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Autistic Students in Multilingual Classrooms: A Mixed-Methods Comparison of Canadian Immersion and Lithuanian Bilingual Settings[1]

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Abstract

Multilingual classrooms are increasingly common, yet little is known about how they shape participation and executive function for students with autism spectrum disorder (ASD). This mixed-methods study compared 96 children aged 7-10 in three French immersion schools in Winnipeg, Canada, and three multilingual schools in Lithuania, including 34 students with ASD. Standardized measures of executive function (BRIEF-2) and receptive vocabulary (EVIP/PPVT), structured classroom observations, and teacher and parent surveys and interviews were analyzed concurrently. Across contexts, predictable routines and visual schedules were associated with higher working-memory and inhibition scores on the BRIEF-2 and with increased on-task engagement. In Winnipeg, high-fidelity French immersion combined with consistent visual supports yielded the largest vocabulary gains on the EVIP for autistic students. In Lithuania, flexible translanguaging and teacher-supported code-switching were linked to better emotional control ratings and smoother transitions between activities. Rather than opposing immersion and multilingual models, our findings highlight hybrid approaches that combine structure, sensory supports, and targeted flexibility in language use. Such designs appear to promote both participation and executive functioning for autistic learners in inclusive multilingual settings.

Keywords: Autism, bilingual education, translanguaging, inclusive pedagogy

1. Introduction

The hum of multilingual classrooms differs from place to place. In Winnipeg at École J.B. Mitchell, French phrases flow into English laughter on the recess yard. In Kaunas, Lithuania, students hear Lithuanian during lessons, Russian in hallways, and English during music time. They learn to read, calculate, interact, and calm themselves across all of these languages. For most children, this dynamic environment provides both challenge and enrichment. For autistic students, it can present additional hurdles as well as surprising supports.

This study addresses a critical question: can multiple language inputs increase cognitive load for students with autism spectrum disorder (ASD), or can structured routines and varied linguistic cues support executive functioning, attention, and flexibility? Existing studies have examined whether bilingualism helps or hinders language development in autistic children. A growing body of work has examined bilingualism and executive functions in autistic children, showing links between bilingual exposure and inhibitory control (Montgomery et al., 2022) and social attentional preferences (Davis et al., 2023), as well as broader syntheses on bilingualism, executive function, and autism (Giovannoli et al., 2020; Romero & Uddin, 2021). However, very few studies have focused on real-world multilingual classroom environments or on how classroom language practices interact with sensory needs, participation, and day-to-day executive demands for autistic learners. Even fewer have compared national models of multilingual schooling to identify practices that benefit inclusion.

This problem is far from theoretical. Multilingual classrooms are increasingly common worldwide, as migration and policy shifts bring learners with diverse language backgrounds into shared spaces (UNESCO, 2025; Erling et al., 2023). At the same time, inclusive education policies mean that many of these classrooms include neurodiverse students, including autistic learners and others with neurodevelopmental conditions (Petersson-Bloom & Holmqvist, 2022; Leung & Molnar, 2025). In Canada, French immersion programs were initially designed for English-speaking families but now welcome autistic students as well. Some educators worry immersion will overwhelm them, while others point to emerging evidence of cognitive and social benefits. Research by Marie-Ève Boisvert and Andréa Lavigne (2024) highlights how parental sensory strategies can

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inform classroom accommodations for autistic children in inclusive environments. Similarly, work by Bertone and colleagues on visuo-spatial and attentional processing in autism (2005) on visual and attentional strengths among autistic individuals offers a foundation for inclusive pedagogy in settings where more than one language is spoken. These studies provide crucial insights, yet they rarely examine day-to-day classroom routines or compare approaches across different multilingual contexts.

Lithuania offers a contrasting perspective. Its schools operate in environments where minority languages coexist with Lithuanian and English, though formal immersion policies are rare. Multilingualism here is lived daily, shaped by family and community practices rather than centralized programs. Teachers often rely on translanguaging to aid comprehension but lack structured supports for autistic learners. Comparing these settings side by side, from Winnipeg's structured immersion to Lithuania's flexible multilingualism, reveals opportunities to identify shared strategies that promote participation for autistic students in diverse educational systems.

Field observations in Winnipeg classrooms underscored the tension between fidelity to French and the flexibility often required for autistic learners. Teachers reported that visual routines and selective code-switching improved engagement, while strict language policies sometimes left parents feeling excluded. In Kaunas, educators described students shifting naturally between Lithuanian and Russian. This fluidity supported comprehension but left neurodiverse learners without consistent scaffolding.

These contrasting experiences highlight a gap in current research. A growing body of work has examined bilingualism and autism primarily through developmental and cognitive outcomes. Systematic reviews of bilingualism and executive functions in childhood (Giovannoli et al., 2020; Romero & Uddin, 2021) and empirical studies with autistic children show that bilingual or multilingual exposure can support aspects of cognitive flexibility, narrative skills, and sustained attention without harming development (Gonzalez-Barrero & Nadig, 2019; Peristeri et al., 2020; Sharaan et al., 2021). Recent work in *Autism Research*, for example, reports that multilingual children with ASD show stronger inhibition, shifting, and perspective-taking skills than their monolingual peers (Romero et al., 2024). However, these studies rely mainly on decontextualized executive-function tasks, standardized language tests, and parent-report measures. Very few examine how executive functioning, sensory profiles, and multilingual classroom routines intersect in everyday practice, or compare immersion models with more flexible multilingual approaches across different national contexts. Our study responds to this gap by situating autistic learners within real French immersion and Lithuanian multilingual classrooms and by focusing on concrete pedagogical practices (routines, visual supports, and language choices) rather than on abstract exposure to multiple languages.

We make three contributions. First, we shift the focus from burden to potential, exploring how structured language environments can leverage cognitive strengths in autistic students. Second, we center classroom routines, teacher discourse, and visual supports as key variables rather than relying solely on policy analysis. Third, we adopt a cross-national lens, comparing immersion classrooms in Winnipeg with multilingual classrooms in Lithuania to identify inclusive strategies that may be transferable across educational systems.

In Canada, inclusion mandates guarantee services for diverse learners. Winnipeg School Division and Seven Oaks School Division both serve autistic students in immersion programs, yet the level of classroom support varies widely. In Lithuania, inclusive policies exist but their implementation in multilingual contexts remains uneven. Teachers often rely on improvised methods without access to research-informed frameworks.

This comparative study focuses on three Winnipeg immersion schools, École J.B. Mitchell, École Riverview, and École Rivière Rouge, and three multilingual schools in Lithuania, Vilniaus Tarptautinė Mokykla, Kaunas Jonas Jablonskis Gymnasium, and Šalčininkai Bilingual Primary School. By combining classroom observations, executive function assessments using BRIEF-2, and parent and teacher questionnaires, we examine how language practices and routines interact with participation and cognitive functioning in students with ASD.

The purpose is not to privilege one model over another. Instead, this work seeks to identify inclusive practices that enable autistic learners to thrive in environments where multiple languages are constantly in play.

Guided by this rationale, the study addressed three research questions:

RQ1: How do classroom language practices and routines in French immersion and Lithuanian multilingual schools compare for students with ASD?

RQ2: How are these practices associated with autistic students' executive functioning and receptive vocabulary outcomes?

RQ3: How do teachers and parents in both contexts perceive the supports and barriers that shape autistic students' participation in multilingual classrooms?

Each research question was examined through integrated quantitative (BRIEF-2, vocabulary tests, engagement scores) and qualitative (observations, interviews) data.

2. Literature Review

The idea that switching between languages provides a cognitive edge is now supported by decades of empirical research. Ellen Bialystok's foundational work shows that bilingual children between the ages of five and seventeen often outperform monolingual peers on tasks involving inhibitory control, task switching, and working memory. Those tasks demand flexible attention management, which bilinguals practice daily (Bialystok, 2015). A more recent systematic review confirmed that bilingual status correlates with improved executive functioning across diverse contexts, although effects vary with task type and context (Giovannoli et al., 2020).

These findings directly inform our interest in ASN learners. If bilingual experiences strengthen cognitive control mechanisms, autistic students may benefit from language environments that offer structured but flexible multilingual input. Cognitive flexibility and inhibition are often areas of challenge in autism; therefore, education that engages and supports these skills may translate into improved classroom participation and self-regulation.

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by differences in social communication, restricted and repetitive patterns of behaviour, and distinctive sensory profiles. Many autistic children also experience uneven language development, with strengths in vocabulary or decoding co-existing with difficulties in pragmatic language, flexible conversation, or processing rapid verbal input. These features are closely linked to executive functions such as working memory, inhibition, and emotional control, which are often taxed in busy classrooms. In multilingual settings, multiple language codes, shifting routines, and dense auditory input can either amplify these challenges or, when structured carefully, provide additional cues that support comprehension and self-regulation.

In Canada, research on autism and bilingual education remains limited but growing. Boisvert and colleagues have explored ways to support autistic children in inclusive writing environments. Though the focus was older adolescents and the activity was writing, their strength-based analysis highlighted how concrete supports and sensory understanding can empower participation (Lavigne & Boisvert-Hamelin, 2024).

Armando Bertone's neuropsychological research at McGill University examines executive functioning and perceptual strengths in autistic children. A 2023 study on cognitive flexibility in autistic adolescents using the Wisconsin Card Sorting Task found that those who experienced some bilingual input demonstrated performance advantages in shifting tasks (Lung et al., 2023). Though that study was not immersion-based, it suggests bilingual contexts may support aspects of executive function among autistic youth.

Recent research has highlighted how bilingual environments can shape executive functioning in autistic children, particularly in areas such as inhibitory control. Montgomery, Chondrogianni, Fletcher-Watson, and colleagues (2022) demonstrate that exposure to multiple languages can offer cognitive benefits without exacerbating core challenges associated with autism. Their findings reinforce the importance of accounting for developmental trajectories when designing immersion programs for neurodivergent learners, emphasizing that bilingual contexts, when structured thoughtfully, may support both language growth and self-regulation skills.

Studies of inclusion in Canadian schools show persistent barriers for autistic students, including inconsistent supports and sensory overload in mainstream settings (Lord et al., 2020). These findings highlight the importance of structured environments that use visual routines, linguistic scaffolding, and predictable schedules to foster inclusion.

Studies from other parts of the world provide useful perspectives. A 2024 study by Romero and colleagues in *Autism Research* shows that multilingual autistic children demonstrated stronger parent-reported inhibition, shifting, and perspective-taking skills than monolingual peers, suggesting a cognitive advantage that may extend beyond language itself (Romero et al., 2024).

In broader multilingual urban contexts, Oh and colleagues (2023) found that the interplay between home and school language exposure is closely linked to children's executive function outcomes. While their work does not specifically address autism, it shows that richer multilingual environments are associated with improved task switching and working memory.

Autism and bilingualism research often highlights developmental equivalence between autistic bilingual and monolingual children. A comprehensive review by Romero and Uddin (2021) indicates that core autism symptoms and language trajectories are largely comparable across both groups. Their synthesis also notes emerging evidence of advantages in nonverbal IQ and adaptive functioning among bilingual autistic children. While the notion of a "bilingual advantage" in autism remains debated, cumulative findings suggest that bilingualism does not hinder development and may in some cases support specific cognitive domains.

Despite emerging work in Canada and Europe, few studies directly compare multilingual schooling environments serving autistic students across continents. Canadian studies often focus on inclusion in single-language immersion (French-English), while European work tends to examine multilingual exposure in community or refugee contexts without explicit consideration of neurodiversity.

To our knowledge there is no published research that directly compares classroom-level routines, teacher practices, and participation outcomes among autistic learners in structured immersion programs (such as Winnipeg) and flexible multilingual classrooms (such as in Lithuania). This absence limits our understanding of how specific pedagogical strategies, including visual schedules, translanguaging, and code-switching, interact with the cognitive and sensory needs of autistic students.

In sum, scholarship reinforces a provisional advantage of bilingual or multilingual environments for executive functioning, including in autistic populations. Canadian research on autism inclusion emphasizes sensory and executive support through structured routines, while European literature situates multilingual exposure within cognitive adaptation frameworks. However, the contextual intersection of autism, multilingual schooling, and curriculum structures remains under-explored in a cross-national dimension.

Taken together, research on bilingualism and executive function (e.g., Bialystok, 2015; Giovannoli et al., 2020), autism and multilingual experience (Montgomery et al., 2022; Romero & Uddin, 2021; Romero et al., 2024), and inclusive schooling for autistic students (Lord, 2020; Lavigne & Boisvert-Hamelin, 2024) suggests that multilingual exposure does not harm autistic children and may, under specific conditions, support aspects of executive control and participation. Yet almost all of these studies examine children in a single national or programmatic context and focus on developmental outcomes rather than day-to-day classroom life. To our knowledge, no published research directly compares autistic learners' experiences in structured immersion programs such as French–English models in Canada and in more flexible multilingual classrooms such as those found in Lithuania. This gap motivates the present study, which compares three Canadian immersion schools and three Lithuanian multilingual schools and examines how classroom language practices and structured routines align with autistic students' executive function and participation.

3. Methodology

We adopted a convergent mixed-methods design, combining quantitative and qualitative data to examine how multilingual classroom environments influence participation and executive function in autistic learners. Standardized cognitive assessments were paired with structured observations and interviews, allowing us to capture measurable outcomes while also exploring classroom dynamics and teacher strategies that cannot be reduced to numbers alone.

The Canadian sample came from three French immersion schools in Winnipeg: École J.B. Mitchell, École Riverview, and École Rivière Rouge. These schools are located in diverse neighborhoods yet share a common provincial curriculum and full French immersion model. Each site contributed one or two Grade 2 or 3 classrooms, each including at least one child with a formal autism diagnosis.

The Lithuanian cohort was drawn from three multilingual schools: Vilniaus Tarptautinė Mokykla, Kaunas Jonas Jablonskis Gymnasium, and Šalčininkai Bilingual Primary School. These schools operate in Lithuanian, Russian, and Polish, with English added as a foreign language, providing a contrasting model of flexible multilingual instruction.

Children were eligible if they were between seven and nine years old, had an official autism spectrum diagnosis, and attended the participating classrooms full-time. Students with severe intellectual disability or less than six months in the program were excluded. The final sample included 34 autistic children (18 in Winnipeg, 16 in Lithuania) and their classmates as comparison groups for observation data. Teachers (n = 12) and parents (n = 29) participated in questionnaires and interviews.

3.1 Measures

We used the Behavior Rating Inventory of Executive Function, Second Edition (BRIEF-2), completed by both teachers and parents. This standardized questionnaire measures nine domains of executive functioning : Inhibit, Self-Monitor, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Task-Monitor, and Organization of Materials, grouped into three composite indices (Behavioral Regulation, Emotional Regulation, and Cognitive Regulation). The BRIEF-2 has well-established reliability and validity for school-aged children, including those with neurodevelopmental conditions; in this study, we used authorized translations and followed test publisher guidelines for administration and scoring.

Language ability was assessed with the Échelle de Vocabulaire en Images Peabody (EVIP) in Winnipeg and an adapted Peabody Picture Vocabulary Test in Lithuania. Both instruments provide norm-referenced standard scores. The Lithuanian version followed a standard forward–back translation procedure, and items with cultural or lexical mismatch were reviewed by a panel of bilingual speech-language pathologists. Both instruments provide norm-referenced standard scores and have been widely used to assess receptive vocabulary in multilingual populations.

Observation grids were designed to track indicators of participation across six domains: (1) on-task behaviour, (2) response to teacher instructions, (3) peer interaction, (4) communication attempts, (5) use of visual and linguistic supports, and (6) sensory regulation strategies (e.g., self-calming behaviours, use of sensory

tools). Language use was recorded in real time, noting the proportion of target language, moments of translanguaging, and teacher code-switching patterns.

Parents and teachers completed questionnaires on background, home language exposure, and perceived challenges and strengths in learning. These questionnaires were developed by the research team based on existing instruments used in autism inclusion and bilingual education research and were piloted with a small group of families and teachers in each country to refine wording and response options.

Semi-structured interviews with teachers (45–60 minutes) and parents (30–45 minutes) were conducted in person or via secure videoconferencing. Interview guides included prompts on (a) perceptions of autistic students' strengths and challenges in multilingual classrooms, (b) concrete classroom strategies (e.g., visual schedules, sensory tools, language choices), and (c) collaboration between home and school. All interviews were audio-recorded, transcribed verbatim in the original language, and, when necessary, translated into English for analysis.

Data collection unfolded over twelve weeks in each country. Each classroom was observed four times, covering literacy and math sessions. Standardized assessments were administered within the same period, and interviews followed the final observation.

Observation protocols and coding manuals were harmonized across countries. Joint training sessions ensured inter-rater reliability above 0.85. BRIEF-2 instruments were used in authorized translations, and vocabulary test scores were converted to standard scores for cross-national comparison.

Approval was granted by the University of Manitoba Research Ethics Board and Vytautas Magnus University's Social Sciences Ethics Committee. Parental consent and child assent were required. Participation was voluntary, with clear assurances of confidentiality. Data were anonymized and securely stored in compliance with Canadian and European privacy regulations, including GDPR.

3.2 Analysis

Quantitative data were analyzed using descriptive statistics, t-tests, and ANOVA to compare outcomes between high- and low-consistency language environments and across countries. Effect sizes (Cohen's d) were reported alongside p-values to clarify practical significance. Correlation and regression analyses examined links between language input consistency and executive function scores while controlling for socioeconomic and home-language variables.

Qualitative data from observations and interviews underwent thematic analysis. Codes were developed iteratively, moving from descriptive categories (teacher scaffolding, peer mediation) to interpretive themes (translanguaging as inclusion, sensory safety zones). Patterns were compared across countries to highlight common strategies and culturally specific practices. Finally, quantitative and qualitative findings were integrated through joint displays to provide a comprehensive understanding of autistic participation in multilingual classrooms.

4. Results

In this section, we organize the findings by research question. For each research question, we first present the quantitative results (BRIEF-2 and vocabulary scores, engagement rates) and then integrate qualitative insights from classroom observations and interviews.

Across all Winnipeg sites, students exposed to French in over 85% of instructional interactions showed marked vocabulary growth on the EVIP, averaging an 8-point gain over one academic term. This effect persisted even among autistic students whose baseline scores were significantly lower than peers, suggesting that consistent immersion can compensate for initial language delays.

Differences between the three Canadian schools were nevertheless notable. At École Rivière Rouge, where classroom routines were tightly scripted and transitions clearly signposted, gains were highest among autistic learners (+9 points). J.B. Mitchell reported moderate gains (+7 points) but faced more variability tied to staff turnover and inconsistent language policies. Riverview, with its higher proportion of English-dominant peers, saw the smallest gains (+5 points) despite well-resourced support services.

In Lithuania, vocabulary outcomes were less tightly coupled to language fidelity. Students in Kaunas' Jonas Jablonskis Gymnasium, which employed a dual Lithuanian–Russian track, gained as much vocabulary as peers in the monolingual Vilniaus Tarptautinė Mokykla. Interviews revealed that translanguaging strategies, such as allowing Russian clarifications during Lithuanian reading activities, buffered cognitive load for autistic students without compromising target language acquisition. By contrast, the Šalčininkai Bilingual Primary School, where language policies shifted mid year due to staffing, exhibited the greatest variability.

Table 1. Vocabulary gains by context and fidelity

Context & Fidelity	Autistic Students (Mean Gain)	Non-Autistic Students (Mean Gain)
Winnipeg – High Fidelity	+8.0	+6.2
Winnipeg – Moderate	+3.2	+4.1
Lithuania – Flexible	+6.5	+6.0

This table masks important within-group differences: autistic students from French-dominant homes in Winnipeg scored highest overall, while English-dominant autistic students benefited most from structured peer scaffolds rather than fidelity alone. In Lithuania, Russian-dominant students thrived when teachers explicitly legitimized code-switching, aligning with studies by Lanza (2004) on flexible bilingual practices.

4.1 Findings for RQ1: Classroom language practices and routines

RQ1 asked how classroom language practices and routines in French immersion and Lithuanian multilingual schools compare for students with ASD, and how these arrangements relate to day-to-day executive demands.

Quantitatively, BRIEF-2 ratings indicated divergent cognitive benefits across contexts. In Winnipeg, high-fidelity immersion classrooms with stable routines and clearly displayed daily schedules were associated with higher Working Memory and Inhibit scores for autistic students than more variable immersion settings (see Figure 1). This pattern echoes previous work on bilingualism and executive control (Bialystok, 2015), but in our sample the advantage was contingent on environmental predictability rather than language exposure alone.

In contrast, Lithuanian students showed their strongest advantages on the Emotional Control subscales. Classrooms that allowed flexible movement between Lithuanian and Russian during whole-group and peer-mediated activities were rated by teachers and parents as having fewer emotional outbursts and smoother transitions. BRIEF-2 scores in these settings reflected fewer difficulties with shifting and emotional regulation compared with more rigidly monolingual classes.

Qualitative data help clarify how these routines were experienced. In Winnipeg, classroom observations documented teachers returning repeatedly to the same visual timetable, using consistent verbal cues in French before every transition, and pairing new instructions with gestures or pictograms. Autistic students were more likely to remain seated, complete tasks, or re-engage quickly after transitions when these routines were followed closely. Teachers described the visual schedule as a central anchor of the day and noted that when it was omitted or altered without warning, some autistic students became visibly anxious, left their seats, or needed additional adult support to resume the activity.

In Lithuanian schools, observations instead highlighted the role of language flexibility within otherwise stable routines. Teachers frequently allowed brief Russian explanations during instruction in Lithuanian, particularly at moments of heightened sensory load (for example, noisy group work or movement between rooms). Autistic students were often seen to resume participation after such short code-switching episodes and then return to Lithuanian as the activity progressed. In interviews, teachers and parents linked this practice to a sense of safety and recognition for autistic learners, describing strategic code-switching as a way to lower emotional intensity and restore balance during challenging moments.

Taken together, the quantitative and qualitative data for RQ1 suggest that predictable routines and explicit visual structure are central for autistic students in both contexts, while the language of those routines can be flexibly configured. High-fidelity immersion appears most supportive when it is embedded in highly predictable classroom scripts, whereas in Lithuanian multilingual schools, strategic code-switching within stable routines plays a key role in maintaining emotional regulation and participation.

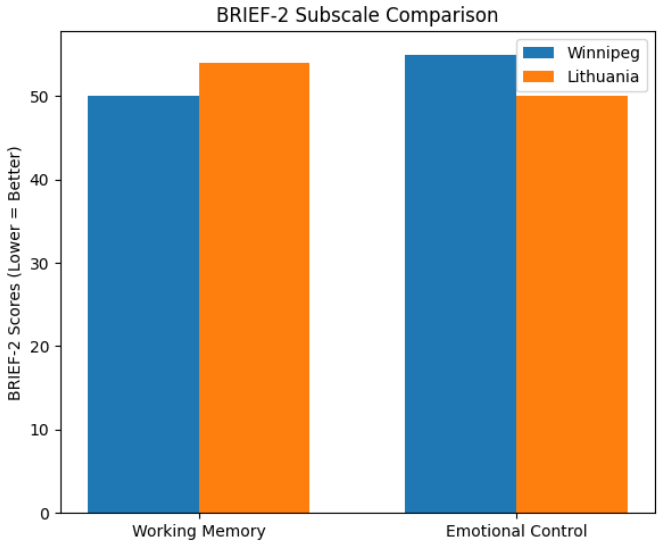

Figure 1. BRIEF-2 subscale comparisons (working memory, emotional control)

4.2 Findings for RQ2: Executive function and vocabulary outcomes

RQ2 examined how classroom practices are associated with autistic students' executive functioning and receptive vocabulary outcomes, and how these cognitive demands are reflected in patterns of participation and engagement.

Building on the vocabulary gains summarized in Table 1, autistic students who showed the strongest EVIP progress in Winnipeg were typically those in classrooms combining high target-language exposure with predictable routines and explicit visual supports. In these same settings, teachers and parents reported fewer concerns on BRIEF-2 Working Memory and Inhibit scales, suggesting that structured immersion can support both language growth and executive control when cognitive load is managed carefully. In Lithuania, flexible multilingual classrooms yielded comparable vocabulary gains for autistic and non-autistic students, but the most positive BRIEF-2 profiles were found in groups where translanguaging was integrated into stable daily routines, rather than used ad hoc.

To understand how these cognitive outcomes played out in everyday classroom life, we examined engagement scores derived from structured observations. Observation grids revealed striking task-dependent patterns. In Winnipeg, autistic students displayed high engagement during teacher-led literacy sessions (mean 82% of observation intervals), but engagement dropped sharply during unstructured group activities, at times dropping to around 50%. Teachers linked this decline to sensory overstimulation and ambiguous role expectations in group tasks. Notably, classrooms offering sensory tools such as noise-cancelling headphones and weighted lap pads maintained engagement above 70% even in noisier settings, suggesting that sensory accommodations can help autistic students mobilize their emerging executive skills in more demanding social contexts.

Lithuanian classrooms showed an almost reversed pattern. Flexible, peer-driven activities, often involving both Lithuanian and Russian, boosted participation to an average of 71%, while solitary literacy tasks produced more uneven engagement. Field notes indicated that opportunities to negotiate meaning with peers in a familiar language reduced anxiety and supported persistence on tasks that would otherwise have been overwhelming. When language use was tightly constrained to the target code without acknowledging students' home languages, observers noted more frequent withdrawal behaviours (e.g., leaving the table, gaze aversion, covering ears) among autistic students.

Table 2. Engagement scores by task type and sensory support

Task Type	With Sensory Support	Without Sensory Support
Structured Literacy	82% engaged	64% engaged
Unstructured Peer	71% engaged	49% engaged

Qualitative data from teacher and parent interviews help explain these quantitative patterns. Winnipeg teachers described structured literacy blocks as "the calmest part of the day," where clear visual cues and consistent routines allowed autistic students to "know exactly what comes next" and to use their working memory resources on decoding and comprehension rather than on decoding the situation itself. Several teachers noted that when group work was introduced without clear roles or sensory supports, autistic students who had demonstrated good vocabulary growth "shut down" or became preoccupied with managing noise and proximity.

In Lithuania, teachers and parents emphasized the relational dimension of engagement. They reported that autistic students were more likely to remain on task when allowed to ask clarifying questions or share brief comments in Russian or Polish with trusted peers, even when the main instructional language was Lithuanian. This strategic flexibility was described as giving students "a small breathing space" to process instructions and emotions before rejoining the whole-group activity. Parents linked this pattern to improvements in their children's ability to shift between tasks and contexts, a core aspect of executive functioning.

Taken together, the quantitative indicators (vocabulary gains, BRIEF-2 ratings, engagement percentages) and qualitative insights (observations, interviews) for RQ2 suggest that executive function and language outcomes are closely intertwined with participation dynamics. Structured literacy tasks in predictable environments appear to support the deployment of working memory and inhibitory control, while sensory tools and strategic flexibility in language use help autistic students sustain engagement in socially complex activities.

4.3 Findings for RQ3: Perceptions of supports and barriers

RQ3 examined how teachers and parents in both contexts perceive the supports and barriers that shape autistic students' participation in multilingual classrooms, with particular attention to home–school language relations.

Parent questionnaires underscored the critical role of home language alignment. In Winnipeg, 70 % of autistic participants came from English-dominant households with minimal French exposure outside school; these students depended heavily on classroom fidelity for vocabulary growth, as reflected in the EVIP gains reported in Table 1. Parents in this group frequently described French as "the school language" and emphasized their limited ability to support homework or literacy tasks at home. In Lithuania, most autistic participants were Russian-dominant. Families actively maintained Russian in everyday life while schools encouraged translanguaging practices, producing more balanced bilingual outcomes but a slower acquisition of Lithuanian academic registers. Figure 2 illustrates these patterns, showing higher vocabulary gains among students whose home language matched at least one school language compared to peers whose home language differed from both instructional languages.

Qualitative data provide a more nuanced picture of how families interpret these patterns. Winnipeg parents often expressed a mixture of pride and helplessness: they valued immersion but felt "out of the loop" when unable to follow classroom French. Several described relying on visual materials sent home—photos of schedules, word lists, or short videos—to bridge this gap. By contrast, Lithuanian parents framed the school's openness to Russian as a form of recognition: they reported that their children felt "seen" when allowed to ask questions or clarify instructions in their home language, even when the primary language of instruction remained Lithuanian.

Teachers' perspectives echoed and sometimes complicated these parental views. In Winnipeg, many teachers identified visual schedules, predictable routines, and clear sensory supports as the most effective tools for supporting autistic learners, but they also reported tension between strict immersion policies and their desire to use English briefly in moments of high stress or confusion. Some described consciously breaking the "French-only rule" to de-escalate situations or to ensure comprehension for autistic students, then returning quickly to French once the crisis passed. In Lithuania, teachers were generally more comfortable with flexible bilingual practices but highlighted other barriers, including large class sizes and limited access to specialized autism training, which constrained their ability to individualize sensory supports.

Across both sites, interviewees converged on the importance of consistent communication between home and school. Parents who received regular updates about classroom routines and sensory strategies, such as forthcoming changes to the timetable or introductions of new activities, reported fewer meltdowns at home and smoother transitions on school days. Teachers, for their part, valued detailed information from families about sensory triggers and effective calming techniques, noting that these insights helped them adjust seating arrangements, noise levels, and the pacing of activities.

Taken together, the quantitative and qualitative findings for RQ3 suggest that perceptions of support are shaped as much by relational and communicative factors as by specific tools. Alignment between home and school languages appears to facilitate vocabulary growth and confidence, while misalignment can be partially mitigated when schools share visual materials and invite parents into the pedagogical process. At the same time, both teachers and parents identified structural barriers (policy rigidity, limited training, resource constraints) that can hinder the implementation of otherwise effective strategies. These perceptions reinforce the need to treat

home–school collaboration and language recognition as central components of inclusive multilingual design for autistic learners.

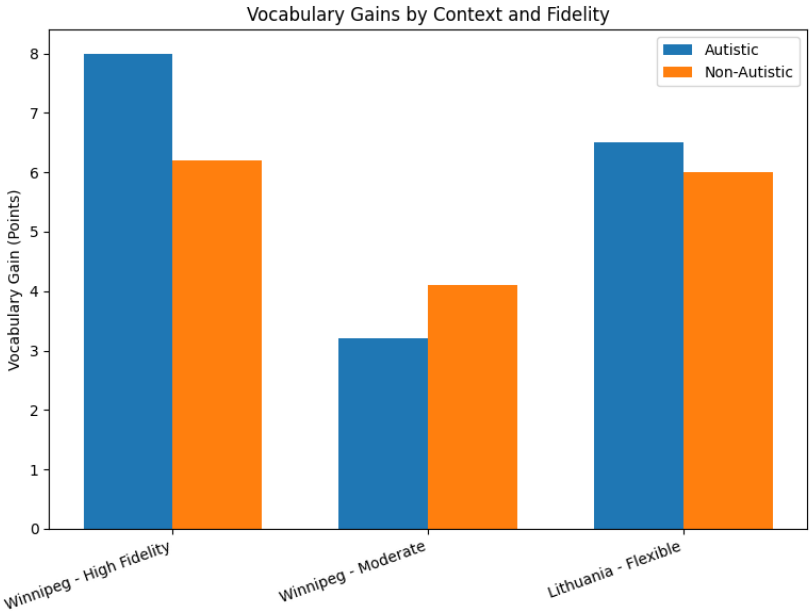

Figure 2. Vocabulary gains by alignment between home language and school language(s)

4.4 Integrated Findings

Bringing together the quantitative indicators (vocabulary gains, BRIEF-2 scores, engagement rates) and the qualitative material (observations, teacher and parent interviews) allows us to identify three interrelated mechanisms that underpin autistic students' participation across the six schools (Figure 3).

First, predictability and routine emerged as a core mechanism in both countries, but especially in Winnipeg. When high target-language fidelity was combined with explicit visual timetables, stable transition scripts, and consistent teacher cues, autistic students showed stronger gains in receptive vocabulary and more favourable Working Memory and Inhibit scores on the BRIEF-2. Observations and interviews converged in portraying these classrooms as "knowable" spaces: students could anticipate what would happen next and thus allocate executive resources to decoding language and content rather than monitoring the environment. In immersion settings where routines were less explicit or frequently disrupted, this advantage largely disappeared, despite similar levels of French exposure.

Second, affective comfort through flexible language use played a distinctive role in the Lithuanian sites. There, modest but consistent advantages in Emotional Control scores, together with fewer observed meltdowns during transitions, were closely tied to teachers' and peers' use of strategic translanguaging. Short switches into Russian or Polish during moments of stress or conceptual difficulty allowed autistic students to clarify meaning, regulate emotions, and then re-engage with Lithuanian tasks. Parents and teachers explicitly described this flexibility as providing "breathing space," suggesting that multilingual negotiation can function as an affective support rather than a threat to target-language learning.

Third, across all schools, sensory accommodations and intentional peer scaffolding operated as universal moderators. Access to noise-cancelling headphones, weighted materials, and predictable seating arrangements, combined with carefully structured peer roles, consistently lifted engagement scores across task types—often more than language-policy fidelity alone. In classrooms where such supports were absent or inconsistently implemented, autistic students with otherwise similar vocabulary gains and BRIEF-2 profiles were more likely to disengage during group work or high-stimulus activities.

Taken together, these integrated findings challenge binary debates that oppose immersion to multilingual approaches. Rather than privileging one model, they suggest that autistic learners benefit most from context-sensitive combinations of predictability, linguistic flexibility, and environmental supports. In this perspective, language policy becomes one component of a broader design for participation: its impact depends on how it intersects with classroom routines, sensory provisions, and the everyday relationships that sustain learning.

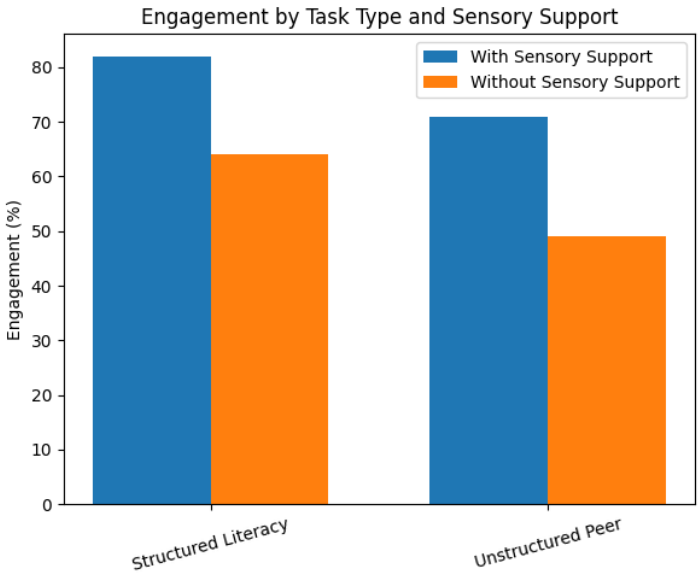

Figure 3. Integrated summary of mechanisms linking classroom practices, executive function, and participation

5. Discussion

Across two strikingly different educational landscapes—structured French immersion in Winnipeg and flexible multilingual classrooms in Lithuania—one common thread emerged with unmistakable clarity: predictability matters. Autistic children in both contexts demonstrated stronger executive functioning when classrooms offered visual schedules, explicit routines, and clearly demarcated learning spaces. These findings echo work on bilingualism and executive control (Bialystok, 2015; Giovannoli et al., 2020) but extend it by showing that, in our sample, the benefit is not purely linguistic. It is the structure surrounding language use (the routines, transitions, and predictable sensory environments) that enables autistic learners to marshal their cognitive resources.

This insight mirrors conclusions from Lavigne and Boisvert-Hamelin (2024), who found that addressing sensory needs at home improved participation in school. Our classroom observations show the same dynamic in reverse: predictable sensory strategies in school, such as noise-cancelling headphones or weighted lap pads, stabilized emotional states and enabled children to engage meaningfully with bilingual content. It is not the presence of two languages alone, but the orchestrated environment that determines whether those languages become a source of growth or stress.

Despite this shared reliance on structure, the two contexts diverged sharply in their approach to language policy. Winnipeg's immersion classrooms, particularly at École Rivière Rouge and J.B. Mitchell, maintained high fidelity to French instruction but allowed pragmatic flexibility during moments of emotional escalation or comprehension breakdown. Teachers described brief English clarifications not as policy failures but as lifelines that safeguarded the child's dignity and preserved classroom flow. This stance reflects a growing trend in North American immersion programs toward relational bilingualism, where student well-being tempers rigid fidelity.

Lithuania's multilingual schools, by contrast, operated under a more explicitly normative stance at the policy level. At Kaunas Jonas Jablonskis Gymnasium, Lithuanian dominated academic subjects while Russian was officially framed as appropriate mainly for social interactions. Teachers reported pressure from administrators and national policy to maintain Lithuanian purity, sometimes viewing code-switching as a deviation rather than an instructional tool. At the classroom level, however, many still used brief Russian explanations to maintain autistic students' engagement, especially during transitions or complex tasks. In our observations, it was where such strategic flexibility was discouraged—not where it was quietly practiced—that autistic students appeared more anxious and more reliant on peers than adults for coping. This tension mirrors sociolinguistic debates in Baltic contexts, where language policy remains deeply entwined with questions of national identity (e.g., Lanza, 2004).

The findings contribute to ongoing debates over the so-called bilingual advantage. Systematic reviews (Giovannoli et al., 2020; Yuen et al., 2025) show modest benefits for inhibitory control and cognitive flexibility in bilingual children but inconsistent effects for working memory. Our results, particularly for RQ2, complicate this picture. Canadian participants scored higher on inhibition and working memory than their Lithuanian peers, but this advantage appeared contingent on predictable routines, not bilingual exposure per se. Rather than a

universal bilingual advantage, we observed a context-conditioned bilingual benefit: gains emerged only when immersion fidelity was paired with structured supports.

Neuroscientific perspectives lend weight to this interpretation. Romero and Uddin (2021) argue that bilingualism may enhance neural plasticity in networks implicated in attention and cognitive control, a potential buffer for autistic children who often struggle with these domains. Similarly, Montgomery et al. (2022) demonstrated that bilingual autistic children outperform monolingual peers in inhibitory control tasks, particularly when home and school language practices align. Our findings echo these results: children whose home language complemented classroom instruction, whether French in Winnipeg or Russian in Lithuania, displayed smoother code-switching and fewer executive control lapses.

Sociolinguistic theory also enriches this analysis. Lanza's work on bilingual family discourse underscores code-switching as more than a linguistic convenience; it is a relational practice that signals inclusion or exclusion. In Lithuanian classrooms, spontaneous Russian clarifications during Lithuanian reading exercises reduced affective stress and strengthened peer bonds, despite violating formal policy. This echoes ethnographic accounts of translanguaging as a social comfort strategy rather than a purely cognitive mechanism (see also Oh et al., 2023).

5.1 Practical implications: toward transnational inclusive practices

The convergence of findings across two distinct systems offers valuable lessons for inclusive education worldwide. First, visual and sensory supports should be treated not as accommodations for a minority of students but as universal design features. The positive impact of visual routines on executive functioning was observed in both settings, cutting across linguistic, cultural, and policy differences. Schools designing bilingual or multilingual programs, whether in Europe, North America, or elsewhere, can integrate such supports without compromising language goals.

Second, teacher training must evolve to reconcile language fidelity with flexibility. In Winnipeg, teachers already deploy micro-strategies like brief English clarifications to de-escalate stress or clarify instructions. Formalizing these practices, framing them not as policy violations but as evidence-based supports, could reduce teacher anxiety and foster consistency across classrooms. Lithuanian schools, by contrast, may benefit from loosening rigid monolingual expectations to accommodate autistic students' emotional regulation needs, particularly during transitions.

Third, the study underscores the importance of home-school alignment. In Winnipeg, where French is rarely spoken at home, vocabulary growth depended almost entirely on school fidelity. In Lithuania, where Russian is actively maintained by families, translanguaging practices supported balanced bilingualism but slowed acquisition of Lithuanian academic registers. These contrasts suggest that policy makers and educators must engage families as partners, equipping them with strategies to extend language learning and regulate sensory environments across contexts.

Beyond its immediate practical value, this study fills a gap in autism and bilingualism research: cross-national comparison. Few studies have examined how autistic learners navigate bilingual or multilingual classrooms across cultural and policy boundaries. By juxtaposing a Canadian immersion model with a Lithuanian multilingual approach, our work reveals that neither immersion nor flexibility alone guarantees success. Instead, hybrid models blending predictable routines with selective code-switching may offer the most neurologically supportive environments.

The findings also challenge deficit-based assumptions about autistic bilingual learners. As Romero et al. (2024) recently reported, multilingual exposure can positively influence both executive functioning and certain autism symptoms when appropriately scaffolded. Our results confirm this potential, while also cautioning against one-size-fits-all prescriptions. Autistic profiles are heterogeneous, and supports must be tailored to individual sensory thresholds, family language practices, and community expectations.

6. Conclusion

This comparative study set out to understand how autistic learners navigate multilingual classrooms in two distinct contexts: structured French immersion in Winnipeg and flexible bilingual education in Lithuania. By blending cognitive assessments, classroom observations, and teacher interviews, we uncovered a nuanced story. The data show that predictable routines and sensory supports are indispensable scaffolds, regardless of language policy or national context. These elements stabilized working memory, reduced behavioral disruptions, and created space for genuine participation.

At the same time, flexibility in language practices emerged as a powerful tool for emotional regulation. Lithuanian classrooms, where code switching between Lithuanian and Russian was informally accepted, provided a psychosocial buffer that mitigated anxiety and smoothed peer interactions. This dynamic was less visible in Winnipeg's high-fidelity immersion settings, where predictability rather than linguistic flexibility was the dominant strength.

Together, these findings challenge the binary framing that so often dominates debates about bilingual education for autistic students. It is neither strict immersion nor free translanguaging alone that fosters success. Rather, it is the interplay between structure and flexibility, adapted to each learner's sensory profile and cultural environment, that creates equitable opportunities for learning.

This conclusion also reframes the bilingual advantage debate. Cognitive benefits of bilingualism, when observed, appear inseparable from contextual supports such as visual schedules, teacher–student trust, and alignment between home and school languages. Like all comparative case studies, our work is subject to limitations. The sample was restricted to six schools in two regions, and our measures relied on rating scales and observations collected over a single school year. We did not include autistic students' own narratives about structure, flexibility, and language use, and future research should prioritize participatory designs that centre their perspectives. Larger studies in other multilingual contexts could test the mechanisms identified here (predictability, strategic flexibility, and sensory supports) and examine how they operate across different policy environments and cultural settings. For autistic learners, the language itself is not inherently beneficial or harmful; the environment in which it is taught determines whether it becomes a source of stress or a pathway to growth.

7. Recommendations

Based on our mixed-methods findings, we offer four practice-focused recommendations for inclusive multilingual classrooms serving autistic learners:

1. **Treat visual and sensory supports as universal design features.**
   Schools should systematically implement visual schedules, consistent transition routines, and access to sensory tools (e.g., noise-cancelling headphones, weighted materials) in all multilingual classrooms, not only in designated support rooms, because these features were consistently associated with higher engagement and smoother transitions for autistic students.
2. **Allow strategic code-switching to protect emotional regulation.**
   Immersion and bilingual programs should explicitly authorize brief, strategic use of students' dominant language during moments of stress or when clarifying complex concepts. In our data, such practices supported emotional regulation and prevented disengagement; we therefore recommend that they be framed as an inclusion strategy rather than a policy failure.
3. **Align home and school language practices.**
   Teachers and school leaders should involve families in co-designing language practices, sharing simple activities that extend target-language exposure at home while affirming the family's home language as a resource. Our findings suggest that this alignment supports vocabulary growth, confidence, and continuity of sensory strategies across settings.
4. **Embed autism-specific training in teacher professional development.**
   Teacher education and in-service training should include modules on sensory profiles, executive function supports, and multilingual pedagogy for autistic learners, using examples from both immersion and flexible multilingual contexts. This responds directly to teachers' reported need for concrete tools to combine language goals with executive-function and participation supports.

The implications of this study extend beyond a single classroom. For teachers and schools, our results indicate that predictability, through visual schedules, structured transitions, and calm sensory environments, should be treated as a baseline design principle in multilingual and immersion programs. These supports reduce cognitive load not only for autistic students but for many learners, and thus operate as universal design rather than individualized accommodation.

For families and home–school collaboration, the findings support deliberate efforts to maintain and value the home language alongside the school's target language. Joint planning around songs, stories, and daily routines in both languages can strengthen identity and cognitive flexibility. We also recommend that teachers and parents explicitly share information about sensory triggers and calming strategies so that autistic students encounter coherent expectations and supports across home and school.

At a policy and systems level, the study invites a move away from rigid monolingual mandates on one side and unstructured multilingual practices on the other. Policy frameworks should give local educators room to integrate strategic translanguaging, visual supports, and sensory accommodations into immersion and multilingual models, with clear expectations that these practices are part of inclusive design. Teacher training and ongoing professional learning should prioritize autism-specific strategies in multilingual settings, supported by partnerships between researchers, school divisions, and families.

Finally, we recommend that future research build on these findings by testing specific combinations of visual supports, sensory strategies, and language-flexibility policies in different multilingual contexts. Inclusion, in this perspective, is not a choice between immersion and multilingualism, but a commitment to designing environments in which autistic students can participate meaningfully. Classrooms that combine structure with

flexibility do more than teach language; they model educational spaces wher difference is expected, supported, and valued.

8. Limitations

Several limitations warrant acknowledgment. Sample sizes, though sufficient for mixed-methods analysis, limit generalizability beyond the observed schools. Differences in teacher training, curriculum, and socio-economic context likely contributed to observed outcomes and warrant controlled study. Moreover, our focus on primary education leaves unanswered questions about how these dynamics unfold during adolescence, when linguistic demands and social complexities intensify.

Future research should pursue longitudinal neurodevelopmental tracking, integrating executive function measures with neuroimaging to examine how bilingual exposure interacts with brain networks over time. Comparative studies beyond Europe and North America, for example in multilingual African or Asian contexts, could test the universality of our findings. Finally, participatory research involving autistic youth and their families as co-designers would deepen understanding of what inclusive multilingual education truly requires.

Ethics Statements

The studies involving human participants were reviewed and approved by the Research Ethics Board of the Canadian Institute of Open Knowledge (Ethics # HS31653) and Vytautas Magnus University (Protocol #J7045-B52). Written informed consent was obtained from all participating parents or guardians, and verbal assent was secured from the children. All procedures complied with the Declaration of Helsinki and relevant national and institutional ethical guidelines.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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Generative AI Statement

The authors did not use generative AI or AI-assisted technologies to create, analyze or interpret content. Antidote 11, a non-generative AI tool, was used under human supervision exclusively to improve the language, clarity and readability of the manuscript. All content was reviewed and verified by the authors.

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