

An Overview of the National Standards Report and the National Standards Project—Phase 2

Diana Askings McCarty, B.S.
Summer 2016

Superheroes social skills training, Rethink Autism internet intervention, parent training, evidence-based practices classroom training, functional behavior assessment: An autism spectrum disorder, evidence-based practices training track for school psychologists

US Office of Education Personnel Preparation Grant:

H325K12306

Principal Investigators:

William R. Jenson, Ph.D.

Elaine Clark, Ph.D.

Grant Director:

Julia Hood, Ph.D.

University of Utah
Department of Educational Psychology
School Psychology Program

An Overview of the National Standards Report and the National Standards Project—Phase 2

The original National Standards Report (NSR) was released in 2009 by the National Autism Center (NAC) as a comprehensive review of the effectiveness of various interventions available for individuals with autism spectrum disorder (ASD) (NAC, 2009). A panel of nationally recognized scholars, researchers, and other leaders that have demonstrated expertise in the field of ASD, were selected to identify studies associated with outlined interventions for further evaluation. First, the expert panel identified relevant study variables, such as the intervention goal and age of participants. Next, the panel evaluated the methodological rigor of each study, as well as the outcomes of the intervention, using the Scientific Merit Rating Scale (SMRS) and the Intervention Effects Rating Scale (IERS), respectively (NAC, 2009; NAC, 2015). Lastly, the quantity, quality, and consistency of research findings for relevant interventions were analyzed to determine if sufficient evidence existed to suggest favorable outcomes for individuals with ASD.

It is important to note that the NSR (NAC, 2009) used the term “treatment” to describe each intervention strategy (i.e., therapeutic techniques that may be used in isolation) and/or intervention class (i.e., a combination of different intervention strategies that hold core characteristics in common). To provide clarification to readers, the expert panel adopted the term “intervention” to replace “treatment” or “strategy” for the National Standards Project (NSP)-phase 2 (NAC, 2015). In contrast to a “treatment,” which typically infers a cure, an “intervention” is commonly described in the behavioral and educational literature as a systematic change within the environment to modify an individual’s behavior. Interventions may consist of an isolated component or a “package” of components. In this monograph, the term “treatment” is used when describing the results of the NSR (NAC, 2009) and the term “intervention” is used when describing the NSP-phase 2 (NAC, 2015) updates.

Autism Spectrum Disorder (ASD) Intervention Considerations

ASD is a neurodevelopmental disorder characterized by deficits in social communication and restricted, repetitive patterns of behavior. According to the Center for Disease Control and Prevention (CDC; 2014), ASD occurs in approximately 1 in every 68 births in the United States. It can be difficult for caregivers to select an intervention that is most appropriate for their loved one with ASD, as there are many different interventions and packaged programs available that promise positive results and claim remarkable outcomes. The number of published research studies is also growing daily, making it difficult for many to stay up-to-date with research findings. Moreover, due to the volume of available information and the varying degrees of empirical support, the research on ASD interventions is often confusing at best for consumers.

Interventions can also be expensive and time consuming. The societal costs for each individual with ASD across the lifespan is estimated at \$3.2 million (Ganz, 2007). Families may also utilize multiple interventions at once (many of which are not covered by insurance), resulting in even greater financial stressors. According to Jarbrink and Knapp (2001), using effective interventions for ASD can reduce the lifetime cost by 65%. This finding ultimately highlights the need for accessible information regarding evidenced-based interventions for those with ASD.

The National Autism Center (NAC)

The NAC is an initiative of the May Institute's Center for the Promotion of Evidence-Based Practice that aims to provide resources to families and individuals with ASD. The May Institute was founded in 1955 in Chatham, Massachusetts as a school for children with ASD (May Institute; n.d.) Since then, The May Institute has become a large non-profit organization with more than 140 locations in over 12 states, providing services to more than 6,000 individuals

and their families (May Institute; nd). The May Institute "...provides educational, rehabilitative, and behavioral healthcare services to individuals with [ASD] and other developmental disabilities, brain injury, mental illness, and behavioral health needs" (NAC, 2015, p. vi). The May Institute also conducts research to advance the field and provides training, consultation, and resources to service providers (NAC, 2015).

Specifically, the NAC is "...a nonprofit organization dedicated to disseminating evidence-based information about the treatment of ASD, promoting best practices, and offering comprehensive and reliable resources for families, practitioners, and communities" (NAC, 2015). The NAC was founded by the May Institute in 2005 to provide support to individuals with ASD and their families (NAC, 2015, p. 10). In particular, the NAC offers quality training to service providers and families and conducts research to promote evidence-based practice (EBP) interventions. The NAC also advocates for individuals with ASD and their families by being involved in public policy (NAC, 2015).

The primary initiative of the NAC is to address the need for EBP guidelines for ASD. In order to address this need, the NAC launched the NSP in 2005. The NSP is a two part, multi-year research project that analyzed the available evidence of various interventions that target the core symptoms of ASD. The NSP is a comprehensive review of the literature, outlining the strength of evidence available to support various educational and behavioral interventions. The NSP includes specific information on the age, diagnosis, and specific skills and/or behaviors targeted with each intervention. The NSP also offers recommendations on intervention selection (according to EBP guidelines), and further identifies the limitations of the current body of research on ASD interventions to ultimately encourage future research and inform the public of the ever-evolving state of research.

Evidence-Based Practice (EBP)

According to Sackett and colleagues (2000), EBP is defined as "...the integration of the best research evidence, professional judgment, and values and preferences of clients." EBP has become the standard in various fields, including medicine, psychology, and education. Although various fields have differing EBP criteria, the NSP (NAC, 2009; NAC, 2015) recognizes the following four key elements of EBP in their comprehensive analysis of the literature: (1) professional judgment, (2) values and preferences, (3) capacity, and (4) research findings. All four elements of EBP should be considered when making intervention decisions in order to ensure best practice.

First, professional judgement encompasses the service provider's knowledge and areas of expertise, while simultaneously considering all of the unique aspects of the individual with ASD, in order to make data-based decisions and provide intervention. This includes their particular areas of needs, consideration of comorbid diagnoses, and evaluating new research and interventions that may be beneficial but not included in the most current update of the NSP. Next, values and preferences includes the opinions of all members of the service delivery team, including parents, care providers, and the individual with ASD. Third, capacity is the service provider's ability to implement the intervention correctly with all appropriate trainings. This includes having the resources and materials necessary to implement the intervention as well as assistance and feedback available from a trained professional. Lastly, the research findings on the intervention should be considered. It is important to prioritize established interventions with strong levels of supportive evidence based on comprehensive analyses of the current state of the literature. The NSP contributes significantly to EBP by clarifying and synthesizing the current literature.

Methodology

In an effort to be transparent, systematic, and unbiased in the categorization of study quality and classification of intervention effectiveness, the NSP expert panel created criteria to evaluate each study (NAC, 2009; NAC, 2015). The following scales were developed in order to clearly explain intervention classification and to provide an objective system of evaluation.

Scientific Merit Rating Scale (SMRS)

Research studies must meet certain standards in order to be published in reputable journals (e.g., peer review); however, journals may have different criteria to accept manuscripts, resulting in varying levels of experimental rigor across journals. The SMRS was developed for the NSP expert panel to allow for objective evaluation of the methodological strength of each reviewed study (NAC, 2009; NAC, 2015). The SMRS consists of five domains: (1) research design, (2) measurement of the dependent variable, (3) measurement of the independent variable, (4) participant ascertainment, (5) and generalization and maintenance effects.

First, the research design domain measures the amount of experimental control within the study. This domain examines the following: the type of the research design (i.e., group, single-subject, or alternating treatment designs); the number of participants, groups, and conditions within the study; and the level of participant attrition. The research design domain also measures whether random assignment is used and if there is any data loss within the study. Second, the measurement of the dependent variable domain describes the accuracy and reliability of the data collected as well as the validity of data collection procedures (i.e., blind/independent evaluators or informed personnel). The psychometric properties of the instruments used are also evaluated, as researchers should include the most direct and comprehensive sample of the target skill or behavior being measured. Furthermore, the protocol should be standardized and any direct

behavioral observations should be reliable with interobserver agreement of equal to, or greater than, 90% for a minimum of 25% of data collected in each condition. Third, the measurement of the independent variable domain measures the level of intervention fidelity (i.e., the implementation accuracy should be greater than 80%). The accuracy should be measured in 25% of total sessions and include interobserver agreement of at least 80%. Fourth, the participant ascertainment domain evaluates the method used to determine participant inclusion in the study. The diagnostic tools used to include or exclude participants should be well-established. Moreover, it is important to consider the classification and diagnostic systems that were utilized, such as the International Statistical Classification of Diseases and Related Health Problems – Tenth Revision (ICD-10) or the Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition (DSM-5). Preferably, diagnosticians and evaluators use the most current classification/diagnostic systems and they should be independent and blind to each intervention condition. Fifth and finally, generalization and maintenance effect(s) evaluates the level of intervention effects across settings, stimuli, and/or persons. Maintenance data should be included for a high score on this domain.

Each domain is rated on a scale from zero (poor quality) to five (strong quality), indicating level of scientific merit. Once each domain has a score, a composite score is then calculated using the following formula: Research Design (.30) + Dependent Variable (.25) + Participant Ascertainment (.20) + Procedural Integrity (.15) + Generalization (.10). This composite score is then rounded to the nearest whole number and categorized. A composite score of zero or one represents insufficient scientific rigor/evidence to suggest whether the intervention was or was not beneficial, ineffective, or harmful. A composite score of two represents initial evidence about intervention effects, but more rigorous research is needed. Lastly, a composite score of three, four, or five indicates sufficient scientific rigor. The NSP describes a study with

scientific merit as having variables “...so well-controlled that independent scholars can draw firm conclusions from the results” (NAC, 2015, p. 22). It is important to consider the level of experimental rigor of each measured domain as well as the degree of support for the intervention by evaluating the research findings.

Intervention Effects Rating Scale (IERS)

It is also important to understand research outcomes in order to compare the findings between studies. For instance, two studies on two different interventions may both find increases in the number of social initiations for students with ASD at recess. On the surface, it may appear that both interventions support their respective intervention and should be treated equally; however, the specific increase in social initiations may differ between studies. One group of students may have a statistically significant increase in social initiations per day, while the other group of students may have improved, but not by a statistically significant amount. In order to categorize the studies by outcomes, the NSP expert panel developed the IERS (NAC, 2009; NAC, 2015). The IERS classified each study as beneficial, ineffective, or unknown. In the NSR (NAC, 2009), an adverse category was also included that was meant to describe studies with sufficient evidence that the intervention was associated with harmful effects. Interestingly, the NSR (NAC, 2009) did not find any studies with adverse effects; therefore, this category was removed from phase two.

Each of the three categories of the IERS include specific, separate criteria for group, single-subject, and alternating intervention design studies that need to be met in order to determine intervention effectiveness. Beneficial intervention effects are reported for studies that have sufficient evidence to support favorable outcomes as a result of the intervention. To be classified as beneficial: a group design study must report statistically significant results; a single-

subject design study must report a functional relationship replicated a minimum of two times; and an alternating intervention design study must find moderate to strong separation between a minimum of two data series for most participants with minimal carryover effects and a minimum of five data points per condition. Ineffective intervention effects are reported for studies that do not have sufficient evidence to support favorable outcomes as a result of the intervention. To be classified as ineffective, a group design study must not report statistically significant effects. An ineffective single-subject design study does not establish a functional relationship, with the results not replicated with similar outcomes on a minimum of two times with at least two participants, five data points in baseline and intervention conditions, and a fair point of comparison. For alternating treatment design studies, ineffective intervention effects are reported if no separation between phases is reported for most participants with stable baseline data. Lastly, unknown intervention effects indicate that there is not enough information to confidently determine the intervention effects. For all research designs, the data does not allow for firm cause-effect conclusions to be drawn regarding the effectiveness of the intervention.

Strength of Evidence Classification System (SECS)

Once the SMRS and the IERS scores are obtained for each study, both of these results were combined in order to determine the overall strength of each intervention using the Strength of Evidence Classification System (SECS) (NAC, 2009; NAC, 2015). The SECS describes the overall effectiveness of the intervention in regard to study quality, quantity, and consistency. Three classifications are used to describe each intervention: unestablished, emerging, and established. In the NSR (NAC, 2009), there was a fourth category, “ineffective/harmful”, included in their classification system; however, no studies included in the review fell into this category. This may be due to researchers not publishing studies with ineffective/harmful results

or it may be because of ethical reasons, as it is important to stop an intervention once negative effects are recognized.

Interventions classified as unestablished have little to no evidence to support or draw firm conclusions about the intervention's level of effectiveness. Unestablished interventions may be based on research with testimonials, opinions, or speculation, resulting in SMRS scores of zero or one with "...ineffective, unknown, or adverse intervention effects reported based on poorly controlled studies" (NAC, 2015, p. 35). Emerging interventions have some support from the research; however, additional high quality studies with consistently favorable outcomes are required in order to draw firm conclusions on the intervention outcomes. These studies must have "...a minimum of two group design studies or two single-subject design studies with a minimum of six participants for which no more than 10% of studies reporting conflicting results." (NAC, 2015, p. 35). Emerging interventions have SMRS scores of two, with beneficial intervention effects indicated for one dependent variable or a specific target. Lastly, established interventions have sufficient evidence available from several published, peer reviewed articles, allowing for consumers to determine that the intervention produced favorable outcomes. These studies must have "...two group design or four single-subject design studies with a minimum of 12 participants for which there are no conflicting results or at least three group design or six single-subject design studies with a minimum of 18 participants with no more than 10% of studies reporting conflicting results" (NAC, 2015, p. 35). Established interventions include studies with SMRS scores of three, four, or five, with beneficial intervention effects noted for a specific target. In addition, both emerging and established interventions may be supplemented with studies that have lower scores on the SMRS; however, the minimum requirements described above should still be met.

Subclassification System

In addition to the SECS, the initial NSR (NAC, 2009) further classified each intervention into six age groups below 22 years old (i.e., 0-2, 3-5, 6-9, 10-14, 15-18, and 19-21), three diagnostic classifications (i.e., Autistic Disorder, Asperger's Syndrome, and Pervasive Developmental Disorders-Not Otherwise Specified [PDD-NOS]), specific skills increased, and behaviors decreased. In comparison, the NSP- phase 2 (NAC, 2015) classified interventions separately for individuals below 22 years old and individuals 22 years and older. The NSP-phase 2 also did not include diagnostic classifications due to the 2013 change in the DSM description of ASD as a continuum, rather than as separate categories. Similar to the NSR, the NSP-phase 2 included 15 intervention targets across skill and behavior categories. The potential skills increased are within the following areas: academic, communication, higher cognitive functions, interpersonal, learning readiness, motor skills, personal responsibility, placement, play, and self-regulation (NAC, 2015).

Specifically, academic skills include pre-academic and academic activities such as mathematics, fluency, reading, and writing. The NAC (2015) describes communication tasks as "...verbal or nonverbal signaling to a social partner regarding content to share experiences, emotions, or information" (p. 37). Higher cognitive functions include "...complex problem-solving skills outside the social domain" such as executive functioning and IQ (NAC, 2015, p. 37). The interpersonal domain includes tasks that require social interaction. The learning readiness skill includes precursor skills necessary to achieve academic success such as imitation, following instructions, attending, and sitting. The motor skills domain involves "...tasks that require coordination of muscle systems to produce a specific goal involving either fine motor or gross motor skills or visual-motor coordination" (NAC, 2015, p. 38). Personal responsibility

includes everyday routine tasks and daily living skills. The placement subclassification is not a skill, but more of an accomplishment of moving to a less restricted environment, such as a change in placement from a special education to a general education classroom. The play domain includes “...non-academic and non-work-related activities that do not involve self-stimulatory behavior or require interaction with other persons” (NAC, 2015, p. 38). The self-regulation subclassification involves managing one’s own behavior to meet a goal (e.g., self-management, self-monitoring, and time management skills).

The possible behaviors decreased include: general symptoms, problem behaviors, restricted/repetitive/nonfunctional patterns of behaviors/interests/activity (RRN), and sensory or emotional regulation (SER) (NAC, 2015). Specifically, general symptoms are the combination of symptoms associated directly with ASD. Problem behaviors vary between individuals, but typically involve harming themselves or others, damage to property, or interference of expected routines. The RRN subclassification includes “...limited, frequently repeated, maladaptive, patterns of motor, speech, and thoughts” (NAC, 2015, p. 39). Lastly, the SER domain is the individual’s ability to modify their level of arousal or response in order to function in their environment. SER behaviors include anxiety, depression, and sleep problems.

The National Standards Report (NSR)

Overview

In this first report, research published between 1957 and September of 2007 were included with 7,038 abstracts initially identified (NAC, 2009). Once the exclusion criteria were applied to the initial articles (i.e., studies unrelated to ASD, studies unrelated to the treatment of ASD, and studies that did not include empirical data were excluded from the review), 775 studies remained. These studies were then categorized by the NSP expert panel into 38 treatment

categories with an interobserver agreement of .92. In order to minimize the overlap between categories, 71 treatments were initially identified but the panel combined treatments into 38 categories (NAC, 2009).

The NSR (NAC, 2009) only included published studies in peer-reviewed journals. All participants were required to be diagnosed with ASD (i.e., autistic disorder, Asperger's syndrome, or PDD-NOS) and treatments were implemented in a variety of settings (i.e., school systems, home, hospital, and community settings). The report excluded studies that did not include empirically-derived information and those that were not published in English. The NAC (2009) only included educational or behavioral treatments that targeted the core characteristics of ASD and excluded any study with the primary purpose of identifying mediation or moderating variables. The panel excluded research on individuals over the age of 22 as well as individuals with Rhett's disorder, childhood disintegrative disorder, those "at-risk" for ASD, and/or those who had uncommon comorbid conditions. Common comorbid conditions included intellectual disability, language impairments, depression, anxiety, obsessive-compulsive disorder, or attention deficit/hyperactivity disorder (NAC, 2009).

Results

Eleven treatments were classified as "established" for individuals with ASD in the NSR (NAC, 2009). The following lists all established treatments in the NSR (NAC, 2009) with the number of supportive studies represented in parenthesis: antecedent package (99), behavioral package (231), comprehensive behavioral treatment for young children (22), joint attention intervention (6), modeling (50), naturalistic teaching strategies (32), peer training package (33), pivotal response treatment® (14), schedules (12), self-management (21), and story-based intervention package (21).

The NSR (NAC, 2009) identified 22 treatments as “emerging.” In other words, more high-quality research is required in order to support the treatment. The NSR (NAC, 2009) described the following emerging treatments: augmentative and alternative communication device (14), cognitive behavioral intervention package (3), developmental relationship-based treatment (7), exercise (4), exposure package (4), imitation-based interaction (6), initiation training (7), language training—production (13), language training—production and understanding (7), massage/touch therapy (2), multi-component package (10), music therapy (6), peer-mediated instructional arrangement (11), picture exchange communication system (13), reductive package (33), scripting (6), sign instruction (11), social communication intervention (5), social skills package (16), structured teaching (4), technology-based treatment (19), and theory of mind training (4).

The NSR (NAC, 2009) found that five treatments had little to no evidence to draw firm conclusions about their effectiveness. These five unestablished treatments were: academic interventions (10), auditory integration training (3), facilitated communication (5), gluten- and casein-free diet (2), and sensory integrative package (7).

Limitations and Future Directions

Although the NSR (NAC, 2009) provided a much-needed service by informing individuals with ASD, their families, and their caregivers/interventionists of the current state of the literature, limitations still existed. For example, the NSR (NAC, 2009) did not include studies of individuals with ASD that were 22 years or older. There was also some concern about the defined treatment categories. Specifically, the NSP (NAC, 2015) received feedback regarding the expert panel’s decisions on combining certain treatments. Lastly, the NSR (NAC, 2009)

concluded their literature review in September of 2007. Since then, there have been many new studies published that deserve attention and have added to the intervention literature.

The National Standards Project (NSP)-Phase 2

Overview

To address some of the limitations of the original report and to provide updated information on intervention effectiveness, phase two of the NSP was released on April 2, 2015, World Autism Awareness Day (NAC, 2015). The NSP-phase 2 (NAC, 2015) reviewed studies between 2007 and February 2012. Phase two also included information on interventions for adults 22 years of age and older by additionally reviewing studies since 1987, yielding 27 identified articles. The expert panel also addressed some of the feedback received from parents and professionals since the release of the NSR (NAC, 2009) by revising a few intervention categories in the NSP-phase 2 (NAC, 2015; see Appendix A for a detailed graphical representation of the literature search process).

The inclusionary and exclusionary criteria for the second phase of the NSP (NAC, 2015) were similar to the criteria described in the NSR (NAC, 2009), with a few noted changes. Phase two included interventions implemented in vocational and clinical settings and, for individuals under the age of 22, excluded participants with “autistic characteristics” or “suspicion of ASD,” instead of individuals “at-risk” for ASD as defined by the NSR. In contrast, for individuals over 22 years old, the panel included studies with the following diagnostic descriptions: “autistic characteristics”, “suspicion of ASD”, or uncommon comorbid conditions. This is due to the limited number of studies that include adults with ASD.

In the NSP-phase 2 (NAC, 2015), the “established” interventions are presented in more detail than phase one, with the following information included for each intervention: a brief

description of the established intervention and its previous level of evidence (if applicable); basic facts on the intervention (i.e., number of articles reviewed in the NSR and NSP-phase 2, age range of participants, skills increased, and behaviors decreased); a detailed description of the intervention with information on how to implement the intervention and variations on the intervention; examples of the intervention; recommended readings; and online resources for further training (if available).

The NSP-phase 2 (NAC, 2015) had four primary goals: (1) to update the NSR by identifying peer-reviewed intervention outcomes for individuals with ASD in studies released since 2007; (2) review interventions for individuals across the lifespan by expanding the search criteria to include studies on individuals 22 years of age and older; (3) incorporate feedback received regarding NSR categorization; and (4) to help parents, caregivers, educators, and service providers understand how to integrate evidence-based interventions into a well-rounded, individualized educational/behavioral program.

Results

The NSP-phase 2 (NAC, 2015) outlines 14 interventions that were classified as “established” for individuals less than 22 years old with ASD. These interventions had sufficient evidence from high quality research studies to suggest that the intervention produces beneficial effects. The 14 interventions include: behavioral interventions (155), cognitive behavioral intervention package (10), comprehensive behavioral treatment for young children (20), language training—production (2), modeling (28), natural teaching strategies (3), parent training (11), peer training package (3), pivotal response treatment® (6), schedules (2), scripting (5), self-management (10), social skills package (21), and story-based intervention (15). The number in parenthesis indicates the number of articles, not studies, reviewed by the NSP panel that had high

SMRS scores and IERS scores in support of each intervention. Compared to the NSR (NAC, 2009), five interventions were added to this category (i.e., cognitive behavioral intervention package, language training—production, parent training, scripting, and social skills package), with the following four interventions moving from the “emerging” category to the “established” category: cognitive behavioral intervention package, language training—production, scripting, and the social skills package. The behavioral interventions category combines the previously established antecedent package, behavioral package, and joint attention interventions described in the NSR. Lastly, parent training is new to the NSP-phase 2 (NAC, 2015) to emphasize the role of caregivers in providing intervention that was not considered in the NSR (NAC, 2009).

Eighteen interventions were classified as “emerging” for individuals under 22 years old with ASD. These interventions had at least one study to suggest beneficial intervention effects. Still, additional, high-quality studies are needed to draw firm conclusions. The emerging interventions outlined in the NSP-phase 2 (NAC, 2015) include: augmentative and alternative communication devices, developmental relationship-based treatment, exercise, exposure package, functional communication training, imitation-based interaction, initiation training, language training—production and understanding, massage therapy, multi-component package, music therapy, picture exchange communication system, reductive package, sign instruction, social communication intervention, structured teaching, technology-based Intervention, and theory of mind training. There were 22 interventions included in the “emerging” category in the NSR (NAC, 2009); however, four interventions were moved to the “established” category, functional communication training was added to this category, and peer-mediated instructional arrangement was removed.

The NSP-phase 2 (NAC, 2015) classified thirteen interventions as “unestablished” for individuals less than 22 years old with ASD. These interventions have little to no evidence to draw firm conclusions about their effectiveness. The thirteen interventions are: animal-assisted therapy, auditory integration training, concept mapping, DIR/floor time, facilitated communication, gluten-free/casein-free diets, movement-based intervention, SENSE theatre intervention, sensory intervention package, shock therapy, social behavioral learning strategy, social cognition intervention, and social thinking intervention. The NSR (NAC, 2009) included only five interventions under the “unestablished” category, with nine added during the second phase (i.e., animal assisted therapy, concept mapping, DIR/floor time, movement-based intervention, SENSE theatre intervention, shock therapy, social behavioral learning strategy, social cognition intervention, and social thinking intervention) and one intervention removed (i.e., academic interventions).

Phase two of the NSP (NAC, 2015) also reviewed the literature for individuals over 22 years old with ASD. The earliest study included in the review was published in 1987; however, there has been limited, high-quality research conducted with adults, resulting in only five interventions evaluated in total. The only “established” intervention for individuals over 22 years old is behavioral interventions with 17 total supporting articles. There was also only one intervention classified as “emerging” for adults with ASD. The vocational training package was considered an emerging intervention, with further high-quality studies needed to draw firm conclusions on the effectiveness of this intervention. Lastly, there were four “unestablished” interventions for adults with ASD including: cognitive behavioral intervention package, modeling, music therapy, and the sensory integration package. More research is needed with this population in order to determine the effectiveness of other interventions, and to better serve adults with ASD.

Limitations and Future Directions

Phase two of the NSP (NAC, 2015) addressed some of the limitations from the NSR (NAC, 2009); however, there are still some notable areas that require further improvement. All of the articles assessed in the NSP were in English, limiting the overall amount of reviewable research. Including non-English studies is important for future literature reviews. The NSP also only included quantitative studies. Quantitative studies provide measurable outcomes, which may be easier to objectively review; however, many notable findings exist from qualitative studies as well. Future comprehensive reviews of the literature should consider the following: including intervention support for individuals “at-risk” for ASD (e.g., high-risk siblings) or with various comorbid conditions; evaluating the outcomes of interventions provided in “real world” and laboratory settings; the cost-effectiveness of the intervention; the level of intervention intensity necessary for positive outcomes; and detailed individual characteristics in the published research (e.g., race/ethnicity, gender, socioeconomic status, and level of functioning), in order to understand the impact of intervention on diverse populations. It is also important to consider potential mediating or moderating variables that may affect intervention outcomes, as well as other factors that may predict which individuals will likely respond positively to intervention. Furthermore, the level of social validity or intervention acceptability should be assessed.

Overall, there is still some disagreement regarding the intervention categorization and definitions. It is also important to note that phase two of the NSP (NAC, 2015) concluded their literature review in January of 2012. Due to the growing research base and the changing level of support for each intervention, it is important to continue to update the NSP and evaluate other systematic reviews of the literature.

Other Systematic Reviews

In order for research and reviews of research to be considered valid, it is important to conduct replications and find consistent results. There are seven recent, nationally-recognized, systematic reviews of interventions for individuals with ASD (NAC, 2015), including three by the following organizations: The Centers for Medicare and Medicaid Services (CMS; Young et al., 2010), the Agency for Healthcare Research and Quality (AHRQ; Warren et al., 2011), and the National Professional Development Center on Autism Spectrum Disorder (NPDC; Wong et al., 2014). It is important to note that each of these reviews have different procedures, criteria for study inclusion, intervention definitions, methods of determining intervention effectiveness, and classifications systems. For example, the AHRQ did not include many single-subject research studies and only included randomized controlled trials (NAC, 2015). This may greatly limit their research pool since 73% of the studies included in phase two of the NSP (NAC, 2015) were single-subject studies. In contrast, the NPDC review of Evidence-Based Practices for Children, Youth, and Young Adults with ASD had very similar findings compared to the NSP-phase 2 (Wong et al., 2014).

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

The NPDC review was funded by the US Department of Education as a collaboration between three universities (Wong et al., 2014): The University of North Carolina at Chapel Hill, the University of Wisconsin at Madison, and the MIND Institute, University of California-Davis. The goal of the NPDC review was to promote the use of EBPs for children and youth with ASD from birth to 22 years of age (Wong et al., 2014). This review examined the identification of focused intervention practices with a single skill or goal (e.g., discrete trial training, pivotal response treatment®, prompting, video modeling, etc.) instead of comprehensive intervention models with more broad learning outcomes (e.g., Early Start Denver Model, UCLA Young

Autism Program, etc.). The NPDC released their first review in 2010 which included studies published from 1997 to 2007 (Odom et al., 2010). This review classified 24 interventions as EBPs, with the results similar to the results of the NSR (NAC, 2009). The NPDC updated the review in 2014 to include a wider range of studies published between the years 1990 to 2011.

In the most recent NPDC update, a group of 159 trained external reviewers initially identified 29,106 articles (Wong et al., 2014). This number was ultimately reduced to 456 articles once inclusion and exclusion criteria were applied. The criteria required for study inclusion are as follows: (1) study participants must be diagnosed with ASD and be under 22 years old; (2) individuals with comorbid conditions were included in the review; (3) behavioral, developmental, or educational interventions must be implemented at home, school, or in the community; (4) the intervention must be compared to no intervention or an alternative intervention; and (5) the study must have an experimental, quasi-experimental, or single-case research design. Once the study met the inclusion criteria, the intervention was categorized and the level of EBP was determined (Wong et al., 2014).

In order to be classified as an EBP intervention, one of three criteria had to be met. The first criteria required a minimum of two high-quality, experimental or quasi-experimental group design studies to be conducted by at least two different researchers or research groups. The second criteria required the intervention to have a minimum of five high-quality, single-case design studies conducted by at least three different researchers or research groups, including at least 20 participants across studies. The third criteria is a combination of the following: (1) a minimum of one high-quality experimental or quasi-experimental group design study and (2) a minimum of three high-quality single-case design studies conducted by at least two different research groups. Overall, the current NPDC review included 48 group design articles and 408

single-case design articles, representing participants between the ages of six and 11 years old (Wong et al., 2014).

The 2014 update of the NPDC review identified 27 interventions as EBPs (Wong et al., 2014). The following interventions met the NPDC EBP criteria: antecedent-based intervention, cognitive behavioral intervention, differential reinforcement of alternative/incompatible/other behavior, discrete trial teaching, exercise, extinction, functional behavior assessment, functional communication training, modeling, naturalistic intervention, parent-implemented intervention, peer-mediated instruction and intervention, picture exchange communication system, pivotal response training, prompting, reinforcement, response interruption/redirection, scripting, self-management, social narratives, social skills training, structured play group, task analysis, technology-aided instruction and intervention, time delay, video modeling, and visual supports.

Furthermore, the NPDC is developing free, online modules for each of the above EBP interventions on their website: Autism Focused Intervention Resources and Modules (AFIRM; <http://afirm.fpg.unc.edu/afirm-modules>). Currently, modules are available on another website (Autism Internet Modules [AIM]; <http://www.autisminternetmodules.org/>) for the 24 interventions previously reviewed. It is important to note that some interventions not classified as EBPs did have minimal support. More research is needed to clearly classify the effectiveness of other practices used for individuals with ASD.

Conclusion

Selecting an intervention can be a complicated and confusing process; however, there are resources available to help determine which intervention to use. First and foremost, an intervention team should consider the unique needs of the individual with ASD and the environment that they live in (e.g., family situation, community, cultural, and ethnic

background). An established intervention should always be implemented first, if possible; however, it is important to note that even established or EBP interventions will not be effective for all individuals with ASD. It is recommended to not begin by using an emerging intervention, but instead consider them if an established intervention is inappropriate for the individual or unsuccessful at producing positive outcomes. Lastly, only consider implementing unestablished interventions if additional, high-quality research produces supportive results in the future.

There were many consistencies between the systematic reviews described, with most interventions based on the principles of applied behavior analysis being found to be effective. Although both the NSP (NAC, 2015) and NPDC (Wong et al., 2014) reviews are comprehensive, it is important to stay up-to-date on current research and future updates of intervention reviews given the ever-growing body of intervention research.

References

- Centers for Disease Control and Prevention. (2014). Prevalence of autism spectrum disorder among children aged 8 years – autism and developmental disabilities monitoring network, 11 sites, United States, 2010. *MMWR Surveillance Summaries*, 63(2), 1-22.
- Ganz, M. L. (2007). The lifetime distribution of the incremental societal costs of autism. *Archives of Pediatrics Adolescent Medicine*, 161(4), 343-349.
- Jarbrink, K. & Knapp, M. (2001). The economic impact of autism in Britain. *Autism: the international journal of research and practice*, 5(1), 7-22. doi: 10.1177/1362361301005001002
- May Institute. (n.d.) *Our history*. Retrieved July 20, 2016 from https://www.mayinstitute.org/about/our_history.html
- National Autism Center. (2009). *National standards report*. Retrieved January 31, 2016, from <http://www.nationalautismcenter.org/>
- National Autism Center. (2015). *Findings and conclusions: National standards project, Phase 2*. Retrieved January 31, 2016, from <http://www.nationalautismcenter.org/>
- 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.
- Sackett, D. L., Straus, S. E., Richardson, W. S., Rosenberg, W., & Haynes, R. B. (2000). *Evidence-based medicine: How to practice and teach EBM*. London, UK: BMJ Books.
- 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.

- Wong, C., Odom, S. L., Hume, K., Cox, A. W., Fettig, A., Kucharczyk, S., Brock, M. E., Plavnick, J. B., Fleury, V. P., & Schultz, T. R. (2014). Evidence-based practices for children, youth, and young adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders*. doi: 10.1007/s10803-014-2351-z.
- 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.

Appendix A: NSP Literature Search Process (NAC, 2015)

