



# Interventions for challenging behavior of autistic students in general education settings: A systematic literature review

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## ABSTRACT

**Background:** As the prevalence of autism spectrum disorder (ASD) increases, the number of students with ASD receiving their education in general education settings continues to rise. Yet, teachers are often underprepared to address the behavioral needs of autistic students in inclusive settings, which often leads to negative school outcomes. Currently, no review has systematically examined the characteristics and effects of behavioral interventions specifically for autistic students in general education settings. The purpose of this systematic literature review was to identify and synthesize empirical studies of interventions aimed at reducing the challenging behavior of students with ASD in general education settings.

**Method:** A literature search was conducted across three academic databases, yielding 9561 articles that were screened for eligibility against a set of inclusion criteria. Additionally, an ancestral search of included articles and a pearling search of recent systematic reviews and meta-analyses on similar topics were conducted. Finally, 12 articles were descriptively synthesized.

**Results:** A lack of participant diversity in relation to disability, age, and race was found across the studies. Majority of the interventions were effective and interventions informed by functional behavioral assessments consistently yielded strong effects. Joint implementation of interventions was the most common form of researcher-practitioner collaboration, with a relative lack of studies involving practitioners in designing interventions.

**Conclusions:** Findings of this review imply a broader issue of restrictive educational placement policies for autistic students who engage in challenging behavior and a critical need to support educators to implement more inclusive educational and behavior management practices.

The prevalence of autism spectrum disorder (ASD) has risen dramatically over the past two decades in the United States, from 1 in 150 children in 2000 to 1 in 36 children in 2020 (Centers for Disease Control and Prevention [CDC], 2023). Among students with disabilities served under the Individuals with Disabilities Education Act (IDEA) Part B, students with autism have doubled over one decade, from 4.97% in 2008 to 10.51% in 2018. (U.S. Department of Education, 2020). In the context of the rising prevalence of ASD and federal policy that mandates providing students with disabilities with access to and ensuring meaningful progress in the general education curriculum (Every Student Succeeds Act, U.S. Department of Education, 2015), schools across the nation are serving an increasing proportion of students with ASD in the general education setting for some or all of their school day. National statistics

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indicate that 40% of students with ASD spend at least 80% or more of their day in general education settings and 18% of them spend 40% to 79% of their day in general education classrooms (U.S. Department of Education, 2020). However, research suggests that teachers are not sufficiently prepared and face barriers in meeting the needs of autistic students in general education or inclusive settings, especially in the area of providing behavioral supports (Brock, Dynia, Dueker, & Barczak, 2020; Iadarola et al., 2015).

Challenging behavior may take many forms and appear differently across individuals (Machalicek et al., 2016). However, it can be broadly defined as behaviors that result in negative or harmful effects in the self, social environment, or physical environment, and typically require intervention or additional resources to remediate (Qureshi & Alborz, 1992). The literature also supports the notion that challenging behavior is often not developmentally appropriate (Kwon, Han, Jeon, & Bingham, 2013). Examples of challenging behavior include physical aggression, self-injury, destruction of the immediate or working environment, and socially or sexually unacceptable behavior based on the norms of a given social group or setting (Qureshi & Alborz, 1992). While challenging behavior is not a core symptom of ASD, research suggests that over half of children with ASD engage in more severe aggressive behavior than children with other developmental disabilities (Kaat & Lecavalier, 2013). This is likely because social communication difficulties, which is one of the core diagnostic symptoms of ASD, may underlie the occurrence of challenging behavior in individuals with autism (Shea, Payne, & Russo, 2018). Additionally, lower adaptive functioning is associated with increasing severity of challenging behavior (Williams et al., 2018). As intellectual disability is found in more than one-third (37.9%) of children with ASD (CDC, 2023), it is reasonable to conclude that challenging behavior is a prevalent and significant concern among many school-age individuals with ASD. When challenging behavior is not addressed, students are more likely to face barriers to inclusive education and receive school suspensions, have less capacity to engage appropriately with their natural environment, and have a poor quality of life (McStay, Disanayake, Scheeren, Koot, & Begeer, 2014; Miller & Meyers, 2015; Muethin et al., 2020; Waters & Healy, 2012). Moreover, challenging behavior has been reported by teachers and parents of children with ASD to be one of their most concerning issues (Azad & Mandell, 2016).

Although challenging behavior is often a major concern for educators and families of children with ASD, it is possible to provide interventions and supports that lead to positive outcomes for students with ASD. Some prior research has examined the evidence base of challenging behavior interventions for students with ASD in school settings. For example, Rivera and colleagues (2019) reviewed school-based interventions that targeted the reduction of challenging behavior in students with ASD between the ages of 10 and 21 years old. Their review found that antecedent-based interventions and function-based interventions produced positive effects in addressing challenging behavior and were rated favorably on feasibility and acceptability among school personnel (Rivera et al., 2019). However, this study did not include the broader age range of the autistic student population and was not limited to interventions implemented in general education settings.

Watkins, Ledbetter-Cho, O'Reilly, Barnard-Brak, and Garcia-Grau (2019) and Mason et al. (2022) systematically reviewed the literature for interventions that were implemented with students with autism in inclusive school settings. Both reviews consistently found that the majority of the interventions targeted social communication outcomes. Watkins and colleagues (2019) concluded that there was an insufficient number of studies addressing challenging behavior outcomes to allow for the statistical analysis of intervention effects, while Mason and colleagues (2022) did not focus on discussing interventions that addressed behavioral outcomes.

A meta-analysis conducted by Lory et al. (2020) examined interventions that specifically addressed challenging behavior in general education settings and identified contextual variables and intervention components that moderated intervention effects (e.g., behavior topography, type of interventionist, embedding student preference). However, this study included students with autism and other developmental disabilities without disaggregating the data of participants with ASD. Research has shown that individuals with ASD have unique needs in the area of challenging behavior, compared to individuals with other developmental disabilities (Shulz et al., 2023). For example, Shulz et al. (2023) found that individuals with autism who have under-responsive sensory profiles are more likely to engage in aggression and rule-breaking behaviors than individuals with attention deficit/hyperactivity disorder. Additionally, engaging in severe restricted and repetitive behaviors, which is a core feature of ASD, tends to be associated with more intensive challenging behavior (Jang, Dixon, Tarbox, & Granpeesheh, 2011). Therefore, it would be beneficial to identify research-supported practices that specifically address the needs of the autism population.

Interestingly, both Watkins et al. (2019) and Lory et al. (2020) found that interventions implemented by teachers yielded significantly stronger effects than those implemented by researchers. This finding points to the importance of involving practitioners in intervention research to promote greater effectiveness and sustainability of interventions. Yet, no literature reviews have specifically examined the methods of researcher-practitioner collaboration in the design and implementation of interventions for students with ASD. Therefore, a key focus of this systematic literature review was to identify the forms of researcher-practitioner collaboration in interventions that addressed the challenging behavior of autistic students.

Ensuring autistic students' access to the general education curriculum and providing opportunities for them to interact meaningfully with typically developing peers offer significant benefits in educational outcomes (Schwartz, Sandall, McBride, & Boulware, 2004). It is therefore critical that we identify research-supported practices for educators in general education settings to support the behavioral needs of autistic students. The purpose of this systematic literature review was to examine the intervention research focused on addressing challenging behavior in school-aged autistic students in general education settings. The following research questions were addressed in this review:

- (a) What are the characteristics of autistic participants included in the literature?
- (b) What interventions have been used to remediate challenging behavior in general education settings for autistic students?
- (c) What are the forms of researcher-practitioner collaboration reported in the literature?

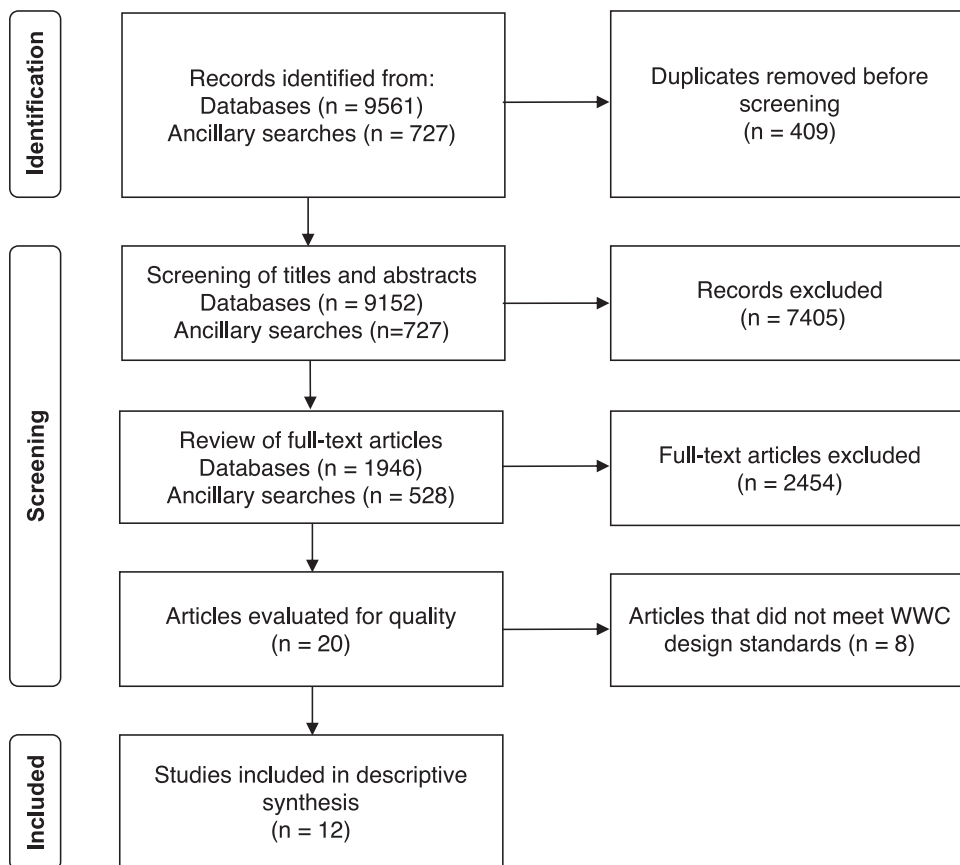
## 1. Method

### 1.1. Article search and identification

Electronic database searches were conducted across three academic databases: *ERIC*, *APA PsycInfo*, and *Academic Search Complete* using the following sets of key terms: (a) “autism” or “autistic” or “autism spectrum” or “Asperger” or “developmental disorder” or “developmental disability” or “mental retardation” or “intellectual disability” AND (b) “inclusion” or “inclusive” or “general education” or “regular education” or “mainstream” or “mainstreamed” or “mainstreaming.” The database searches did not include a limit on publication years and were completed in January 2023. From these databases, 9561 articles were found, of which 409 articles were duplicates that were then removed, resulting in 9152 articles.

The titles and abstracts of 9152 articles were screened for inclusion based on the following criteria: (a) was published in English, (b) was a peer-reviewed publication, (c) included a single-case experimental design study, (d) included a study conducted in a general education setting (i.e., with the presence of one or more typically developing students), (e) included at least one participant with ASD between the ages 3–21 years old and whose data can be disaggregated from other participants, (f) included an educational or behavioral intervention as the independent variable, (g) included challenging behavior as a dependent variable. A total of 1946 articles were identified as potentially eligible articles and the full text of these articles were further reviewed for inclusion or exclusion. As a result, 17 articles were determined to be eligible for inclusion in this review from the database searches.

An ancestral search of these 17 included articles and a pearling search of systematic reviews and meta-analyses on similar topics were conducted to identify additional eligible articles. These ancillary searches yielded 727 articles whose titles and abstracts were screened for potential eligibility, of which 528 articles were reviewed in full text. As a result, 3 additional articles were determined to be eligible for inclusion through the ancillary searches. In total, the database and ancillary searches resulted in the inclusion of 20 article (Bennett, Reichow, & Wolery, 2011; Blair, Umbreit, Dunlap, & Jung, 2007; Buggey, 2005; Casey & Merial, 2006; Chan and O'Reilly, 2008; Crozier & Tincani, 2007; Frea, Arnold, & Vittimberga, 2001; Haley, Heick, & Luiselli, 2010; Lee & Odom, 1996; Lee, He, & Xu, 2022; Loftin et al., 2008; Macdonald, Trembath, Ashburner, Costley, & Keen, 2018; Mancil, Haydon, & Whitby, 2009; McCurdy & Cole, 2014; Ozdemir, 2008; Rispoli et al., 2011; Rosenbloom, Mason, Wills, & Mason, 2016; Strain, Wilson, & Dunlap, 2011; Taylor, Hoch, & Weissman, 2005; Wu et al., 2019). A summary of the article search and identification procedures is displayed in



**Fig. 1.** Summary of the systematic literature search, screening, and review procedures. Adopted from Page et al. (2021). WWC = What Works Clearinghouse.

Fig. 1.

## 2. Research design evaluation

To exclude articles that do not demonstrate minimum standards for methodological rigor, the 20 articles eligible for review were evaluated based on the What Works Clearinghouse design standards for single-case research (WWC Standards Handbook Version 4.1; [What Works Clearinghouse, 2020](#)). The WWC design standards classify the quality of research design into three ratings: (a) meets standards without reservations, (b) meets standards with reservations, and (c) does not meet standards. If a study involved multiple experiments, each experiment was evaluated separately and obtained an individual rating that may differ from the ratings of other experiments in the same study. If an experiment in a study met the design standards, it was included for descriptive synthesis. Based on the design standards described in the WWC Standards Handbook (2020), a checklist was developed to evaluate the research design of each experiment. Out of 20 studies, 12 studies (including 17 experiments) met the design standards with or without reservations.

## 3. Descriptive synthesis of participant characteristics

### 3.1. Sociodemographic information

**Gender.** Participant gender was classified as *male* or *female*, or as otherwise reported in an article.

**Age.** Participant ages were classified into four groups, including *preschool* (3 to 5 years old), *elementary* (6 to 11 years old), *secondary* (12 to 17 years old), and *postsecondary* (18 years old or above).

**Race and Ethnicity.** Classification of participant race and ethnicity was adopted from the recommended categories and definitions by the U.S. National Center for Education Statistics. Participants were first classified as either *Hispanic or Latino* or *not Hispanic or Latino* as their ethnicity, followed by the following categories for their race: *American Indian or Alaska Native*, *Asian*, *Black or African American*, *Native Hawaiian or Other Pacific Islander*, *White*. If a study was conducted outside the U.S., information on nationality was reported.

**Disability Diagnosis.** Participants described as autistic or having Asperger's syndrome or autism were classified as having ASD as a disability diagnosis (APA, 2013). We consider the term "mental retardation" stigmatizing and thus classified participants receiving this label as having *intellectual disability*. Information on all other disabilities was extracted as reported.

### 3.2. Behavioral characteristics

**Verbal Communication.** The verbal communication ability of participants was classified into one of three categories directly based on or inferred from the information reported in an article: (a) *verbal* (speaks in complete sentences), (b) *limited verbal* (speaks in short phrases, single words, or less), (c) *non-verbal* (primarily uses non-speech vocalizations or augmentative and alternative communication). These categories were determined based on prior work that described or grouped individuals with autism based on their level of functioning or support needs, including the verbal communication domain (Carr et al., 2000; Ganz et al., 2010; [Lory et al., 2020](#); [Mason et al., 2022](#); [Watkins et al., 2019](#)).

**Topography of Challenging Behavior.** The challenging behavior described in an article was extracted descriptively and classified into the following categories: (a) *aggression* (e.g., pushing, hitting, damaging objects), (b) *off-task or disruptive behavior* (refusal to complete assigned tasks, talking out), (c) *out-of-context social interaction* (inappropriate play behavior), (d) *self-injurious behavior* (e.g., hitting self), and (e) *stereotypy* (e.g., repetitive vocalization, repetitive motor movement). If a participant's challenging behavior includes multiple topographies, it was coded for multiple categories. These categories were determined based on prior work that descriptively analyzed challenging behavior of individuals with developmental disabilities ([Beavers, Iwata, & Lerman, 2013](#); [Emerson, Thompson, Reeves, Henderson, & Robertson, 1995](#); [Emerson et al., 2001](#)) and prior systematic reviews or meta-analyses that classified behavior topographies for descriptive syntheses or quantitative analyses (e.g., [Mason et al., 2022](#); [Lory et al., 2020](#)).

**Function of Challenging Behavior.** Information on the function of challenging behavior was extracted based on author report, regardless of whether functional analysis (FA) data were presented in the article. The function of challenging behavior was classified as one of the following: (a) *attention*, (b) *tangible*, (c) *escape*, (d) *automatic reinforcement*. These function categories were determined based on the literature base of functional analysis of challenging behavior ([Hanley, Iwata, & McCord, 2003](#); [Iwata, Dorsey, Suifer, Bauman, & Richman, 1982/1994](#); [Iwata & Dozier, 2008](#)).

## 4. Descriptive synthesis of intervention characteristics

### 4.1. Setting

Intervention setting was classified into one of the six following categories described by [Mason et al. \(2022\)](#): (a) *general education whole group* (intervention was conducted in the general education setting and participant was part of the general education curriculum), (b) *general education small group* (intervention was conducted in the general education setting with a small group of students that make up a portion of the whole class), (c) *general education one-on-one* (intervention was conducted in a one-on-one arrangement in a general education classroom), (d) *pull-out with peers* (intervention was conducted in a setting where both the target participant and typically developing peers were pulled from their typical instructional setting to a separate setting), (e) *reverse inclusion* (intervention was conducted in a self-contained setting where one or more typically developing peers were pulled out to work with the target

participant), and (f) *non-academic* (intervention was conducted in a non-academic setting such as lunch, recess, or physical education).

#### 4.2. Implementer

Information on the implementer of the intervention was extracted from an article based on author report.

#### 4.3. Functional behavioral assessment

Information on functional behavioral assessment (FBA) was synthesized based on author report regardless of whether FBA data were presented in the article. The types of FBA conducted were classified into the following categories: (a) indirect assessment (e.g., interviews, questionnaires), (b) direct assessment (e.g., ABC observational data), and (c) functional analysis. If a study conducted multiple types of FBA, it was reported as such.

#### 4.4. Intervention

Information on the intervention implemented was summarized based on the intervention procedures reported in the study.

#### 4.5. Intervention dosage

For intervention dosage, information on the duration of each intervention session and the total number of intervention sessions was gathered from the description of intervention procedures.

#### 4.6. Study duration

For study duration, information on the overall duration of the study, including baseline, was gathered from the description of intervention procedures.

#### 4.7. Researcher-practitioner collaboration

If the researcher in a study worked with a practitioner (e.g., teacher, paraprofessional) in the implementation of an intervention, information on this relationship and process was extracted descriptively. Involving a practitioner in an assessment used to inform intervention (e.g., FBA, preference assessment) was considered as a form of researcher-practitioner collaboration. No predetermined categories were used to classify collaboration in order to capture the full extent and details of the collaboration. The methods of collaboration were summarized descriptively.

#### 4.8. Effect

All experiments (17 experiments from 12 studies) that met the design standards were evaluated for strength of effect using visual analysis. The data in each experiment were examined to determine if a functional relation was demonstrated between the independent and dependent variables. Features including level, trend, variability, immediacy of effect, overlap, and consistency of data patterns across similar phases were considered and a rating of *strong effect*, *moderate effect*, or *non-effect* was given for each experiment (Maggin, Briesch, & Chafouleas, 2013). An experiment was rated as having a *strong effect* if there were at least three demonstrations of experimental effects and no non-effects. An experiment was rated as having a *moderate effect* if the ratio of effects to non-effects were 3:1. For example, if effects were demonstrated across three out of four tiers in a multiple baseline design, the experiment would receive a rating of *moderate effect*. A *non-effect* rating was given if the ratio of effects to non-effects in an experiment was less than 3:1. For example, if experimental effects were demonstrated only two out of three times in a reversal/withdrawal design, the experiment would receive a *non-effect* rating.

#### 4.9. Inter-assessor agreement

To measure inter-assessor agreement (IAA) of the article search and identification procedure, a secondary reviewer independently screened the titles and abstracts of approximately 12% of the articles (1213 out of 9879) yielded from the database searches and reviewed the full text of approximately 22% of the articles (532 out of 2474) that were reviewed in full-text by the primary reviewer. An agreement between two reviewers were defined as both agreeing to include or exclude an article. A disagreement between two reviewers were defined as one reviewer deciding to include an article and the other reviewer deciding to exclude an article. The IAA was 93% for the screening of titles and abstracts and 95% for the screening of full text articles.

For the research design evaluation, a secondary reviewer independently evaluated the quality of research design of 30% (6 out of 20) of the studies eligible for review. Based on the researcher-developed checklist for the design evaluation, there were 94 items on which these six studies, including eight experiments, were scored one of the three ratings described by the WWC Standards Handbook (2020). An agreement was defined as both primary and secondary reviewers assigning an identical rating to a checklist item for an experiment. The IAA was 90% (85 out of 94 items) for the research design evaluation. All disagreements were discussed between the

primary and secondary reviewers until a consensus was reached.

To measure IAA of the descriptive synthesis, a secondary reviewer extracted information for the predetermined variables from all of the 12 studies included. Due to the descriptive nature of the information extracted, two independent reviewers may extract similar information without using identical wordings (e.g., description of intervention and collaboration). An agreement was defined as words that can be interpreted to refer to the same intervention or collaboration procedures. A disagreement was defined as words that clearly convey diverging information. All disagreements were reviewed by at least two of the reviewers until a consensus was reached. The IAA for descriptive synthesis was 86% prior to discussion.

The IAA of the effect evaluation was measured by having a secondary reviewer independently conduct visual analyses of all study results and assigning either *strong*, *moderate*, or *non-effect* as effect rating for each experiment. An agreement was defined as both reviewers assigning the same effect rating for an experiment. A disagreement was defined as the two reviewers assigning different effect ratings for an experiment. The IAA for effect evaluation was 88% across two reviewers.

## 5. Results

A total of 12 studies including 17 experiments were synthesized. A summary of participant characteristics is displayed in [Table 1](#) and a summary of intervention characteristics is displayed in [Table 2](#).

### 5.1. Participant characteristics

Related to sociodemographic information, a total of 20 participants with ASD were included across 12 studies. Of these 20 participants, 20% were female and 80% were male. The majority of participants (65%) were elementary school age (6–11 years old) and the remaining 35% were preschool age (3–5 years old). Out of 15 participants who participated in studies conducted in the United States, information on race and ethnicity was explicitly reported for six (40%) participants. The remaining five out of 20 participants were in studies conducted in South Korea, China, and Taiwan. Out of 20 participants with ASD, four (20%) were reported to have co-occurring intellectual disability and no other disabilities were reported.

In terms of behavioral characteristics, information on verbal communication was reported or could be inferred for 16 (80%) out of 20 participants. Out of 16 participants, two (13%) were non-verbal, eight (50%) had limited verbal communication, and four (25%) were verbal. Off-task or disruptive behavior was most commonly reported as a topography of challenging behavior, across 40% of participants, followed by stereotypy (35%), aggression (25%), out-of-context social interaction (15%), and self-injurious behavior

**Table 1**  
Descriptive Information of Participant Characteristics.

| Study                      | Name     | Gender | Age | Race and Ethnicity | Disability | Verbal Communication | Target Behavior Topography                   | Behavior Function |
|----------------------------|----------|--------|-----|--------------------|------------|----------------------|----------------------------------------------|-------------------|
| Bennett et al. (2011)      | Jacob    | Male   | P   | NR                 | ASD        | NR                   | Disruptive/off-task, stereotypy              | NR                |
| Blair et al. (2007)        | Evette   | Female | P   | NR                 | ASD        | Non-verbal           | Stereotypy                                   | NR                |
|                            | Minsu    | Male   | E   | Korean*            | ASD, ID    | Limited verbal       | Aggression, disruptive/off-task, self-injury | Attention         |
| Crozier and Tincani (2007) | James    | Male   | P   | NR                 | ASD        | Verbal               | Aggression                                   | Attention         |
| Haley et al. (2010)        | Sean     | Male   | E   | White              | ASD        | Limited verbal       | Stereotypy                                   | Automatic         |
| Lee and Odom (1996)        | Burt     | Male   | E   | NR                 | ASD        | NR                   | Stereotypy                                   | NR                |
| Lee et al. (2022)          | Ann      | Female | E   | NR                 | ASD, ID    | NR                   | Stereotypy                                   | NR                |
|                            | Jun      | Male   | P   | Chinese*           | ASD, ID    | Non-verbal           | Out-of-context social interaction            | NR                |
|                            | Feng     | Male   | P   | Chinese*           | ASD, ID    | Limited verbal       | Out-of-context social interaction            | NR                |
|                            | Bo       | Male   | P   | Chinese*           | ASD        | Limited verbal       | Out-of-context social interaction            | NR                |
| Mancil et al. (2009)       | Victor   | Male   | E   | NR                 | ASD        | NR                   | Aggression                                   | NR                |
|                            | Billy    | Male   | E   | NR                 | ASD        | NR                   | Aggression                                   | NR                |
|                            | Denise   | Female | E   | NR                 | ASD        | NR                   | Aggression                                   | NR                |
| Ozdemir (2008)             | Pic      | Male   | E   | Black              | ASD        | Limited verbal       | Disruptive/off-task                          | NR                |
|                            | Nathan   | Male   | E   | White              | ASD        | Verbal               | Disruptive/off-task                          | NR                |
|                            | Aaron    | Male   | E   | White              | ASD        | Verbal               | Disruptive/off-task                          | NR                |
| Rispoli et al. (2011)      | Geoffrey | Male   | E   | Asian              | ASD        | Limited verbal       | Stereotypy, disruptive/off-task              | Tangible          |
| Rosenbloom et al. (2016)   | Student  | Male   | E   | Black              | ASD        | Verbal               | Disruptive/off-task                          | NR                |
| Taylor et al. (2005)       | Mary     | Female | P   | NR                 | ASD        | Limited verbal       | Stereotypy                                   | Automatic         |
| Wu et al. (2019)           | Ted      | Male   | E   | Taiwanese*         | ASD        | Limited verbal       | Disruptive/off-task                          | NR                |

*Note.* \*Nationality was reported for studies conducted outside the United States. P = preschool (3–5 years old); E = elementary (6–11 years old); ASD = autism spectrum disorder; ID = intellectual disability; NR = not reported.

**Table 2**  
Descriptive Information of Intervention Characteristics.

| Study                      | Intervention                                            | Functional Behavioral Assessment | Instructional Setting; Implementer                                    | Intervention Dosage                                                               | Study Duration | Researcher-Practitioner Collaboration                                                                                                                                                                                                                                               | Effect           |
|----------------------------|---------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Bennett et al. (2011)      | Structured work system                                  | NR                               | GE whole group; Researcher                                            | 22 sessions for Jacob, 20 sessions for Evette; up to 10 min per session           | NR             | Teacher selected tasks in intervention.                                                                                                                                                                                                                                             | 2 non-effects    |
| Blair et al. (2007)        | Functional communication training                       | Survey, interview, observation   | GE whole group; GE teacher, SE teacher, teaching aide                 | 26 sessions; 10 min per session                                                   | 13 weeks       | Researcher conducted interviews with family and classroom staff. Researcher and classroom staff jointly designed assessment conditions and intervention. Researcher trained classroom staff in intervention implementation over 3 days (1 h 20 min each day) prior to intervention. | 1 strong effect  |
| Crozier and Tincani (2007) | Social stories                                          | Interview, observation           | GE whole group; Researcher                                            | 12 sessions; 5 min per session                                                    | NR             | Researcher conducted interviews with GE and SE teachers. Researcher taught teachers how to use the social story and provided treatment checklist after completing intervention.                                                                                                     | 1 strong effect  |
| Haley et al. (2010)        | Antecedent-based intervention with visual supports      | Observation                      | GE whole group; Researcher and paraprofessional                       | 16 sessions; 10 min per session                                                   | NR             | Researcher trained and supervised paraprofessional in implementing intervention.                                                                                                                                                                                                    | 1 strong effect  |
| Lee and Odom (1996)        | Peer-mediated play                                      | NR                               | Non-academic; Teacher                                                 | 20 sessions; 6-10 min per session                                                 | NR             | NR                                                                                                                                                                                                                                                                                  | 2 strong effects |
| Lee et al. (2022)          | Cooperative learning in PE                              | NR                               | Non-academic; GE teacher, teaching assistant, researcher (instructor) | 16 sessions for Jun, 13 sessions for Feng, 14 sessions for Bo; 25 min per session | 4-5 months     | Teacher and teaching assistant facilitated PE lesson and assisted in implementing intervention.                                                                                                                                                                                     | 2 non-effects    |
| Mancil et al. (2009)       | Social stories                                          | NR                               | GE whole group; GE teacher                                            | 12 sessions; 5 min per session                                                    | NR             | Researcher conducted unstructured parent and teacher interviews. Researcher and teacher determined setting. Researcher trained teachers and assistant teachers to collect data and implement intervention.                                                                          | 3 strong effects |
| Ozdemir (2008)             | Social stories                                          | NR                               | GE whole group; Teacher and teaching aide                             | 27 sessions; 20 min per session                                                   | 9 weeks        | Teacher or teacher aide implemented intervention after 2-hour training with researcher. Teacher aides collected data.                                                                                                                                                               | 1 strong effect  |
| Rispoli et al. (2011)      | Pre-session satiation                                   | Functional analysis (analogue)   | GE whole group; Researcher                                            | 5 sessions; 21 min per session                                                    | NR             | Researcher conducted preference assessment with parents and teachers.                                                                                                                                                                                                               | 1 strong effect  |
| Rosenbloom et al. (2016)   | App-based self-monitoring                               | NR                               | GE whole group; NR                                                    | 15 min per session; 11 sessions                                                   | NR             | NR                                                                                                                                                                                                                                                                                  | 1 strong effect  |
| Taylor et al. (2005)       | Differential reinforcement of other behavior            | Functional analysis (analogue)   | GE whole group; Researcher, teaching staff                            | 10 min per session; 34 sessions                                                   | NR             | Teacher participated in functional analysis attention condition. Researcher and teaching staff implemented intervention and collected data.                                                                                                                                         | 1 strong effect  |
| Wu et al. (2019)           | Class-wide function-related intervention teams (CW-FIT) | NR                               | GE whole group; Researcher, GE teacher                                | 20 min per session; 9 sessions                                                    | NR             | Researcher trained GE teacher prior to intervention. GE teacher implemented intervention with researcher feedback and booster training.                                                                                                                                             | 1 strong effect  |

*Note.* GE = general education, SE = special education, NR = not reported. Effects are reported by the number of experiments.

(5%). The sum of these percentages exceed 100 as some participants engaged in multiple forms of challenging behavior. Only five (25%) out of 20 participants had an identified behavioral function.

## 5.2. Intervention characteristics

Out of 12 studies, 10 (83%) of them included interventions implemented in the general education whole group setting, while the remaining two (17%) studies included interventions conducted in non-academic settings (i.e., PE and play sessions). Eleven (92%) out of 12 studies reported information about the implementer, of which three studies (25%) involved only the researcher, four studies (33%) involved both the researcher and practitioners (e.g., teacher, teaching aide) as implementers of the intervention, and four other studies (33%) had interventions implemented by only the practitioners. Only five (42%) out of 12 studies reported the administration of at least one type of FBA.

The 12 studies included for descriptive synthesis reported a variety of interventions, including social stories ( $n = 3$ ), structured work system ( $n = 1$ ), functional communication training ( $n = 1$ ), antecedent-based intervention with visual supports ( $n = 1$ ), peer-mediated play intervention ( $n = 1$ ), cooperative learning ( $n = 1$ ), pre-session satiation ( $n = 1$ ), app-based self-monitoring ( $n = 1$ ), differential reinforcement of other behavior ( $n = 1$ ), and class-wide function-related intervention teams (CW-FIT;  $n = 1$ ). The number of intervention sessions ranged from 5 to 34 sessions. Two studies (17%) included less than 10 intervention sessions; five studies (42%) included 10–19 intervention sessions; four studies (33%) included 20–29 intervention sessions; one study (8%) included over 30 intervention sessions. The average duration of intervention sessions in each study ranged from 5 min to 25 min per session. Majority of the studies ( $n = 7$ , 58%) reported 10 min or less as the duration of each intervention session. Only three (25%) out of 12 studies reported information related to the overall intervention duration, ranging from nine weeks (i.e., social story intervention) to five months (i.e., cooperative learning in PE).

Out of 17 experiments across 12 studies, strong intervention effects were demonstrated in 13 experiments that evaluated eight types of interventions (i.e., functional communication training, social stories, stimulus control, peer-mediated play, pre-session satiation, app-based self-monitoring, differential reinforcement of other behavior, CW-FIT). Non-effects were found in four experiments that evaluated two types of interventions (i.e., structured work system, cooperative learning).

## 5.3. Researcher-practitioner collaboration

Ten (83%) out of 12 studies reported information related to researcher-practitioner collaboration for either assessments related to the intervention or the intervention. The most common form of researcher-practitioner collaboration is in the implementation of intervention (e.g., jointly implementing the intervention, researcher providing training for practitioners to learn how to implement the intervention), which was reported across eight studies (i.e., Blair et al., 2007; Crozier & Tincani, 2007; Haley et al., 2010; Lee et al., 2022; Mancil et al., 2009; Ozdemir, 2008; Taylor et al., 2005; Wu et al., 2019). Collaboration in assessment (e.g., interviewing teachers about the target behavior, designing assessment conditions) was reported across five studies (i.e., Blair et al., 2007; Crozier & Tincani, 2007; Mancil et al., 2009; Rispoli et al., 2011; Taylor et al., 2005). Collaboration in intervention design (e.g., determining intervention setting, condition, materials) was reported across three studies (i.e., Bennett et al., 2011; Blair et al., 2007; Mancil et al., 2009).

## 6. Discussion

This review evaluated the literature on school-based challenging behavior interventions for autistic students implemented in a range of general education settings. The first purpose of this review was to evaluate the characteristics of autistic students included in the literature. Results of the sociodemographic analysis revealed a relative lack of diversity related to disability diagnosis, age, and race. Approximately 31% of individuals with autism have a co-occurring intellectual disability (CDC, 2023); however, only 20% of the participants included in this review were reported to have an intellectual disability. The underrepresentation revealed in this review may indicate that autistic students with co-occurring intellectual disability are being included in general education at lower rates than their autistic peers without intellectual disability. This explanation is not unlikely given that less than 20% of students with intellectual disability spend less than 80% of their school day in general education settings (National Center for Educational Statistics, 2023). Related to participant age, all of the included participants were reported as being early childhood or elementary school aged. This finding was not surprising given that previous challenging behavior reviews have cited a lack of challenging behavior intervention research on older individuals with autism (David et al., 2021; Mason et al., 2022) and that students are less likely to be included as they age (Silva, Flores, & Cramer, 2022). For studies conducted in the United States, White students were represented across studies more than Black and Hispanic students. The lack of diversity in this literature base is likely because Black and Hispanic students with disabilities are less likely to be placed in general education (Grindal, Schifter, Schwartz, & Hehir, 2019; Silva et al., 2022). Thus, the lack of participant diversity related to diagnosis, age, and race may reflect broader issues of equity in inclusion practices in the United States (Silva et al., 2022) and may not be unique to this literature base alone.

Disruptive or off-task behavior and stereotypy were the most commonly reported topographies of challenging behavior targeted in the interventions. Stereotypic behavior is a form of restricted and repetitive behavior, which is a core behavioral symptom of ASD (American Psychiatric Association, 2013). While not all stereotypic behavior interferes with participation in educational activities, the frequency or intensity of some stereotypic behavior may impede academic engagement and learning. Our review indicates that there are a variety of interventions that can effectively reduce stereotypy in general education settings, including stimulus control (Haley et al., 2010), peer-mediated play (Lee & Odom, 1996), pre-session satiation (Rispoli et al., 2011), and differential reinforcement of

other behavior (Taylor et al., 2005). On the other hand, aggression and self-injurious behavior were less commonly targeted in the studies included in this review. This is likely due to a common practice of placing students with more severe or dangerous forms of challenging behavior in more restrictive educational settings rather than in general education settings, which highlights the importance of addressing behavioral challenges that autistic students have in order to increase their access to more inclusive education.

Several of the included studies implemented Tier 1 challenging behavior interventions, including structured work systems (Bennett et al., 2011) and social stories (Crozier & Tincani, 2007; Mancil et al., 2009; Ozdemir, 2008). Therefore, it is not surprising that many of the included studies did not conduct a FBA of challenging behavior, as Tier 1 supports are often not function-based. However, it is worth noting that some of the Tier 1 interventions did not yield positive effects, while all FBA-informed interventions yielded strong effects. This finding supports previous research on the importance of designing challenging behavior interventions based on data obtained through FBAs (Ingram, Lewis-Palmer, & Sugai, 2005). In addition, this finding suggests that some students with ASD in general education settings may require more extensive supports than Tier 1 or low intensity supports to remediate behavioral challenges.

Finally, we determined the extent to which researchers collaborated with practitioners in the design and implementation of challenging behavior interventions in general education settings. Most of the included studies involved the special education or general education teacher in some aspect of the assessment of intervention. For most studies, the educator or paraeducator (i.e., teaching aide) was trained to implement the intervention and collect data. This finding aligns with previous research showing that educators can successfully implement challenging behavior interventions in educational settings (Gregori, Rispoli, Lory, Kim, & David, 2022; Kirkpatrick, Akers, & Rivera, 2019; Rispoli, David, Gregori, Mason, & Lory, 2021). However, only two studies reported collaboration in the design of the intervention. This is concerning given that teachers often struggle to develop and tailor interventions that meet the unique needs of students (Gesel, LeJeune, Chow, Sinclair, & Lemons, 2021), indicating the need for teacher support in this area. The need for support related to intervention development may be particularly critical for general education teachers who often have limited training in behavior management (Chelsey & Jordan, 2012). Training teachers to develop challenging behavior interventions has the potential to build capacity in classrooms to better support autistic students with challenging behavior and improve the sustainability of teaching practices.

### 6.1. Implications for research

While early intervention is critical in promoting positive social emotional development and addressing challenging behavior (Raulston & Machalicek, 2018; Schreibman et al., 2015), students with ASD with behavioral challenges may continue to have unmet needs throughout their school years. There is a need for more research to evaluate challenging behavior interventions in inclusive school settings across grade levels to help students with ASD access the general education curriculum to the greatest extent possible.

A synthesis of participant characteristics in this review suggests that the literature does not adequately represent the heterogeneity of the ASD population with regard to age, race and ethnicity, and the presence of co-occurring intellectual disability. It is important for future research to purposefully include autistic participants across a range of ages, race and ethnicity, and cognitive functioning. Including a more representative sample of participants in the literature ensures that there are research-supported practices that work for every subgroup of the diverse ASD population.

Years of intervention research has allowed us to identify a range of evidence-based practices for school age children with ASD (Hume et al., 2021). However, it is unclear what role practitioners played in implementing these practices and the extent to which collaboration existed between researchers and educators in the implementation of evidence-based practices. To date, no studies have focused on synthesizing the methods of collaboration between researchers and practitioners in autism intervention research. Our findings suggest that many of the included studies involved researcher-practitioner collaboration and this can take many forms, including the researcher involving a classroom teacher in the design or selection of an intervention, training a paraeducator to collect data and monitor progress, and providing ongoing feedback on a teacher or paraeducator's implementation of an intervention. This is encouraging given the importance of partnering with stakeholders to promote the appropriateness, feasibility, and acceptability of an intervention in natural contexts (Boyd, Stahmer, Odom, Wallisch, & Matheis, 2022; Odom, Hall, & Suhrheinrich, 2020). Future research in interventions for autistic students should continue to engage in and report researcher-practitioner collaboration.

### 6.2. Implications for practice

While the lack of representation of the diverse range of autistic students in research conducted in general education settings is clearly a critical issue for researchers to address, it also reveals a problem that should concern school administrators and educators who influence decisions that affect system-level or school-wide educational policy and procedures. The findings of this review suggest that autistic students are likely being excluded from general education or less restrictive educational settings due to more severe challenging behavior. To minimize barriers to inclusive education, schools should consider examining the proportion of students with challenging behavior in more restrictive versus more inclusive school settings. An overrepresentation of students with ASD in more restrictive educational settings may indicate a need to reexamine educational placement policies. Additionally, since many teachers are unprepared to meet the needs of students with behavioral challenges (Flower et al., 2017), schools should re-examine methods for preparing teachers to manage behavioral challenges. First, schools may consider implementing strategies to increase collaboration between general and special education teachers. Strategies to promote collaboration may include additional planning time or professional development related to active listening and open communication (DaFonte & Barton-Atwood, 2017). Related to professional development, schools should consider more robust professional development training programs beyond one-time didactic professional

development workshops. For example, schools may consider implementing coaching programs to provide ongoing and targeted professional development for general education teachers. Coaching programs, such as practice-based coaching (Snyder, Hemmeter, & Fox, 2015), allow the development of individualized professional development plans tailored to meet the unique needs of a teacher or paraeducator (Donegan-Ritter & Van Meeteren, 2018; Golden, Hemmeter, & Ledford, 2024; Gregori et al., 2022; Lory et al., 2023; Mason et al., 2017). Such coaching programs have the potential to let educators work together in a peer coaching format to capitalize on the unique expertise of both special and general education teachers and staff and allow for more resource and knowledge sharing.

All of the studies that included some form of FBA produced positive effects in their intervention. However, it should be noted that the FBA implemented did not always involve a functional analysis. This may indicate that some challenging behavior may not warrant a FA and that indirect or observational (non-experimental) FBA methods may yield data sufficient to inform the development of an intervention. Given that FBA without FA is typically more time and cost efficient, school personnel may consider using FBA methods to identify the function of challenging behavior to inform the selection of research-supported behavioral interventions.

## 7. Limitations and future directions

This systematic literature review was limited to peer-reviewed publications and did not include gray literature in the article search and identification procedures. It is possible that this review did not capture literature that are more likely to report null or negative results, which could have influenced the overall findings of this review regarding intervention effects. However, the visual analysis in this review was conducted separately for each study without aggregating effects across studies. This allowed us to draw conclusions based on the individual findings of each study. As the literature base on this area of work continues to grow, future research may consider conducting meta-analyses of existing intervention research to quantify the effects of challenging behavior interventions.

In alignment with the focus and scope of this review, the research team opted to include only single case research in the systematic review. Based on the current state of research on addressing challenging behavior of autistic students in general education settings, it is unlikely that this review would capture group design experiments that involved students with ASD in general education settings with disaggregated data for the autistic participants. Future research should explore more methods to evaluate challenging behavior interventions on a larger scale with autistic students to increase the generalizability of research-supported behavioral interventions for this population.

## Ethics approval

This study did not involve human subjects.

## Scientific writing

No generative AI was used in the writing of this manuscript.

## Author contributions

CL conceptualized and designed the study, collected and analyzed the data, drafted and edited all sections of the manuscript. EG contributed to data analysis and writing of the manuscript. SH and RL contributed to data collection and editing of the manuscript. NR contributed to data collection.

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## CRediT authorship contribution statement

**Nate Rendon:** Formal analysis. **Stephanie Huff:** Formal analysis, Writing – review & editing. **Ramella Lee:** Formal analysis, Writing – review & editing. **Catharine Lory:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Emily Gregori:** Formal analysis, Writing – original draft, Writing – review & editing.

## Declaration of Competing Interest

All authors report no financial or non-financial interests or potential conflicts of interest.

## Data Availability

Data will be made available on request.

## Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.rasd.2024.102385](https://doi.org/10.1016/j.rasd.2024.102385).

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