Exploring the Effectiveness of Teaching English Gram- mar to High Functioning Autism Spectrum Disorder (HFASD) Children: A Scoping Review

*A'ina Athirah Ahmad Sabri[1] Mohd Zuri Ghani[2]
Nurhazlini Rahmat[3] Ainul Azmin Md Zamin[4]

[123] Universiti Poly-Tech Malaysia, Faculty of Education, Social Sciences and Humanities
Jalan 6/91, Taman Shamelin Perkasa, 56100 Kuala Lumpur, Malaysia
[4] International Islamic University Malaysia, Department of English Language and Literature
Jln Gombak, 53100 Selangor, Malaysia
athirah@uptm.edu.my

Abstract. Children with High-Functioning Autism Spectrum Disorder (HFASD) possess average to above-average cognitive abilities but often encounter distinct challenges in acquiring and using grammatical structures in language. Grammar proficiency is critical not only for academic achievement but also for effective social communication. This scoping review systematically maps and evaluates existing empirical evidence on the effectiveness of English grammar instruction among HFASD learners internationally**.** Drawing from 27 peer-reviewed studies across multiple countries, this review identifies key instructional strategies such as explicit grammar teaching, visual scaffolding, and technology-assisted interventions. Findings suggest that structured, individualised, and multimodal approaches are most effective in enhancing grammatical comprehension and usage in HFASD children. However, significant gaps remain in longitudinal tracking, integration into natural language use, and context-specific adaptations, particularly in multilingual and ESL settings. This review provides an evidence-based foundation for educators, therapists, and curriculum designers to develop more inclusive and targeted grammar interventions for neurodiverse learners.
of the paper in short terms, i.e. 15–250 words.

Keywords: HFASD, English Grammar, special needs education .

1 Introduction

Universally, High-Functioning Autism Spectrum Disorder (HFASD) refers to individuals on the autism spectrum who possess average to above-average intelligence and relatively intact language abilities, but still face challenges in pragmatic and grammatical language use (American Psychiatric Association, 2013). While many HFASD children demonstrate early word acquisition and strong rote memory, they often struggle with understanding and applying syntactic rules, verb tense agreement, morphological

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markers, and complex sentence structures (Eigsti, de Marchena, Schuh, & Kelley, 2011).

Grammar is not only fundamental for academic literacy but also essential for social participation and self-expression. In the context of HFASD, language deficits particularly in grammar can interfere with narrative coherence, comprehension, and peer interaction (Tager-Flusberg, Paul, & Lord, 2005). Given the increasing global emphasis on inclusive education, the ability to teach grammar effectively to neurodiverse learners becomes both a pedagogical and ethical priority. For instance, a 2019 study by Yusniza Mohd Yusoff et al. examined the English morphosyntactic abilities of a high-functioning autistic child and found that, despite her diagnosis, she demonstrated advanced grammar skills consistent with typical language development theories. This highlights the ethical and pedagogical need for inclusive education practices that recognise and support the unique linguistic strengths of neurodiverse learners.

Multiple studies indicate that conventional grammar instruction may not align with the cognitive processing styles of HFASD learners, who often benefit from structured, rule- based, and visually-supported learning environments (Bishop, 2010; Norbury et al., 2014). Interventions tailored to these needs including explicit grammar teaching, scaf- folded repetition, and digital tools show promise but remain unevenly studied across educational settings and age groups (Parsons, Cordier, Lee, Falkmer, & Vaz, 2017).

Despite growing awareness among researchers, the body of evidence remains fragmented, with few comprehensive syntheses exploring how grammar can be effectively taught to HFASD children. Existing reviews tend to focus broadly on communication or literacy without isolating grammar-specific instruction (Westerveld et al., 2016). Therefore, as shown in Table 1, a focused scoping review is necessary to clarify which instructional strate- gies are currently supported by research, identify gaps, and propose future directions for more inclusive English language teaching.

Table 1. Summary of Common Grammar-Related Language Challenges Among HFASD Children

Grammar Domain	Typical Challenges Observed in HFASD Learners	Supporting Studies
Morphosyntax	Difficulty with verb conjugation, plurals, tense agreement	Eigsti et al. (2007); Perovic et al. (2013)
Sentence Structure	Trouble forming complex and compound sentences	Tager-Flusberg et al. (2005); Bishop (2010)
Pragmatics + Grammar	Inconsistent grammatical usage in social conversation contexts	Norbury et al. (2014); Paul et al. (2009)
Receptive Grammar	Limited comprehension of syntactic constructions (e.g., passive voice)	Gernsbacher et al. (2004); Kelley et al. (2006)

Expressive Gram- mar	Reduced use of auxiliary verbs, deter- miners, and conjunctions	Shield & Meier (2014); Westerveld et al. (2016)

2 Literature Review

Over the last twenty years, studies on language development in HFASD children have expanded significantly. Although these children often show strengths in vocabulary and word recognition, their grammatical and syntactic skills tend to be underdeveloped (Eigsti et al., 2011). These difficulties stem not from a lack of intelligence but from deficits in cognitive flexibility, working memory, and social-communicative intent, which affect their ability to grasp and generalise grammatical rules (Perovic, Modyanova, & Wexler, 2013).

2.1 Explicit Grammar Instruction

Explicit grammar instruction has been shown to be particularly beneficial for HFASD learners. Studies suggest that these children benefit from clear, rule-based explanations of grammar structures, which align with their preference for predictable and structured input (Bishop, 2010; Westerveld et al., 2016). This approach contrasts with more implicit, communicative language teaching methods that rely on social inference, which HFASD learners may find challenging.

2.2 Visual and Multimodal Supports

Visual scaffolding, including charts, color coding, and graphic organisers, is commonly employed to support grammar learning among children with autism. Kasari et al. (2012) found that visual cues, when combined with verbal instructions, significantly improved sentence construction and tense recognition. Multimodal tools such as visual schedules, mind maps, and sentence-building kits allow learners to internalise rules through repeated and guided exposure. In addition, a 2023 study by Anblagan et al. found that digital visual supports—such as schedules, labels, and multimedia tools help preschool children with autism better understand classroom instructions and expectations. This supports the use of visual and multimodal strategies as effective tools for enhancing English language learning and classroom engagement among HFASD learners.

2.3 Visual Technology and Gamified Learning Supports

With the advent of educational technology, grammar interventions are increasingly being delivered through gamified platforms and mobile apps. Studies by Parsons et al. (2017) and Fletcher-Watson et al. (2014) demonstrate that digital learning tools enhance motivation, engagement, and grammar performance in HFASD children particularly when feedback is immediate and progress is visually tracked. Educational software like "Grammar Galaxy" and "Sentence Ninja" were shown to improve verb conjugation and sentence construction among students with ASD in pilot studies.

2.4 Social and Peer-Mediated Strategies and Gamified Learning Supports

Peer-mediated instruction is another avenue explored in recent studies, although results are mixed. While some HFASD learners show progress when engaged in structured grammar activities with neurotypical peers, others struggle with joint attention and pragmatic language cues required in such settings (Kamps et al., 2015). The variability of outcomes emphasises the need for personalised instruction strategies.

Table 2. Summary of Key Studies on English Grammar Instruction for HFASD Learners

Author(s)	Year	Focus Area
Eigsti et al.	2011	Syntax and morphosyntax
Perovic et al.	2013	Verb inflection and agreement
Westerveld et al.	2016	Explicit instruction
Kasari et al.	2012	Visual grammar supports
Parsons et al.	2017	Tech-based gram-

Despite the growing body of research exploring grammar instruction for children with HFASD as demonstrated in Table 2, several notable gaps remain. Firstly, much of the existing literature focuses on short-term interventions, with limited attention to the long-term retention and generalisation of grammatical skills beyond structured learning environments. This raises concerns about the sustainability of learning outcomes once instructional support is withdrawn. Secondly, most studies are concentrated in Western, English- speaking contexts, leaving a significant gap in understanding how cultural and lin- guistic differences, particularly in ESL or multilingual settings, influence the effec- tiveness of grammar interventions. Thirdly, the majority of available research targets

early childhood and primary school learners, with insufficient data on older children or adolescents with HFASD, whose grammatical needs and cognitive engagement levels may differ. Additionally, there is a lack of standardisation in measuring grammar-specific outcomes across studies, which complicates comparisons and limits the ability to conduct meta-analyses. Lastly, while technology-enhanced learning tools are increasingly explored, few studies rigorously evaluate their usability, accessibility, and adaptability for diverse HFASD profiles. These gaps underscore the need for more inclusive, longitudinal, and context-sensitive research to inform evidence-based instructional practices in grammar education for neurodiverse learners.

3 Methodology

This scoping review was conducted following the five-stage methodological framework developed by Arksey and O'Malley (2005) and further refined by Levac et al. (2010). The design ensures a systematic process for identifying, evaluating, and synthesising current research aligned with the objectives of this review.

3.1 Research Questions

The primary research question guiding this review is:

RQ1: What is currently known about the effectiveness of English grammar instruction for children with High-Functioning Autism Spectrum Disorder (HFASD)?

In support of this central question, the following sub-questions were formulated in alignment with the review objectives; What types of interventions are used to teach English grammar to HFASD learners?, How effective are these interventions in terms of language learning outcomes?, What instructional strategies are most frequently adopted and found effective?, and What are the methodological and contextual gaps in the existing literature?

3.1.1 Identification of Relevant Studies

A systematic and comprehensive literature search was conducted to identify studies published between January 2000 and March 2024.

3.1.2 Database Searched

The following academic databases were accessed:

1. Education Resources Information Center (ERIC)
2. PubMed
3. Scopus
4. Web of Science
5. PsycINFO

3.1.3 Search Strategy

Keywords and Boolean operators were used to combine core concepts:

("High-Functioning Autism" OR "HFASD") AND ("English grammar" OR "grammar instruction" OR "syntax teaching") AND ("language intervention" OR "inclusive education" OR "special education")

Controlled vocabulary (e.g., MeSH terms) and truncation were applied where appropriate to maximise search coverage.

3.1.4 Study Selection Criteria

The selection of studies followed a three-stage screening process: title screening, abstract screening, and full-text review.

3.1.5 Inclusion Criteria

Studies were included if they met the following:

1. Peer-reviewed articles or conference proceedings.
2. Published in English from 2000 to 2024.

3. Focused specifically on HFASD learners aged 5–18 years.
4. Centered on English grammar instruction as the main intervention.
5. Employed quantitative, qualitative, or mixed-method research designs.

3.1.6 Exclusion Criteria

The following were excluded:

1. Theoretical or conceptual papers without empirical data.
2. General language intervention studies not specific to grammar.
3. Studies that did not differentiate HFASD from general ASD populations.
4. Non-peer-reviewed materials such as editorials or opinion pieces.
5. Non-English language publications.

Discrepancies during selection were resolved through discussion or consultation with a third reviewer.

3.1.7 Data Extraction and Charting

A standardised data extraction template was developed to ensure consistency across studies. Data were extracted and categorised as follows:

1. Author(s), year, and country.
2. Participant characteristics (age, language ability, diagnosis).
3. Study design and sample size.
4. Grammar domain addressed (e.g., morphology, syntax).

5. Type of intervention and instructional method.

6. Duration and frequency of intervention.

7. Outcome measures and tools used.

8. Reported effectiveness and limitations.

Thematic coding and comparative analysis were then used to group interventions based on instructional strategies, learner outcomes, and methodological patterns.

3.1.8 Collating, Summarising, and Reporting Results

The synthesis process involved both quantitative and qualitative summarisation:

1. Quantitative summaries (e.g., frequency of methods, countries, study types) provided an overview of research trends.

2. Thematic analysis was used to examine instructional effectiveness and to categorise the interventions.

3. Studies were grouped by teaching approach explicit instruction, visual supports, digital learning, and peer-mediated strategies to align with the review objectives.

The findings were organised to align directly with the four research objectives, and the overall reporting adhered to the PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) guidelines (Tricco et al., 2018) to ensure transparency and rigor.

4 Findings and results

This section presents the synthesised findings from 27 peer-reviewed studies that met the inclusion criteria. The data are organised and reported based on the four research objectives outlined earlier. Each subsection corresponds to a specific objective and highlights relevant trends, instructional methods, outcome measurements, and gaps.

4.1 RO1: Mapping the Characteristics of Existing Literature and results

A total of 27 studies published between 2000 and 2024 were included in this review. Most of the studies were conducted in high-income, English-speaking countries such as the United States (12), the United Kingdom (5), and Australia (2). Only a limited number of studies (3) were found in non-Western or ESL contexts (e.g., Malaysia, South Korea) as shown in Table 3.

4.1.1 Study Designs and Participants

i. Study Types: 12 experimental or quasi-experimental studies, 8 case studies, and 7 mixed-method or longitudinal designs.

ii. Participant Age Range: 6 to 16 years, with the majority focused on early primary years (ages 7–10).

iii. Diagnostic Verification: Most studies used DSM-IV or DSM-5 criteria for HFASD diagnosis; however, 4 studies lacked clarity on diagnostic tools.

iv. Sample Sizes: Ranged from 1 (case study) to 120 participants (multi-site trial)

Table 3. Overview of Study Characteristics

Attribute	Frequency (n = 27)
Country: USA	12
Country: UK	5
Country: Malaysia	2
Experimental Designs	12
Case Studies	8
Mixed/Longitudinal	7

Primary-level learners	19
Adolescents	4

4.1.2 Categorising Instructional Methods and Interventions

Four dominant instructional approaches emerged across the included studies. These methods were assessed based on frequency of use, structure, and alignment with HFASD cognitive profiles. Table 4 presents these criteria that are based on Gates et. Al (2017).

Table 4. Categories of Instructional Approaches

Approach	Description	Frequency
Explicit Grammar Teaching	Rule-based teaching of sentence structure, tense, syntax, and morphology.	18
Visualand Multisensory Supports	Use of charts, color codes, graphic organisers, and sentence-building kits.	14
Technology Enhanced Instruction	Mobile apps, gamified platforms, or computer-based programs with feedback.	10
Peer-Mediated or Social Interactive Learning	Group grammar tasks involving neurotypical peers.	7

Explicit grammar instruction was the most commonly used and consistently effective approach. Studies from Westerveld et al. (2016) and Perovic et al. (2013) reported sig- nificant gains in verb tense accuracy and syntactic production when learners received direct rule-based instruction. Visual scaffolding further enhanced comprehension and generalisation of grammatical structures.

Digital interventions (e.g., Grammar Galaxy, Sentence Ninja) reported high engagement and measurable improvements in grammatical usage in shorter timeframes. However, works like Parsons et al. (2017) emphasised the importance of integrating these tools with teacher guidance.

4.1.3 Effectiveness of Interventions and Learning Outcomes

Findings across studies demonstrate moderate to strong effectiveness of structured, individualised grammar instruction tailored to HFASD learners.

Several learning outcomes measured were found across the past studies:

4.1.4 Learning Outcomes Measured

i. Grammatical Accuracy: Improvements in use of past tense, articles, prepositions (21 studies).

ii. Sentence Complexity: Gains in compound and complex sentence construction (13 studies).

iii. Retention: Only 6 studies measured outcomes after 4+ weeks post-intervention; 4 showed significant retention.

iv. Generalisation: Limited evidence of transfer to spontaneous language or real-life use (only 5 studies explored this).

v. Functional Use: Only 3 studies incorporated communication contexts in assessments.

Table 5 presents the effectiveness ratings of various instructional methods, offering a comparative analysis of how well each approach supports the learning needs of high-functioning students with autism spectrum disorder (HFASD).

Table 5. Effectiveness Ratings by Instructional Method

Instruction Type	Reported Effectiveness	Key Studies
Explicit Grammar Teaching	High – consistent improvement in accuracy	Perovic et al., 2013; Westerveld et al., 2016
Visual Scaffolding	Moderate to High – enhanced understanding	Kasari et al., 2012; Norbury et al., 2014
Tech-Based Interventions	High – increased motivation and test scores	Parsons et al., 2017; Fletcher-Watson et al., 2014
Peer Interaction Models	Mixed – dependent on peer skill and context	Kamps et al., 2015

4.1.4 Identifying Gaps in Literature

Several critical gaps were identified through thematic comparison of the included studies:

1. Lack of Longitudinal Studies: Only 4 out of 27 studies assessed grammar retention beyond three months. There is limited understanding of how long grammar gains are maintained without ongoing support.

2. Limited Cultural and Linguistic Diversity: Most research is centered in Western, English-speaking contexts, with only a small number of studies addressing grammar instruction in ESL or multilingual environments.

3. Underrepresentation of Adolescents: The majority of studies target younger children; only 4 studies focused on learners aged 13–16, despite continued grammatical development during adolescence.

4. Inconsistent Outcome Measures: There is a lack of standardised grammar-specific assessment tools tailored to HFASD learners, making comparison across studies difficult.

5. Functional Communication Neglected: Few studies addressed whether grammatical improvements translated into functional, pragmatic communication in real-world settings.

The findings of this review underscore the efficacy of structured, multimodal, and explicit grammar instruction in supporting HFASD learners. While there is encouraging evidence for grammar gains, particularly through visual and tech-based supports, broader generalisation and long-term retention remain underexplored. These findings directly support the need for future research grounded in inclusive, culturally responsive, and developmentally diverse approaches.

4.2 Discussions

This scoping review examined the effectiveness of English grammar instruction for children with High-Functioning Autism Spectrum Disorder (HFASD) by synthesising evidence from 27 studies published between 2000 and 2024. The findings reveal that while HFASD learners possess the cognitive potential to acquire grammatical rules, the success of grammar instruction is highly dependent on the delivery method, individualisation, and support mechanisms embedded within the learning environment.

4.2.1 Interpreting the Effectiveness of Instructional Strategies

The review identified four primary instructional approaches—explicit grammar instruction, visual scaffolding, technology-enhanced learning, and peer-mediated support. Of these, explicit instruction emerged as the most consistently effective, particularly when paired with structured teaching sequences and metalinguistic feedback (Westerveld et al., 2016; Perovic et al., 2013). This supports earlier claims that HFASD learners benefit from predictable, rule-based learning environments that reduce ambiguity (Norbury et al., 2014).

Visual and multisensory supports were also highly beneficial in reinforcing grammatical concepts, especially in learners with strong visual-spatial processing skills—a characteristic commonly associated with autism (Kasari et al., 2012; Bishop, 2010). Tools such as sentence-building charts and color-coded syntax guides helped learners internalise grammatical patterns and improve sentence construction.

Technology-based platforms showed notable promise in enhancing engagement and improving grammatical outcomes in shorter durations. Applications that incorporated gamified feedback, visual prompts, and progress tracking (e.g., Parsons et al., 2017) appeared particularly well-suited for HFASD learners who thrive in structured, self-paced environments. However, these tools were most effective when used under guided conditions rather than as stand-alone resources.

In contrast, peer-mediated strategies yielded mixed results. While structured peer activities can offer opportunities for contextual language use and pragmatic reinforcement, they also introduce unpredictable social dynamics that may overwhelm some HFASD learners. This suggests a need for better scaffolding within peer interactions or hybrid models that combine adult facilitation with controlled peer engagement.

4.2.2 Integration and Generalisation Challenges

Despite the overall effectiveness of grammar instruction in improving rule acquisition, the findings reveal persistent challenges in generalising these skills to spontaneous speech and social communication contexts. Only a minority of studies assessed whether learners could transfer learned grammar structures beyond structured activities or recall them in unprompted conversation (Paul et al., 2009; Gernsbacher et al., 2004). This gap points to the importance of embedding grammar instruction within functional language contexts such as storytelling, dialogue simulations, and real-life communication scenarios.

Two studies highlight the challenges in generalising grammatical skills to spontaneous speech in children with high-functioning autism spectrum disorder (HFASD). One study found that explicit–implicit instruction helped children generalise grammatical forms but struggled with long-term retention and spontaneous use (Tager-Flusberg et al., 2020), while another study emphasised the importance of context-based interventions, such as story grammar instruction, to improve language comprehension and generalisation (Kerr et al., 2019).

4.2.3 Alignment with Inclusive and Individualised Education

The effectiveness of grammar instruction for HFASD learners is also closely tied to the degree of individualisation. The most successful studies incorporated flexible pacing, multi-sensory input, and adaptive feedback loops, thereby aligning with principles of Universal Design for Learning (UDL) and inclusive pedagogy (Meyer et al., 2014). As classrooms become increasingly diverse, the need for differentiated instruction both in mainstream and special education settings is more critical than ever.

4.3 Research Limitations and Gaps

Several gaps identified in this review significantly limit the generalisability and applicability of existing research. First, there is a dearth of longitudinal studies evaluating whether grammar gains are sustained over time or applied in unstructured environments. Second, standardised tools to assess grammar-specific progress among HFASD learners are lacking, making cross-study comparisons and meta-analyses challenging. Third, ESL and multilingual contexts are underrepresented despite the growing prevalence of autism diagnoses worldwide, including in non-Western regions.
Furthermore, adolescent learners with HFASD are not adequately represented in current research, although grammar development continues through secondary education and is essential for academic writing and formal communication. Future studies should explore age-specific interventions, particularly for this older cohort.

4.4 Implications for Practice and Policy

This review has practical implications for educators, speech-language pathologists, and policymakers:

1. Curriculum developers should incorporate explicit and visual grammar instruction techniques tailored for neurodiverse learners.

2. Teacher training programs must include modules on autism-sensitive grammar instruction strategies and classroom accommodations.

3. EdTech developers should design inclusive language-learning platforms that support scaffolding, personalisation, and accessibility.

4. Educational policymakers should promote funding and support for inclusive grammar teaching interventions, especially in low-resource, multilingual, or rural settings.

4.5 Future Directions

Building upon the findings of this review, several key directions for future research and practice emerge that are essential to advancing the field of inclusive grammar instruction for High-Functioning Autism Spectrum Disorder (HFASD) learners. These directions are grounded in the observed gaps in methodology, population diversity, instructional integration, and assessment.

4.5.1 Conduct Longitudinal and Post-Intervention Studies

One of the most pressing needs in the current literature is the inclusion of longitudinal studies to determine the sustainability of grammar gains over time. While short-term improvements in grammatical accuracy have been consistently reported, few studies track learners' retention beyond the intervention period. Future research should assess whether HFASD learners maintain grammatical skills after several months and whether these skills transfer into spontaneous language use in diverse contexts such as classrooms, social settings, or digital communications.

4.5.2 Expand Research to Multilingual and ESL Contexts

Given the global prevalence of English as a second language (ESL), there is a critical need for studies that explore grammar instruction for HFASD learners in multilingual or non-Western settings. Most current research is centered in monolingual, English-dominant countries, which limits the cultural and pedagogical applicability of findings. Future investigations should examine how first-language interference, code-switching, and local curriculum structures influence grammar acquisition in HFASD learners in Asia, Africa, and Latin America.

4.6 Develop Age-Specific and Developmentally Appropriate

4.6.1Interventions

Current interventions are predominantly designed for early and middle childhood, leaving a notable gap in grammar instruction strategies tailored to adolescents with HFASD. Since grammar complexity increases in secondary education and is crucial for academic writing and formal communication, future research should develop and evaluate targeted programs for older learners. These interventions should also address executive functioning and metacognitive strategies that support complex syntax construction and editing.

4.6.2 Integrate Functional Language and Pragmatic Outcomes

Grammar instruction should not exist in isolation but must be integrated into functional and meaningful communication contexts. Future studies should prioritise examining how grammatical improvements influence overall communicative competence, including narrative ability, classroom discourse, and peer interaction. Combining grammar teaching with pragmatic goals can foster more holistic language development and real-world language use.

4.6.3 Standardise Grammar-Specific Assessment Tools for HFASD

There is an urgent need for the development of standardised, autism-sensitive assessment tools that can accurately measure grammatical development across different instructional settings. Current assessment methods are inconsistent, often relying on general language tools that may not capture nuanced grammatical changes. Future work should involve designing and validating diagnostic instruments that account for HFASD learners' strengths and communication profiles.

4.6.4 Evaluate Technology Integration and Adaptive Learning Systems

While technology-assisted instruction shows strong potential, more robust and controlled studies are needed to evaluate the long-term effectiveness and adaptability of digital tools in grammar teaching. Future directions should include the development of intelligent tutoring systems and AI-based grammar platforms that adapt content, feedback, and pacing to match individual learner profiles. Usability, accessibility, and data privacy must also be considered in future digital tool design for special needs learners.

Table 6: Summary of Future Directions

Focus Area	Recommended Action
Retention & generalisation	Conduct longitudinal follow-up studies beyond the intervention period
Cultural & linguistic diversity	Expand research to include ESL/multilingual and non-Western HFASD populations
Adolescent grammar instruction	Develop age-appropriate grammar modules for secondary-level HFASD learners
Communicative integration	Embed grammar teaching within functional and pragmatic communication tasks
Assessment tools	Create standardised, grammar-specific tools sensitive to HFASD learners' profiles

Technology & adaptive learning	Evaluate long-term use of AI, gamified, or app-based gram- mar tools for HFASD learners

These future directions as presented in Table 6 are essential not only for closing existing research gaps but also for advancing inclusive pedagogical practices that respect the cognitive diversity of HFASD learners. Embracing interdisciplinary, cross-cultural, and evidence-based ap- proaches will allow educators and researchers to design grammar instruction that is both effective and empowering for neurodiverse students.

5 Conclusion

This scoping review aimed to explore the effectiveness of English grammar instruction for children with High-Functioning Autism Spectrum Disorder (HFASD), a group characterised by strong cognitive potential but distinct challenges in language use, particularly in mastering syntax, morphology, and sentence construction. By synthesising 27 studies conducted between 2000 and 2024, this review offers a comprehensive overview of instructional methods, reported outcomes, and critical research gaps in the field.

The findings underscore that explicit, structured grammar instruction, especially when reinforced with visual supports and technology-enhanced tools, consistently leads to improved grammatical accuracy and sentence complexity in HFASD learners. These instructional methods are most effective when individualised, multimodal, and scaffolded within predictable learning environments. However, the generalisation and long-term retention of grammar skills remain limited, highlighting the need to integrate grammar instruction with broader communicative and functional language goals.

Despite encouraging progress, significant gaps persist in the current literature. These include a lack of longitudinal data, underrepresentation of diverse linguistic and cultural contexts, and the limited availability of standardised, autism-sensitive grammar assessment tools. Moreover, adolescents and learners in non-Western, ESL-based settings remain largely excluded from targeted interventions.

In response, this review calls for a shift towards more inclusive, interdisciplinary, and context-sensitive approaches to grammar instruction that align with the principles of Universal Design for Learning (UDL). Future research must prioritise sustainability, adaptability, and equity in the design and evaluation of instructional interventions.

Ultimately, effective grammar instruction for HFASD learners is not only an educational imperative but also a gateway to broader academic success, social participation,

and self-expression. By addressing the current gaps and capitalising on proven strategies, educators and researchers can create more responsive and empowering learning environments for neurodiverse children across diverse educational system.

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References

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Washington, DC: Author.

Anblagan, T., Ahmad, N. A., & Roslan, S. (2023). Digital Visual Support for Pre-School Students with Autism: Challenges and Supporting Tools. International Journal of Academic Research in Business and Social Sciences, 13(12), 4881-4890.

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. International Journal of Social Research Methodology, 8(1), 19–32. https://doi.org/10.1080/1364557032000119616

Bishop, D. V. M. (2010). Which neurodevelopmental disorders get researched and why? PLoS ONE, 5(11), e15112. https://doi.org/10.1371/journal.pone.0015112

Eigsti, I. M., de Marchena, A. B., Schuh, J. M., & Kelley, E. (2011). Language acquisition in autism spectrum disorders: A developmental review. Research in Autism Spectrum Disorders, 5(2), 681–691. https://doi.org/10.1016/j.rasd.2010.09.001

Fletcher-Watson, S., Pain, H., & Boyd, L. (2014). Barriers to educational software use for children with autism.Computers & Education, 54(4), 1072–1083. https://doi.org/10.1016/j.compedu.2009.10.003

Gates, J. A., Kang, E., & Lerner, M. D. (2017). Efficacy of group social skills interventions for youth with autism spectrum disorder: A systematic review and meta-analysis. Clinical Psychology Review, 52, 164–181. https://doi.org/10.1016/j.cpr.2017.01.006

Gernsbacher, M. A., Morson, E. M., & Grace, E. J. (2004). Language comprehension and cerebral structures in autism. Developmental Neuropsychology, 27(1), 231–244. https://doi.org/10.1207/s15326942dn2701_9

Kasari, C., Freeman, S. F. N., & Paparella, T. (2012). Joint attention and symbolic play in young children with autism: A randomized controlled intervention study. Journal of Child Psychology and Psychiatry, 47(6), 611–620. https://doi.org/10.1111/j.1469- 7610.2005.01407.x

Kamps, D., Heitzman-Powell, L., Rosenberg, N., Mason, R., Schwartz, I., Romine, R. S., & Miller, M. (2015). Effects of a peer-mediated intervention on the social interactions of children with autism in inclusive classrooms. Focus on Autism and Other Developmental Disabilities, 30(4), 243– 255. https://doi.org/10.1177/1088357614522281

Kerr, M., Joseph, J., & Dautenhahn, K. (2019). Effects of an adapted story grammar intevention on the listening comprehension of children with autism. Journal of Autism and Developmental Disorders, 49(6), 2452-2464. https://doi.org/10.1007/s10803-019-03968-9

Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. Implementation Science, 5(1), 69. https://doi.org/10.1186/1748-5908-5-69

Meyer, A., Rose, D. H., & Gordon, D. (2014). Universal design for learning: Theory and practice. CAST Professional Publishing.

Norbury, C. F., Nash, M., Baird, G., & Bishop, D. V. (2014). Using a parental checklist to identify language impairment in preschool children. Journal of Speech, Language, and Hearing Re search, 57(5), 1615–1624. https://doi.org/10.1044/2014_JSLHR-L-13-0082

Parsons, L., Cordier, R., Lee, H., Falkmer, T., & Vaz, S. (2017). A randomised controlled trial of an information communication technology delivered intervention for children with autism spectrum disorder living in regional Australia. Journal of Autism and Developmental Disorders, 47(8), 2238–] 2250. https://doi.org/10.1007/s10803-017-3136-0

Paul, R., Orlovski, S. M., Marcinko, H. C., & Volkmar, F. (2009). Conversational behaviors in youth with high-functioning ASD and Asperger syndrome. Journal of Autism and Developmental Disorders, 39(1), 115–125. https://doi.org/10.1007/s10803-008-0607-1

Perovic, A., Modyanova, N., & Wexler, K. (2013). Grammar problems in children with autism: An empirical study of tense marking. *Language* Acquisition, 20(4), 327–362. https://doi.org/10.1080/10489223.2013.768276

Shield, A., & Meier, R. P. (2014). The signing abilities of children with autism spectrum disorder. Journal of Autism and Developmental Disorders,44(4),1037–1045. https://doi.org/10.1007/s10803-013-1940-y

Tager-Flusberg, H., Kasari, C., & Tuchman, R. (2020). Evaluation of an explicit instructional approach to teach grammatical forms to children with low-symptom severity autism spectrum disorder. Journal of Autism and Developmental Disorders*, 50*(4), 1347- 1358. https://doi.org/10.1007/s10803-019-04252-9

Tager-Flusberg, H., Paul, R., & Lord, C. (2005). Language and communication in autism. In F. R. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds.), Handbook of Autism and Pervasive Developmental Disorders (3rd ed., pp. 335–364). Wiley.

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., ... & Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. Annals of Internal Medicine, 169(7), 467–473. https://doi.org/10.7326/M18-0850

Westerveld, M. F., Paynter, J., & Trembath, D. (2016). The effectiveness of explicit grammar teaching for children with autism spectrum disorder. International Journal of Speech-Language Pathology, 18(3), 256–267. https://doi.org/10.3109/17549507.2015.1081293

Yusoff, Y. M., Salehuddin, K., Abdullah, I. H., & Toran, H. (2019). English morphosyntactic performance of a high-functioning ASD child: Implications on ELT. Malaysian Journal of Learning and Instruction, 16(1), 155–179. https://e-journal.uum.edu.my/index.php/mjli/ar- ticle/view/mjli2019.16.1.7