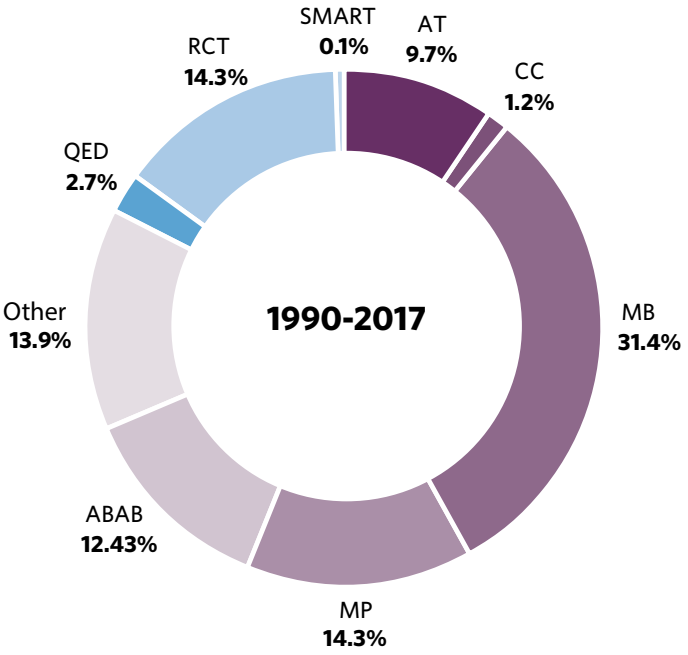
## Table 3.2 Focused intervention practices with some evidence

| Current Review: 1990-2017 | Description | Evidence | Exclusion |
|---|---|---|---|
| Animal Assisted Intervention | Interventions that incorporate the use of a dog to improve performance of targeted behaviors or skills | Becker et al. (2017) | Insufficient evidence |
| Auditory Integration Training | Systematic exposure to modulated tones resulting in changes in parent reported problem behavior | Edelson et al. (1999) | Insufficient evidence<br>*No new evidence* |
| Collaborative Model for Promoting Competence and Success (COMPASS)<br>*Previously called Collaborative Coaching | Systematic consultation between parent and teacher and ongoing coaching across the school year to help the team promote achievement of IEP goals utilizing evidence-based practices | Ruble et al. (2010)<br>Ruble et al. (2013) | Only one research group<br>*Some new evidence* |
| Exposure | Increasing (for accelerating behaviors) or decreasing (for decelerating behaviors) the stimulus intensity or conditions to promote the occurrence of the desired response | Bishop et al. (2013)<br>Ellis et al. (2006)<br>Hodges et al. (2017)<br>Seiverling et al. (2012) | Insufficient evidence<br>*Some new evidence* |
| Massage<br>*Previously called Touch Therapy | Systematic massage using moderate pressure on the head/neck, arms/hands, torso, and the legs/feet. | Field et al. (1997) | Insufficient evidence<br>*No new evidence* |
| Matrix Training | Teaching approach that facilitates generalization of taught information to related but untaught information through the arrangement of components of desired skills (e.g., words) along the horizontal and vertical axes of a rectangle, then systematically teaching combinations of components across the resulting matrix | Frampton et al. (2016)<br>MacManus et al. (2015) | Insufficient evidence |
| Outdoor Adventure | Group camp-style activities that incorporate songs, rope courses, and debriefs focusing on teamwork, trust, communication, facing fears, and self-determination | Zachor et al. (2017) | Insufficient evidence |
| Perceptual Motor | A series of tasks that target body awareness, motor planning, bilateral motor integration, balance skills, fine motor coordination, functional vision skills, and oral motor skills | Afshari (2012) | Insufficient evidence |
| Person-Centered Planning | Team-based process for selecting and organizing the services and supports that an individual may need to live in the community directed by the learner | Hagner et al. (2012) | Insufficient evidence |
| Punishment<br>*See discussion section for commentary on this practice | Consequence that is applied to a behavior that has the effect of reducing the future occurrence of that behavior (e.g. verbal reprimand, response cost) | DeRosa et al. (2016)<br>Dominguez et al. (2014)<br>Dupuis et al. (2015)<br>Pelios et al. (2003) | Insufficient evidence<br>*Some new evidence* |
| Sensory Diet | Sensory based activities integrated into child routines to meet sensory needs | Fazlıoğlu & Baran (2008) | Insufficient evidence<br>*No new evidence* |
| Systematic Transition in Education Programme for Autism Spectrum Disorder (STEP-ASD) | Intervention that supports parents, students, and school teams in individualized planning for and executing the transition from primary to secondary school and addressing related behavioral and emotional issues. | Mandy et al. (2016) | Insufficient evidence |

## Study Characteristics

Study designs were divided into two categories: group studies and single case design studies, each with several sub-categories of designs. Across the studies for both review periods, single case design studies made up 83% of the articles and group design made up 17% (see Figure 3.3). The percentage of group studies was higher for the recent review period, comprised of 23% of the articles compared to only 9% of the articles in the previous review period. In examining the sub-categories, there were notable increases in the use of alternating treatment designs, multiple probe designs, and randomized control trials from the previous review to current review, as well as the addition of one sub-category of group design, the sequential multiple assignment randomized trials (SMART) design. Although regression discontinuity designs could have been considered acceptable, there were no studies using this design in the current review.

Figure 3.3 Types of study designs

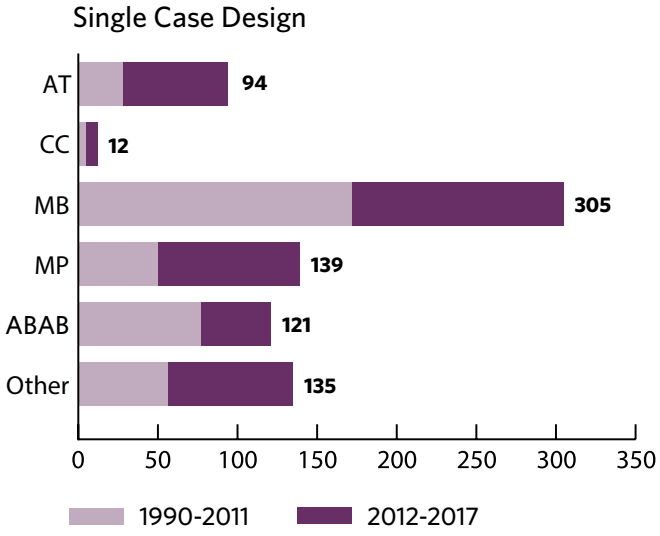


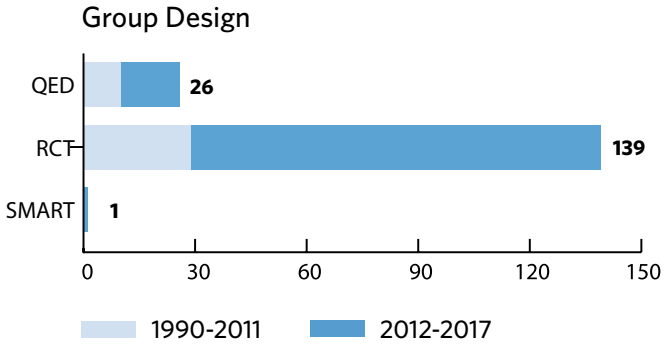

Single Case Design

AT - Alternating Treatment
CC - Changing Criterion
MB - Multiple Baseline
MP - Multiple Probe
ABAB - Withdrawal of treatment
Other

Group Design

QED - Quasi-Experimental Design
RCT - Randomized Control Trial
SMART - Sequential Multiple Assignment Randomized Trial



## Participant Characteristics

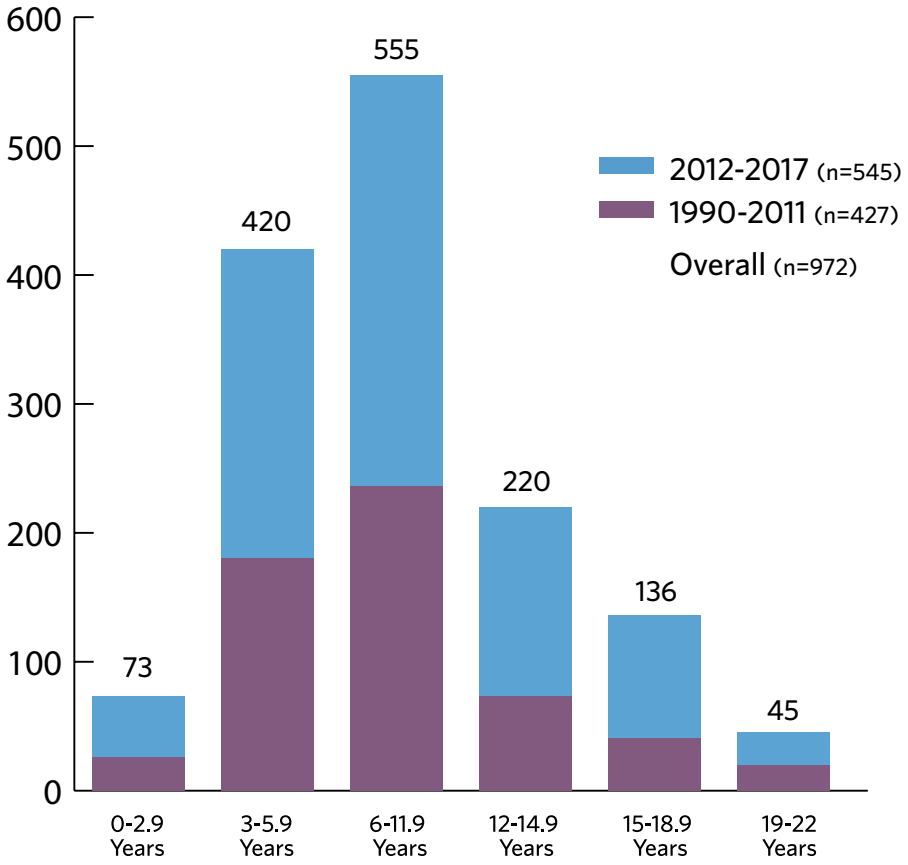
The information on diagnoses and co-occurring conditions is shown in Table 3.3. It is important to note that a given study could include multiple diagnostic or co-occurring conditions categories. Autism was the most frequently reported diagnosis in studies, with 64% of studies indicating at least one participant with autism. There was, however, a drop of about 35% from the 1990-2011 period (83%) to the 2012-2017 period (48%). There was a large increase in reporting of ASD as a diagnosis, moving from 12% (1990-2011) to 55% (2012-2017) with an average of 36% across all studies. The reports of participants with Asperger or High Functioning Autism (HFA) and PDD or PDD-NOS were relatively low (10% and 14%) and stayed relatively stable across review periods. Over 55% of the studies failed to report any information on co-occurring conditions. However, when reported, the most frequent co-occurring condition was intellectual disability, with about one-fifth of all studies noting it in their participants. All other co-occurring conditions were reported in 5% or fewer of the studies.

Table 3.3 Diagnosis and co-occurring conditions of participants across review periods

| | 1990-2011 (n=427) | | 2012-2017 (n=545) | | 1990-2017 (n=972) | |
|---|---|---|---|---|---|---|
| **Diagnosis** | **n** | **%** | **n** | **%** | **n** | **%** |
| ASD | 52 | 12.1% | 298 | 54.6% | **350** | **36.0%** |
| Asperger/HFA | 37 | 8.6% | 60 | 11.0% | **97** | **10.0%** |
| Autism | 357 | 83.6% | 263 | 48.2% | **620** | **63.8%** |
| PDD/PDD-NOS | 62 | 14.5% | 76 | 13.9% | **138** | **14.2%** |
| **Co-occurring Condition(s)** | | | | | | |
| ADD/ADHD | 11 | 2.5% | 39 | 7.1% | **50** | **5.1%** |
| Deaf/Hearing impairment | | | 2 | 0.3% | **2** | **0.2%** |
| Developmental delay | 5 | 1.1% | | | **5** | **0.5%** |
| Epilepsy seizure disorder | 13 | 3.0% | 16 | 2.9% | **29** | **3.0%** |
| Genetic syndrome | 1 | 0.2% | 13 | 2.3% | **14** | **1.4%** |
| Intellectual disability | 109 | 25.5% | 93 | 17.0% | **202** | **20.8%** |
| Learning disability | 4 | 0.9% | 6 | 1.1% | **10** | **1.0%** |
| Mental health condition | 3 | 0.7% | 29 | 5.3% | **32** | **3.3%** |
| Physical disability | 7 | 1.6% | 4 | 0.7% | **11** | **1.1%** |
| Sensory | 11 | 2.5% | | | **11** | **1.1%** |
| Speech/Language | 19 | 4.4% | | | **19** | **2.0%** |
| Visual impairment | | | 1 | 0.1% | **1** | **0.1%** |
| Other | 29 | 6.7% | 69 | 12.6% | **98** | **10.1%** |
| No co-occurring conditions | 38 | 8.9% | 39 | 7.1% | **77** | **7.9%** |
| Not reported | 231 | 54.1% | 319 | 58.5% | **550** | **56.6%** |

Participants' ages were classified into six categories and multiple age categories could be selected for each study. The number of studies that reflect each age category are shown in the bar graph separated by review period and totaled across review periods in Figure 3.4. When comparing the 1990-2011 and 2012-2017 review periods, most studies were conducted with 3-5-year-olds (i.e., 42% and 43% respectively) and 6-11 year-olds (55% and 57% respectively). However, in the more recent review period, there were substantial increases in the percentages of studies conducted with 12-14-year olds (i.e., 17% and 27% respectively) and 15-18-year olds (i.e., 10% and 17% respectively). The youngest age category (birth-35 months) had a slight increase from 6% to 9%. The oldest age category (19-22 years) remained stable across review periods at 5%.

Figure 3.4 Age of participants across review periods




In the previous review, data on gender and sex were not extracted so these data only reflect the 2012-2017 review period. Data on the gender or sex of the participants were reported in 93% of studies (see Figure 3.5). Table 3.4 shows data on the number of articles and participants for males and females. Of note, although non-binary and other were included as options during the data extraction, no included studies reported these categories. In studies that reported the number of participants in the gender or sex categories, 84% of participants were male.

Figure 3.5 Percentage of studies reporting race/ethnicity/nationality and gender/sex data in 2012-2017 review period

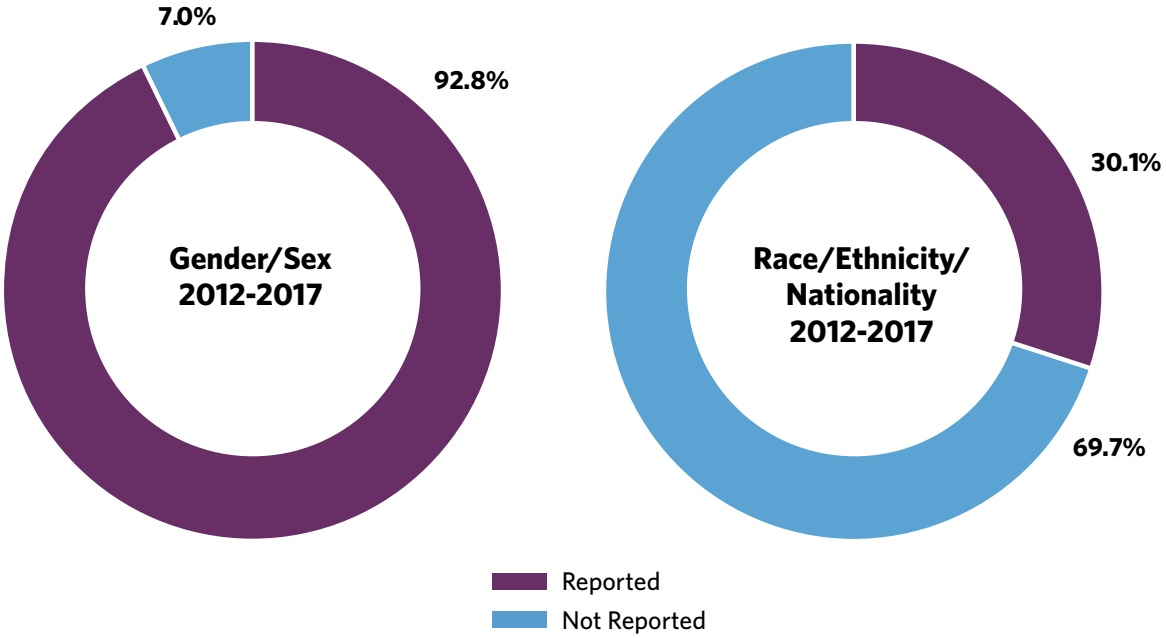



Table 3.4 Race/ethnicity/nationality and gender/sex of participants in 2012-2017 review period

| | 2012-2017 | |
|---|---|---|
| **Gender/Sex** | **Articles (n=545)** | **Participants** |
| Male | 485 | 5934 |
| Female | 259 | 1097 |
| Not reported | 38 | |
| **Total** | | **7031** |
| **Race/Ethnicity/Nationality** | | |
| African American/Black | 74 | 343 |
| Asian | 52 | 314 |
| Hispanic/Latino | 52 | 281 |
| Middle Eastern | 9 | 45 |
| Native American | 1 | 1 |
| Native Hawaiian/Pacific Islander | 3 | 3 |
| White | 130 | 2101 |
| Two or more/Multi-racial | 24 | 119 |
| Other | 29 | 257 |
| Not specified | 7 | 88 |
| Not reported | 381 | |
| **Total** | | **3552** |

Data on race/ethnicity/nationality were also not extracted in the 1990-2011 studies, so these data reflect the 2012-2017 review period. These data were reported in 30% of all studies (see Figure 3.5). Of the articles reporting information nearly 80% reported having at least one White participant, 45% reported having at least one Black participant, and 32% and 31% reported having at least one Hispanic/Latino participant and Asian participant respectively. All other groups had representation in participants for less than 20% of the studies reporting race/ethnicity/nationality data. For studies that reported numbers of participants by categories, 59% of the participants were White, 10% were Black, 9% were Asian, and 8% were Hispanic/Latino. All other groups had less than 5% representation among participants in studies reporting this information.

## Outcomes

There were 13 different types of outcomes reported in this review. Target skills relating to communication, social skills, and challenging behaviors were the most frequently reported outcomes, represented in 34%, 31%, and 27% of studies respectively (see Table 3.5). A smaller percentage of studies showed improved academic/pre-academic skills (15%), play (13%), school readiness (11%), and adaptive/self-help skills (11%). All other skills were noted in 6% or less of the studies. When examining differences between the two review periods, there were notable increases in studies that successfully targeted academic/pre-academic skills (from 55 studies in 1990-2011 to 96 studies in 2012-2017), vocational skills (from 11 studies to 20 studies), and mental health (from 1 study to 16 studies). Most other outcome categories remained relatively stable or decreased in the number of studies between the two reviews.

There were 13 different types of outcomes reported in this review. There were notable increases in studies that successfully targeted academic/pre-academic skills, vocational skills, and mental health.

Table 3.5 Outcomes identified across review periods

| Domain/Instructional Outcome | Definitions | 1990-2011 (n) | 2012-2017 (n) | 1990-2017 (n) |
|---|---|---|---|---|
| Academic/Pre-academic | Outcomes broadly related to performance on tasks typically taught and used in school settings | 55 | 96 | **151** |
| Adaptive/Self-help | Outcomes related to independent living skills and personal care skills | 52 | 53 | **105** |
| Challenging/Interferring behavior | Outcomes related to decreasing or eliminating behaviors that interfere with the individual's ability to learn | 147 | 121 | **268** |
| Cognitive | Outcomes related to performance on measures of intelligence, executive function, problem solving, information processing, reasoning, theory of mind, memory, creativity, or attention | 15 | 22 | **37** |
| Communication | Outcomes related to ability to express wants, needs, choices, feelings, or ideas | 173 | 159 | **332** |
| Joint attention | Outcomes related to behaviors needed for sharing interests and/or experiences | 36 | 27 | **63** |
| Mental health | Outcomes related to emotional well-being | 1 | 16 | **17** |
| Motor | Outcomes related to movement or motion, including both fine and gross motor skills, or related to sensory system/sensory functioning | 17 | 16 | **33** |
| Play | Outcomes related to the use of toys or leisure materials | 73 | 50 | **123** |
| Self-determination | Outcomes related to self-directed actions in setting and achieving goals or making decisions and problem-solving | 0 | 2 | **2** |
| School readiness | Outcomes related to task performance versus task content or curriculum area (e.g., on task behavior, engagement) | 63 | 46 | **109** |
| Social | Outcomes related to skills needed to interact with others | 152 | 150 | **302** |
| Vocational | Outcomes related to employment or employment preparation or relate to technical skills required for a specific job | 11 | 20 | **31** |

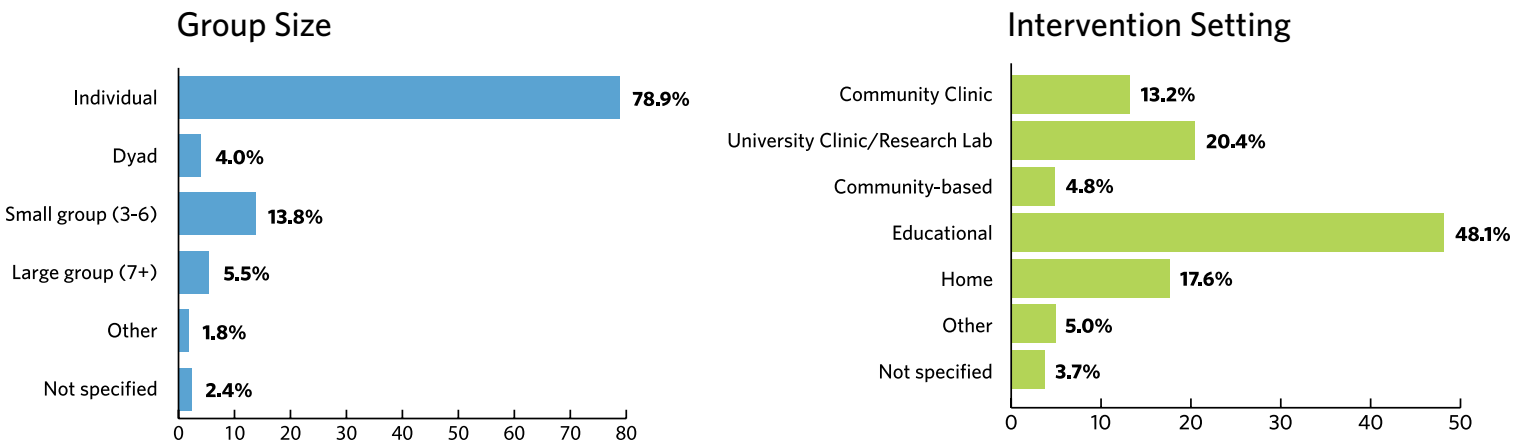
# Implementation Characteristics

Data on the implementers, settings, and group sizes for the 2012-2017 review period are presented in Table 3.6 and Figure 3.6. Studies could include multiple implementers, settings, or group sizes, thus the data are not mutually exclusive. The implementers were primarily research staff, serving as interventionists in 52% of studies and coaches in 10% of studies. Educators and related service providers were each identified as implementers in 20% of studies, and parents were noted as implementers in 10% of studies. Related to settings, nearly 50% of studies noted educational settings, 20% university clinic/research lab settings, 18% home settings, and 13% community clinic settings. Almost 80% of the studies were conducted in individual sessions (i.e., one-on-one), and 14% were conducted in small group settings with 3-6 total participants. All other group sizes occurred in less than 6% of the studies.

Table 3.6 Implementers of evidence-based practices in 2012-2017 review period

| Implementer Categories | Studies (n) | % of studies |
|---|---|---|
| **BCBA** | **15** | **2.8%** |
| **Educator** | **109** | **20.0%** |
| Special Education Teacher | 57 | 10.5% |
| Teacher (not specified) | 30 | 5.5% |
| Paraeducator | 16 | 2.9% |
| General Education Teacher | 5 | 0.9% |
| Early Interventionist | 1 | 0.2% |
| **Parent** | **50** | **9.2%** |
| **Peer** | **14** | **2.6%** |
| Peer (non-family) | 13 | 2.4% |
| Sibling | 1 | 0.2% |
| **Related Service Provider** | **111** | **20.4%** |
| Therapist (not specified) | 69 | 12.7% |
| Psychologist | 20 | 3.7% |
| Speech Language Pathologist | 12 | 2.2% |
| Occupational Therapist | 5 | 0.9% |
| Physical Therapist | 2 | 0.4% |
| Psychiatrist | 2 | 0.4% |
| Counselor | 1 | 0.2% |
| **Researcher** | **339** | **62.2%** |
| Researcher as interventionist | 284 | 52.1% |
| Researcher as coach | 55 | 10.1% |
| **Other** | **51** | **9.4%** |
| **Not specified** | **15** | **2.8%** |

Figure 3.6 Percentage of studies by group size and intervention setting in 2012-2017 review period



## EBPs, Outcomes, and Ages

The matrix in Table 3.7 displays the outcomes identified for each EBP, also sorted by age group within the EBP. The filled cells indicate that at least one study generated the indicated outcome (from the column) for a specific intervention (from the row). Most of the EBPs have at least some evidence of impact across a wide range of ages (three or more age groups). In general, EBPs tend to address a wide variety of outcome categories, ranging from four to 11 outcomes. Notably, 23 EBPs have been shown to impact seven or more outcome categories and 16 EBPs have been shown to impact nine or more. Finally, most outcome categories are positively impacted by a range of EBPs. Three EBPs have proven to impact self-determination, seven impact mental health, and nine impact vocational skills. Cognitive skills, joint attention, and motor skills are linked to 13, 16, and 16 EBPs respectively, and all other outcome categories (academic, adaptive, behavior, communication, play, school readiness, and social) have been successfully improved using 23 or more of the 28 EBPs.

## Summary

The results present data from the search process and include data from the articles used to identify EBPs. In addition, the study design, participant characteristics, outcomes, and implementation characteristics of the articles are provided. They provide insights about the state of research related to behavioral, clinical, developmental, and educational intervention to support autistic individuals which will be highlighted in the discussion chapter.

## Table 3.7 Matrix of evidence-based practices, outcomes, and age categories

| **Evidence-Based Practices** See Table 3.1 to link abbreviations to EBPs | Academic/ Pre-academic | | | Adaptive/ Self-help | | | Challenging/ Interfering behavior | | | Cognitive | | | Communi-cation | | | Joint attention | | | Mental health | | | Motor | | | Play | | | School readiness | | | Self-determination | | | Social | | | Vocational | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years | 0-5 years | 6-14 years | 15-22 years |
| ABI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ASI® | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BMI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CBIS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DTT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EXM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EXT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FBA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FCT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MMI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PII | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PBII | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RIR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SST | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TAII | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

# CHAPTER 4
# DISCUSSION

The current report updates and extends the work on evidence-based, focused intervention practices begun with an initial review published in 2010 (Odom, Collet-Klingenberg, et al., 2010) and extended through a second report published in 2014 (Wong et al., 2014). In this chapter, we discuss the 28 EBPs identified in the current report, describe the differences between the previous report and the current report, and suggest trends across time. As with any review, it is important to identify limitations, which we acknowledge. We also propose implications of the results of this review for practice and future research.

## Evidence-Based Practices

In the current review, 28 practices met the criteria for classification of evidence-based. These practices and their definitions were reported in the previous chapter (Table 3.1). As the intervention literature has provided more empirical information and as practices have evolved, some of the classifications required reconceptualization and revision of previous definitions. In an active research area, knowledge does not stand still, and in fact identification of EBPs should be dynamic, reflecting the growth of knowledge across time, as well as changes in society.

Identified EBPs from the previous review period (1990-2011) and the current, full review (1990-2017) appear in Table 4.1. There are five new EBP categories in this review. Four of the new EBPs were previously identified as "interventions with some evidence," and now meet the evidence-based criteria based on additional articles in the 2012-2017 review period: *Ayres Sensory Integration®*. *Behavior Momentum Intervention, Direct Instruction,* and *Music-Mediated Intervention*. It is important to note that Ayres Sensory Integration® refers explicitly to the model developed by Jean Ayers (2005) and not to a variety of unsupported interventions that address sensory issues (Barton et al., 2015 Case-Smith et al., 2015; Watling & Hauer, 2015). The fifth new EBP is *Augmentative and Alternative Communication,* which includes practices previously in other categories. The new classification provides a more cohesive grouping of practices with common procedural features.

With this review, four focused intervention practices previously identified as EBPs have been merged into other categories. Scripting is now within *Visual Supports*. Structured Play Groups is included in *Peer-Based Instruction and Intervention*, a reconceptualized category that now includes adult-mediated interventions with peers in addition to peer-mediated interventions. While Pivotal Response Training (PRT; Koegel & Koegel, 2006; Stahmer et al., 2011) has quite an expansive literature base, it is often described as a *Naturalistic Intervention*, and to provide more conceptual consistency it has been merged into the latter grouping. Similarly, Picture Exchange Communication System® (PECS™; Bondy & Frost, 2011), with its own expansive literature base, now fits conceptually within the *Augmentative and Alternative Communication* EBP. Importantly, these reclassifications do not indicate that these practices are any less effective or evidence-based. Rather, the reclassifications are designed to provide more conceptual clarity, consistency, and conciseness.

Table 4.1 Comparison of evidence-based practices across review periods

| Evidence-Based Practices from 1990-2017 | Evidence-Based Practices from 1990-2011 | Reason for Change | Manualized Interventions Meeting Criteria (MIMCs) |
|---|---|---|---|
| Antecedent-Based Intervention | Antecedent-Based Interventions | | |
| Augmentative and Alternative Communication | | Distinguished from Technology-Aided Instruction and Intervention as a separate practice | PECS® |
| Ayres Sensory Integration ® (ASI®) | | | |
| Behavioral Momentum Intervention | | | |
| Cognitive Behavioral/Instructional Strategies | Cognitive Behavior Intervention | Expanded category to include academic-focused cognitive interventions | |
| Differential Reinforcement of Alternative, Incompatible or Other Behaviors | Differential Reinforcement of Alternative, Incompatible or Other Behaviors | | |
| Direct Instruction | | | |
| Discrete Trial Training | Discrete Trial Training | | |
| Exercise and Movement | Exercise | Expanded category to include mind-body interventions (e.g., yoga) | |
| Extinction | Extinction | | |
| Functional Behavioral Assessment | Functional Behavioral Assessment | | |
| Functional Communication Training | Functional Communication Training | | |
| Modeling | Modeling | | |
| Music-Mediated Intervention | | | |
| Naturalistic Intervention | Naturalistic Intervention | | JASPER<br>Milieu Teaching<br>PRT |
| Parent-Implemented Intervention | Parent-Implemented Interventions | | Project ImPACT<br>Stepping Stones Triple P |
| | PECS® | Moved to *Augmentative and Alternative Communication* as MIMC | |
| Peer-Based Instruction and Intervention | Peer-Mediated Instruction/ Intervention | Expanded category to include adult-mediated interventions with peers | |
| | Pivotal Response Training | Moved to *Naturalistic Intervention* as MIMC | |
| Prompting | Prompting | | |
| Reinforcement | Reinforcement | | |
| Response Interruption/Redirection | Response Interruption/Redirection | | |
| | Scripting | Moved to *Visual Supports* | |
| Self-Management | Self-Management | | |
| Social Narratives | Social Narratives | | Social Stories™ |
| Social Skills Training | Social Skills Training | | PEERS® |
| | Structured Play Groups | Moved to *Peer-Based Instruction and Intervention* | |
| Task Analysis | Task Analysis | | |
| Technology-Aided Instruction and Intervention | Technology-Aided Instruction and Intervention | NOTE: Speech-Generating Devices were moved to *Augmentative and Alternative Communication* | FaceSay®<br>Mindreading |
| Time Delay | Time Delay | | |
| Video Modeling | Video Modeling | | |
| Visual Supports | Visual Supports | | |

## Manualized Interventions Meeting Criteria

A set of interventions grouped within established EBP categories now themselves have sufficient evidence to be classified as evidence-based. We have labeled these as Manualized Interventions Meeting Criteria (MIMC) and they are operationally defined as interventions that a) are manualized, b) have unique features that create an intervention identity, and c) share common features with other practices grouped within the superordinate EBP classification. Two of the most prominent, which were noted in Chapter 3, are PECS® (Frost & Bondy, 2002), merged into *Augmentative and Alternative Communication* and PRT merged into *Naturalistic Intervention*. Other MIMCs under Naturalistic Intervention are JASPER (Kasari et al., 2014), and Milieu Training (Kaiser & Roberts, 2013). Two MIMCs grouped within *Parent-Mediated Intervention* are Project ImPACT (Ingersoll & Dvortcsak, 2019) and Stepping Stones/Triple P (Turner et al., 2010). Social Stories ™ (Gray, 2000) is grouped within the broader *Social Narrative* EBP, and the PEERS® intervention (Laugeson & Frankel, 2010) is in the *Social Skills Training* EBP. Two programs that do not necessarily have a "manual" but rather have software documentation and sufficient evidence are Mindreading (Golan & Baron-Cohen, 2006) and FaceSay® (Hopkins et al., 2011). They are grouped within the *Technology-Aided Instruction and Intervention* EBP.

## Practices with Some Evidence

In addition to interventions that meet EBP criteria, there were 12 focused intervention practices, that did not yet have sufficient evidence to meet criteria for an EBP. These are listed in the previous chapter in Table 3.2. The primary reason for not meeting criteria was that there were an insufficient number of high-quality studies providing support. Eight of the 12 practices only had one supportive study. Other practices, however, had more empirical support and could be viewed as emerging practices. Two of the practices (i.e., Exposure, Matrix Training) had multiple single case design studies but fell short of the five study criteria. The COMPASS intervention had two group design studies, but the studies were conducted by a single research group, and thus had no independent replications. It is important to note that Punishment is a special case. It does have four supportive single case design studies, but its use falls under the ethical guidelines of state regulatory agencies and professional codes of ethics. Although it may technically be classified as an emerging practice, its appropriateness is sometimes questioned, and its use should be limited or at least carefully monitored. Additionally, there were several focused interventions with some evidence from the previous review period (1990-2011) that were recategorized into EBP categories as part of this review (see Table 4.2). Last, there are some practices (i.e., auditory integration, sensory diet) that were supported by only one study, had no new studies published since the last review, and for which articles have been published that document their lack of effectiveness (i.e., American Academy of Pediatrics, 2010; Barton et al., 2015). Practitioners should not interpret their inclusion in this review as an endorsement of their evidence base.

Table 4.2 Recategorization of practices with some evidence from the 1990-2011 review period

| 1990-2011 Review Period | Categorization for 1990-2017 Review Period | Description |
|---|---|---|
| Aided Language Modeling | Augmentative and Alternative Communication | Use of several augmentative and alternative communication strategies (e.g., pointing with finger, sequential pointing, use of communication symbol and vocalization together) |
| Cooperative Learning Groups | Peer-Based Instruction and Intervention | Academic learning tasks organized around joint activities and goals |
| Handwriting Without Tears | Modeling, Prompting, and Visual Supports | Multisensory activities promoting fine motor and writing skills |
| Independent Work Systems | Visual Supports | Organized sets of visual information that inform a learner about participation in an activity; includes clear specification of task(s), signals when task is finished, and a cue for the next activity |
| Music Intensity | Antecedent-Based Interventions | Different levels of music volume used to affect vocal stereotypy |
| Reciprocal Imitation Training | Naturalistic Intervention | Therapist or teacher repeats the actions, vocalizations, or other behaviors of the learner to promote learner's imitation and other goals |
| Schema-Based Strategy Instruction | Cognitive Behavioral/ Instructional Strategies | Cognitive strategy for establishing mental representations to promote addition and subtraction |
| Self-Regulated Strategy Development Writing Intervention | Cognitive Behavioral/ Instructional Strategies | Instructional package involving explanation of strategy and self-management to teach writing skills |
| Sentence-Combining Technique | Visual Supports | Instructional package including teacher modeling, student practice, and worksheet to increase adjective use in writing |
| Test Taking Strategy Instruction | Cognitive Behavioral/ Instructional Strategies | Instructional package involving modeling, mnemonic devices, verbal practice sessions, controlled practice sessions, advanced practice sessions |
| Theory of Mind Training | Social Skills Treatment | Structured training and practice of using theory of mind skills that includes a parent component |
| Toilet Training | Antecedent-Based Intervention | Modification of toilet training program developed by Azrin and Foxx (1971) |
| Touch-Point Instruction | Visual Supports | Tactile and number line materials used to introduce math and numeracy concepts |

# Trends Across Time

Although the cumulative set of high-quality studies included in this review informed the identification of EBPs, the two time periods represented in this review (1990-2011 and 2012-2017) allow an examination of trends across time. The most apparent trend across time, noted in the introduction, was the accelerating number of articles that meet the methodological criteria for inclusion. For this review, there were more articles (i.e., those meeting methodological criteria) published between 2012-2017 (i.e., 545) as had been published in the previous two decades (1990-2011; 427). Although it is difficult to attribute this growth to any single factor, certainly the increased prevalence of autism has increased public awareness of the condition and the need for knowledge of supports for individuals with autism.

## Experimental Methodology

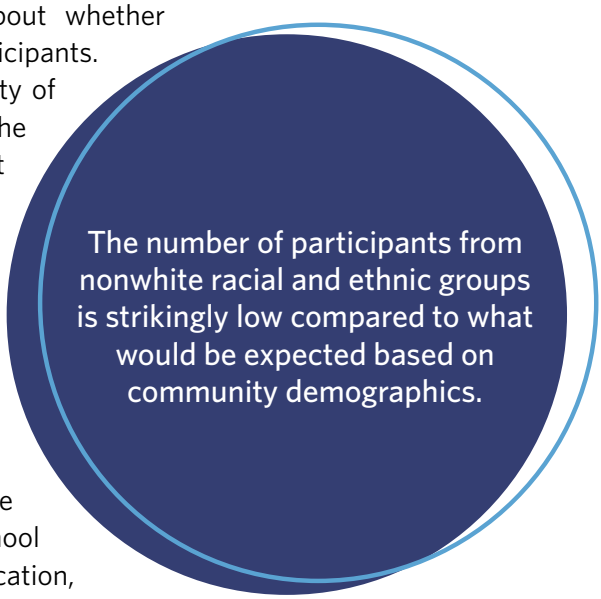
Along with the increase in articles have come some changes in the experimental designs that researchers employ. Over the two time periods, researchers continue to employ single case design most frequently, although the types of designs have changed somewhat. Researchers continue to use multiple baseline designs most often but less frequently in the current review period. This was also true of the traditional withdrawal of treatment designs (i.e., ABAB). In the 2012-2017 set of studies, researchers more often used multiple probe, alternating treatment, and "hybrid design" designated as "Other" (e.g., an ABAB design or alternating treatment design embedded in a multiple baseline design). For group designs, there was a dramatic increase in RCTs across the two time periods (7% vs. 21%), which may reflect the greater funding available for conducting RCTs as well as the methodological requirements of the funding agencies. Researchers in one study (Kasari et al., 2014) from the 2012-2017 literature employed an adaptive or SMART design (Murphy, 2005). Given the potential for examining differential response to interventions and provision of additional support needed, this design may be used more often in the future.

## Participant Characteristics

Inclusion criteria specified that participants have a classification that reflected autism. It is interesting that the two time periods covered in this review loosely "map onto" the change in diagnostic terminology. In 2013, the APA, through DSM-5, changed the diagnostic criteria. The two subsets of articles reflect this historical diagnostic shift, with the 2012-2017 set of articles more often including ASD as an identifier than occurred for the older set of articles. Interestingly, studies in the current review tended not to delineate co-occurring conditions, although when such information was included intellectual disability was identified most often (i.e, in 20 % of the studies). Given the recent reports of the prevalence of intellectual disability among autistic children (e.g., 33% reported in Maenner et al., 2020) and the report of co-occuring mental health conditions (Lai et al., 2019), this may represent under reporting in the literature.

The ages of participants shifted in the 2012-2017 review period, with more studies including students in the middle and early high school years (through age 18) than in the previous review. This is an important trend in the literature, given the more limited EBPs and outcomes noted for these age groups in the previous review and the concerning life trajectory for this population after high school. However, the proportions of studies that included autistic young adults (ages 19-22) and very young children directly following a diagnosis (up to 35 months) were quite low (5% and 8% respectively) and remained relatively stable between the two review periods.

In the 2012-2017 review period, we collected information about whether researchers reported the race/ethnicity/nationality of autistic participants. In the earlier review, we did not code the race/ethnicity/nationality of participants, but fortunately West and colleagues (2016) recoded the early set of articles to retrieve those data, which can serve as a point of comparison. West et al. found that only 17.9% of the articles from 1990-2011 reported race/ethnicity/nationality, while in the 2012-2017 review period, 30% of the reviewed articles reported these data. In both sets of studies, Black and Hispanic/Latino were the most frequent nonwhite racial/ethnic categories reported. The number of participants from nonwhite racial and ethnic groups in the subset of studies that reported this data is strikingly low compared to what would be expected based on community demographics. For example, only 8% of research participants were Hispanic/Latino, while in the United States alone 26% of the school age population identify as Hispanic (U.S. Department of Education, 2017). Also, our impressions from reviewing the studies are that differential treatment outcomes were not examined, which is consistent with findings by Pierce et al. (2014) in an analysis of studies published between 2000-2010. Last, socioeconomic class (SES) of participants is rarely described for autistic participants in research studies, so the possibility of determining how SES affects treatment outcomes is largely not possible.




## Implementation Characteristics

Information on the intervention setting, implementer, and group size is available from the 2012-2017 review period. Although the intervention settings were distributed across clinic, university, and educational settings, they occurred most frequently (50%) in the latter settings. Commenting perhaps on earlier research literature, Parsons & Kasari (2013) lamented the fact that most intervention research was not occurring in the educational settings where many children and youth with autism spend a great part of their life. In the current review, 50% of the research was conducted in education settings, the largest of any setting reported. While an important step in the right direction, the majority of the research is still being conducted in individual sessions by research staff members. Certainly, directions for the future would be to more often examine the efficacy of interventions when implemented in "authentic" educational settings by practitioners such as teachers, speech pathologists, psychologists, and other service providers.

## Outcomes

Outcomes for intervention participants have also shifted somewhat from the 1990-2011 to the 2012-2017 review period. As noted, researchers reported communication, social, and behavior outcomes most frequently across both review periods, as would be expected given that these are the challenges that define autism. When examining the changes in trends across the previous and current review, there were notable increases in studies that successfully targeted academic/pre-academic skills, vocational, and mental health. Most other outcome categories remained relatively stable or decreased in the numbers of studies between the two reviews. Also, it should be noted that self-determination was added to the set of outcome categories and while only addressed by a few studies in the current report, it represents an emerging area of intervention focus.

# Evidence Included in Current NCAEP Review

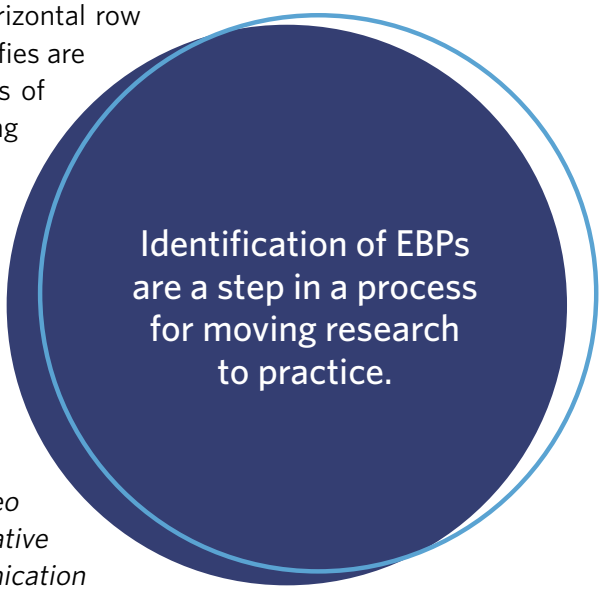
The current review included group, and single case design studies published in peer-reviewed journals. As reported in the previous chapter, nearly 85% of the included studies employed single case design. Although the NSP also included single case design research, other investigators have generally not included single case design research studies in systematic reviews and meta-analyses (Sandbank et al., 2020), although there is some inclination that review practices are changing (Watkins et al., 2019). The exclusion of single case design research is based on the perception that randomized clinical trials are the "gold standard" for experimental research, and studies employing other experimental methodologies do not provide the level of evidence necessary for drawing conclusions about the efficacy of interventions or treatments.

In the current review, the rationale for including single case and group designs is that they both can address efficacy of focused intervention practices. However, that is just the first step. A decision about the level of evidence needed to be confident in the effects of an intervention should be based on (a) scrutiny of individual research studies by the scientific community (i.e., peer-review), (b) the methodological quality of individual research studies, (c) accumulation of evidence across studies, and (d) replication of effects by independent research groups. Peer-review is a foundation of scientific inquiry (Kelly et al., 2014), although it is not a perfect system. So, the quality of articles included in this review were evaluated by at least two external reviewers and then one or two additional NCAEP reviewers when required. The accumulation of evidence was based on the number of high-quality articles supporting a specific practice. Given that single case design studies have fewer participants, a higher standard was imposed for the number of single case design articles needed to verify a practice as evidence-based. The review also went beyond most other systematic reviews of EBPs by requiring that research studies of a specific practice be replicated by separate research groups, again with a higher standard imposed on single case designs (i.e., three research groups required for single case designs and two for group designs). It should be noted that this independent replication requirement is a more conservative criterion than commonly utilized in the field. For example, the Institute of Education Science has dropped the requirement for independent replications of single case designs (Schneider, 2020; What Works Clearinghouse, 2020). The Every Student Succeeds Act (ESSA, 2015) requires only one significant finding to qualify a practice as evidence-based. The more conservative standards for single case design evidence is, in part, a reaction to the health community's rejection or lack of knowledge about this design methodology and the decisions to not accept single case methodology as evidence. However, if we had followed that policy, our analysis would have left out 85% of the knowledge base about focused intervention practices for children and youth with autism.

## Overlap with Previous National Standards Project Review

As noted, both NPDC and the National Standards Project (NSP) published reports of their systematic reviews of the literature and identification of evidence-based practices in 2014 (Wong et al., 2014) and 2015 (National Autism Center, 2015). In Table 4.3, we compare the EBPs identified in the current review with those the NSP identified in their last review. At this writing, we understand that the NSP is conducting an update of their 2015 review, and when that report is published, we will revise the current figure and post it on the NCAEP website.

In Table 4.3, the EBPs that the NSP identified are listed in the horizontal row across the top of the table. The EBPs that this NCAEP report identifies are listed in the vertical column down the side of the table. The cells of this matrix in which checkmarks appear indicate a practice appearing in both reports. Nineteen of the NCAEP EBPs were also identified as established interventions in the NSP report. The NSP groups multiple applied behavior analysis practices within a broad category called Behavioral Interventions. In our reading of the NSP report, twelve of the NCAEP EBPs would be classified into the Behavioral Intervention category. Other overlaps in identification of EBPs are *Cognitive Behavior Instructional Strategies, Modeling, Naturalistic Intervention, Parent-Implemented Intervention, Peer-Based Instruction and Intervention, Visual Supports, Self-Management, Social Narratives, Social Skills Training, and Video Modeling*. Five of the NCAEP EBPs (*Augmentative and Alternative Communication, Exercise and Movement, Functional Communication Training, Music-Mediated Intervention, and Technology-Aided Intervention and Instruction*) were identified as emerging interventions (i.e., some evidence but not sufficient to be classified as an EBP). NCAEP identified four EBPs that were not included in the NSP previous report (*Ayres Sensory Integration®. Behavioral Momentum Intervention, Direct Instruction,* and *Functional Behavior Assessment*). Alternatively, NSP identified Language Training (Production) as an established intervention, whereas it was not included in the current NCAEP report. NSP also included Comprehensive Behavioral Treatment for Young Children, and NCAEP did not consider comprehensive treatment models in the current review. In summary, there continues to be a substantial overlap in EBPs identified by these two independent reviews.



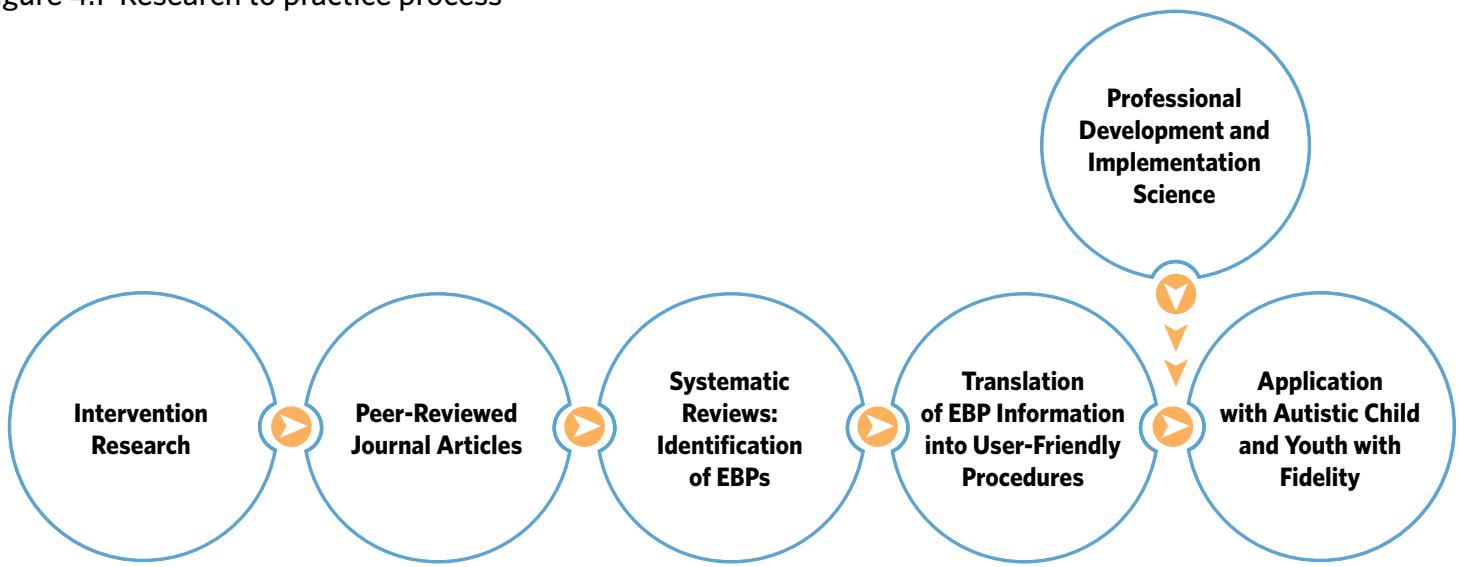

## Implications for Practice

Identification of EBPs is a step in a process for moving research to practice (see Figure 4.1). In the field, there appears to be a misapprehension of the purpose for identifying evidence-based practices and how they might affect the use of scientific information about effective interventions for children and youth with autism (Kasari & Smith, 2016). It is naïve to believe that merely identifying a set of evidence-based practices will lead to a change in implementation of those practices by professionals (Odom, 2009). Rather, intervention research and research syntheses are crucial steps in the process; they are necessary but not individually sufficient steps.

Table 4.3 Overlap between evidence-based practices identified by NCAEP and NSP

| Evidence-Based Practices Identified (NCAEP) | Established Interventions Identified by NSP: Behavioral Interventions | Cognitive Behavioral Intervention Package | Modeling | Naturalistic Teaching Strategies | Parent Training | Peer Training Package | Pivotal Response Treatment® | Schedules | Scripting | Self-management | Social Skills Package | Story-based Intervention | Language Training (Production) | Comprehensive Behavioral Treatment for Young Children |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Antecedent-Based Intervention (ABI) | ✓ | | | | | | | | | | | | Language training did not emerge as a focused intervention by the NCAEP. Components of Language Training (Production) overlap with NCAEP identified practices that may support language production, such as modeling, prompting, reinforcement, visual supports, and music-mediated interventions. | The NCAEP did not review comprehensive treatment models. Components of the Comprehensive Behavioral Treatment of Young Children may overlap with many NCAEP identified practices, such as discrete trial training, modeling, prompting, time delay, and behavior momentum intervention. |
| Cognitive Behavioral Instructional Strategies (CBIS) | | ✓ | | | | | | | | | | | | |
| Differential Reinforcement (DR) | ✓ | | | | | | | | | | | | | |
| Discrete Trial Training (DTT) | ✓ | | | | | | | | | | | | | |
| Extinction (EXT) | ✓ | | | | | | | | | | | | | |
| Modeling (MD) | ✓ | | ✓ | | | | | | | | | | | |
| Naturalistic Interventions (NI) | | | | ✓ | | | ✓ | | | | | | | |
| Parent-Implemented Interventions (PII) | | | | | ✓ | | | | | | | | | |
| Peer-Based Instruction & Intervention (PBII) | | | | | | ✓ | | | | | | | | |
| Prompting (PP) | ✓ | | | | | | | | ✓ | | | | | |
| Reinforcement (R) | ✓ | | | | | | | | | | | | | |
| Response Interruption & Redirection (RIR) | ✓ | | | | | | | | | | | | | |
| Self-Management (SM) | | | | | | | | | | ✓ | | | | |
| Social Narratives (SN) | | | | | | | | | | | | ✓ | | |
| Social Skills Training (SST) | | | | | | | | | | | ✓ | | | |
| Task Analysis (TA) | ✓ | | | | | | | | | | | | | |
| Time Delay (TD) | ✓ | | | | | | | | | | | | | |
| Video Modeling (VM) | ✓ | | ✓ | | | | | | | | | | | |
| Visual Supports (VS) | ✓ | | | | | | | ✓ | ✓ | | | | | |
| Augmentative & Alternative Communication (AAC) | Identified as an emerging intervention by the NSP. | | | | | | | | | | | | | |
| Exercise & Movement (EXM) | Identified as an emerging intervention by the NSP. | | | | | | | | | | | | | |
| Functional Communication Training (FCT) | Identified as an emerging intervention by the NSP. | | | | | | | | | | | | | |
| Music-Mediated Interventions (MMI) | Identified as an emerging intervention by the NSP. | | | | | | | | | | | | | |
| Technology-aided Instruction & Intervention (TAII) | Identified as an emerging intervention by the NSP. | | | | | | | | | | | | | |
| Ayres Sensory Integration® (ASI ®) | The NSP did not consider this as a catergory for intervention. | | | | | | | | | | | | | |
| Behavior Momentum Intervention (BMI) | The NSP did not consider this as a catergory for intervention. | | | | | | | | | | | | | |
| Direct Instruction (DI) | The NSP did not consider this as a catergory for intervention. | | | | | | | | | | | | | |
| Functional Behavior Assessment (FBA) | The NSP did not consider this as a catergory for intervention. | | | | | | | | | | | | | |

Figure 4.1 Research to practice process




The findings from systematic reviews provide the basis for translation procedures described in the research literature into understandable information that teachers or other practitioners can use. After publication of the Wong et al. (2014) report, our research group led by Dr. Ann Sam, developed online e-learning modules that described EBP procedures, steps for implementing the practices, and fidelity checklists (https://afirm.fpg.unc.edu). Titled the *Autism Focused Intervention Resources and Modules* (AFIRM), these modules have been accessed by professionals from a variety of disciplines and parents (Sam et al., 2019). At this writing, AFIRM has had over 135,000 users across 170 countries in the world. The next step for this current review will be to use the new information to revise the modules to reflect the most current scientific information about focused intervention practices.

Again, while this translation process as seen in AFIRM or conducted by other investigators is necessary, it is also a link in the chain for moving research to practice. Some practitioners will be able to take the translated information about EBPs and directly apply it in their classrooms, but implementation science informs us that additional steps are needed for most practitioners. Professional development, such as coaching, and organizational support are all factors that may be necessary for closing the last link of the research to practice gap.

An essential feature of this professional development is establishing a process for selecting specific EBPs to address an autistic child's individual goals. The Matrix of EBPs, outcomes and age categories (Table 3.7) is an important tool for beginning the EBP selection process, in that it highlights the outcome areas in which specific EBPs have demonstrated effects for specific ages. However, that is just a start. Like in evidence-based medicine, the selection of intervention approaches depends on the practitioners' wisdom and knowledge about the specific goal, the characteristics of the child, priorities of the parents and child, and the practitioners' own capacity to implement the practice given their context and resources. The AFIRM website highlights just such a process (National Professional Development Center on Autism Spectrum Disorder, 2017). The assumption that a practitioner should learn all 28 practices is not correct. Rather a more targeted approach based on the learning needs of autistic children and adolescents is the most practical approach that will close the research to practice gap.

# Implications for Future Research

The acceleration in intervention research publications from the previous review to the current review is remarkable. More articles from 2012-2017 met our review criteria than in the 1990-2011 review period. One implication is that synthesizing the literature every five years may not be sufficient for keeping up with the literature, and an ongoing process for research synthesis may be important for comprehensive reviews. Other synthesis organizations such as the Cochrane Collaboration, the Campbell Collaboration, and the What Works Clearinghouse synthesize information at the individual practice or program level, but that level of synthesis will not be adequate to meet the needs of practitioners (e.g., teachers, clinicians) who have the mandate to use EBPs in their programs.

The current literature review also reports the outcome areas for which there has been considerable research and those in which research is needed. The matrix of EBPs, outcomes, and age categories in Table 3.7 highlights these areas. Although more research has positively impacted mental health and vocational outcomes as compared with the previous report, both of these domains have fewer outcomes reported than others. The mental health challenges (Lai et al., 2019) and vocational training needs (i.e., as reflected by poor employment outcomes after graduation; Roux et al., 2017) of autistic children and youth continue to be documented as high need areas. Findings from the current review suggest that these are very important directions for future research. Also, there is a growing recognition that autistic children and youth can and should play a larger part in determining aspects of their educational and intervention programs, thus self-determination has emerged as an important area for which intervention programs will be needed. To date, few interventions have been published showing positive effects in this outcome area.


Increasingly, the importance of examining intervention effects for children and youth with autism from different demographic groups is emerging. In the previous review, we noted that fewer studies are conducted with autistic adolescents than younger children. We also found less research focused on the infant/toddler age range. These trends continued in the current review and suggest a need for focusing future research on both the youngest and older age groups of children and youth with autism. Also, to date the race and ethnicity of autistic children and youth has been underreported and rarely ever analyzed. Even when it is reported, racially and ethnically diverse individuals are underrepresented among participants. With the changing racial and ethnic demographics of all children and youth in the U.S., it will be increasingly important to change reporting standards, increase efforts to recruit participants from racially and ethnically diverse backgrounds, and conduct more targeted analyses of possible differential effects. Although the gender and/or sex of participants in studies are almost always reported, there have been few studies that have examined the differential effects of interventions for girls. Although girls only represent about 25% of the identified population of autistic children and youth, with the rise in overall prevalance of autism, it may become increasingly possible to recruit enough autistic girls to build the required power for group design studies.

# Limitations

As with nearly any review, we acknowledge that some limitations exist for this review. As noted, the review was only of studies published from 1990-2017. Two limitations exist regarding this timeframe. First, we acknowledge that we are missing studies that occurred before 1990, although one might expect early (i.e., pre-1990) studies of important and effective practices to have been replicated in publications over subsequent years. Second, because of the time required to conduct a review of a very large database and involve a national set of reviewers, there was a lag between the end date for a literature review (i.e., 2017) and the date on which the review is published. Certainly, studies have been published in the interim that could have moved some of the "other practices" into the EBP classification.

Regarding the methodology of the review and as mentioned previously, this was clearly a systematic review of the literature and not a meta-analysis. The review only contained peer-reviewed journal articles. We did provide our rationale with regard to following peer review as part of the established scientific process, but it is possible that the review did contain publication bias. Also, we did not include studies with null findings. In fact, experimental studies are rarely set up with a research question of no difference, although there are methodological procedures for addressing such a question (Greene et al., 2007). Research studies with a hypothesis of treatment condition differences that instead "prove the null hypothesis" run the greater risk of Type II error. For the review, we had two reviewers for the methodological quality review and data extraction phases of the study and found adequate inter-rater agreement. However, during the early phases that screened for exclusion (i.e., title/abstract and full-text review), only one reviewer conducted these screening activities so it is possible that error could have occurred at that point in the process. In addition, our review only included articles that were published in English, thus possibly limiting the scope and generalizability of the findings.

The age range of participants in the studies reviewed was from birth to 22 years old, or the typical school-age years (i.e., if one counts early intervention). We noted a smaller set of studies for autistic infants and toddlers. The inclusion criteria in this study specified that participants had to have a diagnosis of ASD. For infants and toddlers, participants were sometimes identified as "children at-risk" for autism and the study was excluded. This may have inadvertently reduced the number of studies in this area. At the other end of the age spectrum, we were able to collect information for young adults, but the top end of the age range was 22. There is increased recognition that the field needs information about interventions that are effective with autistic adults and not including such information is a limitation.

# Conclusion

The current review conveys the state of the science in intervention practice for children and youth with autism as well as the gaps in the science. With regard to the state of the science, the volume and theoretical range of the literature has expanded, which led to the reconceptualization of some EBP categories and addition of new EBPs. This bodes well for a field that is searching for an empirical base for its practice and also for autistic children and youth and their families, who may expect that advances in intervention science will lead to better outcomes. The prospect of better outcomes, however, is couched on the need for translating scientific results into intervention practices that service providers may access and providing professional development and support for implementing the practices with fidelity. Fortunately, the field of implementation science may provide the needed guidance for such a translational process (Odom et al., 2019) and professional development models for teachers and service providers working with children and youth with autism have begun to adopt an implementation science approach (Odom et al. 2012; Odom et al., 2013). Such movement, from science to practice, is a clear challenge and also an important step for the field.

The current review conveys the state of the science in intervention practice for children and youth with autism as well as the gaps in the science.

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## Appendix 1: Group Design Quality Appraisal Form

| Question | Yes | No | Not Reported |
|---|---|---|---|
| Does the study have experimental and control/comparison groups? | | | |
| Were appropriate procedures used to increase the likelihood that relevant characteristics of participants in the sample were comparable across conditions? (To meet this standard, one of the following criteria must be met a) participants were randomly assigned across study conditions, b) participants were matched on key demographic variables, OR c) researchers statistically controlled for effects of differing key variables to ensure equivalence of groups. | | | |
| Were outcomes for capturing the intervention's effect measured at appropriate times (at least pre- and post-test)? | | | |
| Was there evidence for adequate reliability and validity for the key outcome measures? And/or when relevant, was inter-observer reliability assessed and reported to be at an acceptable level? | | | |
| Was the intervention described and specified clearly enough that it could be replicated by another interventionist? | | | |
| Was the control/comparison condition(s) described? | | | |
| Were the data analysis techniques appropriately linked to key research questions and hypotheses? | | | |
| Attrition was not a significant threat to internal validity. | | | |
| Was the measure of effect attributed to the intervention? (no obvious unaccounted confounding factors) | | | |
| Does the research report statistically significant positive effects of the practice for individuals with ASD for at least one outcome variable? | | | |

Appendix 2: Single Case Design Quality Appraisal Form

| Question | Yes | No | Not Reported |
|---|---|---|---|
| Does the dependent variable align with the research question or purpose of the study? | | | |
| Was the dependent variable clearly defined such that another person could identify an occurrence or nonoccurrence of the response? | | | |
| Does the measurement system align with the dependent variable and produce a quantifiable index? | | | |
| Did a secondary observer collect data on the dependent variable for at least 20% of the sessions across conditions? | | | |
| Was mean interobserver agreement (IOA) 80% or greater OR kappa of .60 or greater? | | | |
| Is the independent variable described with enough information to allow for a clear understanding about the critical differences between the baseline and intervention conditions, or were references to other published material used if description does not allow for a clear understanding? | | | |
| Was the baseline described in a manner that allows for a clear understanding of the differences between the baseline and intervention conditions?<br>*Can select not reported for ATDs only | | | |
| Are the results displayed in a graphic format showing repeated measures for a single case (e.g., behavior, participant, group) across time? | | | |
| Do the results demonstrate changes in the dependent variable when the independent variable is manipulated by the experimenter at three different points in time or across three phase repetitions?<br>*For ATD, must be at least 4 repetitions of alternating sequence<br>**Changing criterion- baseline plus three intervention phases | | | |

**Name of EBP**

## Antecedent-Based Intervention (ABI)

**Definition of EBP**

Antecedent-based interventions (ABI) include a variety of modifications that are made to the environment/context in an attempt to change or shape a learner's behavior. ABIs are typically implemented after conducting a functional behavior assessment which can assist in identifying the function of an interfering behavior as well as the environmental conditions that may have become linked to a behavior over time. Once factors in the environment that may be reinforcing interfering behavior have been identified, ABIs are implemented to modify the environment or activity so that the factor no longer elicits the interfering behavior. In addition to targeting challenging behaviors, ABI can also be used to increase the occurrence of desired behaviors or skills. Common ABI procedures include: 1) modifying educational activities, materials, or schedules, 2) incorporating learner choice into learner activities/materials, 3) preparing learners ahead of time for upcoming activities, 4) varying the format, level of difficulty, or order of instruction during educational activities, 5) enriching the environment to provide additional cues or access to additional materials, and 6) modifying prompting and reinforcement schedules and delivery. ABI strategies often are used in conjunction with other evidence-based practices such as functional communication training, extinction, and reinforcement.

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Social | | ✓ | ✓ | ✓ | | ✓ |
| | Joint attention | | | | | | |
| | Play | ✓ | ✓ | ✓ | | | |
|  | Cognitive | | | | | | |
| | School readiness | | ✓ | ✓ | ✓ | | |
| | Academic/ Pre-academic | | ✓ | ✓ | | ✓ | |
|  | Adaptive/ self-help | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Challenging/ Interfering behavior | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Vocational | | | | | | |
| | Motor | | | | | | |
|  | Mental health | | | ✓ | ✓ | ✓ | |
| | Self-determination | | | | | | |

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| Name of EBP | Augmentative and Alternative Communication (AAC) |
|---|---|
| Definition of EBP | Augmentative and Alternative Communication (AAC) interventions use and/or teach the use of a system of communication that is not verbal/vocal including aided and unaided communication systems. Unaided communication systems do not use any materials or technology (e.g., sign language and gestures). Aided communication systems include low tech systems (e.g., exchanging objects/ pictures or pointing to letters) and extend to high tech speech generating devices (SGDs) and applications that allow other devices (i.e., phones, tablets) to serve as SGDs. Methods of teaching AAC use are also included in this category (e.g., Aided Language Modeling) which may include other EBPs such as prompting, reinforcement, visual supports, and peer-mediated interventions.<br>▪ Manualized Interventions Meeting Criteria: Picture Exchange Communication System® (PECS®; Bondy and Frost, 1985). |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Social | ✓ | ✓ | ✓ | | ✓ | |
| | Joint attention | ✓ | ✓ | ✓ | | | |
| | Play | ✓ | ✓ | ✓ | | | |
|  | Cognitive | | | | | | |
| | School readiness | | | | | | |
| | Academic/ Pre-academic | | ✓ | ✓ | | | |
|  | Adaptive/ self-help | | | | | | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | | | |
| | Vocational | | | | | | |
| | Motor | | | | | ✓ | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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* indicates articles that are either secondary data analysis or follow-up for an article already included in the list

| Name of EBP | Ayres Sensory Integration® (ASI®) |
|---|---|
| Definition of EBP | Ayres Sensory Integration® (ASI®, Ayres, 1989) is a theory and practice that targets a person's ability to process and internally integrate sensory information from their body and environment, including visual, auditory, tactile, proprioceptive, and vestibular input. ASI® uses individually tailored activities that challenge sensory processing and motor planning, encourage movement and organization of self in time and space, utilize "just right" challenges, and incorporate clinical equipment in purposeful and playful activities in order to improve adaptive behavior. ASI® is implemented by trained occupational therapists (OTs) and primarily takes place in clinical settings. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | | | |
| | Social | | ✓ | ✓ | ✓ | | |
| | Joint attention | | | | | | |
| | Play | | | | | | |
|  | Cognitive | | ✓ | ✓ | | | |
| | School readiness | | | | | | |
| | Academic/ Pre-academic | | ✓ | ✓ | | | |
|  | Adaptive/ self-help | | ✓ | ✓ | | | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | | |
| | Vocational | | | | | | |
| | Motor | | ✓ | ✓ | ✓ | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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An earlier version of this report referred to Ayres Sensory Integration® (ASI®) as Sensory Integration® (SI). To clarify the practice for which our review found evidence, we have updated the terminology in this report to ASI®.

| Name of EBP | Behavioral Momentum Intervention (BMI) |
|---|---|
| Definition of EBP | Behavioral Momentum Intervention (BMI) is a strategy in which the task presentation is modified so that those requiring less effortful responses (i.e., high probability response sequences) occur before those requiring more difficult responses (i.e., low probability response sequences). This is done so that learners will receive reinforcement earlier and will be more likely to remain engaged and persist with the more challenging tasks or requests that follow. BMI can be used in academic, social, communication, and behavioral domains. In addition to reinforcement, BMI strategies are often used in conjunction with other evidence-based practices such antecedent-based interventions and prompting. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | | | |
| | Social | | ✓ | ✓ | | | |
| | Joint attention | | | | | | |
| | Play | | ✓ | ✓ | | | |
|  | Cognitive | | | | | | |
| | School readiness | | ✓ | ✓ | ✓ | | |
| | Academic/ Pre-academic | | | ✓ | | | |
|  | Adaptive/ self-help | | ✓ | ✓ | | ✓ | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | | |
| | Vocational | | | | | | |
| | Motor | | | | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Cognitive Behavioral/Instructional Strategies (CBIS) |
|---|---|
| Definition of EBP | Cognitive Behavioral/Instructional Strategy (CBIS) interventions are based on the belief that learning and behavior are mediated by cognitive processes. Learners are taught to examine their own thoughts and emotions and then use step-by-step strategies to change their thinking, behavior, and self-awareness. These interventions can be used with learners who display problem behavior related to specific emotions or feelings, such as anger or anxiety (e.g., Cognitive Behavioral Therapy). These interventions can also be used to support learners in acquiring social and academic skills through explicit learning strategy instruction. CBIS interventions are often used in conjunction with other evidence-based practices including modeling, visual supports, prompting, reinforcement, social narratives, peer-based instruction and interventions and parent-implemented interventions. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | | ✓ | ✓ | ✓ | |
| | Social | | | ✓ | ✓ | ✓ | ✓ |
| | Joint attention | | | | | | |
| | Play | | | | | | |
|  | Cognitive | | | ✓ | ✓ | | |
| | School readiness | | | ✓ | ✓ | ✓ | |
| | Academic/ Pre-academic | | | ✓ | ✓ | ✓ | ✓ |
|  | Adaptive/ self-help | | | ✓ | ✓ | ✓ | ✓ |
| | Challenging/ Interfering behavior | | | ✓ | ✓ | ✓ | |
| | Vocational | | | | | | |
| | Motor | | | | | | |
|  | Mental health | | | ✓ | ✓ | ✓ | |
| | Self-determination | | | ✓ | ✓ | | |

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| Name of EBP | **Differential Reinforcement of Alternative, Incompatible, or Other Behavior (DR)** |
|---|---|
| **Definition of EBP** | Differential reinforcement of alternative, incompatible, or other behavior (DRA/I/O) is a systematic process that increases desirable behavior or the absence of an undesirable behavior by providing positive consequences for demonstration/non-demonstration of such behavior. Undesirable behaviors are those that interfere with the learner's development, relationships, and health (e.g., disengagement, tantrums, aggression, self-injury). The learner is provided such consequence when: a) the learner is engaging in a specific desired behavior other than the undesirable behavior (DRA), b) the learner is engaging in a behavior that is physically impossible to do while exhibiting the undesirable behavior (DRI), or c) the learner is not engaging in the undesirable behavior (DRO). Differential reinforcement is often used with other evidence-based practices such as prompting to teach the learner behaviors that are more desirable or incompatible with interfering behavior. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | | |
| | Social | | ✓ | ✓ | ✓ | | |
| | Joint attention | | | ✓ | | | |
| | Play | | ✓ | ✓ | | | |
|  | Cognitive | | | | | | |
| | School readiness | | ✓ | ✓ | ✓ | | |
| | Academic/ Pre-academic | | ✓ | ✓ | | | |
|  | Adaptive/ self-help | ✓ | ✓ | ✓ | | ✓ | |
| | Challenging/ Interfering behavior | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Vocational | | | | | | |
| | Motor | | ✓ | ✓ | ✓ | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Direct Instruction (DI) |
|---|---|
| Definition of EBP | Direct instruction (DI) in systematic approach to teaching and a sequenced instructional package that utilizes scripted protocols or lessons, emphasizes teacher and student dialogue through choral and independent student responses, and employs systematic and explicit error corrections to promote mastery and generalization. Direct Instruction is usually provided to small groups of learners and includes brisk pacing, student responses, explicit signals to cue student responses, correction procedures for incorrect or non-responses, and modeling correct responses. Instruction is sequenced so that students are required to master levels in a pre-specified order before moving to the next level. DI interventions can be used to support learners in acquiring literacy and mathematics skills and are often used in conjunction with other evidence-based practices including prompting, reinforcement, modeling, and visual supports. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | ✓ | ✓ | |
| | Social | | | | | | |
| | Joint attention | | | | | | |
| | Play | | | | | | |
|  | Cognitive | | | ✓ | ✓ | | |
| | School readiness | | | ✓ | ✓ | | |
| | Academic/ Pre-academic | | ✓ | ✓ | | | |
|  | Adaptive/ self-help | | | | | | |
| | Challenging/ Interfering behavior | | | | | | |
| | Vocational | | | | | | |
| | Motor | | | | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Discrete Trial Training (DTT) |
|---|---|
| Definition of EBP | Discrete trial training (DTT) is a one-to-one instructional approach (most typically) used to teach skills in a planned, controlled, and systematic manner. DTT is characterized by repeated, or massed, trials that have a definite beginning and end. Within DTT, the use of antecedents and consequences is carefully planned and implemented. The instructional trial begins when the practitioner presents a clear direction or stimulus, which elicits a target behavior. Positive praise and/or tangible rewards are used to reinforce desired skills or behaviors. Data is typically collected on every trial. Other practices that are used in DTT include task analysis, prompting, time delay, and reinforcement. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Social | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Joint attention | ✓ | ✓ | ✓ | | | |
| | Play | | ✓ | ✓ | | | |
|  | Cognitive | | ✓ | ✓ | | | |
| | School readiness | | ✓ | | | | |
| | Academic/ Pre-academic | | ✓ | ✓ | | ✓ | |
|  | Adaptive/ self-help | | ✓ | ✓ | | | |
| | Challenging/ Interfering behavior | | | ✓ | | | |
| | Vocational | | | ✓ | | | |
| | Motor | | | | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Exercise and Movement (EXM) |
|---|---|
| Definition of EBP | Exercise and movement (EXM) interventions incorporate the use of physical exertion and/or mindful movement to target a variety of skills and behaviors. Exercise can be used as an antecedent activity to improve performance in a task or behavior, or it can be used to increase physical fitness and motor skills. Movement activities can include sports/recreation activities, martial arts, yoga, or other mindful practices that focus on specific sets of motor skills and techniques. EXM interventions may incorporate a warm-up/cool down and aerobic, strength, stretching, and/or skillful motor activities and be performed in individual or group/team-based settings. EXM is often used in conjunction with prompting, modeling, reinforcement, and visual supports. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | ✓ | ✓ | |
| | Social | | ✓ | ✓ | ✓ | ✓ | |
| | Joint attention | | | | | | |
| | Play | | ✓ | | | | |
|  | Cognitive | | ✓ | ✓ | ✓ | ✓ | |
| | School readiness | | ✓ | ✓ | ✓ | ✓ | |
| | Academic/ Pre-academic | | ✓ | | | | |
|  | Adaptive/ self-help | | | ✓ | ✓ | ✓ | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | ✓ | |
| | Vocational | | | | | | |
| | Motor | | ✓ | ✓ | ✓ | ✓ | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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* indicates articles that are either secondary data analysis or follow-up for an article already included in the list

| Name of EBP | Extinction (EXT) |
|---|---|
| Definition of EBP | Extinction (EXT) is the removal of reinforcing consequences of a challenging behavior in order to reduce the future occurrence of that behavior. The extinction procedure relies on accurately identifying the function of the behavior and the consequences that may be reinforcing its occurrence. The consequence that is believed to reinforce the occurrence of the target challenging behavior is removed or withdrawn, resulting in a decrease of the target behavior. An initial increase in the challenging behavior (often called an "extinction burst") is common before eventually being extinguished. Extinction should not be used in isolation. Other practices that are used in combination with extinction include differential reinforcement and functional behavior assessment. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | ✓ | ✓ | |
| | Social | | ✓ | ✓ | ✓ | | |
| | Joint attention | | | | ✓ | | |
| | Play | | | | | | |
|  | Cognitive | | | | | | |
| | School readiness | | ✓ | ✓ | ✓ | | |
| | Academic/ Pre-academic | | | | | | |
|  | Adaptive/ self-help | ✓ | ✓ | ✓ | | ✓ | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | ✓ | |
| | Vocational | | | | | | |
| | Motor | | | | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Functional Behavioral Assessment (FBA) |
|---|---|
| Definition of EBP | Functional behavior assessment (FBA) is a systematic way of determining the underlying function or purpose of a behavior so that an effective intervention plan can be developed. FBA consists of describing the interfering or problem behavior, identifying antecedent and consequent events that control the behavior (sometimes systematically tested through a functional analysis), developing a hypothesis of the function of the behavior, and testing the hypothesis. Data collection is an important part of the FBA process. FBA is typically used to identify the causes of interfering behaviors such as self-injury, aggression towards others, or destructive behaviors and should be followed by the creation and implementation of a behavioral intervention to address the interfering behavior described |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | | ✓ | | ✓ | |
| | Social | | | | | | |
| | Joint attention | | | | | | |
| | Play | | | | | | |
|  | Cognitive | | | | | | |
| | School readiness | | ✓ | ✓ | ✓ | | |
| | Academic/ Pre-academic | | ✓ | ✓ | | | |
|  | Adaptive/ self-help | | | ✓ | | | |
| | Challenging/ Interfering behavior | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Vocational | | | | | | |
| | Motor | | | | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Functional Communication Training (FCT) |
|---|---|
| Definition of EBP | Functional communication training (FCT) is a set of practices that replace a challenging behavior that has a communication function with more appropriate and effective communication behaviors or skills. is a set of practices that replace a challenging behavior that has a communication function with more appropriate and effective communication behaviors or skills. FCT is preceded by a functional behavior assessment to identify the function of an interfering behavior followed by teaching an appropriate communication skill that may serve the same purpose for the learner with ASD. FCT often includes differential reinforcement procedure in which an individual is taught an alternative response that results in the same class of reinforcement identified as maintaining problem behavior. Problem behavior is typically placed on extinction. The distinct component of FCT is that the alternative response is a recognizable form of communication (e.g., a vocalization, manual sign, Picture Exchange Communication System®). |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | ✓ | ✓ | |
| | Social | | ✓ | ✓ | | | |
| | Joint attention | | | | | | |
| | Play | | ✓ | ✓ | | | |
|  | Cognitive | | | | | | |
| | School readiness | | ✓ | ✓ | | | |
| | Academic/ Pre-academic | | | | | | |
|  | Adaptive/ self-help | | ✓ | ✓ | | ✓ | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | ✓ | |
| | Vocational | | | | | | |
| | Motor | | | | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Modeling (MD) |
|---|---|
| Definition of EBP | Modeling (MD) involves the demonstration of a desired target behavior that results in use of the behavior by the learner and that leads to the acquisition of the target behavior. Thus, the learner is picking up on a targeted skill through observational learning. MD is often combined with other strategies such as prompting and reinforcement. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Social | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Joint attention | | ✓ | | | | |
| | Play | | ✓ | ✓ | | | |
|  | Cognitive | | | | | | |
| | School readiness | | ✓ | ✓ | ✓ | | |
| | Academic/ Pre-academic | | ✓ | ✓ | ✓ | ✓ | |
|  | Adaptive/ self-help | | ✓ | ✓ | | | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | | | |
| | Vocational | | | | | | ✓ |
| | Motor | ✓ | ✓ | | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | **Music-Mediated Intervention (MMI)** |
|---|---|
| **Definition of EBP** | Music-mediated intervention (MMI) uses music as a key feature of the intervention delivery. This includes music therapy, which occurs in a therapeutic relationship with a trained music therapist, in addition to the planned use of songs, melodic intonation, and/or rhythm to support the learning or performance of target behaviors and skills in varied contexts. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | | |
| | Social | | ✓ | ✓ | ✓ | | |
| | Joint attention | | | | | | |
| | Play | | ✓ | | | | |
|  | Cognitive | | | | | | |
| | School readiness | | ✓ | ✓ | | | |
| | Academic/ Pre-academic | | | | | | |
|  | Adaptive/ self-help | ✓ | | | | | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | | | |
| | Vocational | | | | | | |
| | Motor | | ✓ | ✓ | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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* indicates articles that are either secondary data analysis or follow-up for an article already included in the list

| Name of EBP | Naturalistic Intervention (NI) |
|---|---|
| Definition of EBP | Naturalistic Intervention (NI) is a collection of practices including environmental arrangement and interaction techniques implemented during everyday routines and activities in the learner's classroom or home environment. These practices are designed to encourage specific target behaviors based on learners' interests by building more complex skills that are naturally reinforcing and appropriate to the interaction. NIs are embedded in typical activities and/or routines in which the learner participates. The NI practices emerge from behavioral (e.g., applied behavior analysis) and/or developmental approaches to learning, and encompass interventions that have been noted as naturalistic developmental behavioral interventions (NDBIs; Schreibman et al., 2015) in recent literature.<br>▪ Manualized Interventions Meeting Criteria: Joint Attention Symbolic Play and Emotion Regulation (JASPER), Milieu Teaching (also includes Enhanced Milieu Teaching, Prelinguistic Milieu Teaching), and Pivotal Response Treatment (PRT). |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | | |
| | Social | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Joint attention | ✓ | ✓ | ✓ | | | |
| | Play | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Cognitive | | ✓ | ✓ | | | |
| | School readiness | ✓ | ✓ | ✓ | | | |
| | Academic/ Pre-academic | ✓ | ✓ | | | | |
|  | Adaptive/ self-help | ✓ | ✓ | | | | |
| | Challenging/ Interfering behavior | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Vocational | | | | | | |
| | Motor | | ✓ | ✓ | | | |
|  | Mental health | ✓ | ✓ | ✓ | | | |
| | Self-determination | | | | | | |

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* indicates articles that are either secondary data analysis or follow-up for an article already included in the list

| Name of EBP | Parent-Implemented Intervention (PII) |
|---|---|
| Definition of EBP | In Parent-Implemented Intervention (PII), parents are the primary person using an intervention practice with their own child. Practitioners teach parents in individual or in group formats in home or community settings. Methods for teaching parents vary, but may include didactic instruction, discussions, modeling, coaching, or performance feedback. The parent's role is to use the intervention practice to teach their child new skills, such as communication, play or self-help, engage their child in social communication and interactions, and/or to decrease challenging behavior. Once parents are trained, they implement all or part of the intervention(s) with their child. Parents are often implementing other EBPs included in this report including naturalistic interventions, video modeling, or social narratives.<br>▪ Manualized Interventions Meeting Criteria: Project ImPACT (Improving Parents as Communication Teachers); Stepping Stones Triple P (SSTP)/Primary Care SSTP. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Social | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Joint attention | ✓ | ✓ | | | | |
| | Play | ✓ | ✓ | ✓ | | | |
|  | Cognitive | ✓ | ✓ | | | | |
| | School readiness | ✓ | ✓ | ✓ | | | |
| | Academic/ Pre-academic | ✓ | ✓ | | | | |
|  | Adaptive/ self-help | ✓ | ✓ | ✓ | ✓ | | |
| | Challenging/ Interfering behavior | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Vocational | | | | | | |
| | Motor | ✓ | ✓ | | | | |
|  | Mental health | ✓ | ✓ | ✓ | ✓ | | |
| | Self-determination | | | | | | |

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* indicates articles that are either secondary data analysis or follow-up for an article already included in the list

| Name of EBP | Peer-Based Instruction and Intervention (PBII) |
|---|---|
| Definition of EBP | In Peer-Based Instruction and Intervention (PBII) peer social interaction is the defining feature of the intervention. Most often but not always, the peer of the learner is a neurotypical child of the same general age. There are two types of PBIIs, which are characterized by the role of the peer and the teacher. In peer-mediated instruction and interventions (PMIIs), the peer receives training and perhaps coaching from an adult (e.g., teacher, clinician) to deliver social initiations or instructions in a way that supports the learning goal of the learner with autism. In a variation of this approach, a sibling of the learner may serve in the peer role (e.g., sibling-mediated intervention), but the procedures are the same. In adult-mediated instruction and interventions (AMII) the teacher or other adults arranges the social environment (e.g. brings children in proximity) and provides coaching, prompts, and/or reinforcement for both the learner and the peer to engage in social interaction. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | ✓ | ✓ | |
| | Social | | ✓ | ✓ | ✓ | ✓ | |
| | Joint attention | | ✓ | ✓ | | | |
| | Play | | ✓ | ✓ | ✓ | | |
|  | Cognitive | | | ✓ | ✓ | | |
| | School readiness | | ✓ | ✓ | | | |
| | Academic/ Pre-academic | | | ✓ | ✓ | ✓ | |
|  | Adaptive/ self-help | | | | | | |
| | Challenging/ Interfering behavior | | | ✓ | | | |
| | Vocational | | | | | | |
| | Motor | | | | | | |
|  | Mental health | | | ✓ | ✓ | | |
| | Self-determination | | | | | | |

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| Name of EBP | Prompting (PP) |
|---|---|
| Definition of EBP | Prompting (PP) procedures include support given to learners that assist them in using a specific skill. Verbal, gestural, or physical assistance is given to learners to help them in acquiring or engaging in a targeted behavior or skill. Prompts are generally given by an adult or peer before or as a learner attempts to use a skill. These procedures are often used in conjunction with other evidence-based practices including time delay and reinforcement or are part of protocols for the use of other evidence-based practices such as social skills training, discrete trial teaching, and video modeling. Thus, prompting procedures are considered foundational to the use of many other evidence-based practices. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Social | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Joint attention | ✓ | ✓ | ✓ | ✓ | | |
| | Play | ✓ | ✓ | ✓ | ✓ | ✓ | |
|  | Cognitive | | | | | | |
| | School readiness | | ✓ | ✓ | ✓ | | ✓ |
| | Academic/ Pre-academic | | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Adaptive/ self-help | | ✓ | ✓ | ✓ | ✓ | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | | ✓ | ✓ |
| | Vocational | | | | ✓ | ✓ | ✓ |
| | Motor | ✓ | ✓ | ✓ | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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* indicates articles that are either secondary data analysis or follow-up for an article already included in the list

| Name of EBP | Reinforcement (R) |
|---|---|
| Definition of EBP | Reinforcement (R) is the application of consequences after a skills or behavior occurs that increases the learner's use of the skills or behavior in future situations. Reinforcement includes positive reinforcement, negative reinforcement (different than punishment), non-contingent reinforcement, and token economy. Reinforcement is a foundational evidence-based practice in that it is almost always used with other evidence-based practices including prompting, discrete trial teaching, functional communication training, naturalistic intervention. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Social | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Joint attention | ✓ | ✓ | ✓ | | ✓ | ✓ |
| | Play | | ✓ | ✓ | | ✓ | ✓ |
|  | Cognitive | | | ✓ | | | |
| | School readiness | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Academic/ Pre-academic | | ✓ | ✓ | ✓ | ✓ | |
|  | Adaptive/ self-help | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Challenging/ Interfering behavior | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Vocational | | | | ✓ | ✓ | ✓ |
| | Motor | ✓ | ✓ | ✓ | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Response Interruption/Redirection (RIR) |
|---|---|
| Definition of EBP | Response interruption/redirection (RIR) involves the introduction of a prompt, comment, or other distractor when an interfering behavior is occurring that is designed to divert the learner's attention away from the interfering behavior and results in its reduction. Specifically, RIR is used predominantly to address behaviors that are repetitive, stereotypical, and/or self-injurious. RIR often is implemented after a functional behavior assessment (FBA) has been conducted to identify the function of the interfering behavior. RIR is particularly useful with persistent interfering behaviors that occur in the absence of other people, in a number of different settings, and during a variety of tasks. These behaviors often are not maintained by attention or escape. Instead, they are more likely maintained by sensory reinforcement and are often resistant to intervention attempts. RIR is particularly effective with sensory-maintained behaviors because learners are interrupted from engaging in interfering behaviors and redirected to more appropriate, alternative behaviors. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | ✓ | | |
| | Social | | ✓ | ✓ | | | |
| | Joint attention | | | | | | |
| | Play | | ✓ | ✓ | | | |
|  | Cognitive | | | | | | |
| | School readiness | | ✓ | ✓ | | | |
| | Academic/ Pre-academic | | ✓ | ✓ | | | |
|  | Adaptive/ self-help | | ✓ | ✓ | | | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Vocational | | | | | | |
| | Motor | | | ✓ | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Self-Management (SM) |
|---|---|
| Definition of EBP | Self-management (SM) is an intervention package that teaches learners to independently regulate their own behavior. Self-management involves teaching learners to discriminate between appropriate and inappropriate behaviors, accurately monitor and record their own behaviors, and reinforce themselves for behaving appropriately. Although learners may initially require adult support to accurately record behaviors and provide self-reinforcement, this support is faded over time. Self-management is often used in conjunction with other evidence-based practices including technology-mediated interventions, modeling, video modeling, and visual supports. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | | ✓ | | | |
| | Social | | ✓ | ✓ | ✓ | | |
| | Joint attention | | | | | | |
| | Play | | | ✓ | ✓ | | |
|  | Cognitive | | | | | | |
| | School readiness | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Academic/ Pre-academic | | ✓ | ✓ | | | |
|  | Adaptive/ self-help | | | | ✓ | ✓ | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | ✓ | |
| | Vocational | | | | ✓ | | ✓ |
| | Motor | | | | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | ✓ | ✓ | | |

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| Name of EBP | Social Narratives (SN) |
|---|---|
| Definition of EBP | Social Narratives (SN) are interventions that describe social situations in order to highlight relevant features of a target behavior or skill and offer examples of appropriate responding. Social narratives are aimed at helping learners adjust to changes in routine, adapt their behaviors based on the social and physical cues of a situation, or to teach specific social skills or behaviors. Social narratives are individualized according to learner needs and typically are quite short, often told in a story format, and often include pictures or other visual aids. Usually written in first person from the perspective of the learner, they include sentences that detail the situation, provide suggestions for appropriate learner responses, and describe the thoughts and feelings of other people involved in the situation.<br>▪ Manualized Interventions Meeting Criteria: Social Stories ™ (Gray, 2010). |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | ✓ | ✓ | |
| | Social | | ✓ | ✓ | ✓ | ✓ | |
| | Joint attention | | ✓ | ✓ | | | |
| | Play | | ✓ | ✓ | | | |
|  | Cognitive | | | | | | |
| | School readiness | | | ✓ | | | |
| | Academic/ Pre-academic | | ✓ | ✓ | | | |
|  | Adaptive/ self-help | | ✓ | ✓ | | | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | ✓ | |
| | Vocational | | | | | | |
| | Motor | | | | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Social Skills Training (SST) |
|---|---|
| Definition of EBP | Social Skills Training (SST) is group or individual instruction designed to teach learners ways to appropriately and successfully participate in their interactions with others. This may include relationships with peers, family, co-workers, community members, and romantic partners. Most instructional sessions include direct instruction of basic concepts, role-play or practice, and feedback to help learners acquire and practice communication, play, or social skills to promote positive interactions with others. SST techniques often include other EBPs such as reinforcement, modeling, prompting, cognitive strategy interventions, social narratives, scripting, and visual supports.<br>• Manualized Interventions Meeting Criteria: PEERS® (Laugeson & Frankel, 2010). |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Social | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Joint attention | | | | | | |
| | Play | ✓ | ✓ | ✓ | ✓ | ✓ | |
|  | Cognitive | | ✓ | ✓ | ✓ | | |
| | School readiness | | | ✓ | ✓ | | |
| | Academic/ Pre-academic | | | | | | |
|  | Adaptive/ self-help | | | ✓ | ✓ | ✓ | |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | ✓ | |
| | Vocational | | | | | | |
| | Motor | | | | | | |
|  | Mental health | | | ✓ | ✓ | ✓ | |
| | Self-determination | | | ✓ | ✓ | | |

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| Name of EBP | Task Analysis (TA) |
|---|---|
| Definition of EBP | Task analysis (TA) is the process of breaking down a complex or "chained" behavioral skill into smaller components in order to teach a skill. The learner can be taught to perform individual steps of the chain progressively until the entire skill is mastered (also called "forward chaining"), or the learner may be taught to perform individual steps beginning with the final step and progressively moving back through the chain of skills until the whole task is mastered from the beginning (backward chaining). TA may also be used to present a whole task to a learner at once with clear steps on how to achieve the skill from start to finish. Other practices, such as reinforcement, video modeling, or time delay, should be used to facilitate learning of the smaller steps. As the smaller steps are mastered, the learner becomes more independent in his/her ability to perform the larger skill. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | ✓ | | |
| | Social | | | ✓ | | | |
| | Joint attention | | ✓ | | ✓ | | |
| | Play | | | | ✓ | | |
|  | Cognitive | | | | | | |
| | School readiness | | | | | | |
| | Academic/ Pre-academic | | | ✓ | ✓ | | |
|  | Adaptive/ self-help | | ✓ | ✓ | | | |
| | Challenging/ Interfering behavior | | | | | | |
| | Vocational | | | | ✓ | ✓ | ✓ |
| | Motor | | | ✓ | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

## References


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| Name of EBP | Technology-Aided Instruction and Intervention (TAII) |
|---|---|
| Definition of EBP | Technology-Aided Instruction and Interventions (TAII) are those in which technology is the central feature of an intervention. Given the rapid rise in the inclusion of technology in interventions, this evidence base is more focused to include technology that is specifically designed or employed to support the learning or performance of a behavior or skill for a learner. Interventions that use a more general form of technology to deliver an alternative EBP (e.g., displaying a visual support on a mobile device, video modeling, alarm on a phone as part of self-management) are not included in this evidence base. TAII includes technologies such as robots, computer or web-based software, applications for devices, and virtual networks. The common features of these interventions are the technology itself (as noted) and instructional procedures for learning to use the technology or supporting its use in appropriate contexts.<br>• Manualized Interventions Meeting Criteria: MindReading software, FaceSay™ (Symbionica, LLC) software<br>• Note: Augmentative and alternative communication (AAC) that incorporates technology is part of the evidence base for AAC and not TAII. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Social | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Joint attention | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Play | | ✓ | ✓ | | | |
|  | Cognitive | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | School readiness | | ✓ | ✓ | ✓ | ✓ | |
| | Academic/ Pre-academic | | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Adaptive/ self-help | ✓ | ✓ | ✓ | | | ✓ |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | | |
| | Vocational | | | | | | |
| | Motor | ✓ | ✓ | ✓ | | | |
|  | Mental health | | ✓ | ✓ | ✓ | | |
| | Self-determination | | | | | | |

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* indicates articles that are either secondary data analysis or follow-up for an article already included in the list

| Name of EBP | Time Delay (TD) |
|---|---|
| Definition of EBP | Time delay (TD) is a practice used to systematically fade the use of prompts during instructional activities. With this procedure, a brief delay is provided between the initial instruction and any additional instructions or prompts. The evidence-based research focuses on two types of time delay procedures: progressive and constant. With progressive time delay, the practitioner gradually increases the waiting time between an instruction and any prompts that might be used to elicit a response from a learner. As the learner becomes more proficient at using the skill, the practitioner gradually increases the waiting time between the instruction and the prompt. In constant time delay, a fixed amount of time is always used between the instruction and the prompt as the learner becomes more proficient at using the new skill. Time delay is always used in conjunction with a prompting procedure (e.g., least-to-most prompting, simultaneous prompting, graduated guidance). |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | ✓ | | ✓ |
| | Social | ✓ | ✓ | ✓ | ✓ | | |
| | Joint attention | ✓ | ✓ | ✓ | | | |
| | Play | | ✓ | ✓ | | | |
|  | Cognitive | | ✓ | ✓ | | | |
| | School readiness | | ✓ | ✓ | | ✓ | ✓ |
| | Academic/ Pre-academic | | ✓ | ✓ | ✓ | | ✓ |
|  | Adaptive/ self-help | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Challenging/ Interfering behavior | | ✓ | ✓ | | | |
| | Vocational | | | ✓ | ✓ | ✓ | ✓ |
| | Motor | | ✓ | | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Video Modeling (VM) |
|---|---|
| Definition of EBP | Video modeling (VM) is a method of instruction that uses video technology to record and show a demonstration of the targeted behavior or skill. The demonstration is shown to the learner, who then has an opportunity to perform the target behavior either in the moment or at a later point in time. Types of video modeling include adult or peer as video model, video self-modeling, point-of-view video modeling, video prompting, and video feedback. Video modeling is often used with other EBPs such as task analysis, prompting, and reinforcement strategies. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | ✓ | ✓ | ✓ | ✓ | ✓ | |
| | Social | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Joint attention | ✓ | ✓ | ✓ | | | |
| | Play | ✓ | ✓ | ✓ | ✓ | ✓ | |
|  | Cognitive | | | ✓ | | | |
| | School readiness | | ✓ | ✓ | ✓ | ✓ | |
| | Academic/ Pre-academic | | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Adaptive/ self-help | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | | |
| | Vocational | | | ✓ | ✓ | ✓ | ✓ |
| | Motor | | ✓ | ✓ | | | ✓ |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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| Name of EBP | Visual Supports (VS) |
|---|---|
| Definition of EBP | Visual supports (VS) are concrete cues that provide information about an activity, routine, or expectation and/or support skill demonstration. Visual supports are often combined with other practices such as prompting and reinforcement, and they are also embedded in many more complex or packaged interventions. Some examples of common visual supports are visual schedules, activity schedules, work systems, graphic organizers, visual cues, and scripts. |

| Outcome Areas | | Age Ranges | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0-2 Toddlers | 3-5 Preschoolers | 6-11 Elementary School | 12-14 Middle School | 15-18 High School | 19-22 Young Adults |
|  | Communication | | ✓ | ✓ | ✓ | | |
| | Social | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Joint attention | | ✓ | ✓ | | | |
| | Play | | ✓ | ✓ | ✓ | | ✓ |
|  | Cognitive | | ✓ | ✓ | | | |
| | School readiness | | ✓ | ✓ | ✓ | | ✓ |
| | Academic/ Pre-academic | | ✓ | ✓ | ✓ | ✓ | ✓ |
|  | Adaptive/ self-help | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Challenging/ Interfering behavior | | ✓ | ✓ | ✓ | | |
| | Vocational | | | ✓ | ✓ | ✓ | ✓ |
| | Motor | ✓ | | ✓ | | | |
|  | Mental health | | | | | | |
| | Self-determination | | | | | | |

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