Findings and Conclusions:
National Standards Project,

Phase 2

ADDRESSING THE NEED FOR
EVIDENCE-BASED PRACTICE GUIDELINES
FOR AUTISM SPECTRUM DISORDER

National Autism Center℠
A Center of May Institute

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National Standards Project,
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Introduction

ABOUT THE NATIONAL AUTISM CENTER

The National Autism Center is May Institute's Center for the Promotion of Evidence-based Practice. It is dedicated to serving individuals with autism spectrum disorder (ASD) by providing reliable information, promoting best practices, and offering comprehensive resources for families, practitioners, and communities.

An advocate for evidence-based intervention approaches, the National Autism Center identifies effective programming and shares practical information with families and practitioners about how to respond to the challenges they face. The Center also conducts applied research and develops training and service models for practitioners. Finally, the Center works to shape public policy concerning ASD and its intervention through the development and dissemination of national standards of practice.

Guided by a Professional Advisory Board, the Center brings concerned constituents together to help individuals with ASD and their families pursue a better quality of life.

ABOUT MAY INSTITUTE

May Institute is an award-winning nonprofit organization that provides educational, rehabilitative, and behavioral healthcare services to individuals with autism spectrum disorder and other developmental disabilities, brain injury, mental illness, and behavioral health needs. The Institute also provides training and consultation services to professionals, organizations, and public school systems.

Since its founding 60 years ago, May Institute has evolved into a national network that serves thousands of individuals and their families annually. With corporate headquarters in Randolph, Mass., the Institute operates more than 160 service locations in more than a dozen states across the country.

Acknowledgments

Chairing the National Standards Project, Phase 2 (NSP2) was an exciting career opportunity presented to me several years ago. Having witnessed the extraordinary work that went into the first phase of the National Standards Project, I was initially intimated by the undertaking. I participated in NSP1 as an article reviewer and learned a great deal about the evaluative process of a systematic review. The opportunity to participate in such an important project and collaborate with dedicated professionals made the decision to chair the NSP2 a relatively easy one.

The tremendous amount of support from professionals and family members across the country has been overwhelming. Article reviewers and expert panelists donated their time to both NSP1 and NSP2. Without their efforts, this project would not exist. The family members and caregivers I've met with over the last several years have provided valuable feedback that we have incorporated into the NSP2. As we disseminate the results of the NSP2, we welcome feedback and continued dialogue with professionals, family members, and individuals with ASD regarding the results of the National Standards Project.

The NSP2 would not exist without the incredible work of Dr. Susan Wilczynski and the professionals responsible for the conceptualization and production of Phase 1 of the National Standards Project. Their work continues to impact countless individuals with ASD around the world. Dr. Maria Knox and Audra Murzycki worked tirelessly to ensure the organization and analysis of data were completed with integrity and reliability. Eileen Pollack and her tremendous staff, Julia Burgess, Juanita Class, and Patricia Ladew, spearheaded the editing, design, production, and dissemination of this document.

It is our hope that you find this document to be a reliable source of information as you start or continue your journey to improve the lives of individuals with autism spectrum disorder.

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National Standards and Autism

About the National Standards Project

The National Standards Project, a primary initiative of the National Autism Center, addresses the need for evidence-based practice guidelines for autism spectrum disorder (ASD). Its primary goal is to provide critical information about which interventions have been shown to be effective for individuals with ASD.

The National Standards Project seeks to:

- provide the strength of evidence supporting educational and behavioral interventions that target the core characteristics of these neurological disorders
- describe the age, diagnosis, and skills/behaviors targeted for improvement associated with intervention options
- identify the limitations of the current body of research on autism interventions
- offer recommendations for engaging in evidence-based practice for ASD

Who benefits from national standards?

We believe that parents, caregivers, educators, and service providers who must make complicated decisions about intervention selection will benefit from national standards.

Phase 1 of the National Standards Project

The National Autism Center launched the project in 2005 with the support and guidance of an expert panel composed of nationally recognized scholars, researchers, and other leaders representing diverse fields of study. The culmination of this rigorous multi-year project was the National Standards Report (Phase 1 of the National Standards Project), published in 2009. It was the most comprehensive analysis available at the time about interventions for children and adolescents with ASD. Since 2009, the National Autism Center has shared these results with hundreds of thousands of individuals.

Phase 1 (NSP1) examined and quantified the level of research supporting interventions that target the core characteristics of ASD in children, adolescents, and young adults (under 22 years of age) on the autism spectrum.

Phase 2 of the National Standards Project

The National Autism Center launched the second phase of the National Standards Project (NSP2) in 2011 in order to provide up-to-date information on the effectiveness of a broad range of interventions for ASD. There has been a great deal of new research published since 2007, the end of the period evaluated by Phase 1 of the National Standards Project.

Phase 2 (NSP2) reviewed studies published between 2007 and February of 2012. As in the first iteration of the National Standards Project, the focus was an evaluation of educational and behavioral intervention literature for individuals with ASD. This review updated our summary of ASD intervention literature for children and youth under age 22. We have updated our original findings, added information, and evaluated whether any of the Emerging interventions in NSP1 had moved into the Established or Unestablished categories in NSP2.

We also analyzed intervention outcome studies for individuals ages 22 years and older. Because the first phase of the NSP focused solely on interventions for individuals under age 22, the NSP2 literature search for individuals ages 22+ spanned several decades. The earliest intervention outcome study for individuals ages 22+ was published in 1987.

About Autism Spectrum Disorder

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by deficits in social interactions and social communication and by restricted, repetitive patterns of behavior.

What are the symptoms of ASD?

Social Interaction and Social Communication: Child shows little interest in making friends; initiates social interactions primarily to have immediate needs met (e.g., to get food, preferred toy); and tends not to share accomplishments and experiences. Other symptoms include lack of eye contact, and absent or limited and atypical gestures (e.g., using someone's hand as a tool for opening the door). Loss of language occurs in some cases.

Restricted Interests and Repetitive Behaviors: Intensely repetitive motor movements or use of objects; child is consumed with a single item, idea, or person; experiences difficulty with changes in the environment or transitioning from one situation to another; may have frequent tantrums; and may be aggressive or self-injurious.

How prevalent is ASD?

The number of diagnosed cases of autism and related disorders has dramatically increased over the past decade. The most recent studies (Centers for Disease Control and Prevention, 2014) report that ASD occurs in approximately one in every 68 births. ASD is one of the most common serious developmental disabilities, and is almost five times more likely to occur in boys than in girls.

How is ASD diagnosed?

There are no medical tests for diagnosing autism, but when parents become concerned about developmental delays in children, they should consult a physician. He or she can rule out various potential medical causes, such as hearing problems. Before a child can be diagnosed, that child should be evaluated by an autism specialist. Such a person may be a psychologist, psychiatrist, pediatric neurologist, or developmental pediatrician who specializes in diagnosing and treating children with ASD.

Best practice guidelines identify the following six components of a comprehensive diagnostic evaluation for autism:

1. Parent or caregiver interview
2. Review of relevant medical, psychological, and/or school records
3. Cognitive/developmental assessment
4. Direct play observation
5. Measurement of adaptive functioning
6. Comprehensive medical examination

ASD diagnostic criteria are described by the American Psychiatric Association (APA) in its *Diagnostic & Statistical Manual of Mental Disorders* (*DSM-5*). Qualified professionals provide these diagnoses when symptoms of ASD (social interaction and social communication, and repetitive behaviors) are present in ranges that are inappropriate for the child's age and developmental level.

ASD is diagnosed when all these symptoms are present to some degree. A diagnosis also includes a specification of severity. Specifically, qualified professionals will use information gathered during the diagnostic assessment to indicate the level of support an individual with ASD requires: Level 1, Requiring Support; Level 2, Requiring Substantial Support; and Level 3, Requiring Very Substantial Support.

What causes ASD?

Although one specific cause of ASD is not known, current research links autism to biological or neurological differences in the brain. Autism is believed to have a genetic basis, although no single gene has been directly linked to the disorder. Researchers are using advanced brain-imaging technology to examine factors that may contribute to the development of autism. MRI (Magnetic Resonance Imaging) and PET (Positron Emission Tomography) scans can show abnormalities in the structure of the brain, with significant cellular differences in the cerebellum.

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Overview of the National Standards Project, Phase 2

Our Goals

Phase 2 of the National Standards Project (NSP2) has four main goals:

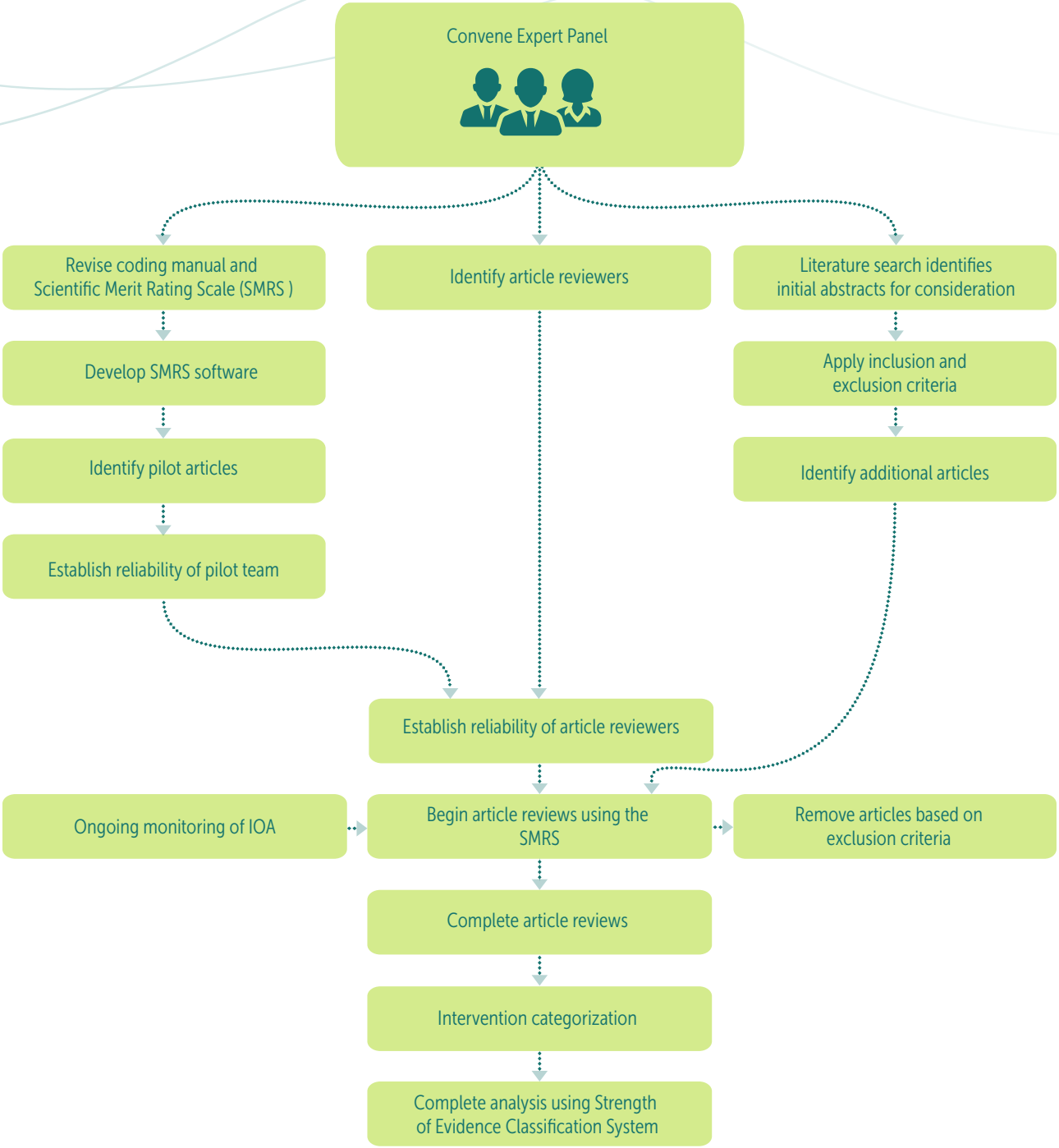
1. To provide an update to the previous project, NSP1, published as the National Standards Report in 2009. Specifically, NSP2 reviews peer-reviewed intervention outcome studies for children/adolescents/young adults with autism spectrum disorder (ASD) since the publication of NSP1. The dates of peer-reviewed studies range from 2007 to 2012.
2. To extend the review of intervention outcome literature to include adults (22 years and older) with ASD.
3. To incorporate relevant feedback received regarding NSP1 categorization. The NSP2 report is intended to be more specific than the NSP1 report regarding the interventions it identifies as beneficial.
4. To assist parents, caregivers, educators, and service providers in understanding how to integrate evidence-based interventions into a well-rounded, individualized educational or behavioral program.

Our Process

Phase 2 of the National Standards Project maintains essentially the same process of evaluating the quality of science and intervention effects that was developed for NSP1. For detailed information regarding the development of our model, please see the National Standards Report, dated 2009.

A flowchart outlining key components of the NSP2 systematic review is provided on the following page.

Flowchart 1} Process of the National Standards Project, Phase 2



Professionals

The expert panel for NSP2 consists of 27 professionals from across the United States who have demonstrated expertise in the field of ASD through their research and clinical practice. The article reviewers included individuals referred to participate in the NSP2 by the expert panelists. The majority of article reviewers hold a doctoral degree, master's degree, or were enrolled in a graduate program at the time of the project. All panelists and reviewers graciously donated their time to this project.

Materials

The NSP1 coding manual detailing the process for coding peer-reviewed studies once again provided instruction for our article reviewers. The coding manual was revised to reflect any changes made to the coding of studies for NSP2. A major change of note is the development of the Scientific Merit Rating Scale (SMRS) software used to collect data.

The SMRS software includes a web-based document allowing article reviewers to upload responses to questions regarding the evaluation of studies included in NSP2. The SMRS document is divided into 11 tabs, or sections, and is aligned with the coding manual. Article reviewers responded to the questions provided or uploaded the relevant data as requested in the SMRS document. The majority of content in the SMRS for NSP2 was included in NSP1.

Studies

A literature search resulted in the identification of 389 studies (as opposed to 378 articles) meeting the inclusion criteria. The following graphic provides information regarding the literature search process.

Inclusion and Exclusion Criteria

The National Standards Project (Phase 1 and Phase 2) is a systemic review of the behavioral and educational peer-reviewed intervention literature involving individuals with ASD. These studies targeted the core characteristics and associated symptoms of ASD. For the purposes of this review, ASD included Autistic Disorder, Asperger's Syndrome, and Pervasive Developmental Disorder–Not Otherwise Specified (PDD-NOS) as described in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association (APA), 2000).

All studies included in the systematic review were published prior to the publication of the *DSM-5* (5th ed.; *DSM-5*; APA, 2013).

Table 1} Examples of Questions Addressed with the Scientific Merit Rating Scale

Rating} Scores fall between 0 and 5 with higher scores representing higher indications of scientific merit specific to the ASD population

Research Design: *Two classes of research design were considered*		**Measurement of Dependent Variable:** *Two types of data were considered*		**Measurement of Independent Variable**	**Participant Ascertainment**	**Generalization and Maintenance of Intervention Effect(s)**
Group Answers questions such as:	**Single-subject** Answers questions such as:	**Test, scale, checklist, etc.** Answers questions such as:	**Direct behavioral observation** Answers questions such as:	Answers questions such as:	Answers questions such as:	Answers questions such as:
How many participants were included? How many groups were included? Were relevant data lost? What was the research design?	How many comparisons were made? How many data points were collected? How many participants were included? Were relevant data lost?	Was the protocol standardized? What are the psychometric properties? Were the evaluators blind and/or independent?	What type of measurement was used? Is there evidence of reliability? How much data were collected?	Is there evidence the intervention was implemented accurately? How much intervention fidelity data were collected? Is there evidence of reliability for intervention fidelity?	Who delivered the diagnosis? Was the diagnosis confirmed? Were psychometrically sound instruments used? Were DSM or ICD criteria used?	Were objective data collected? Were maintenance and/or generalization data collected?

Inclusion Criteria

We included studies if the interventions could be implemented in or by school systems, or early intervention, home-, hospital-, vocational- and/or community-based programs or in clinic settings. Included studies were conducted in a variety of settings.

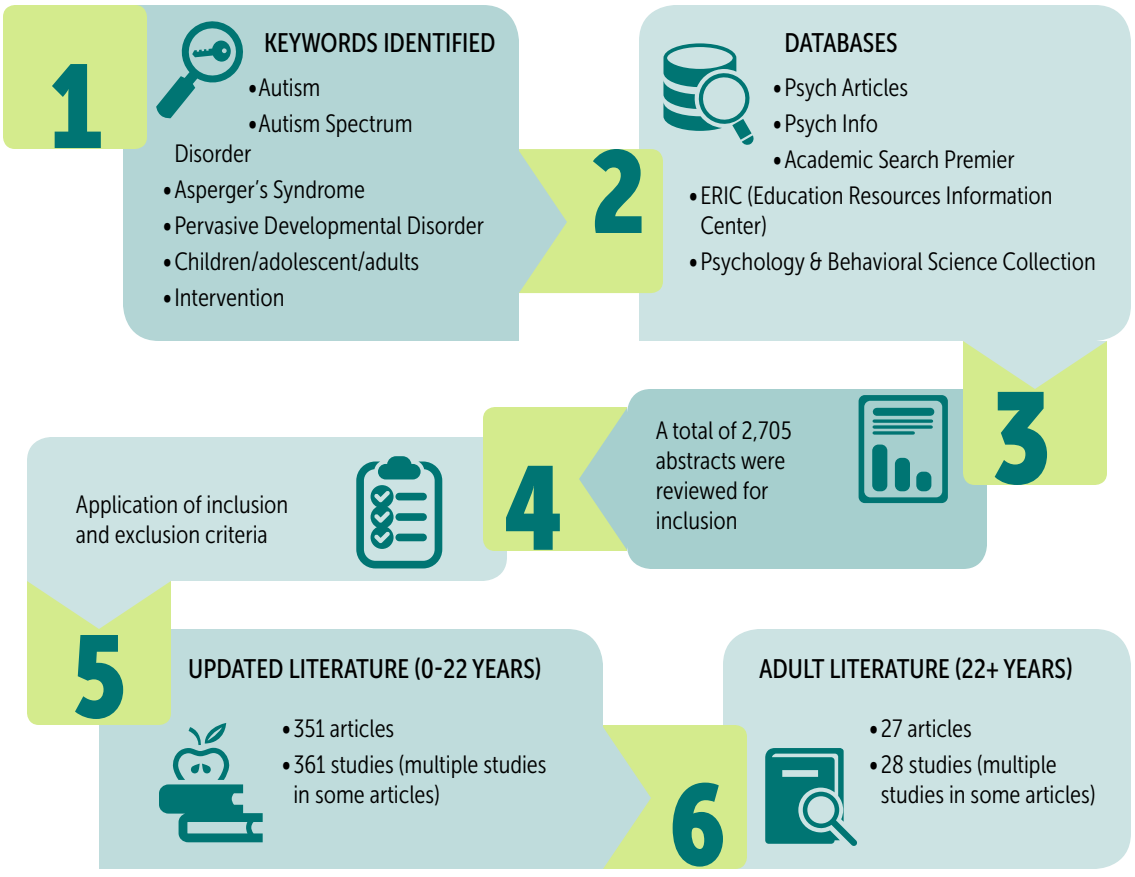
An additional inclusion criterion required that individuals with ASD be the target of the intervention study. Thus, we did not include studies in the review when parents, care providers, educators, or service providers were the *sole* target of intervention. If these individuals were included in the study along with individuals with an ASD diagnosis, we included the data provided for the individual with the ASD diagnosis (not the parent, caretaker, etc.) in the systematic review.

In addition to these inclusion criteria, we included articles in the review only if they had been published in peer-reviewed journals. Peer review requires that researchers submit their work for scrutiny by experts in their fields of study. These experts determine if an article makes an important contribution to the literature because {a} the quality of

research is sufficient to allow for clear conclusions to be drawn or {b} although the scientific merit of the study may be insufficient, the topic or results are provocative enough to warrant publication to promote future research in the area.

It should be noted that all articles published in peer-reviewed journals are not necessarily of equivalent quality. However, peer review increases the likelihood that studies meet the minimum requirements for scientific methodology. Journals that are not peer-reviewed may include articles that are published primarily because the author has paid for this service, thus undermining acceptable standards of scientific publication.

NSP Literature Search Process



Methodological Implications

It is common practice in guidelines of this nature to focus on a specific population (e.g., ASD). However, there are implications that should be noted when this decision is made. By focusing intervention findings exclusively on ASD, we excluded many intervention studies involving the general population. Had these studies been included in the review, the interpretation of findings specific to individuals with ASD could have been different from the overall conclusions drawn for the autism population. Some examples follow:

- A study involving single-subject research design in which the results are replicated across multiple participants (e.g., multiple baseline across participants design) can be very powerful. However, if only one participant with ASD is identified, our ability to draw firm conclusions about intervention effectiveness for individuals with ASD is greatly reduced. Effectively, the results are interpreted as if an AB design were employed because we can only interpret the outcomes for the individual with ASD. An AB design is a much weaker research design, making study results specific to ASD weak as well. In this case, the study was retained, but only the portion of the results involving the participant with ASD was analyzed.
- A study involving group design may have been published to show an intervention is not effective. Separate analyses were not available for individuals with ASD. Because the results for individuals with ASD could not be separated from the overall effects, the study was excluded from the National Standards Project. This study did not sufficiently inform us about intervention effectiveness specific to individuals on the autism spectrum. However, it is still extremely important for professionals to be aware of these results. This is a key example of why professionals must be familiar with literature beyond that described in this report.

In each case—whether single-subject or group design—studies with potentially important implications were either excluded, or not included in their entirety. It was important for us to follow this procedure to ensure our results apply to individuals with ASD. However, in some cases, informed users of this document may need to be familiar with both the results identified in this report and a larger literature base to guide them in the selection of interventions (see Evidence-based Practice chapter).

Exclusion Criteria

Our review did not include individuals described as having "autistic characteristics" or "a suspicion of ASD." Although it is likely that many of these individuals *should* have been diagnosed with ASD, there is no way to know this with certainty. Individuals with other developmental disabilities may show characteristics of ASD, but a diagnosis is not actually warranted. If the intervention outcomes for individuals described as having "autistic characteristics" or "a suspicion of ASD" are different from those for individuals on the autism spectrum, the results of this review could have been compromised.

We implemented a set of other exclusion criteria. For example, studies examining biomedical interventions were largely excluded. Specifically, we excluded medication trials, nutritional supplement studies, and complementary and alternative medical interventions, with the exception of curative diets. We made the decision to include curative diets because professionals across a wide range of settings are often expected to implement curative diets with a high degree of fidelity.

A second exclusion criterion was related to co-morbid conditions. The National Standards Project is intended to review research specifically representing the autism spectrum. The NSP1 included a review of the child/adolescent literature (under age 22). The NSP2 included a review of the literature for individuals with ASD across the lifespan.

It is well-documented in the ASD literature that there is limited intervention outcome research regarding adults with ASD. Because we intended to review as many outcome studies as possible, we did not apply exclusion criteria regarding infrequently co-occurring conditions to studies with participants ages 22 years and older. However, despite broadening the inclusion criteria for the adult literature, only 27 articles (28 studies) met criteria for inclusion in the review.

Both phases of the National Standards Project excluded studies in which participants (under age 22) carried a diagnosis of an ASD and an infrequently co-occurring diagnosis such as cancer or heart disease. Inclusion of such articles could have skewed the outcomes because results of these studies may not generalize to the rest of the ASD population. For example, consider the results of a study in which ineffective intervention effects were reported. If the participants involved in the study were symptomatic of both ASD and a major medical disorder, it would have been impossible to determine if the intervention was ineffective for {a} individuals with ASD *and* major medical disorders, or {b} individuals with only ASD. Including these results in our review could have

misrepresented the research for children and adolescents with ASD. For this reason, we included studies involving participants with co-morbid conditions *only* when they were common co-morbid conditions (e.g., intellectual disability, language impairments, depression, anxiety, Obsessive-Compulsive Disorder, Attention Deficit Hyperactivity Disorder).

We retained studies that used group research designs if separate analyses were completed for those with and without common co-morbid conditions. We excluded studies that used single-subject research designs when all participants had infrequently diagnosed co-morbid conditions, but we retained single-subject studies if at least one participant met the Inclusion criteria. Only results for participants meeting inclusion criteria were analyzed.

A third exclusion criterion involved either the type of study or the data that were produced or presented. Specifically, we excluded articles: if they did not include empirical data; if there were no statistical analyses available for studies using group research design; if there was no linear graphical presentation of data for studies using single-case research design; or if the studies relied on qualitative methods. (See the More Methodological Implications section on the following page.)

A fourth reason for exclusion was if a study's sole purpose was to identify mediating or moderating variables. The primary purpose of the National Standards Project is to identify which interventions have solid research evidence showing that they are effective, as opposed to when intervention effects will hold, or how/why these effects occur.

Finally, articles published exclusively in languages other than English were also excluded from the National Standards Project. We made this decision because volunteer article reviewers did not have sufficient expertise with all the non-English languages in which articles may be published. Often, when articles are published in non-English languages, the authors choose to translate them and also include them in journals published in English. This reduced the number of studies that were excluded from our review, but did not eliminate the problem altogether. We are hopeful we can add field reviewers for future versions of the National Standards Project who can address this exclusion category.

More Methodological Implications

Statistical Analyses: Statistical analysis is a commonly accepted criterion for analyzing data for group research design. If we were to include group design studies that did not use statistical analyses, there would be no generally accepted method for evaluating the scientific merit of the study or the intervention outcomes.

Linear Graphical Presentation: Not all single-subject research involves linear graphical presentation of data. However, strategies for determining intervention effectiveness based on visual analysis of linear graphs are commonly agreed upon. If we were to include single-subject research design studies that did not rely on linear graphical presentation of the data, there would be no generally accepted method for evaluating the scientific merit of the study or the intervention outcomes.

Our decision to exclude studies employing qualitative methods was initially based on consultation with a professional with expertise in qualitative research design. The vast majority of qualitative studies in intervention research focus on identification of mediating or moderating variables (see discussion on previous page). This was not the focus of this version of the National Standards Project (NSP), so we did not include studies using a qualitative research design. In addition, it was apparent that there were an insufficient number of methodologists who had volunteered for the NSP who had adequate training in qualitative methods to satisfactorily develop an evaluation of qualitative methodology that would be consistent with that developed for single-case and group design. Therefore, we made the decision to exclude qualitative studies for the current version of the NSP, but decided to recruit experts with suitable expertise for the next version of the NSP.

Ensuring Reliability

Pilot Team

To ensure a high degree of agreement (i.e., reliability) among reviewers, the coding of articles began with observer calibration. A pilot team of three doctoral-level professionals identified and coded two peer-reviewed studies. One study was considered representative of many group design studies included in the review, and the second study was considered representative of many single-subject design studies. The pilot team evaluated the use of the SMRS software and the standard for coding an article by assessing Interobserver Agreement (IOA). The pilot team achieved >80% IOA on both the single-subject design article and the group design article. These articles became the "pilot articles" used to determine initial IOA for an article reviewer.

Prospective article reviewers indicated a preference to review single-subject design articles or group design articles based on their education and research experience. Prospective reviewers received the coding manual, a download of the SMRS, and electronic copies of their initial pilot article. The prospective reviewers completed coding of the pilot article and uploaded the data to the SMRS software. Each submission was evaluated for IOA with the original pilot team. If the reviewer achieved ≥80% IOA with the pilot team, the individual was then considered an article reviewer and was assigned an additional five to 10 articles. Prospective reviewers who did not achieve at least 80% IOA with the pilot team were provided a second opportunity to reach the 80% IOA criteria to participate in the project.

Data Collection

Article reviewers completed one SMRS submission per study reviewed. Some articles contained multiple studies. For example, if an article included three experiments to test the effectiveness of a prompting method, then the article reviewer would complete a SMRS submission for each of the three studies. Following submission of all coded articles, the data were uploaded to a spreadsheet for analysis. The initial analysis included identification of a SMRS score for each study.

About the Scientific Merit Rating Scale

We developed the Scientific Merit Rating Scale (SMRS) as a means of objectively evaluating if the methods used in each study were strong enough to determine whether or not an intervention was effective for participants on the autism spectrum. This information allows us to determine if the results are believable enough that we would expect similar results in other studies that used equal or better research methodologies.

Studies published in peer-reviewed journals vary greatly in terms of scientific rigor. Sometimes, poorly controlled studies are published because the results are interesting enough to other scientists and the publication will encourage better-controlled research. But it is important to interpret the outcomes of these studies with a great deal of caution. A flawed study may say an intervention is effective, but no reasonable scientist would be confident the outcomes are useful and accurate. A study is described as having scientific merit when variables are so well-controlled that independent scholars can draw firm conclusions from the results.

The SMRS involves five critical dimensions of experimental rigor that can be applied to determine the extent to which interventions are effective. They are: {a} research design, {b} measurement of the dependent variable, {c} measurement of the independent variable or procedural fidelity, {d} participant ascertainment, and {e} generalization and maintenance.

1. **Research design** reflects the degree to which experimental control was demonstrated. Research design is tied to the number of participants and/or groups involved, the extent to which attrition or intervention disruption occurred, and the type of research design employed.

2. **Measurement of the dependent variable** refers to the extent to which {a} accurate and reliable data were collected and {b} these data represent the most direct and comprehensive sample of the target skill or behavior possible.

   Measurement of the dependent variable is tied to the type of measurement system used, the psychometric support and/or reliability for dependent variables, and the extent to which evaluators were blind and/or independent when tests, scales, or checklists served as the dependent variables.

3. **Measurement of independent variable** describes the extent to which intervention fidelity was adequately established. Intervention fidelity is tied to implementation accuracy, the percentage and type of sessions during which data were collected, and the extent to which intervention fidelity was reliably measured.

4. **Participant ascertainment** refers to the degree to which well-established diagnostic tools and procedures were used to determine eligibility for participant inclusion in the study as well as the extent to which diagnosticians and evaluators were independent and/or blind to the intervention conditions. Participant ascertainment is also tied to the use of *Diagnostic and Statistical Manual for Mental Disorders* (*DSM*, APA 2013) or International Classification of Diseases (2010) criteria.

5. **Generalization and maintenance effects** are defined as the extent to which researchers attempted to objectively demonstrate the spread of interventions effects across time, settings, stimuli, responses, or persons. Generalization is also tied to the type of data collected (e.g., objective versus subjective).

   The criteria for each rating on the SMRS are outlined in Table 1.

Table 1} Scientific Merit Rating Scale

SMRS} Rating 5

Research Design			Measurement of Dependent Variable		Measurement of Independent Variable *(procedural integrity or intervention fidelity)*	Participant Ascertainment	Generalization and Maintenance of Intervention Effect(s)
	Single-subject						
Group	All designs except Alternating Treatments Design	Alternating Treatments Design	Test, scale, checklist, etc.	Direct behavioral observation			
Number of groups: two or more Design: Random assignment and/or no significant differences pre-intervention Participants: n ≥ 10 per group or sufficient power for lower number of participants Data Loss: no data loss	A minimum of three comparisons of control and intervention conditions Number of data points per condition: ≥ five Number of participants: ≥ three Data loss: no data loss	Comparison of baseline and experimental conditions Number of data points per experimental condition: ≥ five Follow-up data collected Carryover effects minimized through counterbalancing of key variables (e.g., time of day), and condition discriminability Number of participants: ≥ three Data Loss: no data loss	Type of measurement: Observation-based Protocol: standardized Psychometric properties solid Evaluators: blind and independent	Type of measurement: continuous or discontinuous with calibration data showing low levels of error Reliability: IOA ≥ 90% or kappa ≥ .75 Percentage of sessions: Reliability collected in ≥ 25% Type of conditions in which data were collected: all sessions	Implementation accuracy measured at > 80% Implementation accuracy measured in 25% of total sessions IOA for intervention fidelity > 80%	Diagnosed by a qualified professional Diagnosis confirmed by independent and blind evaluators for research purposes using at least one psychometrically solid instrument DSM or ICD criteria or commonly accepted criteria during the identified time period reported to be met	Objective data Maintenance data collected AND Generalization data collected across at least two of the following: setting, stimuli, persons

SMRS} Rating 4

Research Design			Measurement of Dependent Variable		Measurement of Independent Variable *(procedural integrity or intervention fidelity)*	Participant Ascertainment	Generalization and Maintenance of Intervention Effect(s)
	Single-subject						
Group	**All designs except Alternating Treatments Design**	**Alternating Treatments Design**	**Test, scale, checklist, etc.**	**Direct behavioral observation**			
Number of groups: two or more Design: Matched groups; No significant differences pre-intervention; or better design Participants: n ≥ 10 per group or sufficient power for lower number of participants Data Loss: some data loss possible	A minimum of three comparisons of control and intervention conditions Number of data points per condition: ≥ five Number of participants: ≥ three Data loss: some data loss possible	Comparison of baseline and experimental conditions Number of data points per experimental condition: ≥ five Carryover effects minimized through counterbalancing of key variables (e.g., time of day) OR condition discriminability Number of participants: ≥ three Data Loss: some data loss possible	Type of measurement: Observation-based Protocol: standardized Psychometric properties sufficient Evaluators: blind OR independent	Type of measurement: continuous or discontinuous with no calibration data Reliability: IOA ≥ 80% or kappa ≥ .75 Percentage of sessions: Reliability collected in ≥ 25% Type of conditions in which data were collected: all sessions	Implementation accuracy measured at ≥ 80% Implementation accuracy measured in 20% of total sessions IOA for intervention fidelity: not reported	Diagnosis provided/confirmed by independent and blind evaluators for research purposes using at least one psychometrically sufficient instrument	Objective data Maintenance data collected AND Generalization data collected across at least one of the following: setting, stimuli, persons

SMRS} Rating 3

Research Design			Measurement of Dependent Variable		Measurement of Independent Variable *(procedural integrity or intervention fidelity)*	Participant Ascertainment	Generalization and Maintenance of Intervention Effect(s)
	Single-subject						
Group	**All designs except Alternating Treatments Design**	**Alternating Treatments Design**	**Test, scale, checklist, etc.**	**Direct behavioral observation**			
Number of groups: two or more Design: Pre-intervention differences are controlled statistically or better design Data Loss: some data loss possible	A minimum of two comparisons of control and intervention conditions Number of data points per condition: ≥ three Number of participants: ≥ two Data loss: some data loss possible	Number of data points experimental condition: ≥ five Carryover effects minimized through counterbalancing of key variables (e.g., time of day) OR condition discriminability Number of participants: ≥ two Data Loss: some data loss possible	Type of measurement: Observation-based Protocol: non-standardized or standardized Psychometric properties adequate Evaluators: neither blind nor independent required	Type of measurement: continuous or discontinuous with no calibration data Reliability: IOA ≥ 80% or kappa ≥ .4 Percentage of sessions: Reliability collected in ≥ 20% Type of conditions in which data were collected: all or experimental sessions only	Implementation accuracy measured at ≥ 80% Implementation accuracy measured in 20% of partial sessions IOA for intervention fidelity: not reported	Diagnosis provided/confirmed by independent OR blind evaluators for research purposes using at least one psychometrically adequate instrument OR DSM or ICD criteria confirmed by a qualified diagnostician or independent and/or blind evaluator	Objective data Maintenance data collected OR Generalization data collected across at least one of the following: setting, stimuli, persons

SMRS} Rating 2

Research Design			Measurement of Dependent Variable		Measurement of Independent Variable *(procedural integrity or intervention fidelity)*	Participant Ascertainment	Generalization and Maintenance of Intervention Effect(s)
	Single-subject						
Group	**All designs except Alternating Treatments Design**	**Alternating Treatments Design**	**Test, scale, checklist, etc.**	**Direct behavioral observation**			
Number of groups and Design: If two or more groups, pre-intervention difference not controlled or better design OR A one group repeated measures pre-test/post-test design Data Loss: significant data loss possible	A minimum of two comparisons of control and intervention conditions Number of data points per condition: ≥ three Number of participants: ≥ two Data loss: significant data loss possible	Number of data points experimental condition: ≥ five Number of participants: ≥ two Data Loss: significant data loss possible	Type of measurement: Observation-based or subjective Protocol: non-standardized or standardized Psychometric properties modest Evaluators: neither blind nor independent required	Type of measurement: continuous or discontinuous with no calibration data Reliability: IOA ≥ 80% or kappa ≥ .4 Percentage of sessions: not reported Type of conditions in which data were collected: not necessarily reported Operational definitions are extensive or rudimentary	Control condition is operationally defined at an inadequate level or better Experimental (Intervention) procedures are operationally defined at a rudimentary level or better Implementation accuracy: not reported IOA for intervention fidelity: not reported	Diagnosis with at least one psychometrically modest instrument OR Diagnosis provided by a qualified diagnostician or independent and/or blind evaluator with no reference to psychometric properties of instrument	Subjective data Maintenance data collected AND Generalization data collected across at least one of the following: setting, stimuli, persons

SMRS} Rating 1

Research Design			Measurement of Dependent Variable		Measurement of Independent Variable *(procedural integrity or intervention fidelity)*	Participant Ascertainment	Generalization and Maintenance of Intervention Effect(s)
	Single-subject						
Group	All designs except Alternating Treatments Design	Alternating Treatments Design	Test, scale, checklist, etc.	Direct behavioral observation			
Number of groups and Design: two group post-test only or better research design OR Retrospective comparison of one or more matched groups Data Loss: significant data loss possible	A minimum of two comparisons of control and intervention conditions Number of participants: ≥ one Data loss: significant data loss possible	Number of data points experimental condition: ≥ five Number of participants: ≥ one Data Loss: significant data loss possible	Type of measurement: Observation-based or subjective Protocol: non-standardized or standardized Psychometric properties weak Evaluators: neither blind nor independent required	Type of measurement: continuous or discontinuous with no calibration data Type of conditions in which data were collected: not necessarily reported Operational definitions are extensive or rudimentary	Control condition is operationally defined at an inadequate level or better Experimental (Intervention) procedures are operationally defined at a rudimentary level or better IOA and intervention fidelity are not reported	Diagnosis by review of records OR Instrument with weak psychometric support	Subjective data Maintenance data collected OR Generalization data collected across at least one of the following: setting, stimuli, persons

SMRS} Rating 0

Does not meet criterion for a score of 1	Does not meet criterion for a score of 1	Does not meet criterion for a score of 1	Does not meet criterion for a score of 1	Does not meet criterion for a score of 1	Does not meet criterion for a score of 1	Does not meet criterion for a score of 1

For each of the five dimensions of scientific merit, a score between zero and five (0-5) was assigned with 0 representing a poor score and 5 representing a strong score. The dimension scores were combined to yield a composite score that was rounded to the nearest whole number; this was called the SMRS score. The formula for combining these dimensions is as follows: Research Design (.30) + Dependent Variable (.25) + Participant Ascertainment (.20) + Procedural Integrity (.15) + Generalization and Maintenance (.10).

- SMRS scores of 3, 4, or 5 indicate that sufficient scientific rigor has been applied. We can therefore draw firm conclusions about the intervention effects specific to participants with ASD that were demonstrated in the study. These scores suggest that similar results would likely be obtained in a study that used equal or better research methods.
- SMRS scores of 2 provide initial evidence about intervention effects. However, more rigorous research must be conducted to confirm these same effects would likely occur when more critical analyses of procedures are applied to other individuals with ASD.
- SMRS scores of 0 or 1 indicate that insufficient scientific rigor has been applied to the population of individuals with ASD. There is insufficient evidence to even suggest whether an intervention may or may not have beneficial, ineffective, or harmful effects.

Note that the scores reported in this document are specific to ASD. This is important because a study may, in fact, have a much higher SMRS score if a broader category of participants involved in the study was considered. That is, a well-designed study that used adequate dependent variables, provided evidence of procedural integrity, and involved maintenance and/or generalization data may actually receive a lower score in this report if most

The NSP2 expert panelists agreed to adapt the term "intervention" as opposed to "treatment" or "strategy." Therefore, the results of NSP2 discuss evidence-based interventions that should be used to inform a clinician's evidence-based practice. This terminology may differ from others doing similar research, but we believe this is an important distinction—so parents and professionals understand the difference between an evidence-based intervention and the larger framework of evidence-based practice.

of the participants were described only as having "developmental disabilities" and only one participant was described as having a diagnosis of autism without reporting rigorous participant ascertainment procedures.

We encourage researchers and practitioners to be aware of the data supporting or failing to support the effectiveness of the interventions beyond the ASD literature to supplement their decision making. The purpose of this document, however, is restricted to the ASD population so families, educators, and service providers may gain a better sense of the level of research support specific to the ASD population.

Intervention Effects Rating Scale

The NSP1 expert panel developed the Intervention Effects Rating Scale and criteria for inclusion into each category. Given feedback from professionals, parents/caregivers, and the current expert panel, the NSP2 adapted the term "intervention" as opposed to "treatment." (See information box on previous page.) Members of the expert panel urged the change in the hopes of providing clarification to readers. The term "treatment" is often used in medical literature and can be inferred as resulting in a "cure." Intervention is a term widely used in the behavioral and educational literature to indicate that something is adjusted in the environment to alter an individual's behavior. Interventions can consist of an isolated component such as providing praise for correct word approximation. Interventions may also consist of several strategies. For example, it is not unusual to have an intervention include positive reinforcement for a specific behavior, withholding attention for another specified behavior, communication training, and visual supports.

The NSP1 expert panel also developed criteria to determine if the intervention effects were: {a} beneficial, {b} ineffective, or {c} unknown.

- **Beneficial** is identified when there is sufficient evidence that we can be confident favorable outcomes resulted from the intervention.
- **Ineffective** is identified when there is sufficient evidence that we can be confident favorable outcomes did not result from the intervention.
- **Unknown** is identified when there is not enough information to allow us to confidently determine the intervention effects.

Separate criteria were developed for group research design, single-subject research design, and alternating interventions design (a type of single-subject research design).

The original Intervention Effects Rating Scale was developed to encompass all of the range of possible intervention effects. As with the NSP1, the results of NSP2

did not include identification of any adverse intervention effects in the studies reviewed. Therefore, we did not include adverse in the final presentation of NSP2 results.

For group design studies, we classified intervention effects based on whether or not statistically significant differences were reported. If statistically significant results were not reported, we evaluated whether the research design increased the likelihood that an effect would be found.

For single-subject research design, we classified intervention effects based on whether or not a functional relationship was established, as well as on the number of intervention effects that were attempted and demonstrated. In the case of Ineffective intervention effects, we determined that additional criteria must be met (e.g., a sufficient number of data points and participants, the extent to which comparison conditions sufficiently demonstrated a steady state or appropriate trend line to allow for comparison, etc.).

For alternating treatment design (ATD), which is a special type of single-subject research design, we classified intervention effects based on the extent to which separation was reported, carryover effects were minimized, and number of data points was sufficient. In the case of Ineffective intervention effects, we determined that additional criteria had to be met (e.g., baseline data were collected and a change from baseline to intervention was not evidenced for most participants).

Intervention Classification

The professionals completing NSP2 have taken into account the feedback provided regarding the classification of interventions in NSP1. For example, there was much feedback regarding the use of the term "Behavioral Package." Many parents/caregivers/family members suggested the term did not communicate the specifics of what they needed when meeting with professionals. Therefore, NSP2 has collapsed interventions that fall under "Behavioral Package" and "Antecedent Package" into one larger category simply referred to as "Behavioral Interventions."

Using the term Behavioral Interventions will likely not resolve all of the challenges in trying to classify such a large number of interventions used in isolation (i.e., one component) or as part of a complex intervention package. In an attempt to clarify exactly what constitutes an established Behavioral Intervention, the NSP2 results are presented in a more detailed manner to tease out the specific behavioral strategies used in each of the studies reviewed in the NSP2. It can be argued that all 14 of the Established Interventions are Behavioral Interventions. To some extent, this is true.

Table 2} Intervention Effects Ratings

Beneficial Intervention Effects Reported	Unknown Intervention Effects Reported	Ineffective Intervention Effects Reported
Single: A functional relation is established and is replicated at least two times	**For all research designs:** The nature of the data does not allow for firm conclusions about whether the intervention effects are beneficial, ineffective, or adverse	**Single:** A functional relation was not established and {a} results were not replicated but at least two replications were attempted {b} a minimum of five data points were collected in baseline and intervention conditions {c} a minimum of two participants were included {d} a fair or good point of comparison (e.g., steady state) existed
ATD: Moderate or strong separation between at least two data series for most participants Carryover effects were minimized A minimum of five data points per condition		**ATD:** No separation was reported and baseline data show a stable pattern of responding during baseline and intervention conditions for most participants
Group: Statistically significant effects reported in favor of the intervention		**Group:** No statistically significant effects were reported with sufficient evidence an effect would likely have been found* *The criterion includes: {a} there was sufficient power to detect a small effect {b} the type I error rate was liberal, {c} no efforts were made to control for experiment-wise Type I error rate, and {d} participants were engaged in intervention

For example, Modeling and Peer Training Package, both Established Interventions, are derived from behavior analytic research and are often referred to in colloquial terms as Behavioral Interventions.

So what exactly separates Behavioral Interventions in the Established Intervention category from all other Established Interventions?

Often, it is the *number of elements* combined within a behavior reduction or skill acquisition procedure. In the Behavioral Intervention category, the vast majority of articles include interventions consisting of multiple elements such as differential reinforcement + visual schedule + breaks + functional communication training. Other categories included in Established Interventions consist of studies evaluating singular elements (e.g., modeling) or dual elements (e.g., modeling + reinforcement).

There will likely always remain some level of criticism regarding the terminology used, the categorization of interventions, and the definitions. What we present in NSP2 is the attempt by the expert panel and NAC professionals to communicate in the most effective manner possible the state of intervention literature for individuals with ASD.

Strength of Evidence Classification System

After we identified the interventions, we applied the Strength of Evidence Classification System criteria. The Strength of Evidence Classification System can be used to determine how confident we should be about the effectiveness of an intervention. Ratings reflect the quality, quantity, and consistency of research findings for each type of intervention.

Strength of Evidence ratings reflect the quality, quantity, and consistency of research findings that have been applied specifically to individuals with ASD. As stated previously, the "quality" of a study is important because some research designs do not actually shed much light on whether or not an intervention is effective. "Quantity" is important because a single study, no matter how well-designed, will never be able to tell us absolutely if an intervention is truly effective. "Consistency" is important because, if an intervention is truly effective, we would expect it to consistently show beneficial effects. Of course, even interventions that are truly effective may occasionally appear to be ineffective in a study just by chance—so we have built this chance into the Strength of Evidence Classification System. See the footnote in Table 3 for details.

The Strength of Evidence Classification System can be used to determine how confident we can be about the effectiveness of an intervention. Ratings reflect the level of quality, quantity, and consistency of research findings for each type of intervention. There are three categories in the Strength of Evidence Classification System. Table 3 identifies the criteria associated with each of the ratings.

These general guidelines can be used to interpret each of these categories:

- **Established**. Sufficient evidence is available to confidently determine that an intervention produces favorable outcomes for individuals on the autism spectrum. That is, these interventions are established as effective.
- **Emerging**. Although one or more studies suggest that an intervention produces favorable outcomes for individuals with ASD, additional high quality studies must consistently show this outcome before we can draw firm conclusions about intervention effectiveness.

Table 3} Strength of Evidence Classification System

Established	Emerging	Unestablished
Several[a] published, peer-reviewed articles • SMRS scores of 3, 4, or 5 • Beneficial intervention effects for a specific target These may be supplemented by studies with lower scores on the Scientific Merit Rating Scale.	Few[b] published, peer-reviewed articles • SMRS scores of 2 • Beneficial intervention effects reported for one dependent variable for a specific target These may be supplemented by studies with lower scores on the Scientific Merit Rating Scale.	May or may not be based on research • Beneficial intervention effects reported based on very poorly controlled studies (scores of 0 or 1 on the Scientific Merit Rating Scale) • Claims based on testimonials, unverified clinical observations, opinions, or speculation • Ineffective, unknown, or adverse intervention effects reported based on poorly controlled studies

[a] Several is defined as 2 group design or 4 single-subject design (SSD) studies with a minimum of 12 participants for which there are no conflicting results or at least 3 group design or 6 SSD studies with a minimum of 18 participants with no more than 10% of studies reporting conflicting results. Group and SSD methodologies may be combined.

[b] Few is defined as a minimum of 2 group design studies or 2 SSD studies with a minimum of 6 participants for which no more than 10% of studies reporting conflicting results are reported.* Group and SSD methodologies may be combined.

*Conflicting results are reported when a better or equally controlled study that is assigned a score of at least 3 reports either {a} ineffective intervention effects or {b} adverse intervention effects.

- **Unestablished**. There is little or no evidence to allow us to draw firm conclusions about intervention effectiveness with individuals with ASD. Additional research may show the intervention to be effective, ineffective, or harmful.

Intervention Subclassification

Process

Beyond identifying if an intervention is effective, the research community seeks to answer additional questions that could potentially impact intervention selection.

- "Have favorable outcomes been demonstrated when a specific skill or behavior is targeted for improvement with individuals on the autism spectrum?"
- "Have favorable outcomes been demonstrated with a particular age group of individuals with ASD?"

The purpose of subclassifying interventions and identifying which ones are associated with favorable outcomes is to identify which relevant variables (intervention target and age group) have been the focus of intervention studies to date. This is important for two reasons. First, decision makers feel even more confident when an intervention has been associated with favorable outcomes for the intervention target and age group for a specific individual. Second, it identifies areas in which the existing literature might be extended by the research community. By identifying the limitations of the existing research, we hope to motivate scholars to extend our knowledge about interventions by conducting high quality research for these relevant variables.

We used the following process to subclassify interventions:

1. Identify all studies associated with a given intervention.
2. Identify relevant variables in each of the studies.
   a. What was the target of the intervention? Was the goal to increase a skill or decrease a behavior?
   b. What were the ages of the participants?
3. Identify the SMRS Score and the Intervention Effects Ratings for each of the relevant variables for each of the studies.
4. For each relevant variable (intervention target or age group), identify the quality, quantity, and consistency of research findings across all studies for a given intervention.
5. For each relevant variable, determine if there is evidence suggesting the intervention produces favorable outcomes. We defined favorable outcomes as meeting the following criterion: a few studies with SMRS Scores of 2, 3, 4, or 5 showing beneficial intervention effects. This criterion was selected to increase the chances we would identify any variables associated with favorable outcomes.

Subcategories

Intervention Targets

There are many different skills or behaviors that are targeted for improvement when treating individuals on the autism spectrum. Some of the intervention targets seek to improve skills by increasing developmentally appropriate skills. Other intervention targets are intended to improve life functioning by decreasing behaviors. We broke down 14 intervention targets into two categories: skills increased and behaviors decreased.

Skills Increased

It is always essential for intervention providers to implement interventions to increase developmentally appropriate skills.

We have identified 10 developmental skills that intervention providers may target to increase.

- **Academic**. This category represents tasks that are precursors or required for success with school activities. Dependent variables associated with these tasks include but are not restricted to preschool activities (e.g., sequencing, color, letter, number identification, etc.), fluency, latency, reading, writing, mathematics, science, history, or skills required to study or perform well on exams.
- **Communication**. Communication tasks involve verbal or nonverbal signaling to a social partner regarding content to share experiences, emotions, or information. It also can affect the partner's behavior, and behaviors that involve understanding a partner's intentional signals for the same purposes. This systematic means of communication involves the use of sounds or symbols. Dependent variables associated with these tasks include but are not restricted to requesting, labeling, receptive, conversation, greetings, nonverbal, expressive, syntax, speech, articulation, discourse, vocabulary, and pragmatics.
- **Higher Cognitive Functions**. These tasks require complex problem-solving skills outside the social domain. Dependent variables associated with these tasks include but are not restricted to critical thinking, IQ, problem-solving, working memory, executive functions, organizational skills, and theory of mind tasks.
- **Interpersonal**. The tasks comprising this category require social interaction with one or more individuals. Dependent variables associated with these tasks include but are not limited to joint attention, friendship, social and pretend play, social skills, social engagement, social problem solving, and appropriate participation in group activities. The area of pragmatics is not included in this list because it will be addressed in the communication section.
- **Learning Readiness**. Learning readiness tasks serve as the foundation for successful mastery of complex skills in other domains identified. Dependent variables associated with these tasks include but are not restricted to imitation, following instructions, sitting skills, and attending to environmental sounds.

- **Motor Skills**. Motor skills involve tasks that require coordination of muscle systems to produce a specific goal involving either fine motor or gross motor skills or visual-motor coordination. Fine motor skills require manipulation of objects using precise movements to produce the desired outcome. Examples of fine motor skills include but are not restricted to cutting, coloring, writing, typing, and threading beads. Gross motor skills involve larger muscle movements and include but are not restricted to sitting, standing, walking, and throwing/catching balls.
- **Personal Responsibility**. This category targets tasks that involve activities embedded in everyday routines. Dependent variables associated with these tasks include but are not restricted to feeding, sleeping, dressing, toileting, cleaning, family and/or community activities, health and fitness, phone skills, time and money management, and self-advocacy.
- **Placement**. Placement was coded whenever the dependent variable involves level of restriction in placement in school, home, or community settings. Examples include but are not restricted to placement in general education classroom and placement back into the home setting. Although placement is not a "skill," it represents an important accomplishment toward which intervention programs strive.
- **Play**. Play tasks involve non-academic and non-work-related activities that do not involve self-stimulatory behavior or require interaction with other persons. Dependent variables associated with these tasks may include but are not restricted to functional independent play (i.e., manipulation of toys to determine how they "work" or appropriate use of toys that do not involve pretense, games). Whenever social play was targeted (independently or in conjunction with make-believe play), it was placed in the "interpersonal" categories.
- **Self-Regulation**. Self-regulation tasks involve the management of one's own behaviors in order to meet a goal. Dependent variables associated with these tasks include but are not limited to persistence, effort, task fluency, transfer of attention, being "on schedule," self-management, self-monitoring, self-advocacy, remaining in seat (or its opposite of "out of seat"), time management, or adapting to changes in the environment.

In Chapter 3, we present information about favorable outcomes in each of the intervention tables. Developmentally appropriate skills that parents, educators, and service providers are likely to want to increase are listed in the "Skills Increased" section of each table.

Behaviors Decreased

For some individuals on the autism spectrum, intervention providers may need to implement interventions to decrease behaviors that interfere with life functioning.

We have identified four areas of challenge that intervention providers may target to decrease. These include:

- **General Symptoms**. General symptoms involve a combination of symptoms that may be directly associated with ASD or may be a result of psychoeducational needs that are sometimes associated with ASD.
- **Problem Behaviors**. These behaviors can harm the individual or others OR result in damage to objects OR interfere with the expected routines in the community. Problem behaviors may include but are not restricted to self-injury, aggression, disruption, destruction of property, or hazardous or sexually inappropriate behaviors.
- **Restricted, Repetitive, Nonfunctional Patterns of Behavior, Interests, or Activity (RRN)**. This category is reserved for limited, frequently repeated, maladaptive patterns of motor, speech, and thoughts. The following is a list of representative behaviors: stereotypic and compulsive behaviors, inappropriate speech, or restricted interest.
- **Sensory or Emotional Regulation (SER)**. Sensory and emotional regulation involves the extent to which an individual can flexibly modify his or her level of arousal or response in order to function effectively in the environment. Examples of behaviors that fall into this category include stimulus refusal, sleep disturbance, anxiety, and depression.

Behaviors that parents, educators, and service providers are likely to want to decrease are listed in the "Behaviors Decreased" section of each intervention table in Chapter 3.

Age

Individuals of all ages are affected by ASD. Increasingly, parents and professionals are asking whether or not favorable outcomes are reported for specific age groups. This information is provided in the intervention tables in Chapter 3. For the purposes of this project, children, adolescents, and young adults range in age from 0 to 21 years. Adults are defined as ages 22 years and older.

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3

Research Findings

In this chapter, we provide detailed information about the Established Interventions identified by the National Standards Project, Phase 2 (NSP2). We also provide a list of the interventions identified as Emerging and Unestablished. The results are divided according to age range.

Specifically, we referred to children, adolescents, and young adults as ranging in age from 0 to 21 years. For the purposes of NSP2, adults are defined as any study participant 22 years and older. The reader will notice a discrepancy in terms of the amount of information regarding interventions for individuals under age 22 years as opposed to individuals with ASD 22 years and older. We address this issue at the conclusion of this chapter.

Here are a few key points to remember as you review the results of NSP2:

- **For children, adolescents, and young adults under 22 years of age:**
  - There are 14 Established Interventions that have been thoroughly researched and have sufficient evidence for us to confidently state that they are effective.
  - There are 18 Emerging Interventions that have some evidence of effectiveness, but not enough for us to be confident that they are truly effective.
  - There are 13 Unestablished Interventions for which there is no sound evidence of effectiveness.
- **For adults ages 22 and older:**
  - There is one Established Intervention that has been thoroughly researched and has sufficient evidence for us to confidently state that it is effective.
  - There is one Emerging Intervention that has some evidence of effectiveness, but not enough for us to be confident that it is truly effective.
  - There are four Unestablished Interventions for which there is no sound evidence of effectiveness.

Research Findings for Children, Adolescents, and Young Adults (Under 22 Years)

Established Interventions for Individuals Under Age 22

In the following pages, we provide a detailed definition and description for each of the 14 Established Interventions identified for this population in Phase 2 of the National Standards Project.

You may already be familiar with some of these options. Many volumes have been published on each of these interventions; we encourage you to learn more about those that might be most useful to you.

The following interventions have been identified as falling into the Established level of evidence:

- Behavioral Interventions
- Cognitive Behavioral Intervention Package
- Comprehensive Behavioral Treatment for Young Children
- Language Training (Production)
- Modeling
- Natural Teaching Strategies
- Parent Training
- Peer Training Package
- Pivotal Response Training
- Schedules
- Scripting
- Self-Management
- Social Skills Package
- Story-based Intervention

Behavioral Interventions

Established Intervention & Detailed Description

The largest category of Established Interventions is the Behavioral Intervention category. The results of the NSP1 included Behavioral Package and Antecedent Package. Given the feedback provided by professionals and family members, the antecedent package interventions and behavioral package interventions were combined into one category, Behavioral Interventions.

The challenge in teasing apart the Behavioral Intervention category lies in the complexity of the majority of interventions packages evaluated in the 155 articles in this category. Take, for example, prompting. Prompting is commonly described as a set of procedures used to teach a new skill. Prompting can be gestural (e.g., a teacher pointing to the correct answer), verbal (e.g., a teacher saying "The answer is cat. Say 'cat'."), or positional (e.g., a teacher placing an array of three flashcards with the target flashcard placed closest to the student, to encourage a correct response).

There are at least 12 studies in which prompting is part of a complex behavioral intervention consisting of two or more components. The issue with teasing out prompting as a "stand alone" evidence-based intervention is isolating the use of prompting and its impact on a target behavior. However, prompting along with other components of behavioral interventions was identified as having sufficient evidence to have beneficial intervention effects.

The Behavioral Intervention category is comprised of interventions typically described as antecedent interventions and consequent interventions. Antecedent interventions involve the modification of situational events that typically precede the occurrence of a target behavior. These alterations are made to increase the likelihood of success or reduce the likelihood of problems occurring. Consequent interventions involve making changes to the environment following the occurrence of a targeted behavior. Many of the consequent interventions are designed to reduce problem behavior and teach functional alternative behaviors or skills through the application of basic principles of behavior change.

Basic Facts

Number of articles reviewed:

NSP1 = **298** NSP2 = **155**

Effective ages: Children and adolescents 3–21 years

Skills increased:

- higher cognitive functions (NSP2)
- motor skills (NSP2)
- academic, communication, interpersonal, learning readiness, personal responsibility, play, and self-regulation (NSP1&2)

Behaviors Decreased:

- sensory or emotional regulation (NSP1)
- problem behaviors (NSP1&2)
- restricted, repetitive, nonfunctional patterns of behavior, interests, or activity (NSP1&2)

Example

Examples of Behavioral Interventions consisting of one identified component:

- Joint Attention Intervention
- Chaining
- Differential Observing Response (DOR)
- Forward Chaining
- Function-based Intervention
- Imitation Training
- Reinforcement Schedule (schedule specified)
- Response Interruption and Redirection (RIRD)
- Repeated Practice
- Standard Echoic Training

Examples of Behavioral Interventions consisting of two identified components:

- Extinction + Reinforcement
- Function-based intervention + prompts
- Sign Extinction + Differential Reinforcement of Alternative Behavior (DRA)
- Stimulus Fading + Positive Reinforcement

Examples of Behavioral Interventions consisting of three identified components:

- Choice + Task Interspersal + Positive Reinforcement
- Discrete-trial Training + Natural Consequences + Error Correction
- Most to Least Prompting + Natural Consequences + Activity Interspersal
- Preteaching + Prompting + Positive Reinforcement

Examples of Behavioral Interventions consisting of four or more identified components:

- Combined Task Direction + Contingent Reinforcement + Physical Prompts + Stimulus Fading
- Modeling + Prompting + Reinforcement + Redirection + Abolishing Operation Component
- Prompt Delay + Auditory Scripts + Manual Prompts + Behavioral Rehearsal + Tokens
- Reinforcement Pairing + Habit Reversal + GaitSpot Squeakers + Differential Reinforcement of Incompatible Behavior (DRI)
- Video Modeling + DRA + Escape Extinction + Stimulus Fading + Photo Prompting
- Video Modeling + Highlighting + Prompting/ Fading + Reinforcement
- Video Modeling + Photo Prompts + Contact Desensitization + Shaping + Differential Reinforcement of Other Behavior (DRO) + Escape Extinction
- Written Task Analysis + Social Scripts + Prompting + Self-monitoring + Fading

Recommended Readings

Gerhardt, P. F. & Crimmins, D. (Eds.) (2013). Social skills and adaptive behaviors in learners with autism spectrum disorders. Baltimore: Paul H. Brookes Publishing Co.

Luiselli, J. K. (Ed.) (2014). Children and youth with autism spectrum disorder (ASD): Recent advances and innovations in assessment, education, and intervention. New York: Oxford University Press.

Luiselli, J. K. & Cameron, M. J. (1998). Antecedent control: Innovative approaches to behavioral support. Baltimore: Paul H. Brookes Publishing Co.

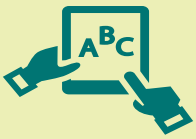
Matson, J. L. (Ed.) (2009). Applied behavior analysis for children with autism spectrum disorders. New York: Springer.

Cognitive Behavioral Intervention Package

Established Intervention

Cognitive Behavioral Intervention Package (CBIP) was previously listed as an Emerging Intervention in NSP1. With additional scientific evidence published since NSP1, CBIP has moved to the Established Intervention category. Cognitive Behavioral Therapy has long been an evidence-based intervention for individuals diagnosed with anxiety disorders and depressive disorders (i.e., without autism spectrum disorder, or ASD).

Basic Facts



Number of articles reviewed:

NSP1 = **3** NSP2 = **10**

Effective ages: Children and adolescents 6-14 years

Skills increased:

- higher cognitive functions (NSP1)
- interpersonal, personal responsibility, and placement (NSP2)

Behaviors decreased:

- problem behaviors (NSP2)
- sensory or emotional regulation (NSP2)

Detailed Description

There are manualized cognitive behavioral intervention programs that have been modified for individuals with ASD. These modifications can take different forms but typically involve making adjustments to materials (e.g., adding visual cues, role-play) or the structure of sessions. There are also cognitive behavioral intervention programs developed and individualized for specific purposes (e.g., to address anger management). In either case, cognitive behavioral interventions often include several commonly used strategies.

Common strategies:

- An educational component describing feelings/emotions, physical responses to emotions, and prevalence of individuals with similar challenges.
- A cognitive restructuring component in which the therapist assists the individual to modify cognitive distortions such as "all-or-nothing" thinking or "catastrophizing."
- Development of scale to identify anxiety or distress. Some scales take the form of a thermometer, a ladder, or "volume control."
- Homework assignments. Individuals are expected to work on skills in the home, school, and community setting. Typically, there is a specific assignment that requires some type of recording of behavior or observations.
- Parent sessions. Cognitive behavioral interventions often take place for 45 minutes to one hour per week for a specified number of weeks

{cont.}

Detailed Description *{cont.}*

(e.g., 16 weeks). During that time, there are often "parent sessions" in which the parents and therapist meet to discuss progress and strategies to support the individual with ASD.

Some of the manualized cognitive behavioral intervention packages modified in studies reviewed in the NSP2 included The Coping Cat Program, and Exploring Feelings.

Note: Cognitive behavioral interventions should be implemented by a trained professional with experience in providing cognitive behavioral therapy as well as working with individuals with ASD.

Example

Ester is a 12-year-old with ASD in a mainstream middle school classroom. She has started to display behaviors associated with anxiety when participating in physical education class. Specifically, Ester is afraid of getting hit by a ball or puck, and afraid of getting knocked down during games. She began to display distress following an incident in which she was bumped into a wall during a kickball game in the gym. She experiences tearfulness, sweating, fidgeting, and refusal to participate.

Professionals at Ester's school hold a case conference with Ester's mother. Ester's mother agrees that the issue should be addressed as it is beginning to interfere with Ester's ability to participate in school activities. The school social worker provides Ester's mother with the name of a doctoral-level psychologist with experience in providing cognitive behavioral therapy for children and adolescents with ASD.

Ester begins to participate in cognitive behavioral therapy to address her concerns regarding participation in physical education class. She and her therapist review how Ester experiences distress (e.g., rapid heart beat, sweating, crying). They work on role playing different games and even bring in Ester's siblings to play. Ester's homework assignments include recording how she feels before, during, and after physical education class and practicing her relaxation techniques. Ester learns strategies such as appropriate breathing, muscle relaxation, and how to tolerate various games (e.g., kickball, soccer, etc).

It takes a number of weeks and participation and support from Ester's parents and teachers, but Ester begins to show progress and a decreased level of distress during physical education class. Ester uses her "thermometer" to self-monitor and communicates her level of distress. Her parents and teachers remind her of the various techniques that she can use to relax and participate in physical education class.

Recommended Readings

Attwood, T. (2004). *Exploring feelings: Anxiety: Cognitive behaviour therapy to manage anxiety*. Future Horizons: Arlington, TX.

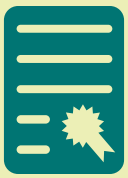
Kendall, P. C., Choudhury, M., Hudson, J., & Webb, A. (2002). *"The C.A.T. Project" manual for the cognitive behavioral treatment of anxious adolescents*. Workbook Publishing: Ardmore, PA.

Kendall, P. C. & Hedtke, K.A. (2006). *Cognitive-behavioral therapy for anxious children: Therapist manual*, 3rd ed. Workbook Publishing: Ardmore, PA.

Scarpa, A., White, S. W., & Attwood, T. (Eds.) (2013). *CBT for children and adolescents with high-functioning autism spectrum disorders*. The Guilford Press: New York.

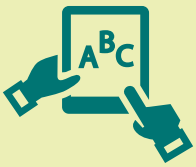
Comprehensive Behavioral Treatment for Young Children

Established Intervention



Comprehensive Behavioral Treatment for Young Children (CBTYC) programs involve intensive early behavioral interventions that target a range of essential skills which define or are associated with autism spectrum disorder (ASD) (e.g., communication, social, and pre-academic/academic skills, etc.). These interventions are often described as ABA (or applied behavior analysis), EIBI (or Early Intensive Behavioral Intervention), or behavioral inclusive programs.

Basic Facts



Number of articles reviewed:

NSP1 = **21** NSP2 = **20**

Effective ages: Children 0-9 years

Skills increased:

- play (NSP1)
- academic and learning readiness (NSP2)
- communication, higher cognitive functions, interpersonal, and personal responsibility (NSP1&2)
- motor skills (NSP1&2)

Behaviors decreased:

- general symptoms (NSP1&2)
- problem behaviors (NSP1&2)

Detailed Description

- Intensive service delivery (typically 25-40 hours per week for 2-3 years) based on the principles of applied behavior analysis (ABA)
- Data-based decision making that targets the defining symptoms of ASD
- Typical interventions include the use of discrete trial teaching, incidental teaching, errorless learning, behavioral momentum, shaping, modeling and other interventions derived from ABA
- Individualized instruction in various settings (e.g., home, community, inclusive, and self-contained classrooms) and small group instruction

Example

Due to the complexity of CBTYC, it is difficult to develop an example that reflects all aspects of this type of intervention. Although programs typically follow a curriculum, each program is individualized to meet the needs of the child with ASD. The following is an example of what a morning might include for a young child in a comprehensive behavioral program.

Ellie is 3 years old and begins her day in a one-to-one teaching situation focused on basic play skills and imitation. Ellie's behavior therapist teaches basic direction following using prompting and modeling. For instance, Ellie learns to clean up her toys when her therapist states, "clean-up time, Ellie." The therapist provides gestural prompts (e.g., pointing) and models how to clean up the playroom (e.g., puts a doll in a basket, then hands the doll to Ellie). The behavior therapist then uses discrete trial training to teach Ellie to label basic household items and different foods. A snack break provides an opportunity for Ellie to make requests for preferred foods. Snack time also provides an opportunity to generalize compliance with directions and attending skills. After snack, Ellie moves to small group activities to work on social communication with same-age peers.

As Ellie progresses through the curriculum during the first year, she develops the ability to effectively communicate her wants and needs. Her tantrum behavior has decreased as her communication skills become fluent. She participates in basic turn-taking games, can follow directions in a small group, and responds to requests from peers.

Recommended Readings

Leaf R. & McEachin (1999). *A work in progress: Behavior management strategies and a curriculum for intensive behavioral treatment of autism*. New York: DRL Books, LLC

Lovaas, O. I. (2002). *Teaching individuals with developmental delays: Basic intervention techniques*. Austin, TX: Pro-Ed.

Maurice, Catherine, Green, Gina & Foxx, Richard M. (2001). *Making a difference: Behavioral intervention for autism*. Austin, TX: Pro-Ed.

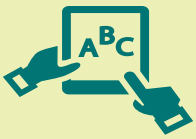
Maurice, C., Green, G., & Luce, S. (Eds.) (1996). *Behavioral intervention for young children with autism: A manual for parents and professionals*. Austin, TX: Pro-Ed.

Language Training (Production)

Established Intervention

Language Training (Production) targets the ability of the individual with autism spectrum disorder (ASD) to emit a verbal communication (i.e., functional use of spoken words). Language Training (Production) was identified as an Emerging Intervention in NSP1 and, with the addition of three studies in NSP2, Language Training (Production) met criteria to be an Established Intervention.

Basic Facts



Number of articles reviewed:

NSP1 = **10** NSP2 = **2**

Effective ages: Children 3–9 years

Skills increased:

- interpersonal and play (NSP1)
- communication (NSP1&2)

Detailed Description

Language Training (Production) makes use of various strategies to elicit verbal communication from individuals with ASD. Language Training (Production) begins with appropriate assessment and identification of developmentally appropriate targets. Individualized programs often include strategies such as:

- Modeling verbalizations for the individual with ASD to imitate
- Various prompting procedures including verbal, visual, gestural prompts
- Cue-Pause-Point
- Using music as part of language training
- Reinforcement for display of targeted verbal response

Example

Felix is a 2.5-year-old boy working with a speech language therapist and a behavior therapist to develop functional verbal communication. Following developmental assessments and an evaluation of items/activities that could be used to motivate Felix, an individualized program was implemented. Identified targets include approximations of "milk," "car" and "dog." The therapists and Felix's parents work throughout each day using the actual objects and modeling to encourage Felix to provide a verbal response. He is provided milk, his toy car, and his toy dog each time he makes a successful approximation such as "mmmmm" for milk.

Recommended Readings

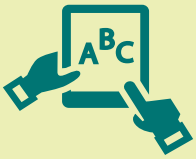
Prelock, P., McCauley, R. J., Fey, M., & Kamhi, A. (Eds.) (2012). *Treatment of autism spectrum disorders: Evidence-based intervention strategies for communication and social interactions*. Paul H. Brookes Publishing Co.: Baltimore, MD.

Modeling

Established Intervention

One of the most effective ways to teach someone what to do is to show him or her how to do it. The goal of modeling is to correctly demonstrate a target behavior to the person learning the new skill, so that person can then imitate the model. Children can learn a great deal from observing the behavior of parents, siblings, peers, and teachers, but they often need to be taught what behaviors should be imitated.

Basic Facts



Number of articles reviewed:

NSP1 = **51** NSP2 = **28**

Effective ages: Children and adolescents 3-18 years

Skills increased:

- higher cognitive functions (NSP1)
- academic (NSP2)
- communication, interpersonal, personal responsibility, and play (NSP1&2)

Behaviors decreased:

- problem behaviors (NSP1)
- sensory or emotional regulation (NSP1)

Detailed Description

There are two types of modeling—live and video modeling.

Live modeling occurs when a person demonstrates the target behavior in the presence of the child with autism spectrum disorder (ASD). When providing live modeling:

- Clearly outline, in writing, the target behavior to model.
- Ensure all individuals modeling the target behavior are doing so in a consistent manner. It may be helpful for parents/caregivers/therapists to practice together to make certain each person provides the same model.
- Obtain the child's attention prior to modeling the target behavior.
- Develop a plan to fade or stop the use of modeling to encourage the child to independently display the target behavior.

Video modeling occurs when you pre-record a person demonstrating the target behavior. Video modeling can be a great option for children/adolescents with an affinity for television shows, movies, or interest in seeing themselves on a monitor (i.e., television screen, computer monitor, video recorder monitor). Some children/adolescents may enjoy assisting in the production of the video.

Detailed Description *{cont.}*

- Anyone who can correctly and independently perform the task can serve as a model—this includes the person with ASD.
- Make sure your child is paying attention to and is interested in the video.
- Point out the important steps/features to your child during the video. Be sure to make the best quality video possible. Remember, after the initial time invested in making the video, it is an easy-to-use teaching tool, and is cost- and time-effective (e.g., the same video clip can be used by multiple individuals any time).

Example

Henry is a 6-year-old kindergartner with ASD. He had many successes during the school year including attending to story time, engaging in turn-taking activities, and following simple directions in a small group. A big challenge for Henry came at lunch time in the cafeteria and during library time when checking out books. Henry could not wait in line while providing peers with personal space. He would consistently stand too close to peers, resulting in a frustrating situation for the peer and, eventually, the teacher.

Henry loved watching YouTube videos of kids singing, dancing, and doing magic tricks. Knowledgeable in the fact that video modeling was an established intervention, Henry's teacher decided Henry might benefit from watching a video demonstrating the appropriate way to remain in line in the school cafeteria and library. His teacher also knew that Henry was able to imitate, as demonstrated in previous skill acquisition programs targeting adaptive behavior. Henry's teacher recruited a few older peers who Henry was familiar with to make the video. The teacher made use of a tablet with a built-in camera to film the video.

Henry was instructed to watch the video of his peers standing in line. He seemed to enjoy watching his peers on the tablet (i.e., just like his preferred YouTube videos). Henry's teacher pointed out a specific peer for Henry to imitate. Henry practiced standing in line just like his peers in the video. During the following week, prior to lunch time or library time, Henry's teacher reviewed the video model of waiting in line with Henry. After several days of viewing the video, Henry demonstrated the appropriate "waiting in line" behavior in the cafeteria and the library.

Recommended Readings

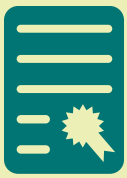
Buggey, T. (2009). *Seeing is believing: Video self-modeling for people with autism and other developmental disabilities*. Bethesda, MD: Woodbine House.

Murray, S. & Nolan, B. (2013). *Video modeling for young children with autism spectrum disorder: A practical guide for parents and professionals*. London: Jessica Kingsley Publishers.

Nikopoulos, C. & Keenan, M. (2006). *Video modelling and behaviour analysis: A guide for teaching social skills to children with autism*. London: Jessica Kingsley Publishers.

Naturalistic Teaching Strategies

Established Intervention



Naturalistic Teaching Strategies (NTS) are a compilation of strategies that are used to teach children skills in their home, school, and community. The basic concepts include using materials in the environment and naturally occurring activities as opportunities to increase adaptive skills. These strategies are primarily child-directed.

Basic Facts

Number of articles reviewed:

NSP1 = **27** NSP2 = **3**

Effective ages: Children 0-9 years

Skills increased:

- interpersonal and play (NSP1)
- learning readiness (NSP2)
- communication (NSP1&2)

Detailed Description

When using NTS, consider the following guidelines:

- Observe your child to find out what motivates him or her, and then structure teaching interactions around those interests.
- Use materials your child is likely to encounter on a daily basis. For example, if you want to teach her to identify items that fall into the category "things you play with," you might use dolls, blocks, and cars that are available at home and at school.
- Teach skills in a variety of situations and settings (such as the home and community) while using a variety of materials (e.g., teach numbers by using different items such as pieces of candy or silverware).
- Provide consequences that are naturally found in the environment and have a direct relationship to the activity you are completing. For example, food might be a natural and direct reinforcer at lunch and toys might be a natural and direct reinforcer during "playtime."
- Provide loosely structured teaching sessions that vary based on the child's interests for that day. For example, if you are teaching your child to request objects of different sizes, you may need to use dolls rather than teddy bears if she shows a greater interest in dolls that day. Different names have been given to the intervention strategies included in the NTS category. These include: focused stimulation, incidental teaching, milieu teaching, embedded teaching, responsive education, and prelinguistic milieu teaching.

Example

Walter is working with a behavior specialist and his parents to identify common objects in his home. Walter enjoys stacking items and filling containers up (i.e., with rice, beans, or water) and emptying containers out. The behavior specialist and Walter's parents decide to use Naturalistic Teaching Strategies to increase his ability to identify common objects.

Walter's parents lay out many different items they hope to teach him to identify. For example, there are cups, hats, shoes, preferred toys, and books placed within easy access. There is also a large bin of beans in the living room that Walter loves to play in. As Walter demonstrates interest in playing in the bean bin, his mother takes out several cups to fill up/pour out with beans. Walter becomes very excited and reaches for the cup. His mother provides a verbal prompt "cup" and Walter responds with an approximation "K-k." His mother excitedly hands over the cup for Walter to fill up with beans. She does this repeatedly with different cups. Over several weeks, Walter's parents use this activity to generate attempts at labeling many items including shoes!

As Walter is able to approximate the names of common items, he is prompted to use the labels during his daily routine. For example, when reaching for his drink at the dinner table, he is prompted to say "cup." Many activities in Walter's home become opportunities to work on skill development.

Recommended Readings

Charlop-Christy, M. H. (2008). *How to do incidental teaching*. Austin, TX: PRO-ED.

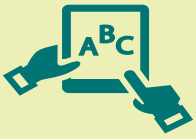
Thompson, T. & Odom, S. (2011). *Individualized autism intervention for young children: Blending discrete trial and naturalistic strategies*. Baltimore, MD: Paul H. Brookes.

Parent Training Package

Established Intervention

The Parent Training Package category is new to the NSP. NSP1 focused on the elements of the interventions used in studies in which parents acted as therapist or received training to implement various strategies. NSP2 made the change to highlight parents' and caregivers' integral role in providing a therapeutic environment for their family members with autism spectrum disorder (ASD).

Basic Facts



Number of articles reviewed:

NSP1 = **37*** NSP2 = **11**

Effective ages: Children and adolescents 0-18 years

Skills increased:

- interpersonal and play (NSP1&2)

Behaviors decreased:

- general symptoms (NSP2)
- problem behaviors (NSP2)
- restricted, repetitive, nonfunctional behavior, interests, or activity (NSP2)

**The 37 studies identified in NSP1 were re-categorized into the current Parent Training category. The majority of the 37 in NSP1 were previously categorized in the Behavioral Package.*

Detailed Description

Parent training can take many forms including:

- *In vivo* individual training
- Group training
- Support groups with an educational component
- Training manuals

Examples of skills parents learned to use include:

- Strategies to develop imitation skills
- Commenting on the child
- Expectant waiting to elicit communication
- Appropriate sleeping routines
- Joint attention
- Development of play date activities

Example

Nico is a 3-year-old recently diagnosed with ASD. His parents have enrolled him in home-based services and other services (speech and OT) outside of the home setting. The behavior therapist and Nico's parents decide to begin working on play skills with Nico. The therapist begins providing parent training regarding evidence-based interventions to increase developmentally appropriate play.

Nico's parents learn how to identify preferred activities and items and how to use these items/activities to increase joint attention, pointing, and turn taking. They also use live modeling to act out play scenarios such as "going shopping" or "walking the dog." Finally, Nico's parents learn to how to develop a daily picture schedule to communicate upcoming events to Nico.

Recommended Readings

Ingersoll, B. & Dvortcsak, A. (2010). *Teaching social communication to children with autism: A practitioner's guide to parent training / A manual for parents* (2 volume set). New York, NY: The Guilford Press.

Rogers, S. J., Dawson, G., & Vismara, L. A. (2012). *An early start for your child with autism: Using everyday activities to help kids connect, communicate, and learn*. New York, NY: The Guilford Press.

Online Resources

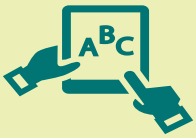
Autism Internet Modules: Online training for parents, professionals, and caregivers.
http://www.autisminternetmodules.org

Peer Training Package

Established Intervention

Difficulty interacting appropriately with peers is a commonly reported characteristic of autism spectrum disorder (ASD). Further, children with ASD often rely on adults for prompting and guidance. Peer Training Packages facilitate skill growth for children with ASD by training peers on how to initiate and respond during social interactions with a child on the spectrum. These programs have been used in school and community settings.

Basic Facts



Number of articles reviewed:

NSP1 = **43** NSP2 = **3**

Effective ages: Children and adolescents 3-14 years

Skills increased:

- learning readiness (NSP2)
- communication and interpersonal (NSP1&2)

Behaviors decreased:

- restricted, repetitive, nonfunctional behavior, interests, or activity (NSP1)

Detailed Description

Some children on the spectrum frequently try to interact with peers, but may do so in unexpected or socially inappropriate ways. There are many factors to consider when designing a Peer Training Package including:

- The age and skill level of the children (with and without ASD) should be similar. You should choose peers who are socially skilled, compliant, regularly available, willing to participate, and able to imitate a model.
- The activities you include in the session should address the interests and preferences of both groups to ensure high motivation.
- Teach the peers how to get the attention of the individual with ASD, facilitate sharing, provide help and affection, model appropriate play skills, and help organize play activities.
- After training, have the peers interact with the individual with ASD in a structured setting during a familiar activity. This will allow the peers to practice their new skills in a comfortable environment.
- The group instructor should use prompts and feedback to facilitate interactions.
- Be sure to train in multiple settings and with multiple peers to increase the likelihood that all the children use their skills frequently. Different names of peer training programs include: Project LEAP, peer networks, circle of friends, buddy skills package, integrated play groups, peer initiation training, and peer-mediated social interaction training.

Example

Fiona is a 9-year-old girl who has made great progress in language/communication, but continues to face challenges when interacting with her peers. Initiating and maintaining interactions with peers is one of Fiona's IEP goals. Her special education teacher decides to make use of a Peer Training Package. The teacher consults with the behavior specialist to complete the appropriate assessments and identify neurotypical peers to work with Fiona.

The special education teacher and behavior specialist design a Peer Training Package tailored to meet Fiona's needs. They recruit several male and female peers to work with Fiona. The initial goal is to get Fiona to sit with her classmates at lunch. The peers work with the teacher and behavior specialist to understand goals and role-play. The peers are motivated to have Fiona join them at lunch.

During the first several school lunch periods, the teacher and behavior specialist provide verbal prompts to the peers and Fiona. The teacher and behavior specialist are able to gradually fade the prompts. Fiona is now motivated to join her peers at lunch and has initiated some verbal exchanges. The special education teacher is excited to generalize the Peer Training Package to recess and gym.

Recommended Readings

Cater, E. W., Cushing, L. S., & Kennedy, C. H. (2008). *Peer support strategies for improving all students' social lives and learning*. Baltimore, MD: Paul H. Brooks.

Reid, D. H., & Parsons, M. B. (2002). *Facilitating play dates for children with autism and typically developing peers in natural settings: A training manual*. Morganton, NC: Habilitative Management Consultants.

Online Resources

LEAP Preschool: An Inclusive Model of Early Autism Intervention
https://www.youtube.com/watch?v=vVl08lHZdZA

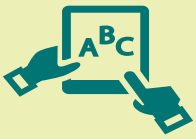
Teacher's Toolbox
http://www.ttoolbox.com/teacher_training.htm

Pivotal Response Treatment®

Established Intervention

Pivotal Response Treatment® focuses on targeting "pivotal" behaviors related to motivation to engage in social communication, self-initiation, self-management, and responsiveness to multiple cues. Key to the delivery of PRT® is parent involvement and implementation in the natural environment such as the home, community, and school setting.

Basic Facts



Number of articles reviewed:

NSP1 = **11** NSP2 = **6**

Effective ages: Children 3-9 years

Skills increased:

- interpersonal (NSP1)
- learning readiness (NSP2)
- communication and play (NSP1&2)

Detailed Description

Pivotal Response Treatment® is also referred to as Pivotal Response Training®, Pivotal Response Teaching® and the Natural Language Paradigm. Like Naturalistic Teaching Strategies, PRT® aims to teach children to respond to various teaching opportunities within their natural environment, and to increase independence from prompting. There are many pivotal areas targeted in PRT®. For example, motivation, self-initiation, self-management, and responding to multiple cues are typically addressed.

- Motivation can be enhanced by increasing choice, making learning materials meaningful by: building a direct relationship between the target behavior and the reinforcer; incorporating both new and mastered tasks into the day; and reinforcing reasonable attempts (none of us do new tasks perfectly!).
- Self-initiation involves teaching children to take action in the world so they can be more independent.
- Self-management involves teaching children to regulate their own behavior by tracking their progress and accessing reinforcers for their successes.
- Responding to multiple cues involves teaching children to respond to the diverse statements of others, or to different kinds of materials.

Example

Ms. Tanaka has noticed that her son Hideki has difficulty asking questions about novel items that interest him. She decides she is going to teach her son to ask questions like, "What is that?" She knows that Hideki has a particular interest in books about trains, so she purchases a couple of pop-up books on this topic. She wants to create an environment that motivates him to learn.

Hideki's mother sits near him and looks inside the bag that contains the books. She verbally prompts Hideki to say, "What's that?" She responds, "It's a book about trains." She then pulls out the book, opens it, and allows him to look at the trains. They look through the book together and comment on the trains. She has also been helping him learn to make comments to others about things that are interesting to him.

They finish the book and set it aside. Ms. Tanaka looks in her bag again and verbally prompts her son by saying, "What's that?" She follows the same procedure, and uses another book to share his interest and work on making comments. She has one more book left. After she looks in the bag, she looks at her son expectantly. After two seconds Hideki says, "What's that?" Hideki's mother is ecstatic! She presents her son with the book and looks through it with him while providing lots of attention.

Recommended Readings

Koegel, R. L., Schreffirnan, L., Good, A., Cerniglia, L., Murphy, C., & Koegel, L. K. (1998). *How to teach pivotal behaviors to children with autism: A training manual*. Santa Barbara, CA: University of California.

Koegel, R. L., & Koegel, L. K. (2012). *The PRT pocket guide: Pivotal response treatment for autism spectrum disorders*. Baltimore, MD: Paul H. Brookes.

Koegel, R. L., & Koegel, L. K. (2006). *Pivotal response treatments for autism: Communication, social, and academic development*. Baltimore, MD: Paul H. Brookes.

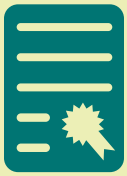
Online Resources

Koegel Autism: Pivotal Response Treatment (PRT)® Training and Services
http://www.autismprthelp.com

University of California Santa Barbara Koegel Autism Center
http://education.ucsb.edu/autism

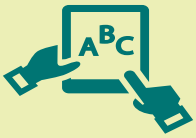
Schedules

Established Intervention



Schedules can be used for children with autism spectrum disorder (ASD) to increase their independence and allow them to plan for upcoming activities. A schedule simply identifies the activities that must be completed during a given time period and the order in which these activities should be completed.

Basic Facts



Number of articles reviewed:

NSP1 = **11** NSP2 = **2**

Effective ages: Children 3-9 years

Skills increased:

- self-regulation (NSP1&2)

Detailed Description

Children with ASD may better handle transitions when they can predict what will happen next. This can be accomplished through the use of schedules. Schedules can be used anywhere—at home, in classrooms, during doctors' visits, or on community outings. Schedules can be used for any activity —including leisure, social interaction, self-care, and housekeeping tasks. It is important for children and adolescents to possess prerequisite skills of picture identification (when using pictures) or reading (when using words/phrases) when considering use of schedules. Schedules:

- Can be used once per day, multiple times per day, or once per week.
- Are often used to help teach "first, then" concepts—such as, first complete your chores, then you can watch television.
- Should be followed by access to preferred activities. You can gradually increase the number of activities required before giving your child access to preferred activities.
- Can be presented in multiple formats. You can use pictures (real photos or Boardmaker®), written or typed schedules, 3-D objects, or personal digital assistance programs.

The use of schedules may be as simple as:

- Placing the pictures/texts on the board at the time of the activity
- Pointing to the activity immediately prior to beginning each step or activity
- Taking the picture off the board when the step or activity is completed
- Placing the picture in a "done" container such as a bin, box, or pile

Example

Carly is learning to pack her own snack for school. Although she is making progress, she consistently forgets certain steps that would allow her to be successful at independently packing her snack.

Her mother and behavior therapist developed a picture schedule to promote independence and success when Carly is completing this task. Her behavior therapist completed a brief assessment to determine the steps Carly could not complete independently. These steps were outlined using the picture schedule shown here. The schedule consisted of pictures and words, as Carly is able to read some sight words. Carly's mom and behavior therapist modeled the use of the schedule for Carly. With the use of the picture schedule, Carly is able to make a snack with no prompting from an adult.

Take out snack

Take out scoop

Take out bags

Two scoops

Put in school bag

Clean up

Recommended Readings

Cohen, M. J. & Sloan, D. L. (2007). *Visual supports for people with autism: A guide for parents and professionals*. Bethesda, MD: Woodbine House.

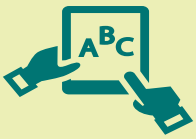
McClannahan, L. E., & Krantz, P. J. (2010). *Activity schedules for children with autism: Teaching independent behavior* (2nd ed.). Bethesda, MD: Woodbine House.

Scripting

Established Intervention

Scripting occurs when an individual with autism spectrum disorder (ASD) is provided guidance as to how to use language to initiate or respond in certain situations. These interventions involve developing a verbal and/or written script about a specific skill or situation which serves as a model for the child with ASD. Scripts are usually practiced repeatedly before the skill is used in the actual situation. Scripting was identified as an Emerging Intervention in NSP1 and, with the addition of five studies in NSP2, Scripting met criteria to be an Established Intervention.

Basic Facts



Number of articles reviewed:

NSP1 = **6** NSP2 = **5**

Effective ages: Children and adolescents 3–14 years

Skills increased:

- play (NSP2)
- communication and interpersonal (NSP1&2)

Detailed Description

Scripting consists of providing the child/adolescent with language to successfully complete an activity or interaction.

- Ensure prerequisite skills are mastered. For example, the child should have necessary reading skills or be able to imitate a verbal model.
- Scripting is typically used in conjunction with behavioral interventions such as reinforcement, modeling, and prompting.
- Scripts can be useful in a variety of social situations in the school, home, and community setting.
- Scripts should be faded as soon as possible to increase independence and spontaneity.

Example

Liam is an 8-year-old boy who often enjoys going to sporting events and restaurants. Liam's parents and behavior therapist decide to target independent ordering of food or snacks (i.e., at concession stands). His behavior therapist develops a brief script detailing the language necessary to order his preferred snacks at a concession stand. Liam's family is often at baseball games to watch his older brother play. Liam's therapist and parents model how to order and provide Liam with an opportunity to practice his script.

With his script ready to go, Liam proceeds to make his first order of nachos at the concession stand. He required gestural prompts during the first few interactions. With repeated opportunities, Liam became proficient at ordering preferred snacks. A fading plan was initiated to promote independence. At the conclusion of the baseball season, Liam was able to order four of his preferred snacks independently.

Recommended Readings

Griffin, S., Harris, R., & Hogdon, L. (2013). *Teach me with pictures: 40 fun picture scripts to develop play and communication skills in children on the autism spectrum*. London, UK: Jessica Kingsley Publishers.

McClannahan, L. E. & Krantz, P. J. (2005). *Teaching conversation to children with autism: Scripts and script fading (topics in autism)*. Bethesda, MD: Woodbine House, Inc.

Online Resources

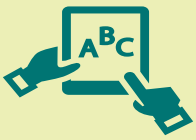
Lovaas Institute Blog
www.lovaas.com/blog/archives/10-Dynamic-and-Creative-Ways-to-Teach-Pretend-Play-Skills-to-Children-with-Autism

Self-management

Established Intervention

Independence is greatly valued in our society because it increases the likelihood of success in any situation and setting. Self-management strategies have been widely used to promote independence with tasks in which adult supervision is not needed, accepted, or expected. The process can involve teaching individuals with autism spectrum disorder (ASD) to evaluate and record their performance while completing an activity. Self-management is also used to help these individuals monitor social behaviors and disruptive behaviors. Finally, these strategies involve teaching individuals to gain access to preferred items/activities for a job well done.

Basic Facts



Number of articles reviewed:

NSP1 = **21** NSP2 = **10**

Effective ages: Adolescents 15-21 years

Skills increased:

- academic, interpersonal, and self-regulation (NSP1)
- communication (NSP2)

Behaviors decreased:

- restrictive, repetitive, nonfunctional patterns of behavior, interests, or activity (NSP2)

Detailed Description

Self-management strategies focus on teaching individuals to be aware of and regulate their own behavior so they will require little or no assistance from adults. Because self-management is a relatively complex skill set, it is important to determine that appropriate prerequisite skills are in place.

Before starting a self-management intervention, make certain your child can perform each component of the task. Initially, you may need to use other strategies like live or video modeling to teach the basic skills.

We all "work" for reinforcers—like a paycheck from your boss and a smile from your child! Before you begin, make sure you have identified reinforcers that will be meaningful for your child.

After completing a step in the activity, your child should evaluate his own efforts to determine if he performed the step correctly.

The evaluation process should consist of:

- Clear criteria so the individual knows when he has succeeded and when he has fallen short of the mark

{cont.}

Detailed Description *{cont.}*

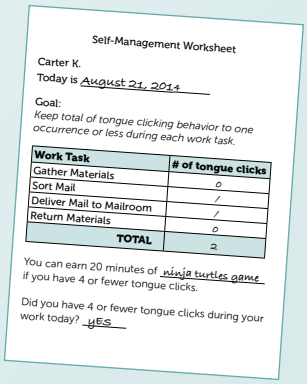
- A systematic method for evaluating performance (e.g., checklists, wrist counters, or Velcro smiley faces that move from the incomplete column to the completed column of a task list)
- Adults who can provide neutral feedback about the accuracy of the recording. Prompts may be necessary so your child can learn to correctly self-record his behavior.
- Adults who can teach your child to seek access to reinforcers when he has met the pre-established criteria
- Initially focusing on rewarding accuracy in recording and not accuracies in performance
- A plan to systematically fade or reduce the number of cues given by adults during self-management

Benefits of self-management include:

- Building awareness of your behavior
- Accountability for carrying out a task
- Direct and immediate feedback when recording your own data
- Multi-tasking (i.e., managing your own behavior and recording it)
- Decreasing social stigma that occurs when an adult's assistance with simple and personal tasks is required

Example

Carter is a 16-year-old student who loves working at a local business as part of his vocational training program. He has made great progress in many of his IEP goals and objectives. However, he continues to engage in self-stimulatory behavior that is described as "tongue clicking." Carter's tongue clicking can be a distraction to others as it can be loud and frequent.



Self-Management Worksheet

Carter K.

Today is August 21, 2014

Goal:

Keep total of tongue clicking behavior to one occurrence or less during each work task.

Work Task	# of tongue clicks
Gather Materials	0
Sort Mail	/
Deliver Mail to Mailroom	/
Return Materials	0
TOTAL	2

You can earn 20 minutes of ninja turtles game if you have 4 or fewer tongue clicks.

Did you have 4 or fewer tongue clicks during your work today? YES

Carter's vocational trainer and behavior specialist conducted an assessment of the tongue clicking behavior and determined that it is automatically reinforced. Carter is aware of the behavior and will stop engaging in tongue clicking when asked. The vocational trainer and behavior specialist decided to make use of a simple self-management protocol to decrease the frequency of tongue clicking during Carter's work at a local business. The vocational trainer worked with Carter to teach accurate self-monitoring. Carter is now able to independently monitor his tongue clicking behavior while working.

Recommended Readings

Baker, Bruce & Brightman, Alan J. (2004). *Steps to independence: Teaching everyday skills*. Baltimore: Brookes Publishing.

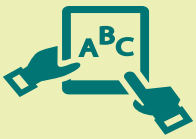
Koegel, L. K., Koegel, R. L., & Parks, D. R. (1992). *How to teach self-management to people with severe disabilities: A training manual*. Santa Barbara, CA: University of California.

Social Skills Package

Established Intervention

Social skills refer to a wide range of abilities including providing appropriate eye contact, using gestures, reciprocating information, initiating or ending an interaction. The challenges individuals with autism spectrum disorder (ASD) face regarding social skills vary greatly. The general goal of any Social Skills Package intervention is to provide individuals with ASD the skills necessary to meaningfully participate in the social environments of their homes, schools, and communities.

Basic Facts



Number of articles reviewed:

NSP1 = **14** NSP2 = **21**

Effective ages: Adolescents 13-18 years

Skills increased:

- communication, learning readiness, placement, and play (NSP2)
- interpersonal (NSP1&2)

Behaviors decreased:

- general symptoms (NSP2)
- problem behaviors (NSP2)
- restricted, repetitive, nonfunctional patterns of behavior, interests, or activity (NSP2)
- sensory or emotional regulation (NSP2)

Detailed Description

Social Skills Package interventions can take many forms. Often, intervention packages include use of reinforcement, prompting, and modeling. A Social Skills Package intervention may occur in a one-to-one setting, in a peer dyad, or in a small group. Targets may include behaviors such as:

- Recognizing facial expressions
- Turn-taking in conversations
- Initiating an interaction and joint attention
- Problem solving

Example

Dexter was a 9-year-old attending third grade at a public elementary school. Dexter seemed to enjoy being around peers. He would follow certain peers in the classroom and on the playground and laugh at some of the silly interactions of his peers.

Dexter spent time in the typical third grade classroom, but was provided time with his behavior specialist, speech therapist, and occupational therapist. During the most recent IEP meeting, the team decided to increase time spent targeting social skills goals. Objectives included teaching Dexter how to ask a peer to play or to request joining in a group already at play.

A baseline measure over one week indicated that Dexter never asked a peer to play and did not ask to join a group of peers at play. School professionals decided to develop a Social Skills Package for Dexter that would include one-to-one work with school staff in which Dexter practiced various ways to ask a peer to play. The plan was to target play requests in a peer dyad in a structured setting, then free time in the classroom, and recess. Modeling and prompting were also used and systematically faded as Dexter demonstrated independence in his ability to ask a peer to play.

After several weeks targeting Dexter's ability to request to play, he began to independently make requests of peers in his classroom setting. The Social Skills Package developed by Dexter's IEP team members included a systematic progression toward relatively more complex social behaviors in the school environment. Dexter's parents indicated interest in replicating the success in the home setting by hosting play dates for Dexter and a classmate.

Recommended Readings

McKinnon, K. & Krempa J. L. (2002). *Social skills solutions: A hands-on manual for teaching social skills to children with autism*. New York: DRL Books, Inc.

McGinnis, E. (2011). *Skillstreaming in early childhood: A guide for teaching prosocial skills* (3rd ed.). Champaign, IL: Research Press Co.

McGinnis, E. (2011). *Skillstreaming the elementary school child: A guide for teaching prosocial skills* (3rd ed.). Champaign, IL: Research Press Co.

McGinnis, E. (2011). *Skillstreaming the adolescent: A guide for teaching prosocial skills* (3rd ed.). Champaign, IL: Research Press Co.

Story-based Interventions

Established Intervention

Story-based interventions identify a target behavior and involve a written description of the situations under which specific behaviors are expected to occur. Most stories aim to increase perspective-taking skills and are written from an "I" or "some people" perspective. The most well-known story-based intervention is Social Stories™.

Basic Facts

Number of articles reviewed:

NSP1 = **21** NSP2 = **15**

Effective ages: Children and adolescents 3-14 years

Skills increased:

- communication and learning readiness (NSP2)
- interpersonal and self-regulation (NSP1&2)

Behaviors decreased:

- problem behaviors (NSP2)

Detailed Description

Story-based interventions are a simple way to teach individuals with autism spectrum disorder (ASD) to manage challenging situations in a wide variety of settings. When using a story-based intervention, use written descriptions for:

- The target behavior
- The situations in which the behavior should occur
- The likely outcome of performing the behavior. This often includes a description of another person's perspective. Although the information included in the story will vary based on your child's cognitive and developmental level, some typical features include:
  - › Information about the "who/what/when/where/why" of the target behavior
  - › Being written from an "I" or "some people" perspective with the goal of increasing perspective-taking skills
  - › Discussion or comprehension questions to make certain the child understands the main points
  - › Pictures to enhance comprehension of the skills

Story-based interventions are often used with individuals who have acquired reading and comprehension skills, but may also be used with individuals with strong listening comprehension skills.

Example

Note: This example includes behavioral components in addition to the story-based intervention.

When Mr. Santiago tries to talk on the telephone at home, his son Alejandro has trouble waiting. Alejandro tries repeatedly to get his father's attention by climbing on him, bringing him activities, and eventually screaming and crying. Mr. Santiago wants to teach his son how to behave when someone is on the telephone.

Alejandro's father develops a story that is written from his son's perspective, and addresses the following questions:

- What is he supposed to do? The answer: select a highly preferred activity such as playing with his Army men or reading a book.
- When is he supposed to demonstrate this behavior? The answer: When his father is on the phone.
- What would likely happen if he correctly performed the behavior? The answer: He will probably be able to get extra attention when his father gets off the phone. The time has come for Mr. Santiago to practice the story with his son. Mr. Santiago reviews the story with Alejandro and asks him comprehension questions along the way to be sure he understands it (e.g., "What should you do when the phone rings?"). He role-plays the situation a couple of times with his son to be sure he understands the procedures. Alejandro's father then asks a friend to call so that he can have a brief (one minute) conversation on the phone. As soon as the phone rings, Mr. Santiago hands Alejandro the story and then picks up the phone. Alejandro begins looking at the book and then decides to pick one of the activities from it. Mr. Santiago quickly gets off the phone and praises Alejandro for playing with his Army men. He then plays with his son for the next five minutes. He knows this is only the beginning. Mr. Santiago will gradually increase the expectation that Alejandro behave appropriately while he is on the phone. He started with one minute, but he wants to work his way up to 10 minutes.

Recommended Readings

Gray, C. (2010). *The new social story book* (10th ed.). Arlington, TX: Future Horizons.

Emerging Interventions for Individuals Under Age 22

Emerging Interventions are those for which one or more studies suggest they may produce favorable outcomes. However, before we can be fully confident that the interventions are effective, additional high quality studies are needed that consistently show these interventions to be effective for individuals with ASD. Based on the available evidence, we are not yet in a position to rule out the possibility that Emerging Interventions are, in fact, not effective.

A large number of studies fall into the Emerging level of evidence. We believe scientists should find fertile ground for further research in these areas.

The following interventions have been identified as falling into the Emerging level of evidence:

- Augmentative and Alternative Communication Devices
- Developmental Relationship-based Treatment
- Exercise
- Exposure Package
- Functional Communication Training
- Imitation-based Intervention
- Initiation Training
- Language Training (Production & Understanding)
- Massage Therapy
- Multi-component Package
- Music Therapy
- Picture Exchange Communication System
- Reductive Package
- Sign Instruction
- Social Communication Intervention
- Structured Teaching
- Technology-based Intervention
- Theory of Mind Training

Unestablished Interventions for Individuals Under Age 22

Unestablished Interventions are those for which there is little or no evidence in the scientific literature that allows us to draw firm conclusions about their effectiveness with individuals with ASD. There is no reason to assume these interventions are effective. Further, there is no way to rule out the possibility these interventions are ineffective or harmful.

The following interventions have been identified as falling into the Unestablished level of evidence:

- Animal-assisted Therapy
- Auditory Integration Training
- Concept Mapping
- DIR/Floor Time
- Facilitated Communication
- Gluten-free/Casein-free diet
- Movement-based Intervention
- SENSE Theatre Intervention
- Sensory Intervention Package
- Shock Therapy
- Social Behavioral Learning Strategy
- Social Cognition Intervention
- Social Thinking Intervention

There are likely many more interventions that fall into this category for which no research has been conducted or, if studies have been published, the accepted process for publishing scientific work was not followed. There are a growing number of interventions that have not yet been investigated scientifically. These would all be Unestablished Interventions. Further, any interventions for which studies were published exclusively in non-peer-reviewed journals would be Unestablished Interventions.

Research Findings for Adults (22+ Years)

Established Interventions for Adults

The only intervention to be identified as Established for individuals ages 22 years and older is Behavioral Interventions. The Behavioral Intervention category consists of applied behavior analytic interventions to increase adaptive behaviors and decrease challenging behaviors. Examples of specific strategies identified in the 17 articles supporting Behavioral Interventions are provided in the table on the following page.

Emerging Interventions for Adults

Emerging Interventions are those for which one or more studies suggest they may produce favorable outcomes. However, before we can be fully confident that the interventions are effective, additional high quality studies are needed that consistently show these interventions to be effective for individuals with ASD. Based on the available evidence, we are not yet in a position to rule out the possibility that Emerging Interventions are, in fact, not effective.

The following intervention has been identified as falling into the Emerging level of evidence:

- Vocational Training Package

Unestablished Interventions for Adults

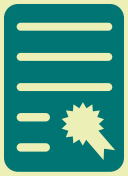
Unestablished Interventions are those for which there is little or no evidence in the scientific literature that allows us to draw firm conclusions about their effectiveness with individuals with ASD. There is no reason to assume these interventions are effective. Further, there is no way to rule out the possibility these interventions are ineffective or harmful.

The following interventions have been identified as falling into the Unestablished level of evidence:

- Cognitive Behavioral Intervention Package
- Modeling
- Music Therapy
- Sensory Integration Package

Behavioral Interventions

Established Intervention & Detailed Description



The Behavioral Intervention category is comprised of interventions typically described as antecedent interventions and consequent interventions. Antecedent interventions involve the modification of situational events that typically precede the occurrence of a target behavior. These alterations are made to increase the likelihood of success or reduce the likelihood of problems occurring. Consequent interventions involve making changes to the environment following the occurrence of a targeted behavior. Many of the consequent interventions are designed to reduce problem behavior and teach functional alternative behaviors or skills through the application of basic principles of behavior change.

Basic Facts

Number of articles reviewed:

NSP2 = **17**

Effective ages: Adults 22+ years

Skills increased:

- communication
- personal responsibility
- self-regulation

Behaviors decreased:

- problem behaviors

Example

Examples of Behavioral Interventions consisting of one identified component:

- Prompting
- Extinction (sensory and escape)
- Differential Reinforcement of Incompatible Behavior (DRI)
- Choice
- Functional Communication Training

Examples of Behavioral Interventions consisting of two identified components:

- Prompting + Error Correction
- Prompting + Blocking
- Escape Extinction + Sensory Extinction
- Differential Reinforcement of Alternative Behavior (DRA) + Extinction
- DRI + Response Interruption

Example *{cont.}*

Examples of Behavioral Interventions consisting of three or more identified components:

- Prompting + Blocking + DRA
- DRI + Reprimand + Overcorrection
- Rapport Building + Choice Making + Embedding + Functional Communication Training

Recommended Readings

Danya International, Inc., Organization for Autism Research & Southwest Autism Research & Resource Center. (2006). *Life journey through autism: A guide for transition to adulthood*. Arlington, VA: Organization for Autism Research, Inc. Retrieved from http://www.researchautism.org/resources/reading/index.asp#Transition

Luiselli, J. K. (Ed.) (2011). *Teaching and behavior support for children and adults with autism spectrum disorder: A practitioner's guide*. New York, NY: Oxford University Press.

Wehman, P. (2011). *Essentials of transition planning*. Baltimore, MD: Paul H. Brookes Publishing Co.

Wehman, P., Smith, M. D. & Schall, C. (2009). *Autism and the transition to adulthood*. Baltimore, MD: Paul H. Brookes Publishing Co.

4

Recommendations for Intervention Selection

Intervention selection is complicated. It should be made by a team of individuals who can consider the unique needs and history of the individual with autism spectrum disorder (ASD) along with the environments in which he or she lives.

Although we do not intend for this document to dictate which interventions can or cannot be used for individuals with ASD, we have been asked by families, educators, and service providers to recommend how our results might be helpful to them in their decision making. In an effort to meet this request, we provide suggestions regarding the interpretation of our outcomes. In all cases, we strongly encourage decision-makers to select an evidence-based practice approach.

Research findings are not the sole factor that should be considered when interventions are selected. The suggestions we make here refer only to the "research findings" component of evidence-based practice and should be only one factor considered when selecting interventions.

Recommendations based on research findings:

- Established Interventions have sufficient evidence of effectiveness. We recommend the decision-making team give serious consideration to these interventions because {a} these interventions have produced beneficial effects for individuals involved in the research studies published in the scientific literature, {b} access to interventions that work can be expected to produce more positive long-term outcomes, and {c} there is no evidence of harmful effects. However, it should not be assumed that these interventions will universally produce favorable outcomes for all individuals with ASD.
- Given the limited research support for Emerging Interventions, we generally do not recommend beginning with these interventions. However, Emerging Interventions should be considered promising and warrant serious consideration if Established Interventions are deemed inappropriate by the decision-making team, or were unsuccessul in producing positive outcomes.

- Unestablished Interventions either have no research support or the research that has been conducted does not allow us to draw firm conclusions about intervention effectiveness for individuals with ASD. When this is the case, decision-makers simply do not know if this intervention is effective, ineffective, or harmful because researchers have not conducted any or enough high-quality research. Given how little is known about these interventions, we would recommend considering these interventions only after additional research has been conducted and this research reveals favorable outcomes for individuals with ASD.

When selecting interventions, the recommendations listed above should be considered along with other sources of critical information within the framework of evidence-based practice. Among these are client variables such as family situation, community, cultural and ethnic background, etc.

5

Evidence-based Practice

The National Autism Center has adopted the definition of evidence-based practice offered by Dr. David Sackett and his colleagues in *Evidence-based medicine: How to practice and teach EBM* (Sackett, D. L., Straus, S. E., Richardson, W. S., Rosenberg, W., & Haynes, R. B., 2000). In that publication, the authors define evidence-based practice as "the integration of the best research evidence, professional judgment, and values and preferences of clients."

One of the primary objectives of our *Findings and Conclusions: National Standards Project, Phase 2* is to identify one component of evidence-based practice, "best research evidence." This is what we term "evidence-based intervention."

We are not alone in this activity. There are a number of agencies and research groups involved in systematic reviews of the ASD intervention literature.

The following three research groups have completed systematic reviews in recent years:

- **The National Professional Development Center on Autism Spectrum Disorder (NPDC)**

  Website: http://autismpdc.fpg.unc.edu/evidence-based-practices

  Odom, S. L., Collet-Klingenberg, L., Rogers, S. J., & Hatton, D. D. (2010). Evidence-based practices in interventions for children and youth with autism spectrum disorders. *Preventing School Failure, 54*(4), 275-282.

- **Centers for Medicare and Medicaid Services (CMS)**

  Website: http://www.impaqint.com/work/project-reports/autism-spectrum-disorders-services-asds-final-report-environmental-scan

  Young, J., Corea, C., Kimani, J., & Mandell, D. (2010). *Autism spectrum disorders (ASDs) services: Final report on environmental scan* (pp. 1-59). Columbia, MD: IMPAQ International.

Agency for Healthcare Research and Quality (AHRQ)

Website: http://www.effectivehealthcare.ahrq.gov/ehc/products/544/1974/autism-update-140923.pdf

Warren, Z., Veenstra-VanderWeele, J., Stone, W., Bruzek, J. L., Nahmias, A. S., Foss-Feig, J. H.,...McPheeters, M. (2011). *Therapies for children with autism spectrum disorders.* Comparative effectiveness review, Number 26. AHRQ publication No. 11-EHC029-EF. Rockville, MD: Agency for Healthcare Research and Quality.

When evaluating the results of systematic reviews, it is important to remember that there are similarities and differences in methodologies, resulting in similarities and differences in findings. For example, the AHRQ did not review studies with fewer than 10 participants. The vast majority of single-subject design studies evaluating interventions for individuals with ASD include fewer than 10 participants. Excluding these studies from systematic reviews results in an exclusion of much of the outcome literature for individuals with ASD.

Single-subject research accounted for 73 percent of the studies reviewed in the National Standards Project, Phase 2 (NSP2). If a research group excludes a large quantity of available published research, the results and recommendations may differ from the NSP2. **The combined results of NSP1 and NSP2 include data from more than 1,000 studies. This is the largest review of its kind for individuals with ASD.**

Why is it important to have so many systematic reviews? In any scientific field, it is important to replicate results across different research groups in different environments (e.g., university settings, clinics, community settings). The same holds true for outcome studies for individuals with ASD. It's great to have a well-designed study indicating that an intervention is effective in changing behavior of study participants with ASD. However, if no other researcher can replicate the intervention resulting in similar behavior change, then the research community and practitioners cannot be confident that the intervention is effective for individuals with ASD.

One common finding among the systematic reviews listed above is that interventions based on the principles of applied behavior analysis, or ABA, have a track record of effectiveness when incorporated in well-designed programs for individuals with ASD. A well-designed program requires professionals to implement the framework of evidence-based practice.

Incorporating Key Elements in Evidence-based Practice

In order for a practitioner to engage in evidence-based practice for individuals with ASD, he/she must incorporate the following elements to develop a well-rounded, individualized intervention.

Research Findings

Begin with interventions identified as "Established" in the NSP2. Serious consideration should be given to Established Interventions because there is sufficient evidence that {a} the interventions produced beneficial effects and {b} they are not associated with unfavorable outcomes (i.e., there is no evidence that they are ineffective or harmful) for individuals with ASD. Despite the fact there is compelling evidence to suggest these interventions generally produce beneficial effects for individuals with ASD, there are reasons alternative interventions (e.g., Emerging Interventions) might be considered. Several of these factors are listed below.

Professional Judgment

The judgment of the professionals with expertise in ASD must be taken into consideration. Once interventions are selected, these professionals have the responsibility to collect data to determine if an intervention is effective.

Professional judgment may play a particularly important role in decision making when:

- An intervention has been correctly implemented in the past and was not effective or had harmful side effects. Even Established Interventions are not expected to produce favorable outcomes for all individuals with ASD.
- The intervention is contraindicated based on other information (e.g., the use of physical prompts for a child displaying self-injury when touched).
- A great deal of research support might be available beyond the ASD literature and should be considered when required. For example, an individual with ASD may present with behaviors associated with a co-morbid anxiety disorder. It may be that various Established Interventions have not had the desired impact and the individual's quality of life is decreased because of continued anxiety. The practitioner working with the individual with ASD may also have expertise in anxiety disorders. There is, in fact, an entire literature

devoted to evidence-based interventions for individuals with anxiety disorders and no ASD. A well-qualified practitioner with expertise in anxiety disorders and ASD may suggest use of an intervention identified as evidence-based in the anxiety literature. Careful consideration should be given to such evidence-based interventions outside the field of ASD when an individual does not respond as expected to Established Interventions.

- The professional may be aware of well-controlled studies that support the effectiveness of an intervention that were not available when the National Standards Project completed its literature search.

Values and Preferences

Consider the values and preferences of parents, care providers, and the individual with ASD. Stakeholder values and preferences play a particularly important role in decision making when:

- An intervention has been correctly implemented in the past and was not effective or had undesirable side effects.
- An intervention is contrary to the values of family members.
- The individual with ASD indicates that he or she does not want a specific intervention.

Capacity

There is substantial evidence to support the use of Established Interventions with individuals with ASD. However, not all individuals with ASD have access to Established Interventions. In the age of budget cuts, limited resources, and some regions with few ASD professionals, it is the capacity to implement interventions that becomes the barrier to evidence-based practice.

Capacity refers to the ability of parents, care providers, educators, and practitioners to correctly implement an intervention for an individual with ASD. Without the capacity to implement an intervention with integrity, even a well-designed intervention program is useless.

There are several levels of capacity to consider when planning to implement an intervention for an individual, or group of individuals, with ASD. For example, there is capacity at the family level. Do the parents have capacity to implement an intervention in the family home? There may be issues of time, money, and stress to resolve before the family develops the capacity to implement an intervention.

It is also important to assess the capacity to implement intervention programs at the school district, individual school, and classroom level. Within a school system, it is critical to have qualified staff to supervise, train, and implement evidence-based interventions.

Additional consideration must be given to allocation of financial resources, classroom space, and materials. There is a body of literature devoted to capacity-building in school settings, non-profit organizations, and medical settings (e.g., Connolly & York, 2002; Hoyle, Samek, & Valois, 2008; Fixen, Naoom, Blasé, Friedman, & Wallace, 2005; Wing, 2004).

Finally, practitioners must examine their capacity to implement interventions with integrity. In many areas in the United States and around the world, there is a shortage of qualified professionals with expertise in ASD. A practitioner in a rural area in the U.S. can become easily overwhelmed. In situations such as these, it is important for the practitioner to address his/her availability to provide adequate training and supervision of an ASD intervention program. Keep in mind that technical support comes in different forms (i.e., families in rural areas Skyping with experts) and can be part of building capacity and supporting practitioners and/or families.

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Limitations and Future Directions

We conclude with a brief discussion of limitations of Phase 2 of the National Standards Project (NSP2), along with considerations for future initiatives and areas of focus for the National Autism Center and the research community.

Limitations

The NSP2 evaluative process was designed by highly regarded researchers in the field of autism spectrum disorder (ASD). The Scientific Merit Rating Scale (SMRS) ratings are based on information widely held as important components of quality science. Even so, and like other projects of this nature, there are limitations to the NSP2. Readers should be familiar with these limitations in order to use this document most effectively.

We have identified the following limitations:

- This review evaluates peer-reviewed research published through January 2012. It is likely that there are published studies since 2012 that would provide additional support to some intervention categories. Professionals are encouraged to remain abreast of the behavioral and educational intervention literature when making decisions regarding individualized intervention development.
- We only included studies that have been published in peer-reviewed journals. It is likely that some researchers conducted studies that provided different or additional data that have not been published. This could influence the reported quality, quantity, or consistency of research findings. One of the goals of the NSP2 was to complete a review using the NSP1 framework and expand it to encompass research across the lifespan. Now that the NSP1 framework has been used to evaluate literature across all ages, consideration should be given to other credible sources of data (e.g., unpublished findings).

- There are studies relying on single-case or group design methods that were not included in this review because they fell outside the commonly agreed-upon criteria for evaluating the effectiveness of study outcomes. The experts involved in the initial development of the NSP made the decision to include only those methodologies that are generally agreed-upon by scientists as sufficient for answering the question, "Is this intervention effective?"
- The NSP2 coding manual was revised to provide more detail regarding coding procedures (e.g., screen shots of the SMRS were added). A brief training video describing coding procedures was also developed to increase the likelihood of accurate coding. However, due to time constraints, not all article coders completed the video training. Upon review of the inter-observer agreement (IOA) from all article coders, there was no difference between coders who watched the training video and coders who did not watch the training video.

Future Directions for the National Autism Center

There are a number of exciting directions to consider for future initiatives and publications related to the National Standards Project. These include:

1. Consideration of feedback regarding intervention categorization
2. An evaluation of interventions for "high-risk siblings"
3. Further evaluation of such topics as functioning level of participants, intensity of intervention, and social validity
4. Consideration of studies not published in peer-reviewed journals, as well as qualitative studies
5. Inclusion of studies published exclusively in non-English journals
6. An evaluation of cultural diversity and its impact on evidence-based practice in the lives of individuals with ASD

Future Directions for the Research Community

There are many areas of intervention research requiring additional investigation. For example, interventions listed as Emerging, such as Technology-based Intervention, require additional research. There were only seven articles evaluating Technology-based Interventions that met criteria for inclusion in NSP2.

The proliferation of software and various smartphone applications intended for individuals with autism warrants critical evaluation from the research community. Music therapy is often sought by parents and provided by numerous agencies and school districts for children with ASD. Seven music therapy articles were reviewed in the NSP2. Again, if parents and professionals are allocating resources to Emerging Interventions such as music therapy, additional controlled evaluations are necessary to determine intervention effectiveness.

Although we did not specifically report on statistics such as racial and ethnic backgrounds of study participants, data were collected on this variable. Unfortunately, many studies did not report the race or ethnicity of participants, particularly the studies utilizing single-case design. The disparity between minority and majority populations in accessing diagnostic services and intervention services is well documented in the ASD literature. It is imperative that variables (e.g., religious beliefs, family structure, language barriers, etc.) impacting intervention effectiveness in culturally diverse families be evaluated to determine appropriate modifications.

The focus of the NSP2 was to utilize the NSP1 framework to evaluate intervention research across the lifespan for participants with a confirmed diagnosis of ASD. As a result, the NSP2 did not include an evaluation of interventions developed for "high-risk siblings." In the scientific community, there is much interest in intervening early with siblings who are considered at high risk for developing ASD. An evaluation of these studies would likely contribute to a better understanding of interventions that have a positive impact on high-risk siblings.

Finally, the paucity of research evaluating effective interventions for adults with ASD is striking. So many adults with ASD are without appropriate services, impacting their ability to participate in the community and their quality of life. Only 27 articles with adults as

participants met criteria for inclusion in NSP2. Critical evaluation of vocational training programs, social skills programs, and sexuality education programs is desperately needed to make appropriate individualized intervention recommendations. As the ASD population ages, elder care and managing health-related issues will become priorities for many caregivers. Research must guide the intervention recommendations for the elderly with ASD.

Concluding Thoughts

This iteration of the National Standards Project is meant to serve as a resource for parents, professionals, and anyone interested in learning more about effective interventions for individuals with ASD. The dissemination of Phase 1 of the NSP in 2009 raised questions and identified gaps in knowledge that we have worked hard to address since its publication. The National Autism Center is committed to continuing to explore relevant questions related to effective interventions and evidence-based practice.

There is no single intervention that is effective for everyone with ASD. We wish it were that easy. However, we truly believe this work to be a valuable tool for informing decisions regarding individualized intervention development.

As always, we encourage readers to take the time to provide feedback regarding this document. We greatly value your feedback.

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