

**PROTOCOL FOR REVIEWING INTERVENTIONS FOR
CHILDREN AND STUDENTS WITH AN AUTISM SPECTRUM DISORDER TOPIC AREA
VERSION 3.0 (AUGUST 31, 2015)**

This review-specific protocol guides the review of research that informs the What Works Clearinghouse (WWC) intervention reports in the Children and Students with an Autism Spectrum Disorder topic area. The review-specific protocol is used in conjunction with the [*WWC Procedures and Standards Handbook \(version 3.0\)*](#).

PURPOSE STATEMENT

This review focuses on interventions designed for use with children and students ages 18 months to 21 years old with an autism spectrum disorder (ASD). The review will examine the effect of interventions on the following types of outcomes: academic, communication/language competencies, problem behaviors, school engagement, self-care/daily living, self-determination, social-emotional, and transitional (i.e., the behavioral, social, and functional skills that enable young adults with disabilities to obtain and hold meaningful employment, live independently, and obtain further training and education). Interventions must be implemented in authentic education settings.

The following research questions guide this review:

- Which interventions are effective at improving outcomes for children and students classified with an ASD? Are some interventions more effective than others for children and students classified with an ASD?
- Does the effectiveness of interventions for children with an ASD vary by type of outcome?
- Are some interventions more effective for particular subgroups of children and students with an ASD (for example, different levels of ASD severity, co-morbidity with other disabilities, age groups, English learner status, gender, race/ethnicity, socioeconomic status, and school level) or in particular settings?

KEY DEFINITION

Autism spectrum disorder (ASD). This review adopts the definition of ASD used in the Individuals With Disabilities Education Act (IDEA), 20 U.S.C. § 1400 (2004) and accompanying federal regulations, 34 C.F.R. § 300.8 (2004). IDEA defines *autism* as

a developmental disability significantly affecting verbal and nonverbal communication and social interaction, generally evident before age three, that adversely affects a child's educational performance. Other characteristics often associated with autism are engagement in repetitive activities and stereotyped movements, resistance to

environmental change or change in daily routines, and unusual responses to sensory experiences. Autism does not apply if a child's educational performance is adversely affected because the child has an emotional disturbance, as defined in paragraph (c)(4) of this section.

ASD refers to the full range of specific diagnoses and descriptors—including terms no longer used—associated with the key characteristics of autism. These include autistic disorder, Asperger's syndrome, Rett's disorder, Pervasive Developmental Disorder (PDD), Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS), and others.

PROCEDURES FOR CONDUCTING THE LITERATURE SEARCH

The *WWC Procedures and Standards Handbook* discusses the procedures for conducting a literature search in Section II: Developing the Review Protocol and Identifying Relevant Literature (p. 4) and in Appendix B: Policies for Searching and Prioritizing Studies for Review.

Search Terms

The following table presents the search terms by category.

Category	Search Terms
Study Design	<ul style="list-style-type: none"> • 1-case design • ABAB design • Alternating treatment • Baseline • Causal • Changing criterion • Comparison group • Control group • Effectiveness • Evaluation • Experiment • Impact • Intrasubject replication • Matched groups • Meta-analysis • Meta analysis • Multi-element • Multiple baseline • Multiple probe • One-subject design • Post-test • Posttest • Pre-test • Pretest • QED • Quasi-experimental design • Random* • Randomized controlled trial • RCT • RDD • Regression discontinuity • Reversal design • Simultaneous treatment • Single-case • Single subject • Treatment • Withdrawal design
Intervention	<ul style="list-style-type: none"> • Approach* • Curricul* • Instruct* • Intervention* • Program* • Strateg* • Teach* • Technique* • Therap* • Train*
Population	<ul style="list-style-type: none"> • Adolescen* • Child* • Student* • Teen* • Young adult* • Youth

Disability	<ul style="list-style-type: none"> • ASD • Asperger • Autis* • CDD • Childhood Disintegrative Disorder 	<ul style="list-style-type: none"> • PDD* • Pervasive Developmental Disorder* • Rett • Spectrum Disorder*
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The asterisk (*) in a search term means that any word that begins with the specified letters is considered to be the search term (e.g., “student” and “students” are both search terms for student*).

Additional Sources

In addition to those listed in the *WWC Procedures and Standards Handbook*, Appendix B, this review searched the following websites:

- American Psychological Association
- Autism Research Institute
- Autism Research Network
- Autism Speaks
- Cambridge Center for Behavioral Studies
- Campbell Collaboration
- Center for Parent Resources and Information
- Council for Exceptional Children
- Kennedy Krieger Institute
- Koegel Autism Center
- Maternal and Child Health Library Knowledge Path: Autism Spectrum Disorders
- National Association of State Directors of Developmental Disabilities Services
- National Association of State Directors of Special Education
- National Autism Center
- National Center on Response to Intervention (RtI)
- National Institute of Child Health and Human Development (NICHD)
- National Institute for Early Education Research (NIEER)
- Public Education Network
- Research Autism
- Rich Center for Autism at Youngstown State University
- UC Davis M.I.N.D. Institute
- U.S. Department of Education

ELIGIBILITY CRITERIA

Eligible Populations

In this review, the following populations are of interest:

- **Age range.** Children and students must be between the ages of 18 months and 21 years when the intervention is administered.
- **Location.** Participants must reside in the United States, its territories, or tribal entities.
- **Disability classification.** Participants must have been classified with an ASD through evaluation by (1) the special education system (IDEA); (2) a medical evaluation; (3) a direct assessment by researchers; or (4) the administration of a standardized, diagnostic protocol by a parent or teacher. Participants cannot be classified with an ASD based solely on a parent or teacher report that is not based on a diagnostic protocol.
- **Overlap with other WWC topic areas.** So that the study findings are relevant for the population of interest, at least 50% of the participants must be classified with an ASD if a study uses a group design or a single-case design where the case is a group of students or the design is multiple probe/baseline across participants. The review will include the participant(s) with an ASD if a study uses a reversal/withdrawal design, alternating treatment design, multiple baseline design across setting/conditions, or multiple probe design across settings/conditions. For studies where these eligibility requirements are not met, the study will be considered ineligible for review in the Children and Students with an Autism Spectrum Disorder topic area. It may be considered eligible for another topic area.

Potential subgroups of interest for this review include:

- Characteristics of children and students:
 - Age
 - Co-morbidity with other disabilities
 - English learner status
 - Gender
 - Race/ethnicity
 - Severity of disability
 - Socioeconomic status
 - School level (elementary, middle, high)
 - Tracked for graduation
- Other characteristics:
 - Setting (such as general education classroom, special education classroom, library)
 - Type of provider (teachers, paraprofessionals, peers, other)
 - Provider characteristics (staff credentials or training)
 - Services received

Eligible Interventions

Interventions must have the acquisition of academic, behavioral, communication, school engagement, self-care/daily living, self-determination, social-emotional, and transitional skills as their primary goals. Interventions must be implemented in authentic education settings. The authentic settings for preschool are: homes, child care, preschool programs, and natural settings for early childhood special education services. The authentic settings for grades K–12 are: schools and alternative schools, school systems, and settings that deliver supplemental education services. Community contexts (e.g., libraries, restaurants) are also authentic educational settings for older students.

For outcomes in the reading or writing domains, the intervention must be administered in English, because English has specific phonological and orthographic correspondences. Interventions with outcomes in other domains can be administered in any language.

Only interventions that are replicable (i.e., can be reproduced) are eligible for review. The following characteristics of an intervention must be known to reliably reproduce the intervention with different participants, in other settings, and at other times:

- Intervention description: skills being targeted, approach to enhancing the skill(s) (e.g., strategies, activities, practices, and materials), unit of delivery of the intervention (e.g., whole group, small group, individual), medium/media of delivery (e.g., teacher-led instruction, paraprofessionals, peers, parents, software), and targeted population
- Intervention duration and intensity
- Description of individuals delivering or administering the intervention

In this review, the following types of interventions may be included:

- **Curricula.** A curriculum is a set of activities, materials, and/or guidance for working with students in education settings that has a clearly identified name, includes a write-up/description, and can be replicated by others based on written guidance, staff training, or technical assistance (for example, *The Me Book*). A curriculum may be (1) intended as the primary instructional tool designed to meet children’s learning needs in multiple areas; or (2) designed to supplement the classroom material with differentiated instruction or meet children’s learning needs in specific areas. Both types of curricula will be included in this review.
- **Practices.** A practice is a named approach to promoting children’s development that educators implement by interacting with children and materials in education settings. The review will include named practices that are clearly described, commonly understood, and used in published works by more than one investigator or team of investigators (for example, pivotal response training). Several terms may be used in the literature to refer to the same practice. A named practice may also refer to an array of specific procedures.

- **Policies.** A policy is a named condition under which programs operate. The policy must be commonly understood in the field and literature and directly affect services for children and students with an ASD (for example, inclusion). Policies may be set by federal, state, or local governments or by the organization providing services.
- **Programs.** A program is a service delivery model that may be associated with a funding stream and includes clear guidelines for implementation (for example, an early childhood special education class).

Both “branded” and “non-branded” interventions will be reviewed. Branded interventions are commercial or published programs and products that may possess any of the following characteristics:

- An external developer who provides technical assistance (e.g., instructions/guidance on the implementation of the intervention) or sells or distributes the intervention
- Trademark or copyright

Eligible Research

The *WWC Procedures and Standards Handbook* discusses the types of research reviewed by the WWC in Section II: Developing the Review Protocol and Identifying Relevant Literature (p. 4). In this review, the following additional parameters define the scope of research studies to be included:

- **Topic.** The intervention must focus on the acquisition of academic, behavioral, communication, community, self-care/daily living, self-determination, social-emotional or vocational skills.
- **Time frame.** The study must have been publicly released in 1990 or later (20 years prior to the start of the review in this area) and be obtained by the WWC for review prior to the drafting of the intervention report.
- **Sample.** The study sample must meet the requirements described in the “Eligible Populations” section above.
- **Language.** The study must be available in English to be included in the review. Studies examining competencies in other languages will not be included in the review.
- **Location.** The study must include children and students in the United States, its territories, or tribal entities.

Eligible Outcomes

This review includes outcomes in the following domains:

- ***Alphabetics.*** Includes outcomes in the following areas: letter identification, phonemic awareness, phonics, phonological awareness, and print awareness. Each is defined below.
 - **Letter identification** refers to knowledge of the names of the letters of the alphabet. Letters can be said aloud or expressively identified.
 - **Phonemic awareness (or phoneme awareness)** refers to the understanding that the sounds of spoken language—phonemes—work together to make words, and phonemes can be substituted and rearranged to create different words. Phonemic awareness includes the ability to identify, think about, and work with the individual sounds in spoken words. Phonemic awareness helps students learn how to read and spell by allowing them to combine or blend the separate sounds of a word to say the word (e.g., “/c/ /a/ /t/ – cat”).
 - **Phonics** refers to the (a) knowledge that there is a predictable relationship between phonemes (the sounds in spoken language) and graphemes (the letters used to represent the sounds in written language), (b) ability to associate letters and letter combinations with sounds and blend them into syllables and words, and (c) understanding that this information can be used to decode or read words. Sight words can be read aloud or expressively identified.
 - **Phonological awareness** is a more encompassing term than phoneme/phonemic awareness. It refers to phoneme awareness *and* to awareness of larger spoken units such as syllables and rhyming words. Tasks of phonological awareness might require students to generate words that rhyme, to segment sentences into words, to segment polysyllabic words into syllables, or to delete syllables from words (e.g., what is “cowboy” without “cow”?).
 - **Print awareness** refers to knowledge of concepts about print, such as (a) print carries a message; (b) print has conventions, such as directionality (left to right, top to bottom), differences between letters and words, distinctions between uppercase and lowercase, and punctuation; and (c) books have some common characteristics (e.g., author, title, front/back).
- ***Communication/language competencies.*** Includes outcomes that assess ability to communicate with other people, such as use of augmentative assistive communication, conversation, requesting, and labeling.
- ***Community.*** Includes outcomes that assess the ability to independently perform activities in the community, such as street crossing, use of a bank, purchasing, and eating in a restaurant.
- ***Comprehension.*** Includes outcomes in the areas of reading comprehension and vocabulary development. Each is defined below.
 - **Reading comprehension** refers to the understanding of the meaning of a passage. Reading comprehension depends on various underlying components, including

decoding (the ability to translate text into speech), knowledge of word meanings, fluency (the ability to read text accurately and automatically), and the ability to understand and interpret spoken language. Struggling readers may have difficulty with any of these components of reading or with multiple components.

- **Vocabulary development** refers to the development of knowledge about the meanings, uses, and pronunciation of words. The development of receptive vocabulary (words understood) and expressive vocabulary (words used) is critical for reading comprehension.
- **General reading achievement.** Includes outcomes that combine measures in two or more of the reading domains (alphabeticity, reading fluency, and comprehension) or provide some other type of summary score across domains, such as a “total reading score” on a standardized reading test.
- **Math achievement.** Includes outcomes in the following areas: math facts, number sense, number and operations, fractions, measurement, data analysis, algebra, and geometry.
- **Problem behavior.** Includes actions that can function as a barrier to the social or academic development of a student or other students, such as behaviors caused by thought disorders or depression, aggression toward others (verbal, physical, and technological), disruption, lying/cheating/stealing, substance abuse, impulsivity, and lack of self-control or inhibition. (Outcomes focusing on time on task that incidentally measure lack of self-control are classified as school engagement.)
- **Reading fluency.** Includes outcomes that measure the ability to read text accurately, automatically, and with expression (including appropriate pausing, response to punctuation, etc.) while extracting meaning from it.
- **School engagement.** Includes outcomes in the following areas: educational attainment, involvement in individualized education plan process, staying in school, daily attendance, and time on task. (Outcomes focusing on problem behaviors that incidentally measure time off task are classified as problem behavior.)
- **Science achievement.** Includes outcomes in the following areas: science facts, and the capacity to use the tools, procedures, inquiry, nature of science, argumentation in science, and reasoning processes of science. This includes subjects such as biology, chemistry, and earth science.
- **Self-care/daily living.** Includes outcomes that assess the ability to independently perform daily activities at home, such as cooking, dressing, eating, toilet use, and housekeeping.
- **Self-determination.** Includes outcomes that assess abilities that help youth set goals and take actions to achieve goals, such as goal setting, problem solving, decision making, self-advocacy, and choice making.

- ***Social-emotional competence.*** Social-emotional competence involves (a) self-awareness of thoughts, feelings, and behaviors; (b) social awareness of context and others; (c) social skills needed to positively interact and communicate with peers, teachers, and other school staff; (d) relationship skills needed to establish and sustain social connections; (e) self-regulation needed to make responsible decisions and manage personal behavior to achieve goals; and (f) self-perceptions associated with functional behavior. This domain includes social engagement (with adults or peers), self-management, adaptive functioning, and well-being.
- ***Social studies achievement.*** Includes, but is not limited to, outcomes in areas included in the National Assessment of Educational Progress (NAEP), which measures knowledge of US history, world history, geography, economics, and civics.
- ***Vocational/Occupational.*** Includes outcomes that assess the ability to independently perform activities at work, such as filing or organizing office supplies.
- ***Writing achievement.*** Includes, but is not limited to, outcomes in areas included in the NAEP, which measures narrative writing (the production of stories or personal essays), informative writing (communication of information), and persuasive writing (seeking to influence the reader to take action or bring about change). Spelling outcomes are considered part of writing achievement.

State alternative assessments are valid outcomes. When the student's first language is not English, outcomes that are in the reading and writing domains (alphabetic, comprehension, reading fluency, general reading achievement, and writing achievement) must be administered in English; outcomes in other domains can be administered in the student's first language.

EVIDENCE STANDARDS

Eligible studies are assessed against WWC evidence standards, as described in the *WWC Procedures and Standards Handbook* Section III: Screening and Reviewing Studies (pp. 8–21).

Sample Attrition

The *WWC Procedures and Standards Handbook* discusses the sample attrition standards in Section III: Subsection B.2 Sample Attrition: Is the combination of overall and differential attrition high? (pp. 11–15).

This review uses the *liberal* boundary for attrition. This boundary allows for higher levels of overall and differential attrition, and was chosen based on the assumption that most attrition in studies of children and students with an ASD was due to factors that were not strongly related to intervention status. For example, most attrition in studies results from exogenous factors, such as parent mobility or absences on days that assessments are conducted. The *WWC Procedures and Standards Handbook* contains a figure illustrating the attrition boundary and an associated table with attrition levels that define high and low attrition. Based on the choice of the boundary, the study review guide calculates attrition and whether it is high or low.

Baseline Equivalence

If the study design is : 1) a randomized controlled trial with high levels of attrition; 2) a regression discontinuity design with high levels of attrition; or 3) a quasi-experimental design, the study must demonstrate baseline equivalence of the intervention and comparison groups for the analytic sample. The onus for demonstrating equivalence in these studies rests with the authors. The *WWC Procedures and Standards Handbook* discusses how authors must demonstrate baseline equivalence in Section III: Subsection B.3 Baseline Equivalence: Is equivalence established at baseline for the groups in the analytic sample? (pp. 15–16).

For studies that must demonstrate baseline equivalence, equivalence must be demonstrated for the intervention and comparison groups in the analytic sample on a baseline measure of the outcome or on another measure that is highly correlated with the outcome measure.

If baseline differences exceed 0.25 standard deviations for any of the measures within a domain, the study will not meet group design standards within this domain.

In a domain with an outcome that requires statistical adjustments, the adjustment is only required for that outcome. For example, if A, B, and C are available as pre- and post-intervention measures, and the pre-intervention difference in B requires statistical adjustment, only the analysis of outcome B must adjust for B.

A review should clearly document if a study has a baseline difference in any of the following characteristics, since it could be evidence that the populations were drawn from very different settings and that the intervention and comparison groups are not sufficiently comparable for the purposes of this review:

- Percentage of sample with an ASD
- Percentage of sample of each gender
- Percentage of sample speaking other languages
- Percentage of sample in each grade or of each age
- Percentage of sample with specific severity of disability
- Percentage of sample from low-socioeconomic status families
- Percentage of sample from different racial/ethnic groups

The provision of such information, however, is not a requirement of the review.

Outcomes

The *WWC Procedures and Standards Handbook* discusses the types of outcomes, criteria the outcomes must meet, and how outcomes are reported by the WWC in Section III: Subsection B.4 Outcome Eligibility and Reliability (pp. 16–19). This review follows the general guidance regarding reliability, outcomes measured at different points in time, impacts measured at different points in time, composite and subscale scores, subgroup findings, categorical ordinal measures, and estimated effects using imputed data.

If an outcome measure is composed of different tests for some participants, it will be considered a valid outcome if the following criteria are met:

- The tests purport to measure a similar construct and were standardized on a similar population, as reflected in the test manual or empirical studies focused on the test.
- There must be clear rules for which test is administered to which child/student, and the rules must be applied in the same way to the intervention and comparison groups.
- The distribution of tests administered at baseline to the intervention and comparison groups must be similar.

Statistical Adjustments

The *WWC Procedures and Standards Handbook* discusses the types of adjustments made by the WWC in Section IV: Subsection B Statistical Significance of Findings (p. 24).

Consistent with the *WWC Procedures and Standards Handbook*, the default intra-class correlations used for this review are 0.20 for reading, math, science, social studies, and writing outcomes, and 0.10 for problem behavior, school engagement, self-care/daily living, community, social-emotional, self-determination, communication, and vocational outcomes.

Other Study Designs

Studies that use regression discontinuity or single-case designs are eligible for review using the appropriate pilot standards.

The *WWC Procedures and Standards Handbook* discusses the pilot standards for reviewing regression discontinuity design studies in Appendix D.

The *WWC Procedures and Standards Handbook* discusses the pilot standards for reviewing single-case design studies in Appendix E. The review of single-case design studies will follow the pilot standards with the following exceptions:

- There may be occasions when fewer than three data points in a phase would not automatically require the study to be rated as *Does Not Meet WWC Pilot Single-Case Design Standards*. In these circumstances, the content expert will consider the intervention and outcomes to determine whether one or two data points is required. Possible exceptions include the following:
 - Interventions for severe problem behavior, such as aggression and self-injury, in which extended initial baselines or reversal conditions pose serious ethical and procedural concerns.
 - Interventions on “zero baseline” behaviors or skills for which there is no logical reason to conceive that further assessment would yield other than zero baseline performance. An example of such a zero baseline performance is when a child is asked to provide a verbal label for an object (“what is this?”) and consistently provides no response to the request because the child has little to no language and has never been observed to label the item or similar items.