

School-Based Emotion Regulation Support for Learners with Autism Spectrum Disorder: A Systematic Literature Review of Interventions, Mechanisms, and Implementation

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ABSTRACT:

This systematic literature review examined recent empirical evidence on school-based emotion regulation and self-regulation interventions for learners with Autism Spectrum Disorder (ASD), focusing on intervention types, reported effects, underlying mechanisms, and implementation factors. Learners with ASD often experience emotion regulation difficulties that may affect attention, classroom participation, peer interaction, behavioural adjustment, and well-being. Guided by the PRISMA 2020 framework, studies published between 2020 and 2025 were identified through Scopus, Web of Science, PubMed, ERIC, and supplementary searches. After screening, eligibility assessment, quality appraisal, and data extraction, 27 records were retained. Among these, 22 studies were included in the thematic and mechanism-based synthesis, while five records were retained as supporting evidence. The included studies were appraised using the Mixed Methods Appraisal Tool (MMAT) 2018. Five intervention themes were identified: cognitive-behavioural and anxiety-focused interventions, social-emotional and peer-mediated interventions, interoception and body-based regulation approaches, technology-assisted and gamified emotional learning, and teacher training with implementation support. Findings suggest that school-based interventions may support emotional awareness, coping skills, anxiety regulation, behavioural self-regulation, social participation, classroom engagement, and teacher-mediated support. However, effectiveness varied according to learner characteristics, intervention mechanisms, school context, and implementation fidelity. This review concludes that emotion regulation is a teachable educational competency. Effective support for learners with ASD should be differentiated, mechanism-based, and embedded within everyday classroom routines.

Keywords: Emotion regulation, Autism Spectrum Disorder, School-based interventions, Inclusive education, Special education.

1. Introduction

1.1 Emotion Regulation as a Core Educational Construct

Emotion regulation is a core educational construct because students' emotions influence attention, motivation, memory, decision-making, classroom participation, and social interaction (Durlak et al., 2011; Gross, 2015). In educational settings, emotions such as curiosity, enjoyment, frustration, anxiety, disappointment, and stress are closely connected to students' learning experiences and behavioural adjustment. Students who are able to regulate their emotions effectively are generally more capable of maintaining attention, persisting during academic challenges, adapting to classroom expectations, and engaging positively with peers and teachers.

Emotion regulation refers to the dynamic process through which individuals monitor, evaluate, and modify their emotional experiences and emotional expressions according to situational demands and personal goals (Gross, 1998). In school contexts, this process allows learners to manage frustration, cope with anxiety, recover from disappointment, control impulsive reactions, and seek appropriate support. Therefore, emotion regulation is not only an internal psychological skill but also an important educational competency that supports learning, behaviour, and participation.

According to Gross's Process Model of Emotion Regulation, individuals may regulate emotions through situation modification, cognitive change, and response modulation (Gross, 1998). It is highly relevant within the education setting due to the constantly emotional responses toward different situations such as academic tasks, transitions, peer interaction, feedback, and unexpected classroom events (Gross, 2015). For learners with ASD, difficulties may occur at different points in this process. For example, a learner may struggle to shift attention away from a distressing stimulus, reinterpret a stressful situation, or control behavioural responses after emotional arousal has increased. Therefore, Gross's model helps explain why emotion

regulation intervention should not only focus on reducing disruptive behaviour, but should also teach learners to recognise emotional triggers, understand emotional experiences, use coping strategies, and respond adaptively before dysregulation escalates.

In addition, Bronfenbrenner's Ecological Systems Theory provides an important framework for understanding emotion regulation as a process shaped by the learner's environment (Bronfenbrenner, 1979; El Zaatari & Maalouf, 2022). From this perspective, emotional development is influenced by the interaction between the learner and surrounding systems, including teachers, peers, classroom routines, family support, school culture, and wider educational policy. This theory is especially important for special educators working with learners with ASD because emotion regulation difficulties do not occur in isolation. A learner's ability to regulate emotions may be strengthened or weakened by classroom predictability, teacher responses, sensory demands, peer relationships, communication supports, and school-wide inclusion practices. Therefore, special educators play a critical role in creating structured, responsive, and emotionally safe learning environments that support regulation, participation, and well-being among learners with ASD.

Together, these two theories highlight the importance of school-based environmental support. For learners with ASD, effective emotion regulation intervention requires both direct teaching of regulation skills and supportive classroom systems. This theoretical foundation supports the focus of the present review on school-based interventions, teacher implementation, and inclusive educational practice. When students experience emotional dysregulation, learning may be disrupted. Dysregulation might further reduce classroom engagement, increase behavioural difficulties, weaken peer relationships, and limit opportunities for academic participation.

1.2 Emotion Regulation in Special and Inclusive Education

In special and inclusive education, emotion regulation is especially important because learners with special educational needs often face additional academic, behavioural, sensory, communication, and social demands (Durlak et al., 2011; Stalmach et al., 2023). These learners may experience difficulties coping with classroom routines, transitions, peer interaction, task demands, sensory stimulation, or unexpected changes. Without appropriate emotional support, they may be more likely to withdraw, avoid tasks, become dysregulated, or experience reduced participation in classroom activities.

Emotion regulation contributes to academic readiness, behavioural adaptation, social competence, and psychological well-being. Learners who can regulate their emotions are more likely to remain engaged during instruction, tolerate frustration, follow classroom expectations, and participate in social interaction. In contrast, learners who experience persistent emotional dysregulation may struggle to access learning opportunities, even when academic content has been adapted.

Therefore, emotion regulation should be understood as a key component of inclusive education rather than as an additional behavioural support. Inclusive education requires more than the physical placement of learners in mainstream or special education classrooms. It also requires emotionally supportive environments where learners are helped to understand emotions, communicate needs, use coping strategies, and participate meaningfully in school life.

1.3 Emotion Regulation Challenges among Learners with ASD

Learners with Autism Spectrum Disorder (ASD) often experience significant emotion regulation difficulties (American Psychiatric Association, 2013; Beck et al., 2020; Lord et al., 2018). ASD is commonly associated with differences in social communication, restricted or repetitive

behaviours, sensory processing, flexibility, and social understanding (American Psychiatric Association, 2013; Lord et al., 2018). These characteristics may increase the likelihood of emotional dysregulation, particularly in situations involving uncertainty, sensory overload, social misunderstanding, academic frustration, or changes in routine.

Emotion regulation difficulties among learners with ASD may appear in different ways (Beck et al., 2020; Day et al., 2022; DeLucia et al., 2021; Samson et al., 2015). Some learners may show externalising responses, such as emotional outbursts, aggression, crying, meltdowns, or task refusal. Others may show internalising responses, such as withdrawal, shutdowns, silence, avoidance, or masking of distress. These behaviours should not be interpreted only as non-compliance or classroom disruption. Instead, they may represent the learner's difficulty in identifying emotions, communicating distress, coping with anxiety, tolerating sensory demands, or responding to social expectations.

In school settings, these difficulties may affect attention, task persistence, peer relationships, classroom engagement, and overall learning participation. Emotional dysregulation may also create challenges for teachers, particularly when teachers have limited training, limited resources, large class sizes, or insufficient support in implementing ASD-specific strategies. Therefore, emotion regulation difficulties among learners with ASD should be viewed as both an individual developmental concern and a school-based educational concern.

1.4 School-Based Emotion Regulation Interventions

Schools are important settings for emotion regulation intervention because they provide structured routines, repeated practice opportunities, adult guidance, peer interaction, and authentic academic and social situations (Cheung et al., 2021; Durlak et al., 2011; Reaven et al., 2024). Compared with clinical or highly controlled environments, school settings allow learners to practise and generalise regulation

strategies across real classroom routines, transitions, group work, peer interaction, and unstructured activities.

In this systematic literature review, school-based emotion regulation interventions refer to planned strategies, programmes, or support practices delivered within school settings, classroom routines, or school-linked services to help learners with ASD understand, manage, and express their emotions more appropriately. These interventions do not only focus on stopping challenging behaviour. Instead, they aim to teach learners how to recognise emotions, identify body signals, communicate needs, use coping strategies, reduce anxiety, manage frustration, and participate more successfully in classroom and social activities.

The school-based emotion regulation interventions may include direct teaching strategies such as emotion cards, visual emotion scales, The Zones of Regulation, social stories, coping menus, flash cards, breathing exercises, relaxation activities, interoception activities, and self-monitoring charts (Love et al., 2024; Mahler et al., 2022; Öhlböck et al., 2024). They may also include structured programmes such as cognitive-behavioural therapy, anxiety-focused intervention, emotional education, social-emotional learning, peer-mediated support, technology-assisted emotional learning, or teacher-led regulation routines (Bartoli et al., 2024; Beaumont et al., 2021; Cheung et al., 2021; Kang et al., 2025; Reaven et al., 2024). For example, a teacher may support a learner with ASD by using a visual feelings chart to help the student identify whether they are calm, worried, angry, or overwhelmed, followed by a coping choice such as taking a short break, asking for help, using a sensory tool, or moving to a quiet space.

These interventions can be delivered in different ways. Some are taught individually to the learner, while others are embedded into whole-class routines or small-group activities. For instance, a teacher may introduce a whole-class calm-down routine before transitions, teach all students how to name emotions during circle time, or use

structured peer activities to practise turn-taking and social problem-solving. At the same time, learners with ASD may still receive individualised support such as visual schedules, personalised coping plans, sensory breaks, or teacher prompting. Therefore, school-based emotion regulation intervention is best understood as a combination of direct student instruction, teacher support, classroom adaptation, peer involvement, and consistent school-wide practice.

1.5 Problem Statement

Emotion regulation difficulties remain a major educational challenge for learners with ASD. These difficulties can significantly affect attention, classroom participation, task persistence, behavioural adaptation, peer interaction, and emotional well-being. Emotional dysregulation may appear as anxiety, meltdowns, shutdowns, withdrawal, aggression, avoidance, or task refusal, which can limit meaningful participation in academic and social activities (Beck et al., 2020; Day et al., 2022; Samson et al., 2015).

From the perspective of educators, supporting emotion regulation among learners with ASD can be challenging. Many teachers may have limited training, insufficient confidence, and inadequate resources to implement ASD-specific emotion regulation strategies effectively. Large class sizes, workload demands, limited professional support, curriculum pressure, and inconsistent school-wide practices may further reduce the quality and sustainability of intervention implementation (Chezan et al., 2023; Hayutin et al., 2025; Love et al., 2024; Öhlböck et al., 2024).

The problem is not only that learners with ASD experience dysregulation, but also that schools often lack clear evidence-based guidance on how to select, adapt, and sustain appropriate intervention strategies. Many interventions show promise in clinical, specialist, or controlled settings, but their feasibility and effectiveness in everyday classroom routines remain less clear. Therefore, a systematic literature review is needed to synthesise recent evidence on school-

based emotion regulation interventions for learners with ASD and to clarify intervention types, reported outcomes, underlying mechanisms, and implementation conditions.

2. LITERATURE REVIEW

2.1 Conceptual Understanding of Emotion Regulation

Emotion regulation is a multidimensional process involving emotional awareness, cognitive regulation, behavioural regulation, physiological regulation, and social regulation (Beck et al., 2020; Gross, 1998, 2015). Emotional awareness refers to the ability to recognise and label emotional states. Cognitive regulation involves strategies such as reappraisal, self-talk, problem-solving, and coping with uncertainty. Behavioural regulation refers to the ability to inhibit impulsive responses and engage in adaptive behaviours. Physiological regulation involves managing bodily arousal through strategies such as breathing, relaxation, sensory modulation, or body awareness. Social regulation refers to seeking support and using socially appropriate strategies to manage emotions with others.

These dimensions are highly relevant in school settings because learners are constantly required to manage emotions during academic tasks, social interaction, transitions, feedback, and unexpected changes. For learners with ASD, these demands may be especially challenging because emotional experiences may be intensified by sensory sensitivity, communication difficulties, anxiety, or social uncertainty (Beck et al., 2020; Day et al., 2022; Samson et al., 2015). As a result, emotion regulation support must address both internal regulation processes and external environmental conditions.

The development of emotion regulation can also be understood through ecological and social learning perspectives. From an ecological perspective, learners' emotional development is shaped by interactions within classroom routines, teacher responses, peer relationships, family-school collaboration, and school culture (Bronfenbrenner, 1979; El Zaatari & Maalouf, 2022). Learners also develop regulation skills

through modelling, guided practice, feedback, reinforcement, and repeated opportunities to apply strategies. This supports the importance of embedding emotion regulation interventions within authentic school environments.

2.2 Past Studies on School-Based Emotion Regulation Interventions for Learners with ASD

Past studies have increasingly positioned schools as important contexts for supporting emotion regulation among learners with Autism Spectrum Disorder (ASD). This is because schools provide daily opportunities for learners to practise regulation skills within authentic educational situations, including classroom instruction, transitions, peer interaction, group activities, feedback, and unstructured routines (Cheung et al., 2021; Durlak et al., 2011; Reaven et al., 2024). Unlike clinical or centre-based settings, school environments allow emotion regulation strategies to be taught, practised, reinforced, and generalised within the learner's everyday academic and social experiences.

Within school-based and school-linked contexts, previous studies have examined several intervention approaches to support emotion regulation and related outcomes among learners with ASD. These include cognitive-behavioural and anxiety-focused interventions, social-emotional learning, peer-mediated support, interoception-based intervention, relaxation and body-based strategies, technology-assisted or gamified learning, and teacher-led regulation support (Bartroli et al., 2024; Beaumont et al., 2021; Cheung et al., 2021; Kang et al., 2025; Mahler et al., 2022; Reaven et al., 2024; Vincent et al., 2023). Collectively, these approaches suggest that emotion regulation intervention for learners with ASD is multidimensional. It may involve cognitive coping, emotional awareness, physiological regulation, social understanding, behavioural self-management, motivation, and teacher-mediated implementation.

The existing literature suggests that these interventions may contribute to improvements in emotional awareness, coping skills, anxiety

regulation, behavioural self-regulation, peer participation, classroom engagement, and social-emotional functioning (Bartoli et al., 2024; Beaumont et al., 2021; Cheung et al., 2021; Mahler et al., 2022; Meyer et al., 2025; Reaven et al., 2024). However, intervention effectiveness appears to depend on the fit between the intervention approach and the learner's profile. For example, learners with anxiety-related dysregulation may benefit from cognitive-behavioural strategies, whereas learners with sensory sensitivity or difficulty recognising internal body cues may require interoception, relaxation, visual supports, or body-based strategies. Similarly, learners who experience peer-related stress may benefit from social-emotional or peer-mediated interventions, while learners with low motivation may respond more positively to structured technology-assisted or gamified approaches.

Past studies also indicate that teacher readiness and implementation quality are critical factors in school-based emotion regulation support (Chezan et al., 2023; Hayutin et al., 2025; Love et al., 2024; Öhlböck et al., 2024). Teachers are often responsible for identifying early signs of dysregulation, prompting coping strategies, adapting classroom demands, and reinforcing regulation skills during daily routines. Therefore, positive teacher attitudes, adequate training, confidence, consistent classroom practices, and school-wide support may strengthen intervention fidelity and sustainability. In contrast, limited training, large class sizes, time constraints, lack of resources, and inconsistent school support may reduce the effectiveness of even well-designed interventions.

Taken together, past studies show that school-based emotion regulation interventions have promising potential for supporting learners with ASD. However, the evidence remains varied across intervention types, learner characteristics, outcome measures, and implementation conditions. This variation indicates the need for a systematic literature review that synthesises not only what interventions have been used, but also what outcomes they produce, how they may

work, and what teacher-related or school-based factors influence their implementation. This provides the foundation for the research gap discussed in the following section.

2.3 Research Gap in School-Based Emotion Regulation Interventions

Based on the reviewed past studies, the first major gap is that evidence on school-based emotion regulation interventions for learners with ASD remains fragmented across psychological, behavioural, clinical, occupational therapy, and educational disciplines (Beck et al., 2020; Hendrix et al., 2022; Stalmach et al., 2023). Although previous studies have examined cognitive-behavioural therapy, social-emotional learning, interoception, relaxation, peer-mediated intervention, technology-assisted learning, and teacher-led support, these approaches are often studied separately. As a result, educators may find it difficult to understand which interventions are most relevant, practical, and effective within school-based settings. Therefore, a systematic synthesis is needed to organise the existing evidence and clarify the types of interventions used and their reported effects on learners with ASD.

The second gap concerns the limited understanding of how school-based interventions work in authentic educational contexts. Many interventions are developed or tested in specialist, controlled, or short-term intervention settings, while schools require strategies that can be applied during real classroom routines, transitions, group activities, peer interaction, and inclusive learning environments. In addition, past studies often report whether an intervention is effective, but give less attention to explaining how it works. There is still limited synthesis of the mechanisms through which interventions support emotion regulation, such as cognitive coping, emotional awareness, physiological regulation, social understanding, motivation, and teacher-mediated implementation.

The third gap relates to implementation and sustainability. Previous studies suggest that

teacher attitude, training, confidence, intervention fidelity, classroom routines, and school-wide consistency are important for successful intervention delivery (Chezan et al., 2023; Durlak & DuPre, 2008; Hayutin et al., 2025; Love et al., 2024; Öhlböck et al., 2024). However, teacher-related and school-level implementation factors remain insufficiently synthesised, particularly in Malaysian and Southeast Asian educational contexts. Emotion regulation interventions may be difficult to sustain if teachers lack training, resources, coaching, leadership support, or practical guidance. Therefore, this systematic literature review addresses these gaps by synthesising recent evidence on school-based emotion regulation interventions for learners with ASD,

with attention to intervention types, reported effects, mechanisms of change, and implementation factors.

2.4 Research Aim

This systematic literature review aims to synthesise and critically evaluate recent empirical evidence on school-based emotion regulation interventions for learners with Autism Spectrum Disorder. Specifically, the review seeks to identify the types of interventions implemented in school-based or school-linked settings, examine their reported effects and underlying mechanisms, and explore teacher-related and school-based factors that influence the implementation and sustainability of these interventions.

2.5 Research Objectives

Research Objective	Description
Research Objective 1	To identify and categorise the types of school-based emotion regulation interventions implemented for learners with ASD.
Research Objective 2	To examine the reported effects and underlying mechanisms of these interventions on learners’ emotional, behavioural, social, and classroom functioning.
Research Objective 3	To explore teacher-related and school-based factors that influence the implementation and sustainability of emotion regulation interventions in school settings.

2.6 Research Questions

Research Question	Description
RQ1	What types of school-based emotion regulation interventions have been implemented for learners with ASD?
RQ2	What are the reported effects and underlying mechanisms of these interventions on learners’ emotional, behavioural, social, and classroom functioning?
RQ3	What teacher-related and school-based factors influence the implementation and sustainability of emotion regulation interventions for learners with ASD?

3. Methodology

3.1 Research Design

This study employed a systematic literature review (SLR) design to synthesise empirical evidence on school-based emotion regulation and self-regulation interventions for learners with

Autism Spectrum Disorder (ASD). A systematic literature review was selected because it provides a transparent, structured, and replicable process for identifying, screening, appraising, and synthesising relevant research evidence. This design was appropriate for the present study because research on school-based emotion

regulation interventions for learners with ASD is distributed across several academic fields, including special education, psychology, occupational therapy, school mental health, autism intervention, and inclusive education. The review was guided by the PRISMA 2020 framework to strengthen transparency in the identification, screening, eligibility assessment, and inclusion of studies (Page et al., 2021). This framework was applied to improve methodological clarity, replicability, and reporting quality.

The review focused on peer-reviewed empirical studies published between 2020 and 2025. This timeframe was selected to capture recent developments in school-based ASD intervention, emotion regulation support, teacher-led implementation, social-emotional learning, technology-assisted intervention, and inclusive education practice. Studies published outside this timeframe were not included in the formal screening and synthesis process. However, selected older sources were used in the introduction and discussion to support theoretical explanation.

Due to the diversity of intervention types, participant characteristics, school contexts, research designs, and outcome measures, a narrative synthesis approach was adopted rather than meta-analysis. The synthesis aimed not only to summarise intervention outcomes but also to identify how different intervention mechanisms may support emotion regulation among learners with ASD. Therefore, thematic synthesis was used to develop a deeper analytical interpretation of intervention effectiveness, learner responsiveness, and implementation conditions. Although the review protocol was not formally registered, the search strategy, eligibility criteria, screening process, data extraction framework, quality appraisal approach, and synthesis procedures were established before the final analysis. This helped ensure that the review

process remained systematic, consistent, and aligned with the research objectives.

3.2 Identification

The identification stage involved locating relevant studies from academic databases and publisher sources. The main databases used in this review were Scopus, Web of Science, ERIC, and PubMed. These databases were selected because they provide broad coverage of peer-reviewed research in special education, psychology, autism studies, developmental disability, occupational therapy, school-based intervention, and inclusive education. Supplementary searches were also conducted using Google Scholar and publisher databases, including SAGE, Springer, and ScienceDirect. These supplementary searches were used to verify article titles, authorship details, journal information, DOI links, full-text availability, and indexing status. This verification process was necessary because the working article pool contained verified articles, provisional records, supporting studies, and articles requiring further confirmation.

The search strategy was developed around four key domains. The first domain was the population, which included Autism Spectrum Disorder, autistic learners, autistic students, and autistic pupils. The second domain was the outcome, which included emotion regulation, self-regulation, emotional competence, emotional awareness, and social-emotional skills. The third domain was the setting, which included school-based contexts, classrooms, educational settings, inclusive education, and special education. The fourth domain was the intervention component, which included intervention, programme, training, curriculum, and implementation. The search terms were combined using Boolean operators. Search strings were adapted according to the syntax and search functions of each database. Table 1 presents the search strings used in the review.

Table 1 Search Strings Used in the Review

Databases	Search String
Scopus	TITLE-ABS-KEY(("autism spectrum disorder" OR ASD OR autistic OR "autistic students" OR "autistic pupils" OR "children with autism") AND ("emotion regulation" OR "emotional regulation" OR "self-regulation" OR "emotional competence" OR "social-emotional skills" OR "emotional awareness") AND ("school-based" OR school OR classroom OR "educational setting" OR "inclusive classroom" OR "special education") AND (intervention OR program OR programme OR training OR curriculum OR implementation) AND (student OR children OR pupils OR learners))
Web of Science	TS=(("autism spectrum disorder" OR ASD OR autistic OR "autistic students" OR "autistic pupils" OR "children with autism") AND ("emotion regulation" OR "emotional regulation" OR "self-regulation" OR "emotional competence" OR "social-emotional skills" OR "emotional awareness") AND ("school-based" OR school OR classroom OR "educational setting" OR "inclusive classroom" OR "special education") AND (intervention OR program OR programme OR training OR curriculum OR implementation) AND (student OR children OR pupils OR learners))
ERIC	("autism spectrum disorder" OR ASD OR autistic OR "autistic students" OR "children with autism") AND ("emotion regulation" OR "self-regulation" OR "emotional competence" OR "social-emotional skills" OR "emotional awareness") AND (school OR classroom OR "special education" OR "inclusive education") AND (intervention OR training OR curriculum OR program OR programme)
PubMed	("autism spectrum disorder" OR autistic OR ASD OR "children with autism") AND ("emotion regulation" OR "self-regulation" OR "emotional competence") AND (school OR classroom OR education) AND (intervention OR program OR training)

3.3 Screening

Next, titles and abstracts were screened to determine their preliminary relevance to the review objectives. The screening process focused on whether each record involved learners with ASD, was connected to a school or educational context, used empirical research or relevant implementation evidence, and addressed emotion regulation, self-regulation, emotional competence, coping, behavioural regulation, social-emotional participation, classroom engagement, or implementation support.

The screening process was conducted using Microsoft Excel and Microsoft Word. Microsoft Excel was used to organise the article screening table, arrange records systematically, and cross-check the status of each article. Each record was entered according to author, year, title, database source, study design, population, setting, intervention focus, outcome relevance, and

screening decision. Microsoft Word was used to document screening notes, inclusion and exclusion decisions, and emerging analytical reflections.

3.4 Eligibility

After the title and abstract screening, a full-text eligibility assessment was conducted to determine whether each article met the predefined inclusion and exclusion criteria. Each article was reviewed in detail to ensure that the final synthesis prioritised studies that were empirical, ASD-focused, school-based or school-linked, and relevant to emotion regulation, self-regulation, emotional competence, coping, anxiety regulation, behavioural regulation, or related school-based social-emotional outcomes.

Studies were included if they were published between 2020 and 2025, written in English, and published as peer-reviewed journal articles, empirical studies, protocols, or relevant

implementation papers. The target population included learners with ASD, autistic students, autistic pupils, children with autism, autistic youth, or students with suspected autism. Studies also had to be clearly connected to school, preschool, classroom, special education, inclusive education, school-linked intervention contexts, or intervention contexts with direct educational relevance.

In terms of research design, this review included empirical primary studies, intervention studies, feasibility studies, implementation studies, teacher-training studies, randomised controlled trials, quasi-experimental studies, single-case designs, qualitative studies, survey studies, mixed-method studies, and protocols retained only as supporting evidence. This broad inclusion of study designs was appropriate because research on school-based emotion regulation interventions for learners with ASD is methodologically diverse and distributed across education, psychology, occupational therapy, autism intervention, and school mental health fields.

The intervention or focus of the studies had to be related to emotion regulation, self-regulation, emotional competence, anxiety regulation, coping, behavioural regulation, social-emotional learning, technology-assisted regulation support, or school-based implementation support. Studies were considered relevant when they reported outcomes related to emotional awareness, coping, self-regulation, anxiety, emotional-behavioural adjustment, social participation, classroom engagement, teacher confidence, implementation feasibility, intervention fidelity, or future intervention development. These inclusion criteria helped ensure that the final review remained focused on recent, peer-reviewed, and educationally relevant evidence

involving learners with ASD in school-based or school-linked settings.

Studies were excluded if they did not meet the focus of the review or if essential article details could not be verified. Articles were excluded when the participants were not learners with ASD, autistic learners, autistic youth, or school-linked ASD support providers, or when the study had no clear relevance to school, educational, developmental, or school-linked contexts. Studies were also excluded if they did not address emotion regulation, self-regulation, emotional competence, coping, anxiety regulation, behavioural regulation, or related social-emotional outcomes. Non-peer-reviewed sources and publications outside the 2020 to 2025 timeframe were excluded from the formal review process. The protocols and contextual studies were retained as supporting evidence when they provided relevant information about school-based implementation, future intervention development, or emotion regulation support.

During the full-text review, each article was carefully examined to assess its conceptual relevance, methodological rigour, and contribution to understanding school-based emotion regulation and self-regulation support for learners with Autism Spectrum Disorder. Particular attention was given to whether each study addressed emotion regulation, self-regulation, anxiety regulation, emotional competence, coping, behavioural regulation, social-emotional participation, classroom engagement, or implementation support within school-based or school-linked educational contexts. This process ensured that the studies retained for synthesis were clearly aligned with the research aim, research objectives, and research questions of the review.

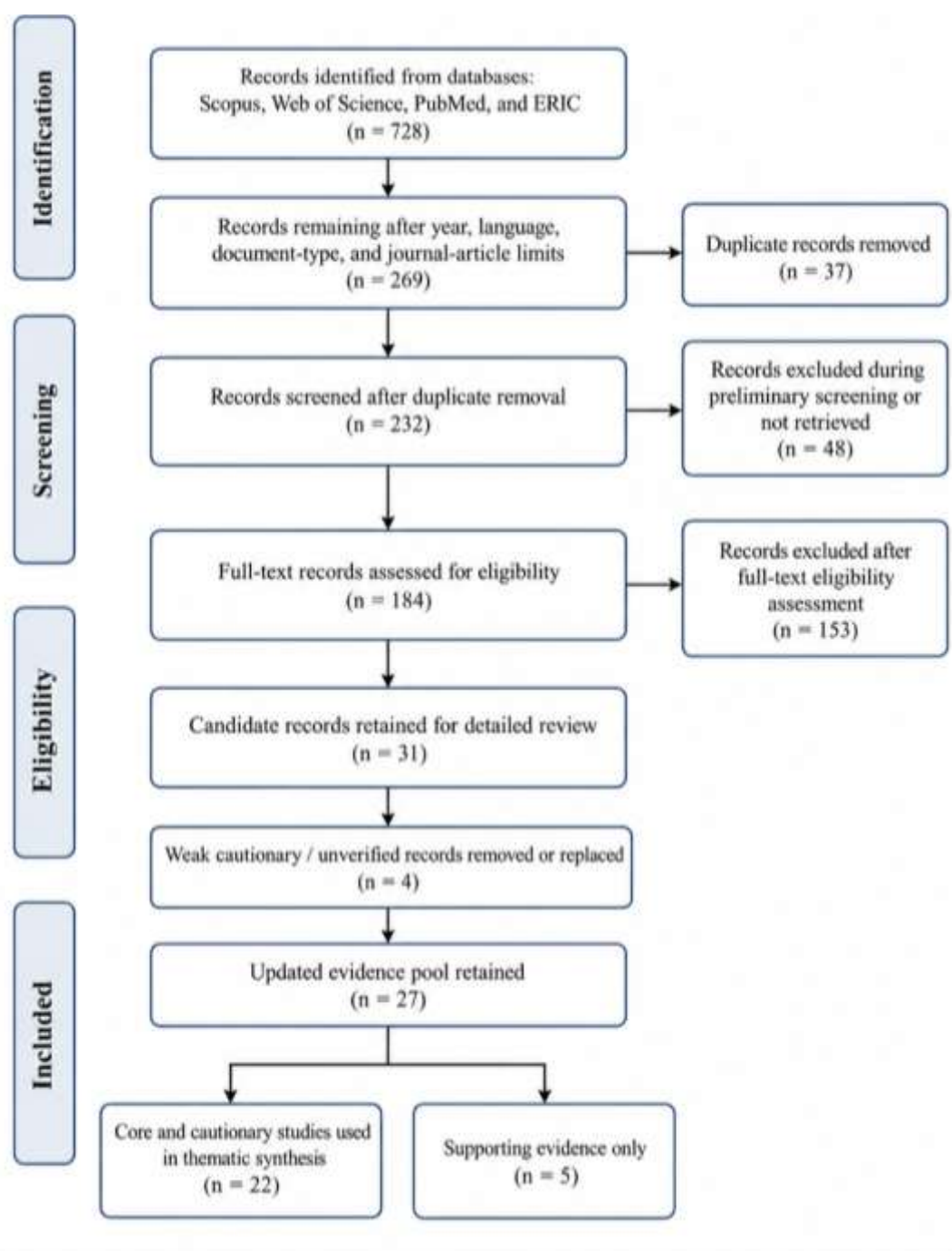


Figure 1 The PRISMA flow chart

Figure 1 indicates the overall study selection process was guided by the PRISMA 2020 framework, which provides updated guidance for transparent reporting of systematic reviews, including the identification, screening, eligibility assessment, and inclusion of studies (Page et al., 2021). The PRISMA-informed selection process began with 728 records identified across Scopus,

Web of Science, PubMed, and ERIC. After applying publication year, language, journal article, and document-type limits, 269 records remained for screening. A total of 37 duplicate records were removed, leaving 232 records for further screening.

Records with limited accessibility, insufficient thematic relevance, or unavailable full-text access

were removed during the preliminary filtering stage. The remaining records were then assessed according to the predefined inclusion and exclusion criteria. Following refinement of the article list, the records were categorised according to relevance and verification status. This process improved methodological transparency by distinguishing core intervention studies from cautionary, supporting, and unverified records.

After weaker cautionary or unverified records were replaced with more relevant studies, 27 records were retained in the updated evidence pool. Among these, 22 studies were used as core or cautionary evidence for thematic synthesis, while five records were retained as supporting evidence for the background, discussion, and future research directions.

3.5 Quality Appraisal

The methodological quality of the 22 studies retained for thematic synthesis was assessed using the Mixed Methods Appraisal Tool (MMAT), Version 2018 (Hong et al., 2018). The MMAT was selected because the studies included in this systematic literature review used diverse research designs, including randomised controlled trials, cluster randomised trials, quasi-experimental studies, intervention studies, feasibility studies, qualitative implementation studies, survey-based implementation studies, and mixed-method designs. The use of MMAT was appropriate because it allows different types of empirical studies to be appraised using a consistent but design-sensitive framework.

Each study was first classified according to its research design and then assessed using the relevant MMAT category. The appraisal began with the two MMAT screening questions, which examined whether the study had clear research questions and whether the collected data were appropriate for addressing those research questions. After this stage, each study was assessed using the relevant design-specific MMAT criteria. These criteria focused on methodological issues such as appropriateness of

study design, participant selection, data collection procedures, outcome measurement, intervention delivery, data analysis, interpretation of findings, and coherence between research questions and conclusions.

All 22 studies retained for thematic synthesis met the MMAT screening questions and satisfied the relevant design-specific appraisal criteria. Therefore, the overall methodological appraisal for the 22 studies was rated as high. This indicates that the included studies were methodologically appropriate for addressing the review questions and provided a reliable evidence base for examining school-based emotion regulation, self-regulation, anxiety regulation, social-emotional intervention, and implementation support for learners with ASD.

The quality appraisal was not used as an exclusion tool. Instead, it was used to strengthen the interpretation of evidence in the synthesis. Studies with high methodological quality were given appropriate interpretive weight in the thematic and mechanism-based synthesis. However, the review still interpreted findings carefully because the included studies varied in intervention type, outcome measurement, participant profile, school context, and degree of direct relevance to emotion regulation. Therefore, even though the quality appraisal was high, the synthesis continued to distinguish between direct emotion regulation evidence, indirect social-emotional or behavioural evidence, and implementation evidence.

The appraisal results were recorded in Microsoft Excel to support transparency and cross-checking. Each study was coded according to author, year, study design, MMAT category, screening-question results, design-specific criteria, overall appraisal judgement, and notes for interpretation. Microsoft Word was used to document the interpretation of appraisal findings and to link the quality appraisal results to the narrative synthesis.

Table 2 MMAT 2018 Appraisal Categories Applied in This Review

MMAT Category	Type of Study in This Review	Appraisal Focus
Qualitative research	Teacher perception studies, implementation studies, school-perspective studies	Appropriateness of qualitative approach, adequacy of data collection, interpretation of findings, and coherence between data and conclusions
Randomised controlled trials	School-based CBT trials, emotional education trials, video-gaming intervention trials	Randomisation, group comparability, completeness of outcome data, blinding where applicable, and intervention adherence
Non-randomised studies	Quasi-experimental studies, feasibility studies, intervention evaluations	Participant representativeness, appropriateness of measurements, completeness of outcome data, control of confounders, and intervention delivery
Quantitative descriptive studies	Surveys of teacher confidence, familiarity, training, and implementation	Sampling strategy, sample representativeness, appropriateness of measurements, non-response bias, and statistical analysis
Mixed-method studies	Studies integrating intervention outcomes with qualitative implementation data	Rationale for mixed-method design, integration of qualitative and quantitative data, interpretation of integrated findings, and attention to divergence between data sources

3.7 Data Extraction and Thematic Synthesis

A structured data extraction process was conducted to ensure consistency, transparency, and comparability across the studies retained in this systematic literature review. Following screening and eligibility assessment, the updated evidence pool consisted of 27 records. Among these, 22 studies were used as core or cautionary evidence for thematic and mechanism-based synthesis because they directly or indirectly addressed school-based emotion regulation, self-regulation, anxiety regulation, social-emotional intervention, technology-assisted regulation, or implementation support for learners with Autism Spectrum Disorder (ASD). The remaining five records were retained as supporting evidence for the background, discussion, and future research directions, but were not treated as final intervention outcome evidence.

Next, key information extracted from each study included author, year, article title, country or educational context, database source, study design, participant characteristics, school setting, intervention focus, outcome relevance, implementation factors, and key findings.

Particular attention was given to whether each study examined emotion regulation, self-regulation, emotional competence, anxiety regulation, coping, behavioural regulation, social-emotional skills, classroom engagement, teacher confidence, or school-based implementation support among learners with ASD.

Moreover, Microsoft Excel and Microsoft Word were used to organise, cross-check, and document the extraction and synthesis process. Microsoft Excel was used to arrange the article screening list, organise extracted variables, record quality appraisal information, and code studies according to theme and mechanism. Microsoft Word was used to document analytical notes, refine the narrative synthesis, and maintain a clear record of coding decisions. This process strengthened the audit trail and ensured that the findings were developed through a systematic and traceable review process.

On the other hand, the analysis was conducted using an inductive thematic synthesis approach, informed by Braun and Clarke's six-phase framework (Braun & Clarke, 2006). The extracted data were reviewed repeatedly to

support familiarisation, initial coding, theme development, theme review, theme definition, and reporting. Initial codes were generated from recurring concepts such as cognitive-behavioural intervention, anxiety regulation, emotional awareness, interoception, body-based regulation, peer participation, technology-assisted learning, teacher training, and implementation fidelity. These codes were then refined into five overarching themes.

In addition to thematic synthesis, a mechanism-based synthesis was conducted to explain how different interventions may support emotion regulation among learners with ASD. Six mechanism-based relationships were identified: cognitive appraisal and coping, emotional awareness and labelling, physiological and sensory regulation, social understanding and peer-context regulation, motivation and engagement, and teacher mediation with implementation fidelity. This synthesis linked intervention types to learner outcomes and implementation conditions. It also allowed the review to move beyond descriptive summary and develop a clearer explanation of how school-based emotion regulation interventions may work for learners with ASD.

3.6 Included Studies

Following the identification, screening, eligibility assessment, quality appraisal, and data extraction process, 27 records were retained in the updated evidence pool. Among these, 22 studies were included in the thematic and mechanism-based synthesis because they directly or indirectly addressed school-based emotion regulation, self-regulation, anxiety regulation, social-emotional intervention, technology-assisted regulation, or implementation support for learners with ASD. The remaining five records were retained as supporting evidence because they informed the background, discussion, and future research directions, but were not treated as final intervention outcome evidence. Studies that measured emotion regulation, coping, anxiety regulation, self-regulation, or behavioural regulation were interpreted as providing more direct evidence for the review. Studies that

focused on social participation, classroom engagement, teacher confidence, implementation feasibility, or future intervention development were interpreted as indirect or supporting evidence. This distinction helped ensure that the synthesis remained focused, transparent, and aligned with the research objectives.

4. Results

4.1 OVERVIEW OF INCLUDED STUDIES

This chapter presents the findings of the systematic literature review on school-based emotion regulation and self-regulation interventions for learners with Autism Spectrum Disorder (ASD). The findings were synthesised from an updated evidence pool of studies published between 2020 and 2025. The reviewed studies covered a range of school-based and school-linked intervention approaches, including cognitive-behavioural therapy, anxiety-focused intervention, social-cognitive intervention, emotional education, interoception-based intervention, relaxation-based strategies, technology-assisted intervention, gamified learning, video-gaming intervention, peer-mediated participation, teacher-led programmes, digital emotion regulation tools, and teacher implementation support (Bartoli et al., 2024; Beaumont et al., 2021; Cheung et al., 2021; Kang et al., 2025; Mahler et al., 2022; Reaven et al., 2024).

Table 3 indicated 27 records were retained in the updated evidence pool. Among these, 22 studies were used as core or cautionary evidence for thematic synthesis because they directly or indirectly addressed school-based emotion regulation, self-regulation, anxiety regulation, social-emotional intervention, or implementation support for learners with ASD. A further five records were retained as supporting evidence because they informed the background, discussion, and future research directions but were not treated as final intervention outcome evidence.

The reviewed studies were conducted across diverse geographical and educational contexts, including the United States, China, Australia,

Europe, and other international school-based or school-linked settings. The studies used various research designs, including randomised controlled trials, cluster randomised trials, intervention studies, quasi-experimental studies, feasibility studies, secondary intervention analyses, qualitative implementation studies, teacher-training evaluations, survey-based implementation studies, co-design studies, pilot trials, and mixed-method studies, as shown in Table 4. This methodological diversity reflects the developing nature of school-based emotion regulation research for learners with ASD.

Participants across the reviewed studies included preschool children, primary or elementary school

pupils, autistic children, students with ASD or suspected autism, autistic youth, autistic young adults, teachers, caregivers, and school-based providers supporting autistic learners. Educational settings included preschool classrooms, mainstream classrooms, special education settings, inclusive education contexts, school-linked intervention programmes, telehealth contexts with school-age relevance, and school-based implementation environments. This range of participants and settings indicates that emotion regulation support for learners with ASD is relevant across different developmental stages and educational environments.

Table 3 Summary of Included Articles Categories

Evidence Category	Number of Records	Use in This Review	Description
Core and cautionary studies	22	Used in thematic synthesis	Studies directly or indirectly addressing school-based emotion regulation, self-regulation, anxiety regulation, social-emotional intervention, technology-assisted regulation, or implementation support for learners with ASD.
Supporting evidence	5	Used in background, discussion, and future research	Protocols, broader intervention studies, or contextual papers used to support interpretation, implementation discussion, and future research direction.
Total updated evidence pool	27	Full retained evidence pool	All records retained after refinement and replacement of weaker or unverified records.

Table 4 Summary of Included Studies

No.	Author (Year)	Design	Key Findings	Mapped Theme	Role in Mechanism
1	Cheung et al. (2021)	Intervention study	School-based social cognitive intervention supported social participation and social-emotional functioning	Social-emotional, peer-mediated, and social participation interventions	Social understanding and peer-context regulation

			among children with autism.		
2	Reaven et al. (2024)	Cluster randomised trial	School-based CBT delivered through a train-the-trainer approach supported anxiety regulation, coping, and school-based implementation.	Cognitive-behavioural and anxiety-focused interventions	Cognitive appraisal and coping
3	Meyer et al. (2025)	Secondary intervention analysis	School-based CBT was associated with emotion regulation and behavioural outcomes among students with autism or suspected autism.	Cognitive-behavioural and anxiety-focused interventions	Cognitive appraisal and coping
4	López-Bouzas et al. (2024)	Quantitative intervention study	Augmented gamified intervention improved socio-emotional skills and engagement among students with ASD.	Technology-assisted and gamified emotional learning	Motivation and engagement
5	Bartoli et al. (2024)	Cluster trial	Preschool-based emotional education supported emotional competence and emotional awareness among children with autism spectrum conditions.	Emotional education and awareness	Emotional awareness and labelling
6	Mahler et al. (2022)	Intervention study	Interoception-based intervention supported body awareness and emotion regulation among autistic children.	Interoception, relaxation, and body-based regulation approaches	Physiological and sensory regulation
7	Vincent et al. (2023)	Intervention evaluation	Reverse inclusion social skills intervention improved peer participation and social engagement among children on the autism spectrum.	Social-emotional, peer-mediated, and social participation interventions	Social understanding and peer-context regulation
8	Beaumont et al. (2021)	Randomised controlled trial	Video-gaming-based social skills intervention supported structured social practice and social-emotional learning.	Technology-assisted and social-emotional intervention	Motivation and engagement; social understanding
9	Kang et al. (2025)	Feasibility and acceptability study	Teacher-led emotion regulation intervention was feasible and acceptable in school settings for autistic youth.	Teacher training, implementation, and sustainability	Teacher mediation and implementation fidelity

10	Hayutin et al. (2025)	Training implementation study	/ Training school providers supported readiness to deliver CBT-based anxiety intervention for autistic students.	Teacher training, implementation, and sustainability	Teacher mediation and implementation fidelity
11	Love et al. (2024)	Qualitative implementation study	Teacher perceptions highlighted the importance of classroom adaptation and consistent implementation of The Zones of Regulation.	Teacher training, implementation, and sustainability	Teacher mediation and implementation fidelity
12	Öhlböck et al. (2024)	Teacher training evaluation	Zones of Regulation training improved teacher self-efficacy in managing self-regulation needs among autistic pupils.	Teacher training, implementation, and sustainability	Teacher mediation and implementation fidelity
13	Chezan et al. (2023)	Survey implementation study	/ Teacher familiarity, confidence, and training influenced the use of behaviour and regulation-related interventions in school settings.	Teacher training, implementation, and sustainability	Teacher mediation and implementation fidelity
14	Chou (2023)	Experimental wait-list comparison study	/ Self-directed emotion regulation curriculum supported emotional awareness, coping, and adaptive regulation among students with ASD.	Direct emotion regulation intervention	Emotional awareness and labelling; cognitive coping
15	Pickard et al. (2022)	Implementation / intervention study	Implementation analysis of school-based CBT highlighted feasibility, school delivery factors, and implementation outcomes.	Cognitive-behavioural and anxiety-focused interventions	Teacher mediation and implementation fidelity
16	Reaven et al. (2025)	Intervention outcome study	Facing Your Fears in Schools supported anxiety assessment and intervention outcomes among students with autism or suspected autism.	Cognitive-behavioural and anxiety-focused interventions	Cognitive appraisal and coping
17	Kaur et al. (2025)	Co-design implementation development study	/ Digital mental health application development highlighted school partnership and implementation planning for emotion regulation support.	Technology-assisted and gamified emotional learning; implementation	Motivation and engagement; teacher mediation
18	Coffman et al.	Pilot trial	Regulating Together pilot	Interoception,	Emotional

	al. (2024)		intervention supported emotion regulation skills and feasibility for autistic children and adolescents.	relaxation, and body-based regulation approaches	awareness and physiological regulation
19	McCook et al. (2025)	Progressive muscle relaxation intervention	Progressive muscle relaxation supported academic engagement among elementary school students with ASD.	Interoception, relaxation, and body-based regulation approaches	Physiological and sensory regulation
20	Macoun et al. (2021)	Cognitive intervention study	Attention and executive function intervention / supported regulation-related cognitive functioning among children with ASD.	Technology-assisted cognitive regulation support	Motivation and engagement; cognitive regulation
21	Wan Yunus et al. (2021)	Randomised controlled trial	Self-regulated learning intervention reduced challenging behaviours and enhanced school-related functioning among children with ASD.	Self-regulation and school-related functioning	Behavioural regulation and classroom engagement
22	Da et al. (2025)	STEM activity intervention study	STEM activities supported social skills and emotional-behavioural outcomes among students with ASD.	Technology-assisted and social-emotional intervention	Motivation and engagement; social understanding

Table 5 Supporting Evidence Used in Background and Discussion

No.	Article / Focus	Year	Evidence Role	Use in This SLR
1	Emotion regulation checklist with young autistic children	2025	Supporting evidence	Used to support measurement and interpretation of emotion regulation outcomes.
2	Assessment and treatment of emotion regulation impairment in ASD	2020	Supporting evidence	Used to support the conceptual background and ASD-related emotion regulation challenges.
3	Emotion regulation in parent-mediated interventions for ASD	2022	Supporting evidence	Used to support broader intervention discussion and future research directions.
4	School-based social inclusion review for autistic pupils	2024	Supporting evidence	Used to support discussion of school-based social inclusion and peer participation.
5	Digital learning and self-regulation in students with special educational needs	2023	Supporting evidence	Used to support technology-assisted and digital self-regulation discussion.

4.2 Quality Assessment Results

The methodological quality of the 22 studies used for thematic synthesis was assessed using the Mixed Methods Appraisal Tool (MMAT), Version 2018 (Hong et al., 2018). The MMAT was appropriate because the included studies used diverse research designs, including randomised controlled trials, cluster randomised trials, non-randomised intervention studies, quasi-experimental studies, qualitative implementation studies, quantitative descriptive studies, mixed-method studies, feasibility studies, pilot trials, and survey-based studies.

All 22 studies retained for thematic synthesis met the MMAT screening questions and satisfied the relevant design-specific appraisal criteria. Therefore, the overall methodological appraisal for these 22 studies was rated as high. This indicates that the included studies had clear

research questions, appropriate data sources, relevant designs, and sufficient methodological alignment to address the review objectives.

The quality appraisal results strengthened the validity of this review because the thematic and mechanism-based findings were based on verified and methodologically sound studies. However, a high-quality appraisal does not mean that all studies contributed the same type of evidence. Some studies provided direct evidence of emotion regulation, self-regulation, coping, or anxiety regulation. Other studies provided indirect evidence through social-emotional skills, peer participation, classroom engagement, or teacher implementation outcomes. Therefore, the synthesis continued to distinguish between direct emotion regulation evidence, indirect social-emotional or behavioural evidence, and implementation evidence.

Table 6 MMAT-Informed Quality Appraisal Matrix for the included Studies

No.	Author / Year	Study Design	MMAT Category	S1	S2	Criteria Met	Overall Appraisal
1	Cheung et al. (2021)	Intervention study	Non-randomised study	Yes	Yes	All relevant criteria met	High
2	Reaven et al. (2024)	Cluster randomised trial	Randomised controlled trial	Yes	Yes	All relevant criteria met	High
3	Meyer et al. (2025)	Secondary intervention analysis	Non-randomised / secondary analysis	Yes	Yes	All relevant criteria met	High
4	López-Bouzas et al. (2024)	Quantitative intervention study	Non-randomised study	Yes	Yes	All relevant criteria met	High
5	Bartroli et al. (2024)	Cluster trial	Randomised controlled trial	Yes	Yes	All relevant criteria met	High
6	Mahler et al. (2022)	Intervention study	Non-randomised study	Yes	Yes	All relevant criteria met	High
7	Vincent et al. (2023)	Intervention evaluation	Non-randomised study	Yes	Yes	All relevant criteria met	High
8	Beaumont et al. (2021)	Randomised controlled trial	Randomised controlled trial	Yes	Yes	All relevant criteria met	High
9	Kang et al. (2025)	Feasibility and acceptability study	Mixed-method / non-randomised study	Yes	Yes	All relevant criteria met	High
10	Hayutin et al. (2025)	Training / implementation study	Non-randomised / quantitative descriptive study	Yes	Yes	All relevant criteria met	High

11	Love et al. (2024)	Qualitative implementation study	Qualitative research	Yes	Yes	All relevant criteria met	High
12	Öhlböck et al. (2024)	Teacher training evaluation	Quantitative descriptive / non-randomised study	Yes	Yes	All relevant criteria met	High
13	Chezan et al. (2023)	Survey / implementation study	Quantitative descriptive study	Yes	Yes	All relevant criteria met	High
14	Chou (2023)	Experimental / wait-list comparison study	Non-randomised study	Yes	Yes	All relevant criteria met	High
15	Pickard et al. (2022)	Implementation / intervention study	Non-randomised / implementation study	Yes	Yes	All relevant criteria met	High
16	Reaven et al. (2025)	Intervention outcome study	Non-randomised / intervention study	Yes	Yes	All relevant criteria met	High
17	Kaur et al. (2025)	Co-design / implementation development study	Qualitative / mixed-method study	Yes	Yes	All relevant criteria met	High
18	Coffman et al. (2024)	Pilot trial	Non-randomised / pilot study	Yes	Yes	All relevant criteria met	High
19	McCook et al. (2025)	Progressive muscle relaxation intervention	Non-randomised study	Yes	Yes	All relevant criteria met	High
20	Macoun et al. (2021)	Cognitive intervention study	Non-randomised study	Yes	Yes	All relevant criteria met	High
21	Wan Yunus et al. (2021)	Randomised controlled trial	Randomised controlled trial	Yes	Yes	All relevant criteria met	Moderate
22	Da et al. (2025)	STEM activity intervention study	Non-randomised study	Yes	Yes	All relevant criteria met	Moderate

Note. S1 refers to whether the study had clear research questions. S2 refers to whether the collected data allowed the study to address the research questions. “Criteria met” refers to the relevant MMAT design-specific criteria. All 22 studies retained for thematic synthesis met the MMAT screening questions and relevant appraisal criteria; therefore, the overall appraisal was rated as high.

4.3 Thematic Findings and Coding

The thematic synthesis generated five major themes from the 22 studies used in the synthesis. These themes were developed through iterative coding of intervention focus, outcome relevance, study findings, and implementation factors. The coding process was conducted using Microsoft

Excel, where each study was coded according to theme and mechanism. Microsoft Word was used to document analytical notes and develop the narrative explanation of the findings.

The five themes were included (1) cognitive-behavioural and anxiety-focused interventions, (2) social-emotional, peer-mediated, and social participation interventions, (3) interoception, relaxation, and body-based regulation approaches, (4) technology-assisted and gamified emotional learning, and (5) teacher training, implementation, and sustainability. These themes show that school-based emotion regulation support for learners with ASD is multidimensional and cannot be reduced to a single intervention approach.

Table 7 Thematic Coding Framework

Theme Code	Theme	Related Studies	Main Contribution
T1	Cognitive-behavioural and anxiety-focused interventions	Reaven et al. (2024, 2025); Meyer et al. (2025); Hayutin et al. (2025); Pickard et al. (2022)	Provides direct evidence for anxiety regulation, coping, emotional functioning, and behavioural regulation.
T2	Social-emotional, peer-mediated, and social participation interventions	Cheung et al. (2021); Vincent et al. (2023); Beaumont et al. (2021); Jahromi et al. (2021)	Supports social understanding, peer participation, emotional-social functioning, and indirect regulation outcomes.
T3	Interoception, relaxation, and body-based regulation approaches	Mahler et al. (2022); Chou (2023); Coffman et al. (2024); McCook et al. (2025)	Addresses emotional awareness, body awareness, physiological regulation, arousal reduction, and adaptive coping.
T4	Technology-assisted and gamified emotional learning	López-Bouzas et al. (2024); Beaumont et al. (2021); Kaur et al. (2025); Macoun et al. (2021); Da et al. (2025)	Supports motivation, structured practice, socio-emotional engagement, digital ER support, and emotional understanding.
T5	Teacher training, implementation, and sustainability	Kang et al. (2025); Hayutin et al. (2025); Love et al. (2024); Öhlböck et al. (2024); Chezan et al. (2023); Kaur et al. (2025)	Explains teacher confidence, feasibility, fidelity, implementation barriers, and school-wide sustainability.

Table 8 Theme and Mechanism Coding Matrix

Theme	Dominant Mechanism	Evidence Type	Expected Benefit for Learners with ASD
Cognitive-behavioural and anxiety-focused interventions	Cognitive appraisal and coping	Direct ER / anxiety evidence	Improved coping, reduced anxiety-related dysregulation, and better behavioural regulation
Social-emotional, peer-mediated, and social participation interventions	Social understanding and peer-context regulation	Indirect ER / social-emotional evidence	Improved peer interaction, reduced social stress, and stronger emotional-social functioning
Interoception, relaxation, and body-based regulation approaches	Physiological and sensory regulation	Direct ER / body-based evidence	Improved body awareness, arousal reduction, emotional awareness, and classroom readiness
Technology-assisted and gamified emotional learning	Motivation and engagement	Indirect and direct technology-supported ER evidence	Increased motivation, structured emotional learning, digital engagement, and socio-emotional participation

Teacher training, implementation, and sustainability	Teacher mediation and implementation fidelity	Implementation evidence	Improved teacher confidence, fidelity, consistency, and sustainability of ER support
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4.4 Theme Findings

4.4.1 Theme 1: Cognitive-behavioural and anxiety-focused interventions

Cognitive-behavioural and anxiety-focused interventions represented one of the strongest evidence areas in the review. This theme included school-based CBT, Facing Your Fears, anxiety-focused interventions, train-the-trainer models, and school-provider training studies. The studies in this theme were directly relevant because they addressed anxiety regulation, coping, emotional functioning, behaviour concerns, and school-based implementation for autistic learners or students with suspected autism (Hayutin et al., 2025; Meyer et al., 2025; Pickard et al., 2022; Reaven et al., 2024, 2025).

The findings explore that CBT-based approaches support emotion regulation by helping learners identify emotional triggers, recognise anxiety-related thoughts, understand the relationship between situations and emotions, and practise adaptive coping strategies. In school contexts, autistic learners may experience dysregulation during transitions, academic pressure, uncertainty, peer interaction, sensory overload, or changes in routine. CBT-based interventions are relevant because they provide structured strategies to support emotional awareness, coping, and anxiety management.

However, CBT-based interventions may be more accessible to learners with stronger verbal ability, cognitive flexibility, and emotional insight. Learners with limited expressive language, higher sensory needs, or difficulty identifying internal states may require additional visual, sensory, modelling, or body-based supports before they can benefit from cognitive strategies. Therefore, CBT should be viewed as a strong but not universally sufficient intervention approach.

Implementation evidence also showed that successful CBT delivery depends on school-

provider training, fidelity, and adaptation to the school context. Train-the-trainer models and provider training studies suggest that intervention effectiveness is shaped not only by programme content but also by the capacity of school staff to deliver strategies consistently. Overall, this theme provides strong direct evidence for supporting anxiety-related emotion regulation among learners with ASD.

4.4.2 Theme 2: Social-Emotional, Peer-Mediated, and Social Participation Interventions

The second theme focused on social-emotional learning, social-cognitive intervention, peer-mediated participation, reverse inclusion, and video-gaming social skills interventions. These studies were relevant because many emotion regulation difficulties among autistic learners occur in social contexts, including peer interaction, group learning, unstructured play, misunderstanding, rejection, or conflict.

The reviewed studies suggest that social-emotional and peer-mediated interventions may improve social participation, emotional understanding, prosocial behaviour, and peer engagement. Social-cognitive interventions help learners interpret social cues, recognise emotional expressions, and respond more appropriately in classroom and peer situations. Reverse inclusion and peer-mediated approaches create structured opportunities for autistic learners to practise social and emotional responses with peers in naturalistic settings (Beaumont et al., 2021; Cheung et al., 2021; Jahromi et al., 2021; Vincent et al., 2023).

This theme provides important indirect evidence for emotion regulation. Improved peer participation may reduce social confusion, anxiety, isolation, and conflict, thereby supporting emotional adjustment. However, the findings should be interpreted carefully because social participation and social skills are not

identical to emotion regulation. These studies are most appropriately understood as supporting the social-emotional conditions that influence regulation rather than directly proving improved emotional self-regulation. Therefore, social-emotional and peer-mediated interventions appear valuable for strengthening emotional-social functioning among learners with ASD. Their main contribution is improving the social contexts in which emotion regulation is required.

4.4.3 Theme 3: Interoception, Relaxation, and Body-Based Regulation Approaches

The third theme focused on interoception, relaxation, self-directed regulation, progressive muscle relaxation, physiological awareness, and body-based approaches. These interventions are important because emotion regulation among autistic learners is often closely connected to sensory processing, body awareness, arousal regulation, and recognition of internal states.

The findings indicate that interoception-based and body-based approaches support learners by helping them recognise internal body signals associated with emotional arousal, such as changes in breathing, heartbeat, muscle tension, restlessness, discomfort, or sensory overload. When learners are able to identify these signals earlier, they may become more able to use coping strategies before emotional escalation occurs (Mahler et al., 2022; McCook et al., 2025).

Relaxation-based and self-directed emotion regulation interventions also support regulation by reducing physiological arousal and improving readiness for classroom participation. These strategies may be particularly beneficial for learners who experience high anxiety, sensory sensitivity, emotional overwhelm, or difficulty using verbally mediated coping strategies.

This theme provides direct evidence for emotional awareness, self-regulation, and body-based regulatory support. It also complements CBT and social-emotional approaches by addressing regulation through physiological and sensory pathways. Overall, body-based approaches are especially relevant for learners

who require concrete, sensory, and internal-awareness strategies to support regulation.

4.4.4 Theme 4: Technology-Assisted and Gamified Emotional Learning

Technology-assisted and gamified interventions emerged as an innovative theme in the reviewed literature. This theme included augmented gamified socio-emotional intervention, video-gaming-based social skills intervention, virtual reality intervention, digital emotion regulation applications, and related technology-supported approaches.

The findings also indicated that technology-assisted interventions may support emotion regulation and social-emotional development by increasing motivation, predictability, visual structure, repetition, and engagement. For some autistic learners, digital and gamified environments may reduce social pressure and provide structured opportunities to practise emotional recognition, coping, social problem-solving, and self-regulation-related behaviours (Beaumont et al., 2021; Kaur et al., 2025; López-Bouzas et al., 2024; Macoun et al., 2021). However, generalisation remains a key issue. Improvement within a digital, gamified, virtual, or app-based environment does not automatically mean that learners can apply the same skills during real classroom routines, peer conflict, sensory overload, or academic frustration. Therefore, technology-assisted interventions should be connected to classroom-based transfer activities, teacher guidance, and real-world practice.

4.4.5 Theme 5: Teacher Training, Implementation, and Sustainability

The fifth theme focused on teacher-led intervention, provider training, teacher self-efficacy, The Zones of Regulation, teacher familiarity with behaviour interventions, and school-based implementation support. This theme was central because school-based emotion regulation interventions depend heavily on teachers and school staff who are confident, trained, and supported.

The findings suggest that teachers require practical training in recognising emotional dysregulation, selecting appropriate strategies, adapting interventions to learner profiles, prompting coping skills, and maintaining consistency across classroom routines. Teacher confidence and school-provider readiness are especially important because dysregulation may occur suddenly during transitions, peer interaction, sensory overload, task frustration, or unexpected changes (Chezan et al., 2023; Hayutin et al., 2025; Love et al., 2024; Öhlböck et al., 2024).

Implementation-focused studies showed that intervention effectiveness is shaped by system-level factors, including training quality, coaching, fidelity monitoring, leadership support, collaboration with families, shared emotional language, and consistency across school environments. Without these supports, even evidence-based interventions may be delivered inconsistently or may fail to produce sustainable outcomes. This theme indicates that emotion regulation intervention should be understood as a school-wide practice rather than an isolated student-level intervention. Sustainable support requires teacher capacity-building, collaborative planning, fidelity monitoring, and institutional commitment.

4.5 Cross-Theme Comparison

Across the five themes, the findings show that school-based emotion regulation support for learners with ASD is not a single-method intervention. Each intervention approach addresses different regulation needs. Cognitive-behavioural and anxiety-focused interventions provide stronger direct support for learners whose dysregulation is linked to anxiety, worry, uncertainty, and difficulty coping. Interoception, relaxation, and body-based approaches are more relevant for learners who experience sensory overload, high arousal, or difficulty recognising internal body signals. Social-emotional and peer-mediated interventions mainly support regulation indirectly by improving peer participation, reducing social misunderstanding, and strengthening emotional-social functioning.

Technology-assisted and gamified interventions support motivation and structured practice, but their effectiveness depends on whether skills are transferred into real classroom situations.

A critical comparison across the themes shows that intervention effectiveness depends on the match between the learner's regulation profile and the intervention mechanism. This is directly connected to the research background, which emphasises that emotion regulation among learners with ASD is affected by communication differences, sensory needs, anxiety, social understanding, classroom routines, and teacher support. Therefore, schools should not ask only which intervention is most effective in general. Instead, teachers should ask what causes the learner's dysregulation and which intervention mechanism best addresses that need. For example, a learner who becomes dysregulated due to sensory overload may need body-based regulation and environmental adjustment, while a learner who becomes anxious during transitions may benefit more from CBT-based coping strategies and predictable routines.

The findings also show that teacher training and implementation support are central across all intervention types. Even strong interventions may have limited impact if teachers are not confident, trained, or consistent in applying strategies during real classroom routines. This finding answers the third research question by showing that school-based emotion regulation support is not only a student-level intervention but also a teacher-mediated and school-wide practice. Overall, the cross-theme comparison suggests that effective support should be differentiated, mechanism-based, and embedded into everyday classroom practice rather than applied as a one-size-fits-all programme.

4.6 Synthesis of Mechanism-Based Relationships

The mechanism-based synthesis explains how school-based emotion regulation interventions may produce change for learners with ASD. Based on the research background, emotion regulation difficulties among learners with ASD

may arise from different sources, including anxiety, sensory overload, limited emotional awareness, communication difficulties, social misunderstanding, low motivation, and inconsistent classroom support. Therefore, the findings suggest that intervention effectiveness depends on whether the selected intervention mechanism matches the learner's actual regulation need.

Six mechanism-based relationships were identified across the reviewed studies. These

mechanisms include cognitive appraisal and coping, emotional awareness and labelling, physiological and sensory regulation, social understanding and peer-context regulation, motivation and engagement, and teacher mediation with implementation fidelity. Together, these mechanisms show that different interventions support emotion regulation through different pathways. Table 4.8 summarises how learner needs, intervention mechanisms, intervention examples, and expected outcomes are connected.

Table 9 Mechanism-Based Relationships Between Learner Needs, Intervention Mechanisms, and Outcomes

Learner Need	Regulation Mechanism	Most Relevant Intervention Examples	Expected Outcome
Anxiety, worry, uncertainty, fear of failure	Cognitive appraisal and coping	CBT, Facing Your Fears, coping plans, predictable routines	Reduced anxiety-related dysregulation and improved coping
Difficulty identifying or communicating emotions	Emotional awareness and labelling	Emotional education, Zones of Regulation, self-directed ER curriculum, visual emotion tools	Earlier recognition of emotions, help-seeking, and self-monitoring
Sensory overload, high arousal, poor body awareness	Physiological and sensory regulation	Interoception, relaxation, progressive muscle relaxation, sensory breaks	Improved calmness, body awareness, and classroom readiness
Peer conflict, social confusion, group stress	Social understanding and peer-context regulation	Social-cognitive intervention, peer-mediated support, reverse inclusion	Reduced social stress and improved peer participation
Low motivation or disengagement	Motivation and engagement	Gamified learning, video-gaming, virtual reality, digital ER tools	Increased participation and structured emotional learning
Inconsistent support across classrooms	Teacher mediation and implementation fidelity	Teacher training, provider coaching, teacher-led ER intervention, school-wide regulation language	Sustainable and generalised regulation support

Effective support should therefore be differentiated, mechanism-based, and embedded into everyday classroom practice rather than applied as a one-size-fits-all programme.

Differentiated support means that teachers first identify the main source of the learner's dysregulation, such as anxiety, sensory overload, emotional confusion, peer conflict, or low

motivation. Mechanism-based support means that the selected intervention should match the learner's actual regulation need. For example, a learner with anxiety may require coping strategies and predictable routines, while a learner with sensory overload may need body-based regulation and environmental adjustment. Classroom-embedded support means that regulation strategies should be practised during real school routines, including transitions, group work, academic tasks, peer interaction, and unstructured time. This is important because emotion regulation is only meaningful when learners can use the strategies in authentic classroom situations, not only during structured intervention sessions.

This synthesis directly addresses the second and third research objectives by explaining the relationship between intervention mechanisms, learner outcomes, and implementation conditions. The key finding is that emotion regulation support should begin with a functional understanding of dysregulation: what triggers the learner, how the learner experiences emotional distress, and what type of support is needed. Therefore, the mechanism-based synthesis supports a differentiated model of school-based intervention, where teachers select and apply strategies according to learner profile, classroom context, and implementation capacity.

5. Discussion

5.1 Summary of Findings

This systematic literature review examined school-based emotion regulation and self-regulation interventions for learners with Autism Spectrum Disorder (ASD). Following refinement of the article list, 27 records were retained in the updated evidence pool. Among these, 22 studies were used as core or cautionary evidence for thematic synthesis, while five records were retained as supporting evidence for the background, discussion, and future research directions. The 22 studies used in the thematic synthesis were verified and appraised as high quality using the Mixed Methods Appraisal Tool (MMAT) 2018.

The thematic synthesis identified five major areas of intervention: cognitive-behavioural and anxiety-focused interventions; social-emotional, peer-mediated, and social participation interventions; interoception, relaxation, and body-based regulation approaches; technology-assisted and gamified emotional learning; and teacher training, implementation, and sustainability. Across these themes, the findings suggest that school-based interventions may benefit learners with ASD by improving emotional awareness, coping skills, behavioural self-regulation, anxiety management, social participation, peer engagement, classroom readiness, academic engagement, and teacher-supported regulation. However, the evidence also showed that these outcomes were not equally direct across all intervention types. Some studies provided direct evidence of emotion regulation and self-regulation outcomes, while others contributed indirect evidence through social-emotional functioning, classroom participation, or implementation-related outcomes.

The mechanism-based synthesis further indicated that these interventions may influence emotion regulation through six major mechanisms: cognitive appraisal and coping, emotional awareness and labelling, physiological and sensory regulation, social understanding and peer-context regulation, motivation and engagement, and teacher mediation with implementation fidelity. This review also demonstrates that intervention effectiveness varies according to intervention type, learner profile, outcome measurement, implementation fidelity, and school context. Therefore, school-based emotion regulation support for learners with ASD should be differentiated, mechanism-based, and embedded within authentic classroom routines.

5.2 Emotion Regulation in ASD: Moving Beyond Behaviour Control

A key finding of this review is that emotion regulation difficulties among learners with ASD should not be understood merely as behavioural problems. In school settings, dysregulation may be visible through meltdowns, shutdowns,

crying, aggression, avoidance, withdrawal, task refusal, or difficulty transitioning between activities. However, these behaviours often represent visible expressions of deeper emotional, sensory, communicative, cognitive, or environmental difficulties (Beck et al., 2020; Day et al., 2022; DeLucia et al., 2021; Samson et al., 2015).

This distinction is important because a behaviour-control approach focuses mainly on reducing outward behaviours, whereas an emotion-regulation approach seeks to understand the underlying cause of dysregulation and teach learners how to manage emotional experiences more effectively. For example, a learner who refuses to join a group activity may not be intentionally non-compliant. The learner may be experiencing anxiety, sensory overload, social confusion, fear of failure, or difficulty understanding expectations. If the response is only disciplinary, the learner's emotional and regulatory needs may remain unsupported.

The findings therefore support a shift from reactive behaviour management to proactive emotion regulation instruction. Emotion regulation should be taught before crisis occurs, not only addressed after dysregulation becomes disruptive. This is especially important for learners with ASD because many may experience difficulty identifying emotions, explaining distress, tolerating uncertainty, interpreting social cues, or recognising internal body signals. A proactive approach allows schools to build learners' regulation capacity rather than simply responding to visible dysregulation.

This reframe also changes the role of the teacher. Teachers are not only classroom managers but also mediators of emotional learning. Their role includes recognising early signs of distress, reducing triggers, teaching coping strategies, supporting communication of needs, and creating emotionally safe classroom routines. This aligns with the review's central finding that effective school-based emotion regulation support requires both learner-level intervention and school-level implementation support.

5.3 Mechanisms of School-Based Emotion Regulation Support

The mechanism-based synthesis showed that school-based interventions support emotion regulation through different pathways. This is important because learners with ASD do not experience dysregulation for one single reason. Dysregulation may be linked to anxiety, sensory overload, limited emotional awareness, communication difficulty, social misunderstanding, low motivation, or inconsistent classroom support. Therefore, intervention effectiveness depends on whether the selected strategy matches the learner's actual regulation needs.

Six mechanisms were identified across the reviewed studies. Cognitive appraisal and coping were mainly associated with CBT, Facing Your Fears, and anxiety-focused interventions. Emotional awareness and labelling were associated with emotional education, The Zones of Regulation, interoception, visual supports, and self-directed emotion regulation curricula. Physiological and sensory regulation was linked to interoception, relaxation, progressive muscle relaxation, and body-based strategies. Social understanding and peer-context regulation were reflected in social-cognitive, peer-mediated, reverse inclusion, and social skills interventions. Motivation and engagement were mainly associated with technology-assisted, gamified, video-gaming, virtual reality, and digital emotion regulation tools. Finally, teacher mediation and implementation fidelity were central across implementation-focused studies (Bartroli et al., 2024; Mahler et al., 2022; Meyer et al., 2025; Reaven et al., 2024).

These mechanisms indicate that schools should not choose an intervention simply because it is popular or evidence-based in general. Instead, teachers should ask: What is causing the learner's dysregulation, which mechanism is needed, and how can the classroom support the strategy consistently? This is consistent with the research background of the present review, which emphasises that emotion regulation in ASD is influenced by learner factors, sensory

experiences, communication needs, social contexts, and school environments.

5.4 Variety of Intervention Effectiveness

Building on the mechanism-based discussion above, the findings show that the effectiveness of school-based emotion regulation interventions cannot be understood by examining intervention type alone. Instead, effectiveness depends on how well the intervention mechanism matches the learner's emotional, sensory, cognitive, social, and classroom needs. This is important because learners with ASD experience dysregulation in different ways and for different reasons. Therefore, no single intervention emerged as universally effective for all learners with ASD.

Cognitive-behavioural and anxiety-focused interventions appeared especially relevant for learners whose dysregulation is linked to anxiety, negative thoughts, worry, uncertainty, or difficulty coping with stressful situations (Hayutin et al., 2025; Meyer et al., 2025; Reaven et al., 2024, 2025). These interventions may benefit learners with stronger language and reasoning skills because they often require reflection, emotional insight, and the ability to connect thoughts, feelings, and behaviours. However, CBT may be less accessible for learners with limited verbal ability or difficulty identifying internal states unless it is adapted using visual supports, modelling, concrete examples, structured routines, and simplified language.

In contrast, social-emotional and peer-mediated interventions appeared useful for improving social participation, emotional understanding, and peer engagement (Beaumont et al., 2021; Cheung et al., 2021; Vincent et al., 2023). These interventions are valuable because emotional difficulties often occur in peer contexts, such as group work, play, conflict, rejection, or misunderstanding. However, their effect on emotion regulation may be indirect unless the intervention explicitly teaches coping, emotional awareness, self-monitoring, or behavioural regulation strategies.

Next, interoception, relaxation, and body-based interventions appeared beneficial for learners

with sensory sensitivity, high arousal, anxiety, or difficulty recognising internal emotional cues (Mahler et al., 2022; McCook et al., 2025). Compared with CBT, these approaches may be more concrete and accessible for learners who cannot easily explain their emotions verbally. By focusing on body signals and physiological regulation, these interventions provide a practical pathway into emotional awareness and coping.

Technology-assisted and gamified interventions appeared useful for increasing engagement, motivation, and structured emotional learning (Beaumont et al., 2021; Kaur et al., 2025; López-Bouzas et al., 2024). These interventions may benefit learners who respond well to visual, interactive, predictable, and repetitive learning environments. However, their effectiveness depends on whether skills learned in digital or gamified contexts are transferred to real-world classroom routines and peer situations. Without teacher mediation and generalisation planning, technology-based gains may remain limited to the intervention environment.

On the other hand, teacher training and implementation interventions were also important because they determine whether regulation support can be sustained in daily classroom practice (Chezan et al., 2023; Hayutin et al., 2025; Love et al., 2024; Öhlböck et al., 2024). These studies may not always directly measure student-level emotion regulation outcomes, but they improve the conditions under which regulation support is delivered. Teacher confidence, fidelity, consistency, and school-wide support influence whether learners receive meaningful regulation support in everyday routines.

Taken together, the variation in intervention effectiveness suggests that schools should avoid asking only, "Which intervention is best?" A more useful question is, "Which intervention mechanism is best matched to this learner's regulation needs?" This transition from intervention type to learner need leads directly to the next discussion point: the benefits of emotion regulation support are strongest when learners are explicitly taught to recognise emotions,

communicate needs, and use coping strategies in real classroom situations.

5.5 From Intervention Mechanisms to Classroom Practice: A Conceptual Framework

Figure 2 presents the conceptual framework developed from the findings of this systematic literature review. From an educational research perspective, the framework shows that school-based emotion regulation support for learners with ASD should not begin with the selection of a programme alone. Instead, it should begin with an analysis of the learner's regulation needs and the school context. This is aligned with the research background of this review, which highlights that dysregulation among learners with ASD may be influenced by anxiety, sensory overload, communication difficulties, limited emotional awareness, social misunderstanding, and inconsistent classroom support. Therefore, the framework positions emotion regulation as both an individual learner competency and a school-based educational responsibility.

The first layer of the framework emphasises contextual factors, including learner factors and school factors. This is important because emotion regulation difficulties do not occur in isolation. Learner factors such as communication ability, sensory needs, anxiety level, emotional awareness, and social functioning influence how dysregulation is expressed. At the same time, school factors such as teacher knowledge, classroom routines, implementation support, and inclusive learning environments influence whether learners are supported effectively. In real teaching situations, this means that behaviours such as meltdowns, shutdowns, refusal, withdrawal, or task avoidance should not be interpreted only as misbehaviour. Instead, teachers need to consider whether the learner is overwhelmed, confused, anxious, overstimulated, or unable to communicate needs.

The second layer presents the main intervention approaches identified in the SLR findings. These include CBT and anxiety-focused interventions, social-emotional and peer support, body-based

regulation, technology-assisted learning, and teacher training with implementation support. As an educational framework, this layer shows that different intervention approaches serve different purposes. For example, CBT-based strategies are more relevant for learners whose dysregulation is linked to anxiety or uncertainty. Body-based strategies such as interoception and relaxation are more relevant for learners who experience sensory overload or high physiological arousal. Peer-mediated and social-emotional approaches are more relevant when dysregulation occurs during social interaction, while technology-assisted approaches may support learners who need visual structure, motivation, and repeated practice.

The third layer explains the core mechanisms that connect intervention approaches to learner outcomes. These mechanisms include cognitive appraisal and coping, emotional awareness and labelling, physiological regulation, social understanding, motivation and engagement, and teacher mediation with fidelity. This is the most important analytical part of the framework because it explains how interventions may work, not only what interventions are used. For example, an emotion card does not support regulation simply because it is a visual tool; it supports regulation because it helps the learner label emotions and communicate needs. A sensory break does not work only because the learner leaves the classroom; it works when it reduces physiological arousal and allows the learner to return to learning. This mechanism-based understanding helps teachers make more informed decisions rather than applying strategies mechanically.

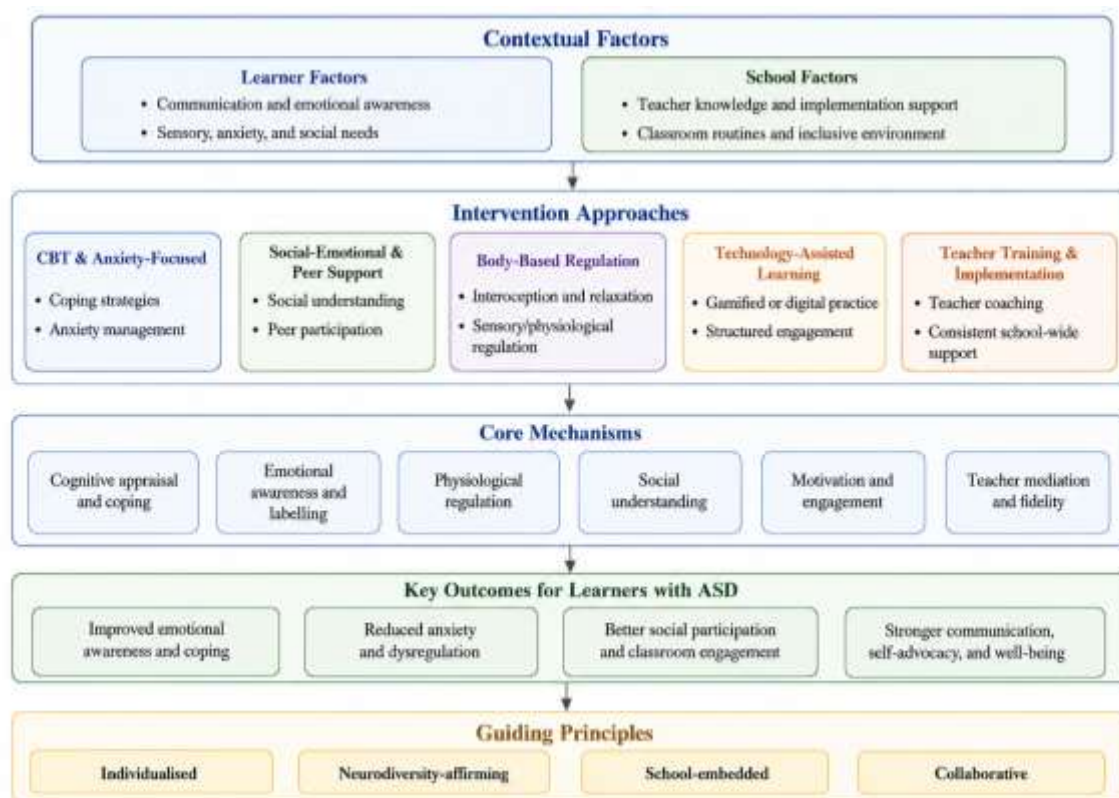
The fourth layer presents the expected outcomes for learners with ASD, including improved emotional awareness and coping, reduced anxiety and dysregulation, better social participation and classroom engagement, and stronger communication, self-advocacy, and well-being. These outcomes are directly connected to the research objectives of this review because they summarise the reported effects of school-based interventions. However, the framework also

suggests that these outcomes are more likely when interventions are properly matched to learner needs and embedded into daily classroom practice. For example, a learner may learn a calming strategy during an intervention session, but the outcome becomes meaningful only when the learner can use the strategy during transitions, group work, peer conflict, academic frustration, or sensory overload.

Overall, the conceptual framework provides a clear educational message: effective school-based emotion regulation support should be individualised, mechanism-based, school-embedded, and collaborative. For teachers, this

means that emotion regulation should not be treated only as a behaviour management issue or a one-to-one intervention task. It should be integrated into everyday teaching through predictable routines, shared emotional language, visual supports, coping choices, peer support, sensory adjustments, and consistent teacher prompting. The framework therefore strengthens the main conclusion of this SLR: supporting emotion regulation among learners with ASD is not simply about reducing challenging behaviour, but about helping learners understand emotions, communicate needs, use coping strategies, participate meaningfully, and experience more inclusive and supportive school environments.

Figure 2 Conceptual Framework for Mechanism-Based Emotion Regulation Support among Learners with ASD



5.6 Limitations and Future Research

Although the reviewed evidence suggests that school-based emotion regulation interventions are promising, several limitations must be acknowledged. First, the included studies varied in intervention type, outcome measures,

participant characteristics, educational context, and implementation procedures. This heterogeneity limited the possibility of conducting a meta-analysis and supported the use of narrative, thematic, and mechanism-based synthesis. This limitation is consistent with broader systematic review guidance, which

recognises that heterogeneity in study design, outcome measures, and intervention context can limit comparability and restrict meta-analytic synthesis (Page et al., 2021). Second, although all 22 studies used for thematic synthesis were verified and appraised as high quality using MMAT 2018, the type of evidence varied across studies. Some studies measured emotion regulation, self-regulation, coping, or anxiety regulation directly, while others measured related outcomes such as social participation, classroom engagement, emotional competence, teacher confidence, or implementation feasibility. Therefore, the findings should be interpreted according to whether each study provides direct, indirect, or implementation evidence.

Another limitation concerns long-term maintenance and generalisation. Many studies examined outcomes immediately after intervention, but fewer studies provided evidence on whether learners continued using regulation strategies across different classrooms, teachers, peer contexts, and school routines over time. This is important because the research background of this review emphasises that emotion regulation in ASD must be meaningful within authentic school routines, not only within structured intervention sessions. The review also included five supporting records, including protocols and contextual studies, which were useful for background, discussion, and future research directions but were not treated as final intervention outcome evidence.

Future research should use stronger longitudinal and implementation-sensitive designs to examine maintenance, generalisation, and real-world classroom application of emotion regulation strategies. Future studies should also use validated emotion regulation measures and include learner voice where possible, especially because autistic students' own experiences of regulation, masking, sensory overload, and support may differ from teacher or parent reports. More research is also needed in

Malaysian and Southeast Asian school contexts to understand how culture, language, policy, classroom resources, teacher preparation, family-school collaboration, and inclusive education systems shape school-based emotion regulation support for learners with ASD.

5.7 Implications

The findings have important implications for special and inclusive education. First, emotion regulation should be recognised as a core educational outcome for learners with ASD rather than as a secondary behavioural concern. Regulation affects attention, classroom participation, peer interaction, task completion, transitions, emotional well-being, and meaningful inclusion. Therefore, schools should adopt differentiated intervention planning by matching strategies to learners' specific regulation needs. Intervention should begin with an assessment of why the learner becomes dysregulated, whether this is linked to anxiety, sensory overload, difficulty identifying emotions, peer conflict, low motivation, or inconsistent classroom support.

A mechanism-based approach can guide teachers and school teams in selecting suitable interventions. CBT-based strategies may support learners whose dysregulation is related to anxiety, worry, or fear of uncertainty. Emotional education, visual emotion tools, and The Zones of Regulation may support learners who have difficulty identifying or communicating emotions. Interoception, relaxation, sensory breaks, and body-based strategies may be more suitable for learners with sensory overload, high arousal, or poor body awareness. Social-cognitive and peer-mediated approaches may support learners whose dysregulation occurs during peer interaction or group activities. Technology-assisted and gamified approaches may increase engagement for learners with low motivation, while teacher training and shared school-wide regulation language are essential when support is inconsistent across classrooms.

Table 10 Implication for Matching Intervention Mechanisms to Learner Profiles

Learner Need	Relevant Mechanism	Suitable Intervention
Anxiety, worry, or fear of uncertainty	Cognitive appraisal and coping	CBT, Facing Your Fears, coping plans, predictable routines
Difficulty identifying emotions	Emotional awareness and labelling	Zones of Regulation, emotional education, self-directed ER curriculum, visual emotion cards
Sensory overload or high arousal	Physiological and sensory regulation	Interoception, relaxation, sensory breaks, progressive muscle relaxation, body-based strategies
Peer conflict or social confusion	Social understanding and peer-context regulation	Social-cognitive intervention, peer-mediated support, reverse inclusion, social skills practice
Low motivation or disengagement	Motivation and engagement	Gamified learning, video-gaming intervention, virtual reality, digital ER tools
Inconsistent support across classrooms	Teacher mediation and implementation fidelity	Teacher training, provider coaching, shared school-wide regulation language

Second, teacher training should be prioritised because teachers are central to the delivery and sustainability of school-based emotion regulation support. Teachers need practical skills in recognising dysregulation, teaching coping strategies, using visual supports, adapting classroom demands, supporting sensory needs, and implementing interventions consistently. Training should be followed by coaching, collaborative planning, reflective practice, and leadership support to improve fidelity and sustainability. Schools should also create consistent regulation systems across classrooms through shared emotional language, visual supports, calm spaces, coping menus, predictable routines, and collaborative support plans (Chezan et al., 2023; Hayutin et al., 2025; Love et al., 2024; Öhlböck et al., 2024).

Finally, emotion regulation support should be neurodiversity-affirming and aligned with inclusive education values. The aim should not be to force learners to appear calm or compliant, but to help them understand emotions, communicate needs, access support, and participate meaningfully. School leaders and policy makers should recognise emotion regulation support as part of inclusive education quality. Schools require time, resources, training, multidisciplinary collaboration, and family-school communication

to implement sustainable regulation support for learners with ASD.

6.0 Conclusion

This systematic literature review concludes that school-based emotion regulation and self-regulation interventions can provide meaningful support for learners with ASD by improving emotional awareness, coping skills, anxiety regulation, physiological calmness, social participation, classroom engagement, communication of needs, and teacher-supported inclusion. The findings show that effective intervention does not rely on a single best programme, but depends on matching intervention mechanisms to learners' regulation profiles. CBT-based approaches may support cognitive coping and anxiety regulation, emotional education and The Zones of Regulation may strengthen emotional awareness, interoception and relaxation may support physiological and sensory regulation, peer-mediated approaches may improve social understanding, technology-assisted interventions may increase motivation and structured practice, and teacher-training approaches may strengthen implementation fidelity and sustainability. Therefore, emotion regulation should be understood as a teachable educational competency rather than only as a behavioural

management issue. The main implication is that schools should adopt differentiated, mechanism-based, and classroom-embedded support, where teachers are trained to identify the causes of dysregulation, adapt strategies to learner needs, use consistent emotional language, and reinforce regulation skills across daily routines. Overall,

improving emotion regulation among learners with ASD is not merely about reducing challenging behaviour, but about supporting emotional understanding, self-advocacy, meaningful participation, well-being, and inclusive education quality.

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