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REVIEW PAPER

Bridging the Gap! Strategies to Prevent Challenging Situations in Educational Contexts Focusing on Students with Autism: Findings from a Scoping Review

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Abstract

This scoping review aimed to identify the characteristics of the current literature examining school strategies to prevent challenging situations and support students with autism. This comprehensive review sought to synthesize findings from quantitative, qualitative, and mixed-method studies, using a convergent integrated approach. After several screening stages, 129 studies were included in the review and appraised for quality. Data were synthesized using deductive textural narrative synthesis. The analyses presented a comprehensive understanding of the characteristics of the studies and identified eight key strategies used in schools to prevent challenging situations. Few studies have explored the relationship between the learning environment and students in preventing challenging situations. Several research gaps were identified, including the need for follow-up and longitudinal studies, as well the necessity of grasping the experiences of students with autism.

Keywords Autism · Challenging situation · Education · Preschool · Primary school · Scoping review · Secondary school · Educational strategy

Human rights and equity in education are the core components of developing an inclusive school environment. The quality of teaching significantly impacts student learning (Mitchell & Sutherland, 2020). Educating students with autism requires extensive knowledge (Lord et al., 2022). Recent systematic review findings underscore the need for teachers to have a comprehensive understanding of autism, including its social–communication characteristics and sensory needs, and the importance of insight into practice-based strategies that can be tailored to their local school contexts (Petersson-Bloom et al., 2023). For instance, professional development must address not only instructional methods but also collaborative approaches, support, and values that position educators to meet the diverse needs of autistic learners to increase equitable education and wellbeing. Petersson-Bloom et al. (2023) argue that when teachers gain both theoretical grounding and hands-on practice reflecting real challenges in their classrooms, they are more likely to implement—and sustain—effective strategies. Autism spectrum disorder (hereafter, autism) may involve impairments in interaction and communication (APA, 2013), as well as cognitive and behavioral differences impacting students with autism functioning in school (Macdonald et al., 2018). Unique ways of processing information and understanding the social environment can affect interactions and relationships (Aubineau & Blicharska, 2020). Therefore, poor-quality teacher–child relationships and high rates of externalizing behavior adversely affect the learning and well-being of students with autism (Nucifora & Walker, 2021). This results in the emergence of special educational needs within a social context and institution, such as schools or education systems (Mitchell & Sutherland, 2020). Several environmental barriers can limit students with autism functioning, well-being, and academic achievement. Thus, identifying new ways to approach and support student diversity in educational contexts and complex social structures is imperative (Hume et al., 2021; Leifler et al., 2021). Successful inclusion of students with autism may require additional support.

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Forms of provision necessitate a dualistic approach of interventions targeting the learning environment and reducing barriers, as well as supporting the individual to function more independently (Leifler, 2022). To regard challenges as an isolated issue may not develop the practice sufficiently. Herein, Farmer et al. (2014) propose an integrated behavioral, ecological, and social interactional framework, which calls for teachers to systematically address both individual needs and the broader environment, so that educators can foster positive engagement in the classroom.

Despite the enhanced knowledge on student diversity, educators still struggle to make school a better place for all students (Bottema-Beutel et al., 2016; Watkins et al., 2019). Challenging situations at school can occur when students exhibit self-injurious behavior, destructive behavior, or aggression (Iffland et al., 2023). We use the term *challenging situations* to highlight that behavioral issues often emerge as an interplay between the learner and the environment, rather than residing solely in the individual student. In contrast, *problem behaviors or challenging behaviors* typically focus on the observable, and sometimes disruptive, actions of the student. By using the term *challenging situations*, we emphasize the relational stance—that the learning environment (e.g., teachers' practices, classroom arrangements, social contexts) can contribute to, exacerbate, or mitigate a student's behaviors. As such, this study focuses on challenging situations due to a relational stance, where the environment is considered one of the causes of eventual challenging situations. This aligns with Spilt and Koomen's (2023) approach of looking beyond student behavior and shedding light on the holistic perspective of student school situations. Thus, the demands for accountability in education and challenging situations require identifying practical strategies and methods for teachers and students.

Extant literature examines interventions targeting what many studies label "problem" or "challenging" behaviors, as well as self- and emotional regulation (McKeithan & Sarbornie, 2020; Nucifora & Walker, 2021). However, studies that target preventive strategies in the learning environment or professional development are scarce. Despite many promising teaching strategies and intervention programs for students with autism, issues with social validity, implementation, and poor fit in real-life settings still exist (Kasari & Smith, 2013; Odom et al., 2020). Recently, stakeholders' opinions have been emphasized in several steps of the research process (Fayette & Bond, 2018; Fletcher-Watson et al., 2017; Lord et al., 2022; Petersson-Bloom & Holmqvist, 2022; Walton et al., 2024). The urgency of feasibility and other aspects of social validity for sustainability are core factors in understanding successful implementation. Research priorities include identifying the best ways to train professionals who provide services, care, support, and education to young children and youths with autism and fostering the development of practical coping skills, emotional understanding, and how emotional expression in children with autism can be supported (Walton et al., 2024).

However, none of the previous reviews and meta-analyses have specifically examined the content and effects of interventions targeting challenging situations in naturalistic settings, such as schools, with peers and teachers present. Given that many "problem behaviors" are embedded in *challenging situations* shaped by environmental and social factors, it is essential to review research focusing on real educational contexts. In this scoping review, we include studies that use the term *problem behaviors* and/or *challenging behaviors* in their interventions or approaches, but we interpret them through a lens that acknowledges the dynamic interplay between the student and the educational environment.

Aim and Research Questions

This study aims to not only identify the characteristics of the current literature examining school strategies to prevent challenging situations and support students with autism in such situations but also summarize and synthesize key research findings, highlighting the gaps and limitations to guide future research.

The research questions (RQs) we seek to address are as follows:

RQ1: What key methodological and conceptual characteristics (e.g., study design, types of interventions, setting, participant features) are present in the existing literature on school strategies to prevent and handle challenging situations for students with autism?
RQ 2: What is known about strategies used in schools to prevent and support students in challenging situations?
RQ 3: Which critical research gaps can be identified in studies examining school strategies to prevent and handle challenging situations for students with autism?

Method

Scoping reviews allow for a more comprehensive overview of area topic than do other forms of knowledge synthesis that focus on pooling and describing an evidence base (Munn et al., 2018). In this scoping review, we used the Preferred Reporting Items for Systematic Reviews and meta-analysis extension guidelines (PRISMA-ScR; Tricco et al., 2018). The essential reporting items outlined in the PRISMA-ScR guidelines were implemented and, following Arksey & O'Malley (2005), the five-stage scoping review framework (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4)

extracting (or 'charting") the data, and (5) collating, summarizing, and reporting the results, was completed. Additionally, we added quality appraisal as one stage, following the Mixed Methods Appraisal Tool (MMAT), version 18 (Hong et al., 2018). Furthermore, since this scoping review includes qualitative, quantitative, and mixed-methods research, a convergent integrated approach was applied to synthesize and integrate findings. Following Stern et al. (2020), this approach involved data transformation. Therefore, the quantitative data were converted into textual descriptions for integration with the qualitative data. The review was not preregistered.

Review Criteria/Eligible Criteria

To identify inclusion and exclusion criteria, the Sample, Phenomenon of Interest, Design, Evaluation, and Research (SPIDER) framework was used (Table 1). The SPIDER tool was developed to serve better qualitative and mixed-methods research search strategies than PICOS (Cooke et al., 2012; Methley et al., 2014). The inclusion and exclusion criteria are presented in Table 2.

Search Strategy

The process of identifying search terminology began in December 2022. The first and fourth authors developed the search strategy in collaboration with a librarian at the University of Gothenburg. The first steps comprised test searches and tests of combinations of search terminology. The following databases were searched: PsycInfo (Proquest), Education Resources Information Center (ERIC; ProQuest), Education Database (ProQuest), and Education Research Complete (Ebsco). Articles written in English between January 2012 and February 2023 were eligible for inclusion in the review and synthesis. The entire search strategy is available in the Supplemental Material called Search Strategy. The articles identified in the searches were imported into the reference management software Rayyan (Ouzzani et al., 2016).

Study Selection

The combined database search identified 2786 studies. Figure 1 presents the study selection process in a PRISMA flowchart. After removing duplicates, 2185 studies remained.

Table 1 The SPIDER framework

SPIDER framework[a]	
Sample	Autistic students in preschool, primary school, secondary school, upper secondary school, special school, general school setting
Phenomenon of interest	Strategies (e.g., methods, interventions, modifications, teaching, support, attitudes, including staff/teacher training and professional development) in preventing challenging situations
Design	Questionnaire, interview, case study, observation, focus group, intervention in naturalistic settings, and single case study design
Evaluation	Outcome (including subjective outcomes such as views and attitudes)
Research type	Quantitative, qualitative, and mixed methods

[a]Both American and British wording and spelling were used

Table 2 Inclusion and exclusion criteria

Inclusion	Exclusion
Educational settings ranging from preschool, primary school, middle school, secondary school, and upper secondary school, special school and general education	Further education: college, university Parents training Interventions at home Clinical settings
Autism	Other neurodevelopmental disorders
Strategies (e.g., interventions, methods, modifications, support, adjustments, attitudes) to prevent challenging behavior/situations including staff/ teacher training and professional development	Strategies that are not be implemented within educational settings Medical interventions
Peer reviewed	Reviews Grey literature Editorials
Year intervals 2012–February 2023	
English	

[a]Both American and British wording and spelling were used

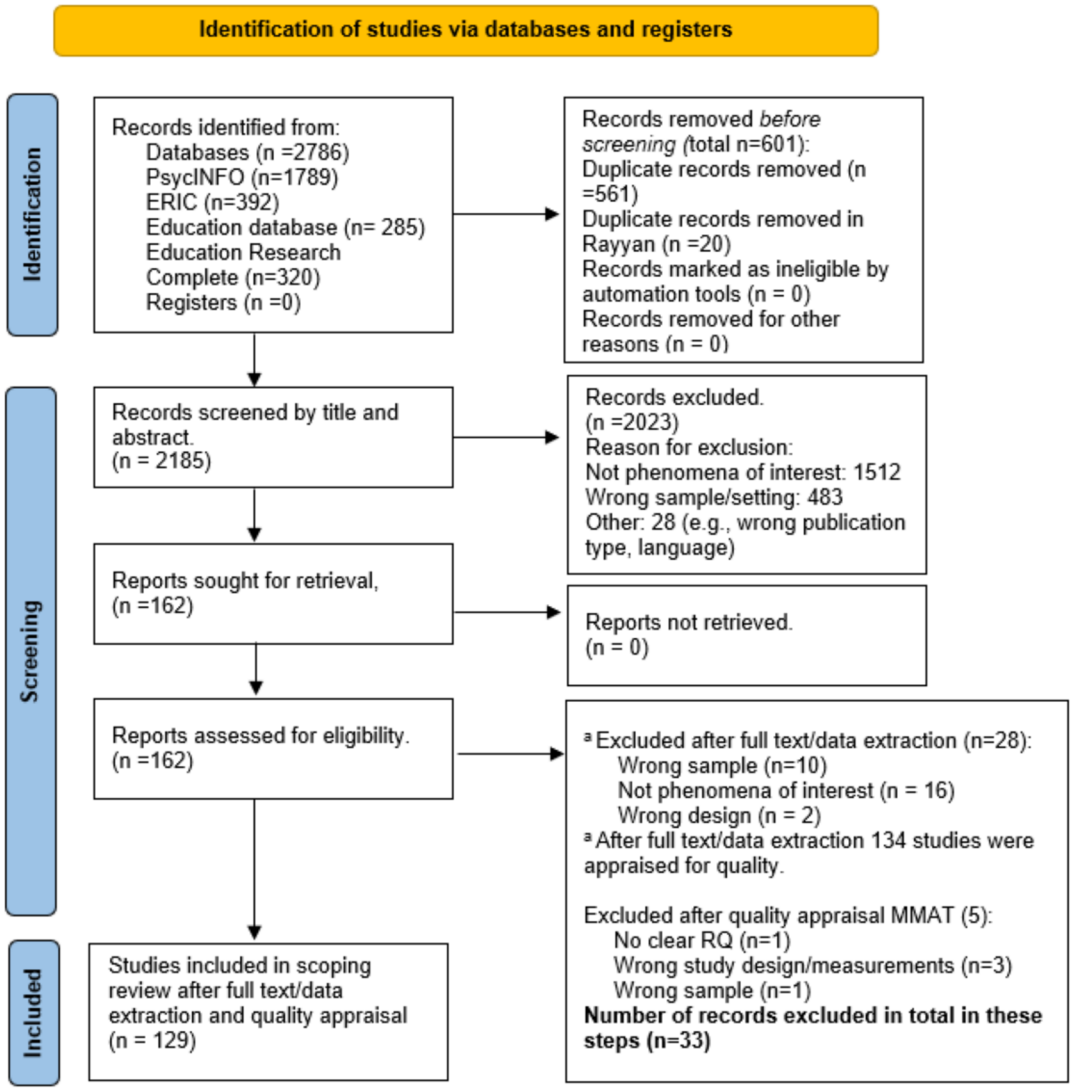


Fig. 1 PRISMA 2020 flow diagram (Page et al., 2021)

The first and fourth authors individually screened the titles and abstracts of the remaining studies, using the blinded function in Rayyan to ensure independent ratings. Cohen's kappa indicated substantial agreement (0.65). In total, 2023 studies were excluded; most of them were excluded as they were not phenomena of interest. Disagreements were resolved in a consensus meeting, during which reviewers carefully examined each conflicting case and worked together until they arrived at a unified decision. Subsequently, 162 records were eligible for the next screening phase.

Data Extraction/Charting

As Kraus et al. (2020) noted, using and adapting the data extraction sheet to a specific study is an essential step in reviews. Thus, the first author designed a data extraction sheet inspired by those used in two previous systematic reviews (Petersson-Bloom & Holmqvist, 2022; Petersson-Bloom et al., 2023) but adjusted to suit the present study's aim and RQs. Since the screening step included 162 articles, the first and fourth authors read the full text and extracted relevant data from 81 articles each, using the SPIDER framework as a guide. The data included (1) author/year, (2) country, (3) type of school placement, (4) school year, (5) participants, (6) strategy focus, (7) method, (8) research type, (9) staff included, (10) setting for data collection, (11) summary of research focus, (12) summary of outcomes/findings, and (13) ethnicity reported (yes or no). During the charting process, researchers met to address any uncertainties. We then held a final meeting to discuss the remaining ambiguities and resolve them until reaching a consensus

decision. The process resulted in the first and fourth authors identifying 28 studies as ineligible for inclusion based on the inclusion and exclusion criteria. Subsequently, 134 studies were eligible for the next step, the quality appraisal (Fig. 1).

Quality Appraisal

Since the scoping review included qualitative, quantitative, and mixed methods studies, we used the MMAT (Hong et al., 2018) to evaluate quality and risk of bias. The MMAT is a quality appraisal checklist designed to support and validate systematic mixed-methods research reviews. The checklist includes five methodological quality criteria for each category of study design (qualitative, quantitative randomized controlled trials (RCTs), quantitative non-randomized, quantitative descriptive, and mixed methods) and two criteria for all types. The quality of the 134 studies included after the full text and extraction phase was appraised. All four authors were included in this phase. The first author designed a quality appraisal sheet based on the original (Hong et al., 2018). To increase the validity and understanding of the MMAT, we appraised five studies together, assessing the rest individually. The first and fourth authors cross-validated the individual quality assessment to increase the validity. We decided to include all studies, regardless of quality, to the synthesis if they fulfilled the first *two* general screening questions (for all research types). Following the instructions of the MMAT, one of the studies (Goodman-Scott & Carlise, 2015) was excluded, either because it did not clearly state the RQ or because the collected data did not address the RQ, which are the first two screening questions in the MMAT. Furthermore, after meticulously reviewing the full texts of the studies in this phase, four were deemed ineligible for the synthesis because their study design and measurements did not meet the inclusion criteria or because students with autism were not explicitly included. The decision to exclude these four studies was made post hoc.

Subsequently, 33 records were excluded in the full text/data extraction phase ($n=28$) and the quality appraisal stage ($n=5$) leaving 129 articles to be included in the data synthesis (Fig. 1). The results of the quality appraisal of the 129 included studies are presented in Supplementary Material Quality Assessment, MMAT.

In both phases (data extraction and quality appraisal), studies that involved a combination of methods were assessed as mixed methods only if the authors defined the study as such and used a specific mixed methods design, following Creswell and Creswell's (2018). In one case, Jennings & O' Halloran (2015) used a combination of interviews and questionnaires. However, since the findings were weighted toward qualitative data collection, the appraisal was completed based on specific questions directed to qualitative research in MMAT.

Because studies were identified as not eligible at different stages, the data extraction of the final 129 eligible studies is presented in the Supplementary Material, Data Extraction of Included Studies.

Data Summary and Synthesis

A deductive textual narrative synthesis was applied, inspired by Harden et al. (2004). Typical aspects of textual narrative synthesis are comparisons of studies' similarities and differences in terms of characteristics, context, quality, and findings (Harden et al., 2004). Additionally, a numeric analysis was also conducted to analyze the characteristics of the study. The analysis identifying strategies in educational settings was based on a deductive narrative approach. The characteristics of the included studies and the key strategies were identified by the first and fourth authors. Then, in an iterative process, they were reworked by the first author and validated by the fourth author. The data extraction sheet was used as a tool to identify the characteristics of the study and the key themes.

Results

The first section includes study characteristics (RQ1), the second section presents key findings regarding strategies (RQ2), and, lastly, the research gap is presented (RQ 3). The Supplementary Material, Data Extraction of Included Studies, presents the evidence regarding characteristics and key strategies.

Study Characteristics

The included studies originate from 17 countries, mostly from the USA (92), followed by China (7), the UK (6), and Australia (5). Eight studies from European countries were conducted. No studies originating from South America or Africa were identified (see Table 3).

Participants and Settings

Most of the 129 studies were conducted in primary school settings ($n=75$), followed by preschool settings ($n=21$) and secondary school, including middle school ($=19$). Only a few ($n=13$) included a combination of school years. The distribution between studies that focus on general and special school placement is even. While 61 studies were related to general education, 58 were related to special schools. Six studies were conducted in both school settings.

In 100 studies, participants included students with autism. Only 14 of the studies included teachers and students, while 11 included only teachers. Some studies ($n=4$) included

Table 3 Distribution of studies based on countries

Country	Numbers of studies	Percentage
USA	92	71.3%
China	7	5.4%
UK	6	4.7%
Australia	5	3.9%
Ireland	4	3.1%
Canada	3	2.3%
Saudi Arabia	2	1.6%
Denmark	1	0.8%
Greece	1	0.8%
Iceland	1	0.8%
Italy	1	0.8%
The Netherlands	1	0.8%
New Zealand	1	0.8%
Romania	1	0.8%
Taiwan	1	0.8%
Turkey	1	0.8%
United Arab Emirates	1	0.8%

Note: Total = 129 studies. Percentages sum to approximately 100%

various stakeholders, such as different groups of professionals and students (Cihak et al., 2012; Dearden et al., 2017; Fronapfel et al., 2018; Güleç-Aslan, 2013). Three studies included only professionals (Bitsika et al., 2017; Gaines et al., 2014; Lushin et al., 2020). Most studies ($n = 97$) focused on changing student behavior (training or teaching). This can be compared with the number of studies ($n = 13$) focusing on implementing changes in the learning environment and combining both strategies ($n = 17$). The number of students participating ranged from 1 in 25 of the studies to 389 (in which 44% of the participants had autism) in Breeman et al. (2016). The ethnicity of the participants was documented in 38 studies. With regard to the participants' gender, 518 were male and 108 were female.

Most interventions or activities were conducted in general education or special educational/self-contained classrooms ($n = 62$). In 36 studies, the intervention or activity was delivered in a smaller room (e.g., therapy or unoccupied room). Fourteen studies were conducted at school, covering a more general school level rather than classroom activities. The school level is a broad category that includes professional development (e.g., Oakes et al., 2018) as well as evaluations of comprehensive programs (e.g., D'Elia et al.,2014) and activities throughout the school day (e.g., Cui, et al., 2023). Some studies ($n = 7$) reported a mix of locations, such as, in the classroom and on the playground (e.g., McDonald et al., 2012) or a mix of small rooms at school and classrooms (e.g., Diorio et al., 2019). Three studies were conducted in virtual or online classrooms (Alwahbi, 2022; Rakap et al., 2015; Shillingsburg et al., 2022). Moreover, four studies were conducted in specific areas of schools (e.g., Tse, 2020) and included outdoor activities (e.g., Ward et al., 2013). In 73 studies, staff (i.e., mainly teachers) were active participants. In several studies, teachers delivered the intervention (e.g., Hartz et al., 2020; Koenig et al., 2012). However, in 47 studies, staff were not active participants. In one study (Clarke & Duda, 2019), peers delivered the intervention.

Methods Employed

Most studies ($n = 120$) used a quantitative approach, often with different single case study designs. An RCT approach was applied in five quantitative studies, and a quantitative descriptive approach was used in nine studies. In comparison, the number of studies that applied a qualitative approach was five and in four studies mixed methods were used. In four of the studies, a longitudinal approach was applied (Crişan & Stan, 2013; D'Elia et al., 2014; Dearden et al., 2017; Shochet et al., 2022).

Quality Appraisal Results

Some studies ($n = 10$) lacked clear RQs (i.e., only included a more general aim). In one study, uncertainty prevailed about whether the data collected addressed the RQs. Qualitative studies demonstrated a varied appraisal, with some being unclear on whether the interpretation of the results was sufficiently substantiated by data. Qualitative studies were appraised to have high quality across all the five MMAT questions. The studies appraised as quantitative RCT ($n = 5$) were also assessed as having high quality, with two studies receiving high-quality assessments across the five MMAT questions. However, some RCT studies were appraised as not providing information on blinded assessors. As previously reported, most studies were evaluated as quantitative non-randomized ($n = 106$) (e.g., single case studies). Although quality varies; the MMAT question showing lower quality (in 21 studies) is related to whether confounders were accounted for in the design and analyses. Furthermore, 22 studies lacked clarity on whether the participants represent the target population. They also lacked a clear sample description, inclusion and exclusion criteria, and information on why individuals chose not to participate. However, 51 studies were appraised as having high quality across all the areas covered in the MMAT. Eight of the studies were quantitatively descriptive, one demonstrated high quality in all the five MMAT areas, and the rest revealed varied results regarding quality. Lastly, of the four mixed-methods studies, one was assessed as having high quality in regard to the MMAT questions. The other three studies lacked quality regarding the integration and trustworthiness of both quantitative and qualitative components. The complete quality appraisal is reported in Supplementary Material, MMAT.

Summary and Synthesis of Key Findings

Eight categories related to strategies were identified. Before detailing these categories, it is important to clarify the terminology used in this section. Although we embrace the term *challenging situations* throughout the paper to emphasize the relational interplay between the student and environment, the original studies vary in their use of labels such as "problem behaviors" or "challenging behaviors." For consistency in summarizing these studies' results, we standardize on the phrase *challenging behaviors* wherever the research included focuses on discrete, observable actions that may interfere with learning. We do not use the term "problem behaviors" in our own framing, even if some studies do, to maintain a strengths-based language approach.

Some categories overlap, and we therefore merged certain constructs to avoid duplication. In particular, *Support Systems* and *Skill Development* were combined in the synthesis because many interventions incorporate both environmental modifications (e.g., assistive technologies) and skill-building (e.g., self-regulation). We also classified studies as either using *Functional Behavioral Assessment (FBA)* or *Functional Communication Training (FCT)* based on whether their primary focus was assessing behavioral functions or implementing a communication-focused intervention. In cases where FCT followed an FBA, we categorized the study as FCT to highlight the intervention component. Because the review includes 129 studies, examples of the studies in each category are provided in the text. Complete information on how the studies relate to key strategies is presented in the Supplementary Material (Data Extraction of the Included Studies) and Table 4. Only the references mentioned in the text are included in the reference list of the article, a complete reference list is provided in the Supplementary Material.

Functional Behavior Assessment/Behavior Interventions

This category includes 41 studies employing various strategies focusing on functional behavior assessments and general behavior interventions. Overall, the outcomes reported are positive, demonstrating a decrease in not only challenging behaviors but also escape-maintained behavior (e.g., Andzik et al., 2022; Hoffmann et al., 2022) and task avoidance and off-task behavior (e.g., Cihak et al., 2012; Kuo & Plavnick, 2015). Larkin et al. (2016) evaluated the function of challenging behaviors using functional analyses based on trials and individualized function-based interventions, resulting in decreased challenging behaviors and increased classroom engagement. The effects of school-based cognitive behavioral therapy (CBT), cognitive behavioral, and behavior analyses were tested by Parent et al. (2016), which revealed decreased physical and verbal aggression and developed coping strategies. Some studies show a mixed result. For example, in Pitts et al. (2019), an applied behavior analysis (ABA) intervention showed significant effects on adaptive behavior, a medium effect on self-injurious behavior, a negligible effect on aggressive behaviors, and a nonsignificant effect on destructive behavior. Lydon et al. (2017) also presented mixed results, comparing the behavioral intervention with sensory integration therapy. The findings suggest a decrease and increase in challenging behaviors with respect to behavior interventions and sensory integration therapy, respectively. Some studies report follow-up and maintained effects (Aldosari, 2016; Boyd et al., 2013; Ducharme & Ng., 2012; Hartz et al., 2020; Kelly et al., 2015; Reeves et al., 2013; Riden et al., 2021a).

Support System/Skill Development

This category includes 25 studies employing various strategies. Some studies focus on testing visual strategies and instructions, such as comic strips or social stories (Ahmed-Husain & Dunsmuir, 2014; Thompson and Johnston, (2017);;, using video for self-modelling (Diorio et al., 2019) and structured teaching (Macdonald et al., 2017). The outcomes show overall positive effects. However, Diorio et al. (2019) reported a modest increase in classroom compliance. Several strategies in this category include digital components (e.g., Fachantidis et al., 2019; Romans et al., 2020; Rosenbloom et al., 2016; Rosenbloom et al., 2019; Siegel & Lien, 2015). The effects of a web-based self-monitoring intervention (using I-Connect) were tested, suggesting reduced problem behaviors and increased on-task behaviors among the participating students (Romans et al., 2020; Rosenbloom et al., 2016, 2019). Fachantidis et al. (2019) investigated the impact of an educational robot and assistive tools. The findings suggest a decrease in challenging behaviors for the student with autism and a greater positive attitude of peers towards the student.

Functional Communication Training (FCT)/Strategies to Develop Communication

Sixteen studies explored areas related to FCT or other strategies to develop communication. In all studies, the identified challenging behaviors decreased. For example, Crişan and Stan (2013) revealed that the language and communication stimulation method in autism was used to express refusal leading to a decrease in challenging behaviors. Another study (Alakhzami & Chitiyo, 2022) explored the effects of FCT on self-injurious behaviors (SIB), with findings suggests a significant decrease in SIB for participants. However, SIB reappeared when the extinction was implemented. The effects of teaching an omnibus mand with combined reinforcements were explored by Ward et al. (2021) and

Table 4 Key strategies/themes

Key themes strategies	Studies
Functional behavior analyses/behavior interventions 41 studies	Aldosari (2016); Andzik et al. (2022); Banda et al. (2012); Boyd et al. (2013); Bruhn et al. (2015); Cihak et al. (2012); Ducharme and Ng. (2012); Fahmie et al. (2016); Flynn and Lo (2016); Foran et al. (2015); Gann et al. (2014); Hartz et al. (2020); Herman et al. (2018); Hoffmann et al. (2022); Kelly et al., 2015; Kuo and Plavnick (2015); Larkin et al. (2016); Lewis et al. (2015); Lydon et al. (2017); Marsteller and St. Peter (2014); Martinez et al. (2016); McDonald et al. (2012); Parent et al. (2016); Pennington et al. (2012); Pingale et al. (2019); Pitts et al. (2019); Reeves et al. (2013); Riden et al. (2021a); Riden et al. (2021); Rispoli et al. (2013); Rispoli et al. (2016); Sansosti (2012); Shawler et al. (2020); Slocum et al. (2023); Stevenson et al. (2019); Sy et al. (2014); Taylor et al. (2018); Warner et al. (2020); Wells et al. (2016); Wiggins and Roscoe (2020); Wu et al. (2019)
Support system/skill development 25 studies	Ahmed-Husain and Dunsmuir (2014); Anderson et al., (2016); Cassidy et al. (2018); Dean et al. (2020); Diorio et al. (2019); Fachantidis et al. (2019); Falligant and Pence (2017); Jones and Fein (2016); Hálfdanardóttir et al. (2022); Karoff et al. (2017); Ledbetter-Cho et al. (2023); Macdonald et al. (2017); McCurdy and Cole (2014); Reutebuch et al. (2015); Roberts et al. (2019); Robison et al. (2020); Romans et al. (2020); Rosenbloom et al. (2016); Rosenbloom et al. (2019); Siegel and Lien (2015); Sullivan et al. (2017); Imasaka et al. (2020); Thompson et al. (2019); Thompson and Johnston (2017); Xu et al. (2017)
Functional communication training/communication development strategies 16 studies	Adami et al. (2017); Alakhzami and Chitiyo (2022); Crişan and Stan (2013); Dearden et al. (2017); Falcomata et al. (2013); Falcomata et al. (2018); Fragale et al. (2016); Hoffman and Falcomata (2014); Kreibich et al. (2015); Muharib et al. (2019); O'Reilly et al. (2012); Plavnick and Ferreri (2012); Plavnick and Vitale (2016); Seaver et al. (2023); Ward et al. (2021); Zabala and Wunderlich (2022)
Positive behavior support 13 studies	Alwahbi (2022); Aspiranti et al. (2018); Aspiranti et al. (2019); Breeman et al. (2016); Clarke and Duda (2019); Conradi et al. (2021); Fronapfel et al. (2018); Harvey et al. (2021); Iadarola et al. (2018); Kranak et al. (2017); Mouzakitis et al. (2015); Vargo and Brown (2020); Voorhees et al. (2013)
Professional development 13 studies	Bitsika et al. (2017); Güleç-Aslan (2013); Ling and Mak (2012); Lushin et al. (2020); Oakes et al. (2018); Pas et al. (2016); Rakap et al. (2015); Scott Larsen et al. (2019); Shillingsburg et al. (2022); Thomas and Lafasakis (2019); Walker et al. (2021a); Walker et al. (2021): Walker and Snell (2017)
Physical activity 9 studies	Carey et al. (2022); Duan et al. (2022); Koenig et al. (2012); Lee et al. (2022); Losinski et al. (2017); Shah et al. (2022); Tse et al. (2018); Ward et al. (2013)
Comprehensive models 7 studies	Breitenbach et al. (2013); Cui et al. (2023); D'Elia et al. (2014); Jennings and O'Halloran (2015); Morgan et al. (2018); Schwartz et al. (2013); Shochet et al. (2022)
Classroom modifications 5 studies	Benson et al. (2019); Gaines et al. (2014); Jackson et al. (2022); Ross (2019); Lanovaz and Huxley (2017)

included functional analyses and FCT. The results revealed that the challenging behavior was eliminated immediately. Furthermore, the effects of functional communication training via iPad application, systematic prompting, and natural reinforcement suggested decreased challenging behaviors (Muharib et al., 2019).

Positive Behavior Support (PBS)

The PBS category includes 13 studies, with several reporting positive outcomes. The Color Wheel System (CWS) was implemented in inclusive classrooms and significantly and immediately decreased inappropriate vocalizations. It also positively affected self-contained classrooms, decreasing students' challenging behaviors (Aspiranti et al., 2019). Furthermore, the effects of virtual school-wide PBS programs were examined by Alwahbi et al. (2022). The findings suggest a significant and immediate improvement in student behavior. The efficacy of three versions of the Good Behavior Game (GBG) (i.e., traditional and technology-enhanced versions) was tested, revealing that all three versions decreased disruptive behaviors (Vargo & Brown, 2020). However, Breeman et al. (2016), implementing GDG, suggested a negligible effect on students' challenging behaviors and no effects on teaching efficacy or burnout symptoms. One follow-up study (Voorhees et al., 2013) suggests reduced challenging behaviors during the intervention that was not sustained during follow-up.

Professional Development

Thirteen studies were identified in this category. Several include professional development efforts focusing on a specific area. Two of these areas are functional behavior assessment or FCT, showing positive outcomes on teachers' efficacy (Bitsika et al., 2017), teachers' knowledge (Oakes et al., 2018), paraprofessionals' implementation fidelity, and reduction of students' challenging behaviors (Walker et al., 2021; Walker et al., 2017). Scott Larsen et al., (2019) explored the effects of professional development focusing on professional growth and changes in professionals' culture. The findings suggest changes in the behavior of professionals.

Physical Activity

Nine studies included strategies related to physical activity, with varying results. For example, Koenig et al. (2012) tested the Get Ready to Learn classroom yoga program, which significantly decreased challenging behaviors based on teacher ratings. Shah et al. (2022) examined a mindfulness program with a stable and decreasing trend in challenging behaviors. An intervention including therapeutic horseback riding showed a decrease in the severity of symptoms, which was not maintained without activity but was regained when therapeutic horseback riding was restarted (Ward et al., 2013). Lee et al. (2022) tested the effects of cooperative physical activities, which showed significant-to-moderate effects on appropriate interactions in physical education, although they were not sustained after the intervention.

Comprehensive Models

Seven studies were related to comprehensive strategies. For example, Cui et al. (2023) tested the effects of the integrated therapy model. The findings suggest a slight improvement regarding participating students' challenging behaviors. A longitudinal evaluation of the Treatment and Education of Autistic and Communication handicapped CHildren (TEACCH) program was examined by D'Elia et al. (2014), who identified a reduction of maladaptive behaviors amongst students with autism in the program. Another longitudinal intervention, the multilevel resilience intervention, was tested by Shochet et al. (2022). The results indicate improvement in coping and self-efficacy and a reduction in anxiety and emotional and behavioral difficulties amongst students with autism. Lastly, the findings of an inclusive educational program for one student with autism described by Breitenbach et al. (2013) suggest that the strategies that affected the boy's behavior were related to common vision, professional development, positive interactions, teamwork, participation, and successful learning.

Classroom Modifications

Only five studies focused on strategies implemented in the physical classroom environment. Lanovaz and Huxley (2017) tested the effects of background music in the classroom on challenging behaviors, obtaining mixed results. A mixed result was also obtained when testing the effects of alternative seating; no consistent changes were found in seat behavior and attention (Benson et al., 2019). Exploring the effects of implementing a safe space (oasis room) reduced challenging behaviors and increased appropriate interactions (Ross, 2019). Gaines et al. (2014) examined the relationship between the design of the learning environment and student behavior, concluding that keeping a neat and orderly classroom and reducing visual stimuli reduce challenging behaviors.

Research Gaps

Several research gaps have been identified. Most studies focus on training and teaching strategies. However, only a few studies focus on changes in the learning environment (e.g., physical learning environment, professional learning, and understanding). Male students outnumbered female students by approximately five times, identifying a research gap focusing on understanding challenging situations and effective strategies concerning girls with autism. Most of the studies were conducted in the USA, highlighting the lack of studies in developing countries. Regarding methodology, a research gap regarding longitudinal, mixed methods, qualitative (including student perspectives), and follow-up studies was identified. No studies focus on strategies for teachers or paraprofessionals to act in challenging situations.

Discussion

Taking a principled stand on the issues of rights, participation, and educational inclusion for all students, we cannot understand the functioning of students with autism simply in terms of the characteristics of individual learners. A shift from focusing on "problem behaviors" and "challenging behavior"—generally referring to undesirable or disruptive actions demonstrated by the student—to "challenging situations," which we define as any context or interaction that becomes stressful or confrontational for both the student and the environment (i.e., teachers, peers, classroom setup) may direct attention to a more dualistic view.

By integrating quantitative, qualitative, and mixed-methods research and using a dualistic approach targeting the learning environment and the individual, this scoping review sought to explore strategies to prevent challenging

situations for students with autism. After reviewing different interventions, positive outcomes and changes were found. However, most studies employed an individual approach. The largest proportion of studies was on the approach of functional behavioral assessment ($n = 41$), followed by Support System/Skill Development ($n = 25$) and FCT ($n = 16$). Although we merged Support Systems and Skill Development in the Results to reflect their frequent overlap (environmental plus instructional supports), we maintained FCT as a separate category because it specifically teaches replacement communication skills following functional behavioral assessment. Less common were professional development, physical activity interventions, comprehensive models, and classroom modifications. A better balance between the individual and the environment and a broader repertoire of interventions (e.g., professional development) can improve the learning environment for students and teachers. Managing challenging situations is a significant concern among preschool, primary, and secondary teachers. To address these concerns, education systems need to develop more flexible strategies to support teachers in all school settings. As highlighted by Watkins et al. (2019), interventions are for inclusive purposes. Additionally, few studies in this scoping review were identified at the school level and included different stakeholders. One way to strike a balance between strategies focusing on the individual and the learning environment could be by focusing on whole school processes (i.e., individual classroom and school levels), including different stakeholders at school to develop a whole school approach to support students with autism (Roberts & Webster, 2022).

Study trends tend to focus on the child and individual skill development, neglecting crucial interactions between the child, the teacher, and the learning environment. However, teacher training and learning are other pieces of the puzzle to prevent challenging situations for students with autism (Petersson-Bloom et al., 2023).

Few studies have been conducted during teaching and typical daily routines and activities. This leads to issues with generalizability and longitudinal change (Odom et al., 2020). Considerable interruptions and unexpected events in educational settings can affect the rigor of research and the behaviors of participants and other students. However, research in naturalistic settings, such as schools, is necessary to develop ecologically valid interventions that can be implemented in real classrooms (Kasari & Smith, 2013). Interestingly, although social validity was reported in some studies, the focus was on teachers' perceptions of the intervention. The views and experiences of students with autism regarding the interventions were not reported. Not actively including the experiences, views and voices of students with autism has also been identified as an issue in previous research; this is particularly true of young students and students with more significant support needs (Fayette & Bond, 2018; Zanuttini, 2023).

In schools, peer interactions play a crucial role in social life and social skills to avoid social exclusion. Students with autism may be at higher risk of being excluded from school than other students (Brede et al., 2017). The reasons for exclusion from regular school context may differ but often pertains to challenges in the learning environment, such as sensory demands, conflicts, and schools and teachers not being able to recognize such students' individual needs (Brede et al., 2017; Sproston et al., 2017). However, having friends increases the sense of belonging and positively impacts the school experience of students with autism (Aubineau & Blicharska, 2020). Therefore, peers could be an essential factor in preventing challenging situations. Conversely, preventing challenging situations and social exclusion by involving peers and raising awareness of diverse ways of functioning and social cognition were only observed in few studies included in this review (e.g., Clarke & Duda, 2019). Indeed, involving peers to enhance the social outcomes of students with autism has proven both effective and feasible in school settings (Brock et al., 2018).

There are reasons to believe that interventions that are too isolated and have a narrow focus will not improve or bridge the gap between research and practice, thereby missing opportunities to implement more substantial changes in the classroom and at the school.

The findings of this review indicate promising results when using digital components, such as video modelling, digital self-management, assistive tools, and educational robots, which could be developed further for service and support. Hence, it is vital to continue the progress and work to find solutions to complex issues. Essential factors include understanding the needs of children, implementing effective preventive methods, and embedding the capacity and potential of all individuals. As Peers (2018) reminds us, meaningful change in the education system and human development comes from a bottom-up perspective and depends on students' feelings of being, belonging, and becoming.

Limitations

This scoping review was conducted over more than a year. Due to the rapid publication growth, some more recent publications that could have been in press or not indexed when the searches were implemented may have been overlooked. Furthermore, we did not conduct additional searches to update the data. These aspects could have affected the result. We referred to four databases; therefore, some studies may have been overlooked. In addition, only English-language articles were included. Some factors must temper conclusions based on the present findings. The number of RCTs identified and the single case

studies have not been synthesized to a meta-analysis, nor have calculations of effect sizes been performed. The quality of the single case design was estimated based on visual support. The low number of identified RCTs signifies the difficulties of large-scale studies in this area. To conclude, despite rigorous and systematic search strategies, a small risk of publication bias in the extensive literature and scoping reviews remains.

Future Research

Several critical research gaps were identified, and the findings suggest several directions for future research. Most studies were conducted in high-income Western countries (especially the USA). Hence, interventions from other parts of the world must be explored. Continued work is needed to summarize findings through research synthesis in single-subject experimental design studies, since it can contribute to knowledge within the field of autism and related to small sample sizes (Kratchowill et al., 2023). Simultaneously, there is a need to contribute with more qualitative research capturing views and experiences from different stakeholders, particularly for female students, and employing mixed methodologies to grasp the complexity of multilevel systems and processes such as educational settings (Fetters et al., 2013). Furthermore, understanding the perspectives of students' social validity in various studies and interventions is essential to determine the natural effect for the individual. Examining social validity in creative, student-, and communication-friendly ways explicitly designed for participants with autism is an essential next step in research. Little is known about the feasibility of interventions capturing the experiences of students with autism, regarding which, the views of girls with autism are an explicit area to direct future research. Lastly, an urgent need exists for research on preventive methods, their long-term effects, and accommodations in the learning environment to support the well-being, learning and development of students with autism.

Implications for Practice

Arguably, one vital implication for practice is the importance of combining modifications and support in the learning environment with strategies to foster the learning and development of this group of students. The results of this scoping review have implications for inclusive education, preventing challenging situations, and supporting students with autism and their development concerning communication and interaction. Furthermore, the results present evidence-based strategies and methods (e.g., physical activity interventions, modifications in the didactics and physical environment, and professional development efforts) that can be implemented in school settings.

Conclusions

A high-quality classroom and learning environment tailored to accommodate diverse student needs will empower students to learn to their full potential and grow as individuals. Improving student learning and well-being necessitates fostering independence and on-task skills and addressing the contextual and structural phenomena such as knowledgeable professionals. Research on the relationship between context and learning environment and students with autism in preventing challenging situations is scarce. Thus, more participatory studies implemented in an educational context *with*, rather than *on,* teachers, other professionals, and students with autism is needed. Indeed, especially the voices of students with autism are central to capture what changes that we need to implement further. To summarize these aspects, need to be developed and implemented to bridge the gap between research and practice.

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Data Availability The data supporting the findings of this study are available within the paper and its Supplementary Information.

Declarations

Ethics Approval The study was performed with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Conflict of interest The authors declare no competing interests.

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